

Глубокоуважаемый Рысбек Зарылдыкович!

Профессорско-преподавательский состав и весь коллектив Кыргызского национального аграрного университета им. К.И. Скрябина сердечно поздравляют Вас с 60-летним юбилеем и 38-летием трудовой деятельности и желают Вам крепкого здоровья, дальнейшей плодотворной деятельности на благо процветания нашего учебного заведения.

Вы, Рысбек Зарылдыкович - академик национальной академии наук Кыргызской Республики, доктор ветеринарных наук, Лауреат Государственной премии Кыргызской Республики в области науки и техники, заслуженный деятель науки КР, ректор Кыргызского национального аграрного университета им. К.И. Скрябина. ведущий ученый в области вирусологии и биотехнологии.

После окончания Московской ветеринарной академии им. К.И. Скрябина которую Вы закончили блестяще, получили диплом с отличием в 1983 году, свою трудовую деятельность начали главным ветеринарным врачом колхоза “Коммунизм” Тянь-Шаньского р-на Нарынской области. Но, вскоре Вы поняли, что хотите заниматься наукой и в 1985 году поступили в аспирантуру Московской ветеринарной академии им. К.И. Скрябина. В годы учебы в аспирантуре Вам посчастливилось работать с известными советскими учеными, как академик Сюрин Василий Николаевич, профессор Белоусова Раиса Васильевна.

После завершения аспирантуры, Вы возвратились в Киргизию, в свой альма-матер и продолжали свою научную деятельность в качестве ассистента кафедры эпизоотологии, микробиологии и паразитологии Кыргызского сельскохозяйственного института им. К.И. Скрябина. Все эти годы Ваша трудовая деятельность неразрывно связана с флагманом высшего аграрного образования Республики - Кыргызским национальным аграрным университетом им. К.И. Скрябина, в котором Вы работали преподавателем, доцентом, заместителем декана, деканом факультета ветеринарной медицины, профессором и наконец – ректором.

В 1989 году Вы успешно защитили кандидатскую, в 1997 году - докторскую диссертацию; а в 1999 году по решению ВАК КР Вам было присвоено ученое звание профессора.

В 2010 году Вы были избраны член-корреспондентом, а в 2021 году - действительным членом (академиком) Национальной Академии Наук КР.

Под Вашим началом воспитывается целое поколение молодых ученых и специалистов по вирусологии и молекулярной биологии. Вы организовали обучение молодых исследователей в передовых международных научных центрах по исследованию особо опасных инфекций (России, Казахстане, США, Канаде, Японии, Германии, Швейцарии), которые теперь работают не только в нашей

республике, но и в ближнем и дальнем зарубежье. Являясь учеником и последователем советской и российской школы вирусологов академика ВАСХНИЛ Сюрин В.Н. и профессора Белоусовой Р.В., Вы создали и возглавили в Кыргызской Республике отечественную школу вирусологов, где подготовили 5 докторов и 18 кандидатов биологических и ветеринарных наук.

Вы, уважаемый Рысбек Зарылдыкович, одним из первых в Кыргызстане стали заниматься молекулярно-биологической диагностикой вирусных болезней. Под Вашим научным руководством развиваются научные исследования по вирусным заболеваниям в республике, обеспечивающие биологическую безопасность Кыргызстана. В свое время Вы проходили научные стажировки по молекулярной биологии и вирусологии в научно-исследовательских центрах России, Германии, Австрии, США и Канаде.

Вы являетесь разработчиком и научным координатором пяти международных проектов по изучению трансграничных инфекционных болезней в области биологической безопасности по линии МНТЦ. Так же руководили международными проектами по линии ICARDA, IFAT, JICA, МФСР, ФАО, ТИКА.

Вы как ученый представляете интересы научной мысли Кыргызстана на многих авторитетнейших международных форумах – Германии, Австрии, Китая, Кореи. Ваша научная деятельность признана мировым научным сообществом, результаты Ваших научных исследований публикуются в известных международных индексируемых журналах. По индексу Хирша в области сельскохозяйственных научных изысканий Вы занимаете одно из первых мест в Кыргызской Республике. Вами опубликовано 323 научные работы, в т.ч. 2 монографии, 26 методических рекомендаций, 12 научных разработок по биотехнологии вакцинных препаратов, которые признаны изобретениями и запатентованы.

Под Вашим руководством как ректора КНАУ им. К.И. Скрябина произошли большие изменения. Вы сказали себе *«...я приложу все усилия, для того, чтобы университет стал одним из лучших университетов Кыргызстана, и студенты будут гордиться своим альма-матер, как я в свое время»*. У Вас есть любимое выражение *«step by step»* шаг за шагом уверенно идти к своей цели. Это было нелегко, но благодаря своим качествам, таким как: смелость, настойчивость, уверенность, сила духа, требовательность к себе и подчиненным, коммуникабельность и жажда научного поиска, Вам удалось добиться того, что сейчас КНАУ им. К.И. Скрябина заслуженно занимает достойное место в числе ведущих вузов страны. Благодаря Вам в Кыргызском национальном аграрном университете им. К.И. Скрябина большое внимание уделяется развитию международного сотрудничества в области образования и науки путем интеграции

в мировое образовательное пространство и установления двусторонних связей с университетами и научно-исследовательскими Центрами стран СНГ и мира.

Благодаря Вашей инициативе открыт единственный в Центральной Азии музей воды, созданы центр аквакультуры и рыболовства (Аквацентр), электронная библиотека, демонстрационное рыбное хозяйство (ДРФ), лаборатория Воды, на кафедрах факультетов открыты лаборатории для подготовки высококвалифицированных специалистов.

Как талантливый педагог и ученый, все эти годы Вы как крупный ученый ведете большую научно-организационную работу, активно занимаетесь подготовкой кадров высшей квалификации. Вы являетесь членом Совета ректоров аграрных ВУЗов стран Содружества; членом Ассоциации ректоров Кыргызской Республики, членом президиума Национальной Академии Наук КР, членом Лиги аграрного образования, науки и инновационных технологий в рамках инициативы КНР «Один пояс-Один путь» сотрудничества Юг-Юг, председателем диссертационного Совета.

К своему славному юбилею Вы подошли как видный ученый, организатор науки и образования, внесший большой вклад в развитие нашего университета и страны в целом.

**Коллектив Кыргызского национального аграрного университета
им. К.И. Скрябина**

Dear (honorable) Rysbek Zaryldykovich!



On behalf of the Council of Rectors of Leading Agrarian Universities of the CIS, and also the multi-thousand-strong team of the Kazakh National Agrarian Research University, I congratulate you on your Jubilee!

Let me express to you my deep respect and respect as a person, talented leader, statesman and scientist. A competent approach to business, high authority and foresight allow you to successfully implement the most projects.

You know how to captivate and unite people. With your inherent decisiveness and dedication you achieve high results. Your energy, erudition, hard work and adherence to principles in life serve as a worthy example.

You are a renowned scientist in biotechnology and veterinary virology, academician of the National Academy of Sciences, laureate of the State Prize in the field of science and technology, Honored Scientist of the Kyrgyz Republic. You have prepared 5 doctors, 18 candidates of sciences.

In your activities, you give priority not to the form, but the content of the work performed. This is required not only from yourself, but also from your employees, scientists, teachers involved in the training of the young generation of specialists.

In making decisions, you try to take into account the opinions of students, young scientists, faculty, stakeholders, foreign partners, as this allows you to combine various ideas and proposals for the development of the university.

Under your leadership, the university opened: the Kyrgyz-Chinese research laboratory for the study of water and soil quality in Central Asia, an information and computer technology station, a demonstration and training center for Aquaculture, a training information and consulting center to support the country's cooperatives, a Kyrgyz-Chinese techno park is being created, a lot of work is being done to ensure the food and biological security of the country, etc.

We are proud that our universities have strong partnerships that are characterized by mutual understanding and mutual respect. And this is your great merit!

We sincerely wish you good health, success in implementation of the plans, happiness and prosperity.

Sincerely,

**Chairman of the Council of Rectors
leading agricultural universities of the CIS,
Rector of the Kazakh National
Agricultural Research University,
Vice-President of the National Academy of Sciences of the Republic of Kazakhstan,
academician T. I. ESPOLOV**

Dear (honorable) Rysbek Zaryldykovich!

On behalf of me personally and on behalf of the staff of the Moscow State Academy of Veterinary Medicine and Biotechnology, please accept my heartfelt congratulations on your jubilee.

As a graduate of the academy, which it is rightfully proud of. Reliable partners of your alma mater. For many years of successful and fruitful work for the benefit of higher education, you have earned great respect from Russian and foreign colleagues.

High professionalism, competence and responsibility help you to work fruitfully as a rector of the Kyrgyz National Agrarian University named after K.I. Skryabin.



Today you are confidently leading your course forward, along the path of developing international, scientific and cultural cooperation. Thus, increasing the opportunities for international educational mobility for the younger generation.

Your labor, scientific and pedagogical activity has been duly appreciated by numerous awards.

I wish that your inherent professionalism and strategic thinking, scientific competence and creative potential will continue to accompany your successful activities in the training of demanded and highly professional specialists in the field of veterinary medicine and agriculture.

Rysbek Zaryldykovich, may excellent health, happiness and good luck become your constant companions.

Goodness and prosperity to you and your family

With Sincerely

Rektor of Moscow State Academy of Veterinary Medicine and Biotechnology

Doctor of Veterinary Science, Professor Pozyabin S. V.

Section I. Agronomy

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PROSPECTS FOR THE INTRODUCTION OF GREEN FERTILIZERS IN IRRIGATED ARABLE LAND IN KYRGYZSTAN

Abstract: *This work reflects the role of green manure stubble plants - white melilot, white mustard, oil radish, rowan-leaved phacelia, spring barley, in the intensification of irrigated agriculture and the formation of the main indicator of soil fertility - humus, improving the agrochemical properties of arable land when additional biophilic nutrients enter the soil as part of the phytomass of stubble green manure plants and substantiates the need for further development of irrigated agriculture based on its biologization using green fertilizer and shows high agrotechnical, agroecological, energy-saving and economic efficiency of green manure in stubble crops of green manure in combination with the straw of the previous main crop, winter wheat, when microbiological processes in the soil take place under optimal conditions, with the replenishment of soil organic matter.*

Key words: *animal manure (manure), stubble crops, green manure, nutrients, soil fertility*

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ПЕРСПЕКТИВЫ ВНЕДРЕНИЯ ЗЕЛЕННЫХ УДОБРЕНИЙ НА ОРОШАЕМЫХ ЗЕМЛЯХ КЫРГЫЗСТАНА

Аннотация: *отражена роль пожнивных сидеральных растений - донника белого, горчицы белой, редьки масличной, фацелии рябинколистной, ярового ячменя, в интенсификации орошаемого земледелия и формировании основного показателя плодородия почвы – гумуса, улучшения агрохимических свойств пашни при поступлении дополнительных биофильных элементов питания в почву в составе фитомасса пожнивных сидеральных растений и обоснована необходимость дальнейшего развития орошаемого земледелия на основе его биологизации с использованием зеленого удобрения, и показана высокая агротехническая, агроэкологическая, энергосберегающая и экономическая эффективность сидерации при пожнивных посевах сидератов в сочетании с соломой предыдущей основной культуры-озимой пшеницы, когда в оптимальных условиях протекают микробиологические процессы в почве, с пополнением запасов органического вещества почвы.*

Ключевые слова: *навоз, пожнивные сидераты, зеленое удобрение, питательные вещества, плодородие почвы*

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КЫРГЫЗСТАНДЫН СУГАРЫЛУУЧУ АРАБИЛДИК ЖЕРЛЕРИНДЕ ЖАШЫЛ ЖЕР СЕМИРТКИЧТЕРДИ КИРГИЗҮҮНҮН КЕЛЕЧЕГИ

Аннотация: *жаздык арпа, ак таттуу беде, ак кычы, май чамгыр, фацелия сыяктуу орто мезгилде өстүрүлүүчү сидерат өсүмдүктөрүн жашыл жер семирткич түрүндө пайдаланып, аларды сугат айдоо топурактарынын асылдуулугун көтөрүүдө, өзгөчө топурактын органикалык заты – гумусту көбөйтүүдө жана айдоо жерлеринин агрохимиялык сапаттарын сидераттар топуракта фитомассасынын курамында калтырган биофилдик азык элементтери менен жакшыртууда сидераттарды максатка*

ылайык колдонуу менен дыйканчылыкты жүргүзүүдө биологиялаштыруу ыкмаларын кучагына камтыган жашыл жер семирткичтерди пайдаланууну айыл чарба өндүрүшүндө киргизүү менен дыйканчылык жүргүзүүнүн агроэкологиялык, энергия үнөмдөөчү ымаларын жана жогорку сапаттагы агротехниканы айыл чарба өсүмдүктөрүнүн түшүмүн көбөйтүүдө киргизсе болот жана топурактын күрдүүлүгүн көтөрүүдө сидераттар талаада калтырган фитомасса менен мурдагы өстүрүлгөн өсүмдүк - буудайдын фитомассасы туура айкалышып, топурактын микробиологиялык активдүүлүгүн көбөйтүп, топурактын азык зат режимин жакшыртып, түшүмдү жогорулатууга түздөн-түз таасир берет.

Ачык сөздөр: кык, орто мезгилде өстүрүлүүчү сидерат өсүмдүктөрү, жашыл жер семирткичтер, азык зат элементтери, топурактын асылдуулугу

Introduction

Currently, the issue of rational use of irrigated arable land and its preservation as the main means of production in agriculture and an important link in the biosphere, where the primary task is the reproduction of soil fertility, is acute. One of the promising agricultural technologies is the use of green manure as a green fertilizer in combination with technogenic factors of soil fertility reproduction, which is of great agroecological, energy-saving and economic importance [1,2,4].

The soil and climatic conditions of the main regions of irrigated agriculture in our country make it possible to widely introduce stubble catch crops and their placement is practiced after early harvested (cereal crops, early vegetables, etc.) agricultural crops [7]. The scientifically grounded use of green fertilizer in combination with other agrotechnical methods contributes to an increase in the profitability of agricultural production and works to protect the agricultural landscape.

The introduction of green fertilizers into agricultural production will help create conditions for attracting foreign investment in the development and implementation of environmentally friendly technologies, the integrated implementation of the principles of a green economy, environmentally friendly, energy and water saving technologies, and also serves to prevent environmental migration, the development of

ecotourism and the implementation of other environmental protection measures.

Object, materials and research methods

On irrigated arable lands in the central part of the Chui Valley of the Kyrgyz Republic, research is being carried out to study the influence of green manure crops - white mustard, white melilot, spring barley, rowan-leaved phacelia, oil radish on the yield and quality of potato production and on soil fertility indicators against the background of sprinkling irrigation.

Field experiments with green manure stubble crops placed after winter wheat were carried out according to the following scheme:

- 1*. Control - 50% NPK
- 2 *. Green manure (white annual sweet clover) + Potatoes -50% NPK
- 3 *. Green manure (white mustard) + Potatoes -50% NPK
- 4*. Green manure (oil radish) + Potatoes - 50% NPK
- 5*. Green manure (rowan-leaved phacelia) + Potatoes -50% NPK
- 6 *. Green manure (barley) + Potatoes -50% NPK

*where *: control and variants of the experiment have an agrochemical background - 50% NPK, i.e.*

N = 120 kg/ha of active ingredient, P = 90 kg/ha of active ingredient, K = 90 kg/ha of active ingredient.

Indeed, according to the research of many scientists with The joint application of green and mineral fertilizers is more effective than their separate application (Berdnikov, 1990; Schieder, 1978; Vetter, 1959). In

In our experience, the previous crop is winter wheat, the harvest of which is harvested in the third decade of July, and The agroclimatic potential of the central part of the Chui Valley, the subsequent growing season of green manure plants, allows them to be placed against the background of irrigation (irrigation with sprinklers).

The method of field work on the experimental site, and laboratory studies of plant and soil samples were carried out according to the generally accepted methods of the Kyrgyz Republic.

Thus, the selection of the aboveground mass of green manure crops (in late autumn before plowing) was carried out on an area of 1 m² in four replicates, placing them along the diagonal of each plot of the experiment and in each variant of the experiment for 3 replicates, i.e. selected 4 x 3 = 12 samples of the aboveground mass in each variant of the experiment according to the method of Grishina L.A., Samoilova E.M. (1971) and Levina F.I. (1973). And in the same place, root samples are taken from the topsoil (0-25 cm) and subsoil (25-50 cm) of the soil, using the monolith method from an area of 25 cm x 25 cm and to a depth of 25 cm by the method of N.A. Kachinsky. (1925), i.e. 4 x 3 = 12 samples from the arable and 4 x 3 = 12 samples from the subsoil, and until the roots lost their turgor, they were washed with water using a sieve with a diameter of 0.25 mm and separated the green manure roots from the soil.

addition, plowing green manures together with straw against the background of mineral fertilizers (from 50 to 200 kg / ha of active ingredient) in a crop rotation with green manure fallow increased the nutritional value of corn silage by 0.02 - 0.03 feed units as compared with occupied fallow (Sotnikov, 2004)...

Fresh aboveground and root mass of green manure is weighed on an analytical balance and dried to an air-dry state and weighed, and the difference (fresh and dry samples) is used to calculate the percentage of phytomass moisture. From the samples of the green manure phytomass taken from the entire plots of each variant of the experiment, the average amount of phytomass is calculated and from the average samples of the green manure phytomass samples are taken for laboratory analyzes.

Research results and evaluation

As you know, the main sources of organic matter replenishment in irrigated arable land are the annual input of organic matter in the composition of post-harvest plant residues, lifetime root exudates of agrocenosis and the introduction of manure, as well as the input of green manure in the green phytomass. Annual insufficient replenishment is the main reason for the decrease in the potential soil fertility and ensuring the country's food security requires a solution to this urgent problem of agricultural production.

One promising direction for the biologization of irrigated agriculture is the introduction of green manure (winter and stubble intermediate plants) as a green fertilizer, which serves as a link in intensive farming, performing the function of protecting the environment from pollution [3,9].

Their use is more environmentally and cost effective than preparing and spreading manure. In Table 1, we compare the incoming nutrients in the composition of Table 1

the green manure phytomass with cattle manure (at the equivalent to semi-rotted manure).

Application of biophilic nutrients into the soil as part of the phytomass of green manure stubble plants

Green manure and animal manure	dry weight, t / ha	nutrients enter the soil, kg / ha				Equiva tapes to manure, t / ha
		N	P ₂ O ₅	K ₂ O	sum	
Manure, 20 t/ha	6.0	84.0	44.0	102.0	230.0	20.0
White melilot	6.31	201.95	14.48	107.59	324.2	28.2
Mustard white	12.35	343.61	24.71	237.28	605.6	52.7
Spring barley	5.9	165.07	12.57	110.73	288.37	25.1
Phacelia rowan-leaved	8.72	185.83	17.21	136.66	339.7	29.5
Oil radish	12.14	264.82	21.72	157.07	443.61	38.6

Biophilic nutrients in the composition of green fertilizers certainly represent a natural biological factor - increasing soil fertility and working in solving environmental problems of the agricultural landscape.

As can be seen from Table 1, in the green phytomass of green manure plants, there is a clear dominance of nitrogen and a small amount of phosphorus in comparison with similar indicators of manure. Thus, the phytomass of white sweet clover (dry weight 6.31 t / ha) contains 201.95 kg / ha nitrogen, 14.48 kg / ha phosphorus, 107.59 kg / ha potassium, i.e. the sum of biophilic plant nutrients is 324.2 kg / ha, and 20 t / ha of semi-rotted cattle manure (6 t / ha dry weight), respectively, contains 84.0 kg / ha of nitrogen, 44.0 kg / ha of phosphorus and 102, 0 kg / ha potassium (total 230 kg / ha).

And the use of fresh phytomass of white melilot as a green fertilizer when comparing their equivalent to 20 t / ha semi-rotted cattle manure is 28.2 t / ha of organic fertilizer, and similar indicators of white mustard, respectively, is -52.7 t / ha, spring barley - 25.1 t / ha, phacelia - 29.5 t / ha, oil radish - 38.6 t / ha.

Moreover, the coefficient of nitrogen utilization of stubble manure in the first year is 2 times higher than the coefficient of manure and the processes of decomposition of green fertilizers in the soil proceed faster than others. [organic fertilizers](#) containing slowly decomposing (straw, etc.) substances [3].

The plowing of the above amount of organic matter of stubble manure improves the nutrient regime of the soil, activates microbiological activity and replenishes

humus reserves, and also increases the content of nitrates, saprophytic microorganisms and actinomycetes. All this contributes to the improvement of [phytosanitary](#) soil conditions.

The studied stubble crops represent environmentally friendly, economically profitable renewable sources of green fertilizers, which are based on the use of solar energy resources for the production of organic fertilizers and is the forerunner of the introduction of the principles of a "green"

Findings and summary

1. Introduction of green manure stubble plants into the irrigated agriculture system of the Kyrgyz Republic as green fertilizers serve to improve agro-ecological, energy-saving and economic indicators of agricultural production.

2. The use of intermediate stubble green manure plants as green fertilizer is economically and environmentally more efficient than the use of manure.

3. The obtained materials of our research work allow us to recommend green manure crops on irrigated arable lands in the Central part of the Chui Valley of the Kyrgyz Republic: white mustard, white sweet clover, spring barley, mountain ash-leaved phacelia, oil radish as green fertilizers.

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The green phytomass of stubble green manures entering the soil in the soil and climatic conditions of the central part of the Chui Valley, when optimal conditions for decomposition are created in spring, provide a vigorous vital activity of soil microorganisms and can play the maximum role of green fertilizers.

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ROOT MASS OF GREEN MANURE STUBBLE CROPS AND THEIR IMPORTANCE FOR THE FERTILITY OF IRRIGATED SIEROZEMIC AND MEADOW SOILS

Abstract: *This work address the issue of the importance of the underground mass of green manure stubble plants - sweet clover, white mustard, oil radish, rowan-leaved phacelia, spring barley, concentrated in the arable and sub-arable layers of arable land to increase the fertility of irrigated arable land in the sierozemic and meadow soils of the Chui valley of the Kyrgyz Republic, especially to improve the agrophysical and agrochemical properties and microbiological activity of soils, which ultimately works to increase the yield of agricultural crops and improve the quality of products of agroecology, and they form the basis of organic agriculture with agrobiological production technologies to obtain environmentally friendly crop products in the recommended system of irrigated agriculture of agricultural farms in Kyrgyzstan. The obtained materials of research work make it possible to recommend green manure stubble crops on irrigated arable lands in the Central part of the Chui Valley of the Kyrgyz Republic: white mustard, white melilot, spring barley, rowan-leaved phacelia, oil radish as green fertilizers.*

Key words: *root mass, value, green manure, fertility, soil, biological activity of soil, yield, agroecology*

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КОРНЕВАЯ МАССА ЗЕЛЕННЫХ НАВОЗНЫХ СИДЕРАЛЬНЫХ КУЛЬТУР И ИХ ЗНАЧЕНИЕ ДЛЯ ПЛОДОРОДА ОРОШАЕМЫХ СЕРОЗЕМНЫХ И ЛУГОВЫХ ПОЧВ

Аннотация: *рассматривается значение подземной массы пожнивных сидеральных растений - донника белого, горчицы белой, редьки масличной, фацелии рябинколистной, ярового ячменя, сосредоточенные в пахотном и подпахотном слоях пашни для повышения плодородия орошаемой пашни сероземно-луговых почв Чуйской долины Кыргызской Республики, особенно для улучшения агрофизических и агрохимических свойств и микробиологической активности почв, что в конечном счете работает на увеличение урожайности сельскохозяйственных культур и повышение качества продукции агроценозов и они составляют основы ведения органического сельского хозяйства с агробиологическими технологиями производства для получения экологически чистых продуктов растениеводства в рекомендуемой системе орошаемого земледелия аграрных хозяйств Кыргызстана. Полученные материалы научно-исследовательской работы позволяют рекомендовать на орошаемых пашнях Центральной части Чуйской долины КР пожнивные сидеральные культуры: горчицы белой, донника белого, ячменя ярового, фацелии рябинколистной, редьки масличной в качестве зеленых удобрений.*

Ключевые слова: *корневая масса, значение, сидераты, плодородие, почва, биологическая активность почвы, урожайность, агроценозы*

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КЫКТУУ СИДЕРАЛДЫК ЖАШЫЛ ӨСҮМДҮКТӨРДҮН ТАМЫР МАССАСЫ ЖАНА СУГАРЫЛУУЧУ БОЗ ТОПУРАКТУУ ЖАНА ШАЛБАЛУУ ЖЕР КЫРТЫШЫНЫН АСЫЛДУУЛУГУ ҮЧҮН АЛАРДЫН МААНИСИ

Аннотация: *жаздык арпа, ак таттуу беде, ак кычы, май чамгыр, фацелия сыяктуу орто мезгилде өстүрүлүүчү сидерат өсүмдүктөрүнүн айдоо жана айдоо алдындагы катмарда*

топтолгон тамыр массаларынын сугат айдоолору болгон боз-шалбаа топурактарынын асылдуулугун көтөрүүдөгү ролу көрсөтүлүп, өзгөчө алардын топурактын агрофизикалык, агрохимиялык сапаттары менен микробиологиялык активдүүлүгүн жогорлатуудагы тийгизген таасири каралган жана алар айыл чарба өсүмдүктөрүнүн түшүмдүүлүгүн көтөрүүдө, агроценоздордун продукциясынын сапатын жакшыртууда кызмат көрсөтүүсү баса белгиленген жана сидераттарды айыл чарба өндүрүшүндө кеңири колдонуунун негизиндеги агробиологиялык технологияларды айыл чарба өндүрүшүнө киргизүүгө болору жана экологиялык жактан таза өсүмдүк продукциясын алууга өбөлгө түзөрү айтылган. Илимий изилдөөлөрдүн негизинде алынган жыйынтыктар - Кыргызстандын Чүй өрөөнүнүн борбордук бөлүгүндө эрте жыйналуучу өсүмдүктөрдөн кийин жайга штырылган орто мезгилде өстүрүлүүчү: жаздык арпа, ак таттуу беде, ак кычы, май чамгыр, фацелия сидераттарын жашыл жер семирткич түрүндө пайдалануу үчүн сунуштоого мүмкүнчүлүк берет.

Өзөктүү сөздөр: тамыр массасы, мааниси, сидератар, топурак асылдуулугу, биологиялык активдүүлүк, түшүмдүүлүк, агроценоздор

Introduction

The agro-industrial complexes of developed countries, to increase the fertility and phytosanitary state of soils, widely use renewable sources of green fertilizers, which contribute to increasing plant productivity and obtaining ecologically clean agricultural products. Numerous research works carried out in the Eurasian continent have shown that green manure crops are the most effective and accessible method of soil enrichment with bioenergetic organic material and have great agroecological, energy-saving and economic significance (1,2,7,8,9). They found that the effective use of irrigated land by sowing catch crops increases the flow of organic matter into the soil and restores the fertility of irrigated arable land. However, green manure crops have not yet become widespread in the Kyrgyz Republic.

Subject and methodology of the Research

On irrigated sierozemic and meadow soils of the central part of the Chui Valley, on the basis of public-private partnership: Kirby and the K.I. Skriabin Kyrgyz National University of Agriculture (KNAU), study the influence of green manure crops on soil fertility and yield and quality of potato products against the background of sprinkler irrigation.

Field experiments on crops of stubble green manure crops placed after harvesting winter

wheat were carried out according to the following scheme:

1. Control
2. Green manure (white annual sweet clover) + potatoes
3. Green manure (white mustard) + potatoes
4. Green manure (oil radish) + potatoes
5. Green manure (rowan-leaved phacelia) + potatoes
6. Green manure (barley) + potatoes

The preceding crop is winter wheat, the harvest of which is harvested in the third decade of July and, the agroclimatic potential of the central part of the Chui Valley allows the placement of stubble crops against the background of irrigation (irrigation with sprinklers)

The method of field work on the experimental site, and laboratory studies of plant and soil samples were carried out according to the generally accepted methods of the Kyrgyz Republic.

Thus, the selection of the aboveground mass of green manure crops (in late autumn before plowing) was carried out on an area of 1 m² in four replicates, placing them along the diagonal of each plot of the experiment and in each variant of the experiment for 3 replicates, i.e. selected

4 x 3 = 12 samples of the aboveground mass in each variant of the experiment according to the method of Grishina L.A., Samoilova E.M. (1971) and Levina F.I. (1973). And in the same place, root samples are taken from the topsoil (0-25 cm) and subsoil (25-50 cm) of the soil,

using the monolith method from an area of 25 cm x 25 cm and to a depth of 25 cm by the method of N.A. Kachinsky (1925), i.e. 4 x 3 = 12 samples from the arable soil and 4 x 3 = 12 samples from the subsoil layers, and until the roots lost their turgor, they were washed with water using a sieve with a diameter of 0.25 mm and separated the green manure roots from the soil.

Fresh root mass of green manures is weighed on an analytical balance and dried to an air-dry state and weighed, and the percentage of phytomass moisture is calculated by the differences (fresh and dry samples). From the samples of the green manure phytomass taken from the entire plots of each variant of the experiment, the average amount of phytomass is calculated and from the average samples of the green manure phytomass samples are taken for laboratory analyzes.

Research results

It is well known that the role of plant root systems is important in the soil-forming process, which are directly related to the accumulation of soil organic matter, in particular humus, biological redistribution of

nutrients in the soil, improving the structure of arable land and activating the vital activity of soil microorganisms (3,4,7,11, 12).

In addition, the root system of plants is involved in the emission of carbon dioxide, i.e. v the process of CO₂ release from the earth's surface into the atmosphere, which is the total CO₂ production produced by soil microorganisms as a result of the decomposition of organic matter, as well as a result of the vital activity of soil fauna and plant root systems (9).

When green manure crops are introduced into agricultural production, their positive effect and high efficiency of the action of their green plant mass on the nutrient regime of soils, especially the vegetative fresh root mass, are felt. They determine the legitimacy of considering green manure as a biological factor in increasing the fertility of the studied irrigated soils of the Chui Valley, where their positive effect as a green fertilizer is stated.

In table 1, we present the indicators (amount) of the root mass of green manure stubble plants cultivated in the fields of the Kirby company.

Table 1

Indicators of root mass of green manure stubble crops, kg / ha

No.	Variants experience	Root mass of stubble crops from the soil layer, on absolutely dry weight, kg / ha			Winter wheat straw residues (previous crop)	Total phytomass in soil
		0-25 cm	25-50 cm	0-50 cm		
1	Control	657.8 *	151.1 *	808.9 *	986.7 *	1795.6 *
2	Mustard white	3528.7	511.1	4039.8	1324.4 *	13674.2
3	White melilot	2355.5	386.7	2742.2	1528.9 *	7837.8
4	Spring barley	2017.7	661.4	2679.1	1484.5 *	7396.9
5	Phacelia rowan-coliform	4337.7	448.9	4786.6	1336.3 *	10056.2
6	Oil radish	3528.8	278.2	3807	1431.1 *	13571.4

Note: * root residues of winter wheat and winter wheat straw, selected in the fall before plowing green manure

According to the materials of our research, it can be seen that the studied green manure crops have a well-developed root system that penetrates into the subsoil horizons. From there, they assimilate mobile nutrients and accumulate them in the arable horizon, i.e. their fresh root masses of the aforementioned green manure replenish the supply of nutrients in the topsoil.

The roots of green manure stubble plants during the growing season, in contact with soil particles, contribute to the uniform distribution of organic matter and the formation of structural aggregates.

As can be seen, by the amount of root mass left in a half-meter layer of soil, the green manure dominates - the rowan-leaved phacelia (4786.8 kg / ha) and the bulk of its roots accumulates in the topsoil (90.6%).

After plowing the rich green manure phytomass, organic matter enters the soil not after the vegetation (dying off) of the plants, but during the period of their active life, i.e. in a fresh vegetative state. Then, during the active vegetation cycle of plants, root exudates are released into the rhizosphere, and the microbiological activity of the soil develops rapidly (3,8,10). Root excretions are capable of converting nutrients into a form that is easily accessible to plants. Thus, they have the most direct effect on improving soil fertility.

White mustard in a half-meter layer of soil accumulates 4039.8 kg / ha of root mass, oil radish - 3807 kg / ha, sweet clover White - 2742.2 kg / ha, and spring barley - 2679.1 kg / ha. At the same time, in spring barley only 24.7%, in white mustard 12.6% of the root mass is concentrated in the subsoil.

In late autumn, when the phytomass (aboveground and root) of green manure is embedded in the soil (plowing), the microbiological activity increases and the physicochemical properties of irrigated arable land improve, i.e. the amount of nutrients increases, the formation of an agronomically valuable soil structure, water and wind erosion, migration of nutrients outside the root layer are prevented.

In addition, the root system of green manure plants extract nutrients from both arable and sub-arable soil layers, involving them in a small biological cycle.

As can be seen from the research materials, in our experiments, green plant residues of green manure - root and stubble phytomasses, i.e. they act as green fertilizers.

All complex microbiological and biochemical processes are associated with them, leading to the formation of various organic and mineral compounds in the soil, which together determine soil fertility. Based on the materials of numerous research projects, it can be seen that the rate of decomposition of plowed phytomass by soil microorganisms is very important during green manure (3, 6, 10).

Thus, the influence of green manure crops on soil fertility is carried out not only by their lifetime influence (root exudates), but mainly through organic matter that enters the soil during plowing of phytomass and their role is multifaceted.

For the fertility of irrigated arable land, especially for the process of replenishing the humus stock and increasing the nutrient regime of the soil, the time of mineralization of the phytomass of green manure crops plays an important role and the most agronomically favorable period of their mineralization is the early growing season of the main crop - potato.

Therefore, in late autumn, on the plowed fields of green manure crops, under the influence of early frosts and with the onset of cold weather, the microbiological activity of soils decreases and then is conserved in winter.

On the irrigated fields of the Kirby company, in late autumn, after plowing the green manure phytomass, night temperatures will sharply get colder, going through the roof by minus 5-10 ° C. Then the course of mineralization of organic matter is preserved and the task of the agronomic service of the Kirby company is to determine the latest period of plowing of green manure (before the autumn frosts).

The next year, in the spring, during the growing season of potatoes, favorable soil

conditions (thermal, air and water) are created for the optimal passage of mineralization of incoming organic substances - green manure phytomass, and active microbiological activity of microorganisms occurs. Then, organic matter (green manure phytomass) serves as a source of mineral compounds released during its decomposition by soil microorganisms.

Considering the above, it can be stated that the entire spectrum of the positive influence of organic matter of green manure on the effective and potential soil fertility occurs when the importance of organic matter entering the soil of green manure will depend on the rate and direction of its transformation in the soil. If environmental conditions favor rapid mineralization, then the role of organic matter will mainly be reduced as a source of mineral nutrition and, conversely, if conditions favor humification, then the role of green fertilizer as a source of humus formation will be more significant (5,7,8).

Therefore, as we stated above, green manure stubble crops introduced in the fields of the Kirby company are plowed up in late autumn and the stormy period of their mineralization by soil microorganisms occurs in the spring, during the growing season of potatoes.

It should be especially noted that the favorable course of the biochemical process of humus formation is helped by the post-harvest plant residues of winter wheat (the previous crop), where the amount of straw before plowing the green manure phytomass (autumn) into the soil according to the experimental options ranges from 1324.4 kg / ha to 1528.9 kg / ha (see Table 1). This amount of hard-to-decompose winter wheat straw with a wide ratio of C: N = 61 (C -32.35% and N -0.53%), together with the green manure phytomass, purposefully serve the process of humus formation.

Thus, the previous crop, winter wheat, was correctly selected when placing stubble crops, which works to restore the fertility of irrigated arable land.

As our research has shown, an important reserve for increasing the yield and quality of crop production on the irrigated lands of the Chui Valley is an agrotechnical method - the introduction of catch crops, incl. stubble green manure crops.

Green manure crops represent an important agrotechnical method of biologization and greening of irrigated agriculture in the Kyrgyz Republic, which is the main way to increase ecologically clean agricultural production.

It is also important that when plowing green manure, their aboveground and especially underground mass is evenly distributed over the field, which is practically excluded when applying manure. In addition, the correct procurement of traditional organic fertilizers is not cheap, and even with improper procurement, their quality is doubtful due to the abundance of weed seeds. Green manures do not have these shortcomings.

Findings and summary

Thus, the research materials allow us to draw the following conclusions:

- the studied green manure crops represent an important agrotechnical method of biologization and ecologization of irrigated agriculture in the Kyrgyz Republic,
- the bulk of the root mass of green manure stubble crops introduced in the fields of the Kirby company is concentrated in the arable layer of irrigated arable land;
- the phytomass of green manure plants is an organic source of replenishment of humus and soil nutrients,
- the root mass of green manure stubble crops is plowed into the soil in a fresh state, and in this form they are optimally decomposed, performing the role of green fertilizers;
- during the growing season of green manure stubble crops in the rhizosphere, where root exudates occur, microbiological activity actively develops.
- phytomass of green manure and post-harvest plant residues of the previous crop -

winter wheat purposefully serve to restore soil organic matter.

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**PRODUCTIVITY OF COMMON RASPBERRY (*RUBUS IDAEUS* L.) VARIETIES
UNDER CHU VALLEY**

Abstract: *the article covers the main components of productivity indicators of raspberry plants. In the process of variety study, the main components of raspberry productivity have been studied. Raspberry bush yield consists of the following components: the number of fruiting shoots, the number of fruit branches (laterals) on the shoot, the number of berries on the laterals, the average mass of berries. The study has shown that cultivated raspberry varieties in the Chui Valley have the yield 7-8 t/ha (normally 3...6 t/ha) with the average berry weight of 2.0...3.5 g, and the highest yields up to 10...12 t/ha with the maximum berry size of 4...5 g. The goal of the research was to study productivity and large-fruitedness of common raspberry. The research was conducted in 2014-2016. Four different varieties of common raspberry were tested under the Chui valley. The experimental site is located in Dmitrievka village of the Chui valley, where varieties of raspberries were planted in spring 2011. Scheme of planting was 2,0×0,5 m. Research was conducted in accordance with the "Program and methodology of fruit, berry and nut crops varietal study".*

Key words: *adaptability, components of productivity, number of fruit-bearing shoots, average berry weight.*

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**ПРОДУКТИВНОСТЬ СОРТОВ МАЛИНЫ ОБЫКНОВЕННОЙ (*RUBUS IDAEUS* L.)
В УСЛОВИЯХ ЧУЙСКОЙ ДОЛИНЫ**

Аннотация: *В статье рассматриваются основные составляющие показатели продуктивности растений малины. В процессе сортоизучения были изучены основные компоненты продуктивности куста малины. Урожай куста складывается из следующих составляющих компонентов: количества плодоносящих побегов, числа плодовых веточек (латералов) на побеге, количества ягод на латерале, средней массы ягод. В результате изучения было выявлено, что возделываемые районированные сорта малины в Чуйской долине имеют урожайность до 7-8 т/га (обычно 3...6 т/га) при средней массе ягоды 2,0...3,5 г, а лучшие – до 10...12 т/га при максимальном размере ягод 4...5 г. Цель исследований: продуктивность и крупноплодность малины обыкновенной. Исследования проводились в 2014-2016 годах. Объектами исследований служили 4 сорта малины обыкновенной. Место проведения исследований – опытный участок находится в Чуйской долине село Дмитриевка, закладка насаждения весна 2011 года. Схема расположения растений 2,0×0,5 м. Исследования проведены в соответствии с «Программой и методикой сортоизучения плодовых, ягодных и орехоплодных культур».*

Ключевые слова: *адаптивность, компоненты продуктивности, количество плодоносящих побегов, средняя масса ягоды.*

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**ЧҮЙ ӨРҮҮНҮН ШАРТЫНДАГЫ КАДИМКИ МАЛИНАНЫН (*RUBUS IDAEUS L.*)
СОРТТОРУНУН ТҮШҮМДҮҮЛҮГҮ**

Аннотация: Маклада дан куурайдын түшүмдүүлүгүн түзгөн негизги көрсөткүчтөрү каралган. Сортторду изилдөө жүргүзүүдө дан куурайдын бадалынын түшүмдүүлүгүнү негизги компоненттери изилденген. Бадалдын түшүмдүүлүгү төмөнкү компоненттердин курамасынан түзүлөт: түшүм берүүчү бутактардын санынын, бутактардагы түшүм алган бутакчалардын санынан, түшүм алган бутакчалардагы мөмөлөрдүн санынан, мөмөлөрдүн орточо массасынан. Изилдөөлөрдүн жыйынтыгында Чүй өрөөнүндө райондоштурулган дан куурайдын өстүрүлүп жаткан сорттору, мөмөлөрү орточо салмакта 2,0-3,5 г болуп, 7-8 т/га (адатта 3-6 т/га), ал эми эн жакшылары, мөмөлөрү максималдуу 4-5 г болуп, 10-12 т/га чейин түшүм береери аныкталган. Изилдөөнүн максаты: жөнөкөй дан куурайдын иримөмөлүүлүгү жана өндүрүмдүүлүгү. Изилдөөлөр 2014-2016 жылдары жүргүзүлдү. Изилдөөнүн объектилери болуп жөнөкөй дан куурайдын 4 сорту каралды. Изилдөөлөр жери Чүй өрөөнүндөгү Димитревка айлындагы тажырыйба таласында 2011 жылы жазында отургузулган. Өсүмдүктөрдүн отургузуу схемасы 2,0x0,5 м. Изилдөө иштери «Мөмө-жемиш жана жангак жер-жемиш культураларынын сортторун изилдөө усулдары жана программаларынын» негизинде жүргүзүлгөн.

Негизги сөздөр: Көнгөндүүлүк, өндүрүмдүүлүктүн компоненттери, түшүм берүүчү бутактардын саны, мөмөлөрдүн орточо массасы.

Introduction

Raspberries are one of the most valuable and sought-after berry crops. Its fruits have unique nutritional and medicinal properties, and it is no coincidence that modern medicine considers them an elixir of human health and creative longevity [1].

Industrial cultivation of raspberries is actively expanding around the world, especially in countries where cheap labour can be used for manual harvesting. Thus, if by the beginning of the 21st century about 300 thousand tons of raspberry fruits per year were grown in the world, in 2004 more than 450 thousand tons were obtained, and in 2007 - more than 600 thousand tons. In a decade and a half the growth of production was 100% [1, 2, 3]. To obtain high and stable yields of raspberry in unstable weather conditions in most regions of our country cannot do without a large variety of new adaptive varieties. Production to a large

extent needs varieties corresponding to industrial cultivation technologies, responsive to fertilizers, with berries of universal purpose [4].

The main indicator of high adaptation of a variety in the end is its productivity [5, 6, 7] The raspberry bush yield consists of the following components: number of fruiting shoots, number of fruit branches on a shoot, number of berries on a lateral, weight of one berry. Each of these components contributes to the value of variety yield, and in different ways. The level of manifestation of each productivity component is in close dependence of genotype reaction to weather conditions at the specific vegetation period [8].

High and stable plant yield is one of the main features of modern raspberry varieties. However, these productivity indicators in many cultivated varieties have not yet reached the biologically possible level [9].

The majority of released and widespread varieties of raspberry in Russia have a yield of up to 10 t/ha (usually 3...6 t/ha) with an average berry weight of 2.0...2.5 g, and the best - up to 12...15 t/ha with a maximum berry size of 4...5 g. [9].

In zones of raspberry fruit growing, climatic conditions, including periodic soil and air droughts and heat, have a noticeable effect on the performance of raspberry growing. The most critical phases to water supply deficit and high temperatures are: the phase of intensive growth of shoots, flowering, formation of ovary and fructification of plants [10, 11].

The aim of the research is to study the productivity of raspberry varieties within the Chui Valley conditions and to isolate the productivity and large-fruitedness of common raspberry.

Research objectives:

- To carry out analysis of cultivated varieties of raspberry on structural components of productivity.

- To select high-productive and large-fruited forms of raspberry for further promotion in production and establishment of highly profitable plantations.

Materials and methods

The research had been conducted from 2014 to 2016 on an irrigated experimental plot in the Dmitrievka village of Chui Valley. The plot is located in the middle zone at an altitude of 735 meters above sea level, on light-chestnut soils conditions.

Experiments were laid in fourfold replications. Scheme of planting was 2.0 x 0.5 m.

The climate of the area is continental, with hot, dry summers and moderately cold winters. Precipitation is 250-500 mm per year, falling mainly in spring. The frost-free period is up to 180 days.

Research was conducted in accordance with the "Program and methodology of fruit, berry and nut crops varietal study".

Average annual temperature for 2014-2016.

Table 1.

Month	Year		
	2014	2015	2016
January	-1,9	-1,5	1,3
February	-7,2	2,6	3
March	5,3	5,1	10,9
April	10	14,7	13,3
May	19	19,5	17,7
June	24,4	23,9	23,9
July	25,3	27,8	24,7
August	25,1	24	23,8
September	18,6	16,8	21,3
October	9,8	11,9	7,7
November	2,2	4,4	1,9
December	-1,5	1,1	1,6
Mean annual temperature	10,7	12,525	12,6

Table 2.

Жылы /айы	2014	2015	2016
Январь	32	40	55
Февраль	34	45	12
Март	29	65	55
Апрель	90	64	91
Май	27	62	125
Июнь	6	33	63
Июль	5	3	87
Август	2	28	0
Сентябрь	9	25	15
Октябрь	110	59	83
Ноябрь	53	66	61
Декабрь	37	42	70
Орточо жыл	36,1	44,3	59,75

Results and discussion. As a result of the study, a group of varieties with compact type of bush for trellis-free cultivation was identified.

The greatest number of fruit branches (laterals) are characterized by varieties: Babe Leto, Novost Kuzmina - in the range of 27...44 pcs. With a load of one lateral berries in the range from 15 to 23 pcs. (Diagram 1). The average load of berries per lateral revealed in the varieties: Babie Leto, Barnaulskaia, Novost Kuzmina in the range of 15...20 pcs. (Diagram 2).

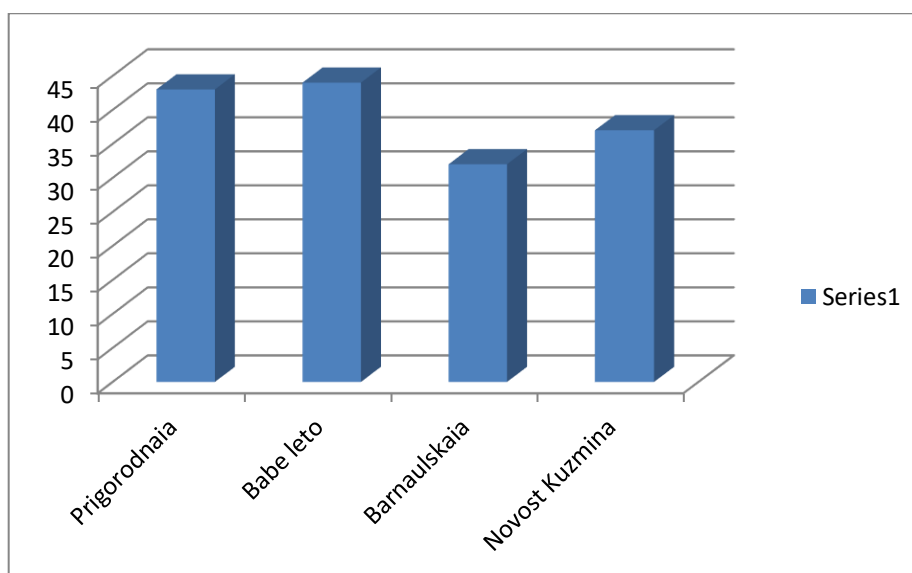


Diagram 1 - Number of fruiting branches (laterals) on a shoot, pcs.

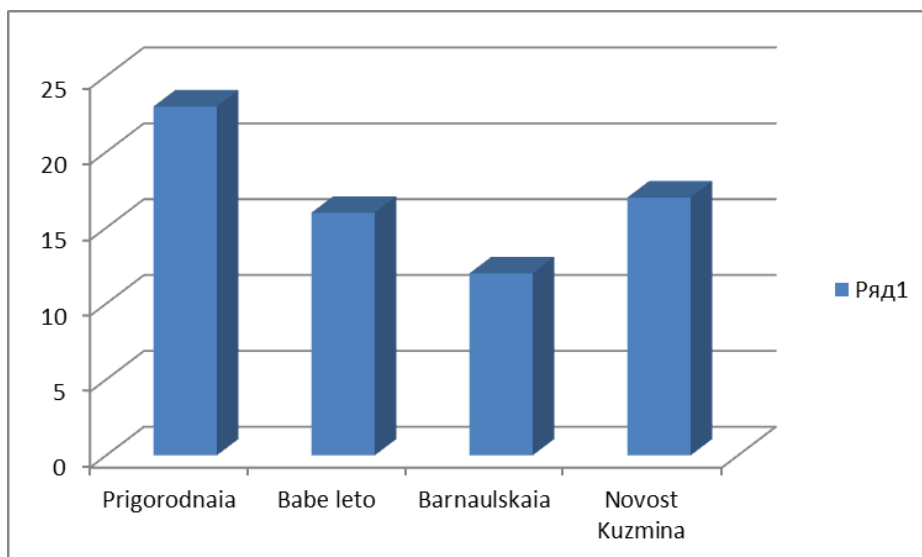


Diagram 2 - Number of berries in one lateral, pcs.

Fruiting branches vary greatly in strength of development, which is due primarily to the development of the buds from which they are formed and their location on the shoot. The uppermost buds produce short fruit branches with few flowers. The most productive are fruit branches located in the middle part of the shoot. They have a moderate growth, have the greatest number of inflorescences and flowers, and produce larger fruits. Laterals do not develop from a considerable number of buds in the lower part of the shoot, which is connected with the phenomenon of apical dominance. The degree of manifestation of the trait is greatly influenced by the denseness of plantations, their light

regime and the level of fungal infection accumulation.

One of the important and basic biological traits of raspberry variety is the number of reproductive formations (twigs, berries), potentially influencing the yield. It is known that in raspberry, all buds are fruiting, and in optimal growing conditions, one fruit branch is formed from each shoot node. In this regard, the fruiting zone in raspberry in different varieties and hybrids is different.

The average indicators of berry size were shown in the following varieties: Prigorodnaia, Babe Leto, Barnaulskaia within 1.7...2.8 g, with the highest berry size within 3.5 g. Novost Kuzmina variety (Diagram 3).

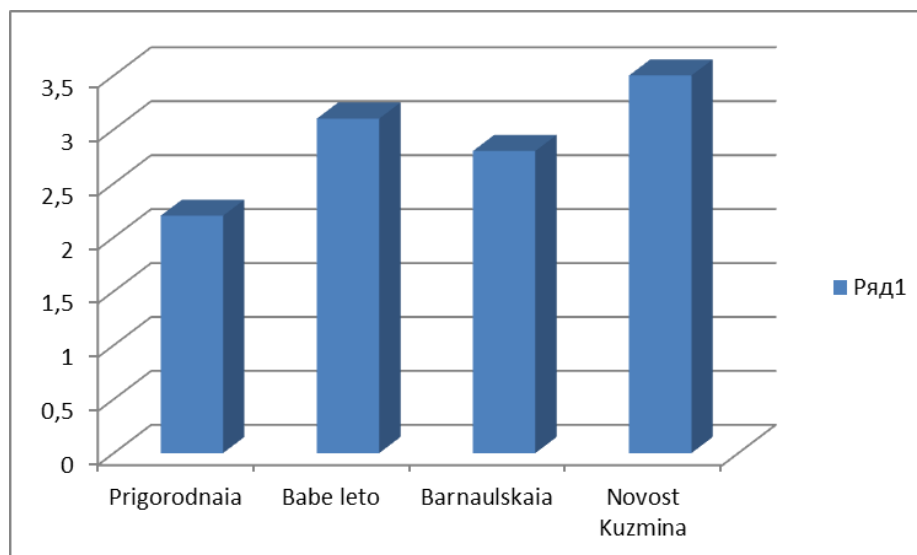


Diagram 3 - Weight of one berry, g

Conclusions

The greatest number of fruit branches (laterals) are characterized by varieties: Babe Leto, Novost Kuzmina - in the range of 27...44 pcs.

The average load of berries per lateral revealed in varieties: Babe Leto, Barnaulskaia, Novost Kuzmina in the range - 15...20 pcs. (Diagram 2).

The average values of the size of berries appeared in the varieties: Prigorodnaia, Babe Leto, Barnaulskaia in the range of 1.7 ... 2.8 g, with the largest berry size in the range of 3.5 g. variety Novost Kuzmina.

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**GROWTH AND DEVELOPMENT OF COMMON RASPBERRY (*RUBUS IDAEUS* L.)
CULTIVARS IN THE CHUI VALLEY**

Abstract: *This article presents the results of the phenological phase studies in four common raspberry cultivars in the Chui Valley of Kyrgyzstan. Weather conditions affect the timing and duration of the phenological phases of raspberry. Based on multiple years of data collection on the flowering and fruit ripening, raspberry cultivars are divided into three groups: early, medium, late.*

Key words: *raspberry, cultivars, phenological phases, the sum of active and effective temperatures*

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**РОСТ И РАЗВИТИЕ СОРТОВ МАЛИНЫ ОБЫКНОВЕННОЙ (*RUBUS IDAEUS* L.) В
УСЛОВИЯХ ЧУЙСКОЙ ДОЛИНЫ**

Аннотация: *в статье представлены результаты изучения фенологических фаз у 4-х сортов малины обыкновенной в Чуйской долине Кыргызстане. Погодные условия влияют на сроки и продолжительность прохождения фенологических фаз малины. На основании многолетних данных по срокам цветения и созревания плодов сорта распределены на группы: ранние, средние, поздние.*

Ключевые слова: *малина, сорта, фенологические фазы, суммы активных и эффективных температур*

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**ЧҮЙ ӨРӨӨНҮНҮН ШАРТЫНДА КАДИМКИ МАЛИНАНЫН (*RUBUS IDAEUS* L.)
СОРТТОРУНУН ӨСҮШҮ ЖАНА ӨНҮГҮШҮ**

Аннотация: *маклада Кыргызстандын Чүй өрөөнүндө жөнөкөй дан куурайдын 4 сортторунун фенологиялык фазаларын изилдөө келтирилген. Дан куурайдын фенологиялык фазасынын убактысына жана анын узактылуулугуна аба ырайынын таасир этет. Көп жылдык көрсөткүчтөрдүн негизинде сорттордун гүлдөө жана мөмөлөрдүн бышуу убактысы боюнча группаларга бөлүнөт: эрте, орто, кечки.*

Негизги сөздөр: *Дан куурай, сорттор, фенологиялык фаза, активтүү жана эффективтүү температууралардын кошундусу..*

Introduction

Raspberry is one of the valuable berry crops in the world. Its fruits have nutritious and

medicinal properties and are considered as an elixir of health and longevity of man [1].

A determining factor of its wide distribution is adaptation to various growing conditions [2, 3].

The study of the timing of the onset of phenological phases makes it possible to assess the adaptive capacity of regionalized raspberry cultivars to changes in weather conditions in the Chu Valley.

Materials and methodology

The research was conducted on an irrigated experimental plot in the Dmitrievka village of Issyk-Ata district of the Chui valley from 2012 to 2015 years. Experimental plot is situated in the middle zone at an altitude of 735 meters above sea level, with light, chestnut soils. Total duration of frost-free period is 171-190 days per annum.

Experiments were set up in quadruple replications. The scheme of planting is 2.0 x 0.5 m. All studies were conducted in accordance with the "Program and methods of varietal study of fruit, berry and nut crops" [4].

The initial material for our studies are four cultivars of raspberry, planted in 2011: Prigorodnaya (Ukrainian Research Institute of Horticulture), Babie Leto (Kokin base in VSTISP), Barnaulskaya (RIH named after M.A. Lisavenko), Novosti Kuzmin (Vetluga city, Nizhegorod region).

The timing of the onset and duration of the following phenological phases (beginning of vegetation; beginning, end and duration of flowering and fruiting) were studied. To estimate the need in warm temperatures at different phenological phases and to predict the possibility of growing the cultivar in this area, the sum of average daily active above +5° ($\sum t > 5$ °C) and effective temperatures above +10° ($\sum t > 10$ °C) were measured [5].

In autumn, all raspberry shoots cease growth, buds also pass into a dormant state and are inactive even at air temperatures of +6.1°C, at which tree species usually start to grow [6].

The time of onset of organic or deep dormancy in raspberry varies depending on the place of growth and the length of the vegetation period, coming earlier in a long and later in a shorter vegetation period [3].

Climatic conditions influence the peculiarities of plant development. They can change the timing of phenophases, form the conditions of temperature stress under extreme high and low temperatures, favor growth, development, and accumulation of phytomass and formation of its components or, conversely, negatively affect these processes [7].

Results and discussion. Under Chui valley conditions, vegetation of raspberry plants begins in the second decade of March and the first decade of April, and this indicator varies significantly from year to year. The earliest start of vegetation on March 24 was noted in 2016, when the average temperature passed +5 °C, and was 10 days ahead of the multi-year dates. The latest date of the start of the growing season was 11 April in 2015.

The amount of future crop depends on the timing, intensity and conditions under which raspberry flowering occurs. The research conducted during (2014-2016) revealed differences in the timing of the onset and passage of the phenological phases between the individual cultivars. This is due to the varying requirements of the cultivars for the set of weather conditions necessary for the transition of plants from one phase to the other.

Flowering is one of the most important phenological phases in the life of the plant, the timing and duration of which varies from year to year and depends on the genetic characteristics of the cultivar and climatic conditions.

The inflorescences on the fruit branches do not develop at the same time, with the upper flowers blossoming first and then the lower ones. Because of the elongated flowering

period of the plants, the berries on raspberry plants do not ripen at the same time. Raspberry blossoming in one cultivar can last 20-30 days.

Raspberry flowering starts at a certain amount of positive temperatures (above +5 °C). Early-flowering cultivars are demand less warmth at the beginning of flowering, whereas late-flowering cultivars are more demanding.

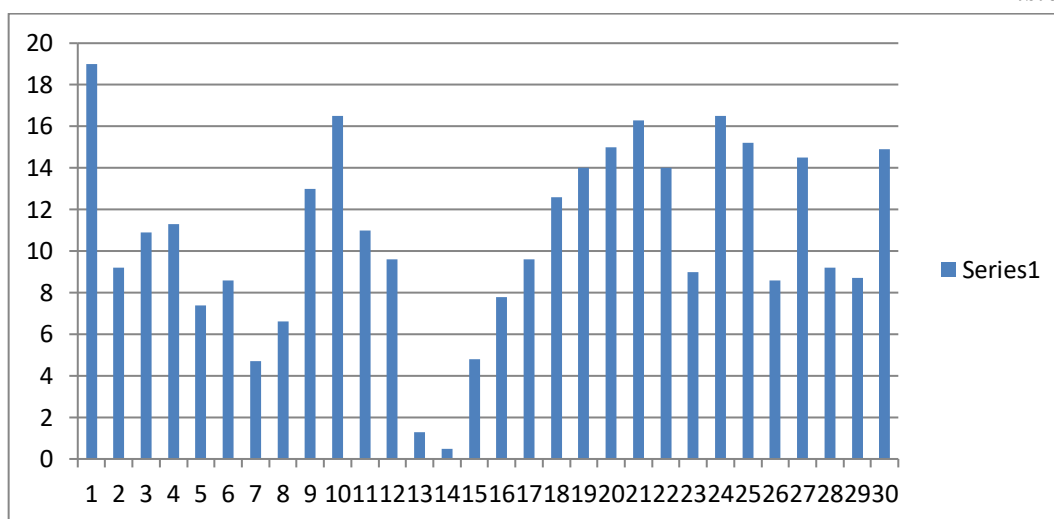
During the years of research, there was a variation in the sum of average daily

temperatures from the moment of their transition through +5°C to the beginning of raspberry flowering.

On the average by cultivars the sum of active temperatures ($\sum t > 5 \text{ }^\circ\text{C}$) for early cultivars- 581,7-651,9°C, middle-633,1-810,3°C, late- 678,3-850,6°C and sum of effective temperatures ($\sum t > 10 \text{ }^\circ\text{C}$) early-401,0- 561,0°C, middle-427,0-719,4°C and late- 472,2-759,7°C are required for the beginning of flowering[13].

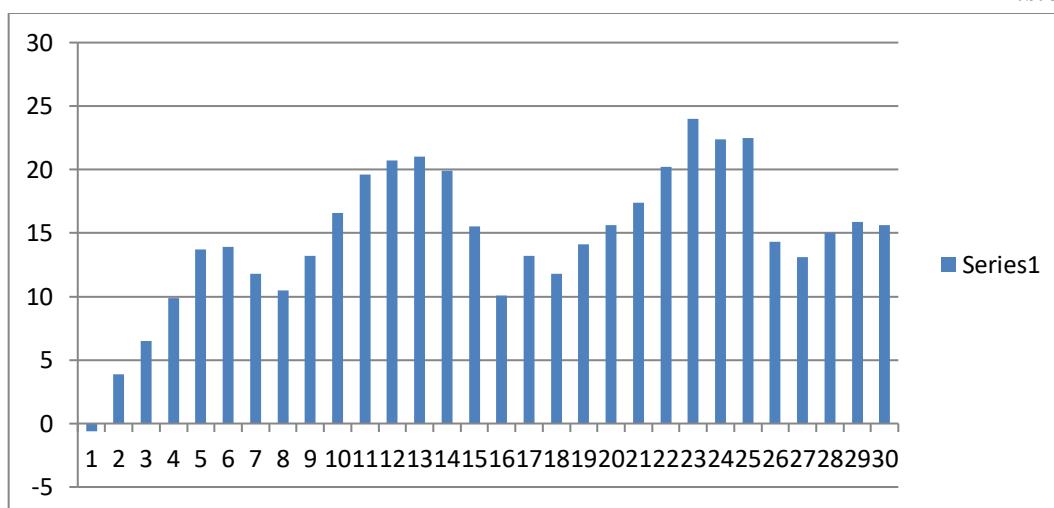
The histogram shows weather conditions in Issyk-Ata district. An air temperature data is given for each day of April 2014.

Histogram 1.



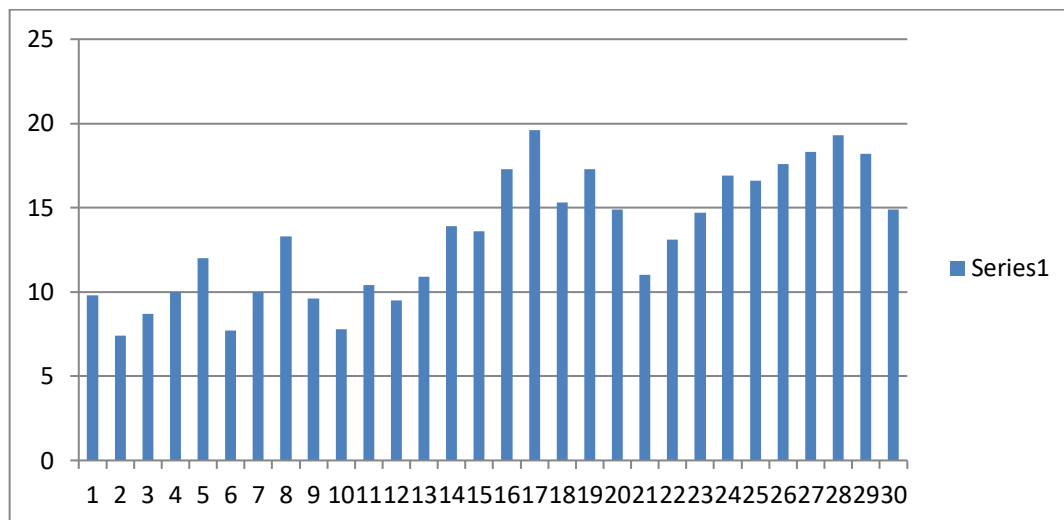
The histogram shows weather conditions in Issyk-Ata district. An air temperature data is given for each day of April 2015.

Histogram 2.



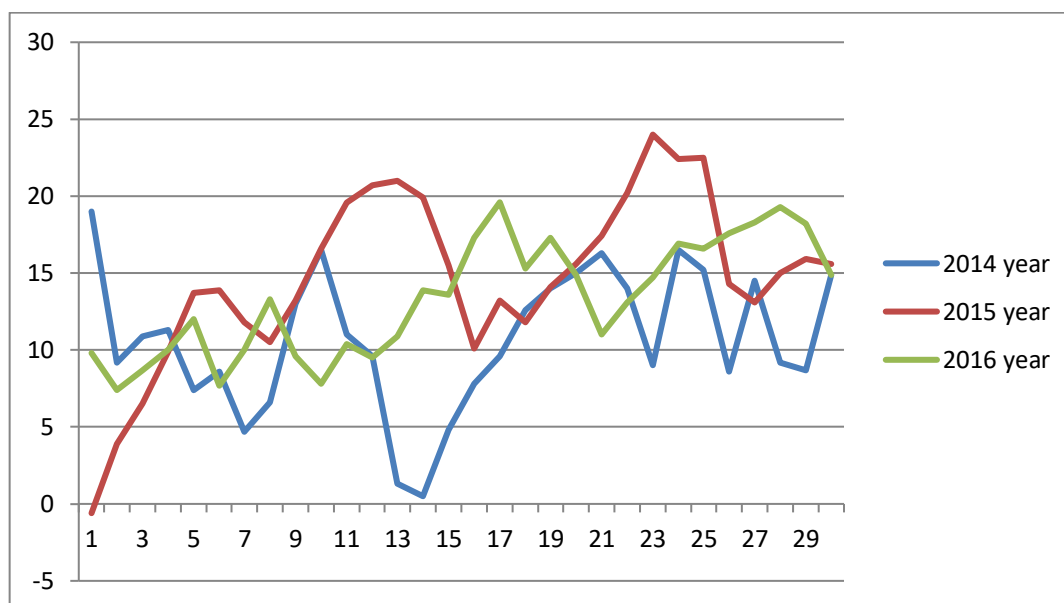
The histogram shows weather conditions in Issyk-Ata district. An air temperature data is given for each day of April 2016.

Histogram 3.



The graph shows weather conditions in Issyk-Ata district. An air temperature data is given for every day of April 2014-2016.

Graph1.



Three groups of cultivars are identified as a result of the research: early, medium and late. Calendar dates of flowering and fruiting of raspberry cultivars by groups are given in Table 1.

Average dates of raspberry flowering beginning in Chui valley conditions are marked in early cultivars on April 2, medium cultivars on April 5, late cultivars on April 8. The earliest start of flowering was noted in 2016 on March 25. The weather was warm in April-May in preparation for flowering. Average daily temperatures were +10.7; +19.5 °C, respectively which was +2.1; +1.7°C above the norm. The maximum temperature reached +26.1; +34.5 °C.

Timing of raspberry flowering and fruiting

Table 1.

Year	Cultivars	Flowering			Fruiting		
		start	end	Duration, days	start	end	Duration, days
2014	early	02.05	26.05	24	04.06.	30.06	26
	middle	05.05	30.05	25	06.06	03.07	28
	late	08.05	05.06	28	08.06	07.07	30
2015	early	06.05	31.05	25	07.06	04.07	27
	middle	09.05	05.06	28	10.06	08.07	28
	late	12.05	09.06	30	12.06.	10.07	28
2016	early	25.04	18.05	24	28.05	21.06	24
	middle	28.04	23.05	25	03.06	28.06	25
	late	02.05	29.05	27	07.06	30.06	27

The latest flowering dates were recorded in 2015 on 6 May. The spring was late and cool, so flowering was delayed. Closer to average flowering dates for raspberries were recorded in 2014.

Depending on the cultivar and weather conditions during the growing season, the average duration of flowering during the study period ranged from 24 to 30 days, with an average of 26 days.

The timing of the onset of berry ripening varied across the study years. The average dates for 2014-2016 study of the beginning of fruit ripening were noted in early cultivars - June 4, medium - June 6, late - June 10 (see Table 1). The earliest onset of berry ripening was observed in 2016, with early cultivars on 28 May, medium cultivars on 3 June, and late cultivars on 7 June. The spring was early, warm and dry, with average daily temperatures in April-June being above the long-term average of +1.1-1.4 °C.

Average duration of fruit ripening, taking into account biological features and weather conditions, varied by year of study from 24 to 30 days. The shortest ripening period by

study year was observed in the cultivars in 2016 24-27 days. The average daily air temperature in May-June was higher than the average annual data by +2.5; +1.9 °C, and the maximum temperature reached +36 °C.

As a result of the research, it was found that raspberry cultivars differ among themselves in time of onset and duration of phenological phases under the influence of weather conditions of Chui valley.

Conclusions

On average, $\sum t > 5$ °C are required for the beginning of flowering.

On the basis of multi-year research on the timing of flowering and ripening of fruits, raspberry cultivars were divided into three groups: early, medium and late. The group of early includes 2 cultivars- Babie Leto and Barnaulskaya; 1 medium cultivar- Novosti Kuzmina and 1 late cultivar- Prigorodnaya.

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EFFICIENCY OF PRE-SOWING TREATMENT OF SPRING WHEAT SEEDS WITH BIOPREPARATIONS AND FUNGICIDES

Abstract. *The objective of the article is to reveal the efficiency of seed treatment with fungicides and biological products against spring wheat diseases in Chui region of Kyrgyzstan. The obtained data on yield capacity confirm the results of the analysis of yield structure. The lowest yield (25.2 cantner (c) / ha) was obtained in the control. The treatment of seeds with Raxil (Tebuconazole 6%) at the consumption rate of 0.5 l / t made it possible to obtain 32.9 c / ha, this is 7.7 c / ha more than in the control, and with Fuldazon (Benomyl) - 30.4 c / ha, the yield gain was 5.2 c / ha. By using Agrothiram (Thiram), we received 29.9 c / ha, which is 4.7 c / ha more than in the control. With the use of biological products: Rootkat 29.2 c / ha, this is only 4 c / ha more than control, and Suprild - 30.4, the gain was 4.9 c / ha. But it must be taken into account that biological products have a minimal impact on the environment.*

Key words: *wheat, fungicides, seed dressing, wheat yield.*

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ЭФФЕКТИВНОСТЬ ПРЕПОСЕВНОЙ ОБРАБОТКИ СЕМЯН ЯРОВОЙ ПШЕНИЦЫ БИОПРЕПАРАТАМИ И ФУНГИЦИДАМИ

Аннотация. *Цель статьи - выявить эффективность обработки семян фунгицидами и биопрепаратами против болезней яровой пшеницы в Чуйской области Кыргызстана. Полученные данные по урожайности подтверждают результаты анализа структуры урожая. Наименьшая урожайность (25,2 ц / га) была получена в контроле. Обработка семян раксиллом (Тебуконазол 6%) из расчета 0,5 л / т позволила получить 32,9 ц / га, что на 7,7 ц / га больше, чем в контроле, и Фулдазоном (Беномилом) - 30,4 ц / га. ц / га, прибавка урожая составила 5,2 ц / га. При использовании Агротирама (Тирама) мы получили 29,9 ц / га, что на 4,7 ц / га больше, чем в контроле. При использовании биопрепаратов: Руткат 29,2 ц / га, это всего на 4 ц / га больше контроля, и Суприлд - 30,4, прирост составил 4,9 ц / га. Но нужно учитывать, что биопрепараты минимально влияют на окружающую среду.*

Ключевые слова: *пшеница, фунгициды, протравливание семян, урожайность пшеницы.*

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ЖАЗГЫ БУУДАЙДЫН ҮРӨНҮН БИОПРАПАРАТТАР ЖАНА ФУНГИЦИДЕР МЕНЕН СЕБҮҮ АЛДЫНДА ИШТЕТҮҮНҮН НАТЫЙЖАЛУУЛУГУ

Аннотация. *Макаланын максаты- Кыргызстандын Чүй облусунда жаздык буудайдын ооруларын алдын алуу максатында үрөндү фунгициддер жана биодарылар менен дарылоонун эффективдүүлүгүн аныктоо. Түшүмдүүлүктүн көлөмү боюнча алынган маалыматтар түшүмдүн структурасын аныктоого багытталган анализдин жыйынтыктарына туура келет. Эң төмөн түшүм (25,2 ц / га) контролдоо учурунда алынган. Урукту 0,5 л / т Раксил (Тебуконазол 6%) менен дарылоонун натыйжасында 32,9 ц / га түшүм алынган, бул контролдоо учуруна караганда 7,7 ц / га көп, ал эми Фулдазон*

(Беномил) менен дарылоонун натыйжасында 30,4 ц / га түшүм алынды, түшүмдүүлүктүн өсүшү 5,2 ц / га түздү. Агротирамды (Тирам) колдонуунун натыйжасында биз 29,9 ц / га алдык, бул контролдоо учуруна караганда 4,7 ц / га көп. Биодарыларды колдонуу менен: Руткат 29,2 ц / га -бул контролдоо учурунан 4 ц / га гана көп, ал эми Суприлд 30,4 колдонуунун натыйжасында өсүш 4,9 ц / га түздү. Ошол эле учурда, биодарылар айлана-чөйрөгө минималдуу таасири этерин эске алыш керек.

Негизги сөздөр: буудай, фунгициддер, үрөн тазалоо, буудайдын түшүмдүүлүгү

1. Introduction

The use of seed material infected with diseases leads to a decrease in yield up to 20%, on the one hand, and to the contamination of products with toxins [1], on the other hand. In this regard, it is always necessary to carry out a phyto-examination of seeds and, on the basis of these results, make a decision to use of a particular grain batch for sowing purposes and to make disinfection [2]. When choosing a preparation for pre-sowing seed treatment, one is guided by the main qualities of seed disinfection from external and internal infection, protection of seeds and seedlings from damage by pathogens in the soil [3].

The modern assortment of disinfectants is represented mainly by systemic fungicides with high biological activity against not only pathogens, but also the plant itself [4]. In order to achieve optimal biological action against diseases and pests, these substances must be studied in a variety of geographic areas of agriculture. For each type of environmental conditions, it is necessary to check the recommended application rate of disinfection agent required for a faultless seed treatment [5]. In connection with the above, not only the development and introduction of new drugs, but also the study of existing ones, is an urgent issue at the present time.

The goal of the research is to study the efficiency of fungicides and biological preparations for seed dressing of spring wheat seeds and their effect on yield grain.

2. Seed treatment – brief review

Pre-sowing treatment of seeds of agricultural plants increases germinating power, reduces the susceptibility to fungal diseases caused by seed infection, and stimulates the development of seedlings. As a result, the

possibility of future seedlings to survive in unfavorable conditions and to form a high yield gains [6]. Today we have a fairly rich assortment of remedies, represented by various chemical classes and combined preparations. Research on the selection of drugs continues up to the date, where an important goal is to ensure the safety of pesticides for human health and useful components of the agrocenosis, excluding contamination of grown agricultural products [7].

The technology of cultivation of spring wheat resolves into obtaining seedlings of optimal thickness with a high starting rhythm of growth processes. This ensures the resistance and competitiveness of plants to the entire range of harmful organisms. The use of growth regulators makes it possible to increase the nitrogen content in the leaves of experimental crops during the germination and tillering phases [8]. Biological products can affect the germination of seeds, while the nature of their influence is determined by the type of preparation, as well as weather conditions during the germination of spring wheat [9].

The biomass of plants and size of the leaf area are important indicators of the formation of high and high-quality grain yields of spring wheat. The influence of the humic preparation on the growth and development of wheat is noted in the flowering phase. Pre-sowing seed treatment with Gumostim affects the leaf area of one plant by 0.73 and 4.65 cm². The dry weight of 10 plants increases by 3.24 g. Pre-sowing seed treatment with LFSC (Liquid Fertilizer Stimulating Composition) in combination with foliar feeding contributes to the achievement of the highest efficiency. As to be expected, their use is also higher against the background of macro fertilizers than without them. An increase in yield is

associated with an improvement in all indicators of the structure of the crop: an increase in the number of productive stems, an increase in the mass of 1000 grains, i.e. when seed treatment is combined with foliar feeding, the needs of plants for copper and molybdenum are satisfied during the entire growing season, which is reflected on photosynthetic activity [10].

At present, preparations based on a number of active substances, such as tebuconazole, cyproconazole, triticonazole, prochloraz, and others, are also used as seed disinfection agents. Preparations are used both on the basis of one active substance and combined multicomponent [11]. The germination rate of spring wheat seeds with Raxil at a dose of 0.5 l / t increases by 7%. The greatest excess was noted with the use of the couple: Raxil 0.25 l / t + Biosil 0.05 l / t [12]. The seed disinfectant TMTD-plus has good results on spring and winter wheat. According to laboratory studies, the growth stimulant, which is part of the dressing agent, increases the resistance to diseases of root rot by 36.4-42.8% and yield gain by 15% [13].

The general conclusion of this brief review is that the use of disinfectants, micronutrient fertilizers and growth stimulants is a viable solution, starting with pre-sowing seed treatment.

3. Research conditions and location

3.1. Climate

The Kyrgyz Republic is located between coordinates 69 ° 15' - 80 ° 18' east longitude and 39 ° 11' - 43 ° 16' north latitude within Tien Shan and northern parts of the Pamir-Alai mountain system at a great distance from the ocean, which determines the continental nature of the climate (Fig. 1). In the foothill zone, summer temperatures (July) average 20–25 °C, winter temperatures (January) - 4–7°C below zero. More than half of all winds are light and calm winds, 30-40% -are weak

winds (from 2 to 5 m / s), only a few percent - are moderate and fresh winds (from 6 to 10 m / s), and the winds more than 10 m / s are observed in narrow mountain valleys and on mountain passes [14, 15].

3.2. Soil

The soils of rainfed selective crop rotation, located on the lands of the experimental farm of the Kyrgyz Scientific Research Institute of Agriculture (Fig. 2 and 3) (altitude 829 m above sea level) are northern ordinary gray soil with closely lying pebbles. The humus content in the soil varies is between 1.2% - 2.7% [16]. Morphologically, they are characterized by a small thickness of humus horizons, high carbonate content with a weakly pronounced leaching of carbonates from the upper horizons. These soils are poorly supplied with nitrogen and phosphorus, which indicates to the need to use organic and mineral fertilizers [17]. The destruction and degradation of soils is a characteristic feature of the increasing anthropogenic pressure on nature. The processes of soil destruction and washout occur mainly on the slopes, and their intensity is directly dependent on the shape, steepness, length and illumination of the slopes. This can be clearly seen in the research area [18]. Farmers in the region need new types of crops that, on these soil types, will benefit from climate change and will be able to resist new pathogens [19].

4. Materials and research methods

The research material was the seeds of spring soft wheat "Intensive" (*Triticum aestivum* L). Counting and observations were carried out according to the " State Variety Testing Methods" [20]. To study the efficiency of pre-sowing seed treatment with disinfectants and biological products, a field experiment was imbedded according to the scheme given in table. 1.

Sowing scheme of spring wheat "Intensive"

Table 1.

№	Preparation	Active substance	Consumption norm
1	Control	Without treatment	-
2	Raxil KC	Tebuconazole 6%	0,5 l/t
3	Fuldazon	Benomyl	0,1 kg/t
4	Agrothiram	Thiram 80%	0,2 kg/t
5	Rootkat	Biopreparation	250 ml/t
6	Suprild	Biopreparation	25 ml/t

All counts and observations were carried out according to the experimental work method, dispersion analysis of data from a one-factor field experiment using Excel. The placement of the plots was randomized, the repetition was fourfold [21].

5. Research results

The study of liquid, powdery and biological preparations in the field conditions enabled to reveal a significant effect on the biometric parameters of “Intensive” spring wheat.

Table 2. Biometric indicators of wheat varieties: "Intensive", average for 2019-2020 (EOC of the Kyrgyz Research Institute of Agriculture, Sokuluk district, Chui region)

Table 2.

Variants	Consumption rate of the preparation l / ha, kg / t, ml / t	Productive bushiness, pcs	Ear length, cm.	Number of plants pcs/m ²	Number of productive stems, pcs / m ²	Plant height, cm
Control (without treatment)	-	1,37	9,4	182	250	71,4
Raxil KC	0,5	1,67	9,2	207	344	76,9
Fuldazon	0,1	1,52	8,8	185	280	71,4
Agrothiram	0,2	1,51	9	194	292	75,5
Rootkat	250	1,54	8,8	203	310	72,5
Suprild	25	1,2	7,9	273	339	71,9

The field experiment revealed the following main results (Table 2):

- Productive tillering of control is 1.37, much higher with Raxil, i.e. 1.67, and slightly lower Fuldazon and Agrothiram -1.52 and 1.51.
- The ear length is maximum on control, Raxil and Agrothiram. In other cases, slightly lower.
- The number of plants in control is 182, and 207 with Raxil, 203 with Rootkat, which means the most similar results. Under the influence of Fuldazon and Agrothiram, the difference is not large at the almost level of control.

- The maximum number of productive stems was obtained with Raxil -344, and Rootkat - 310, in other cases it ranges from 280-292 pieces per 1 m².
- The height of plants with Raxil is 76.9 cm, and in other cases it is slightly lower and similar to others.

The yield structure of “Intensive” sort in experimental sowing, average for 2019-2020

Table 3.

Variants	Spikelets per ear, pcs.	Number of grains per ear pcs.	Grain weight of 1 ear, gr.	Weight of the total mass of grain, gr. per 1m ² .	Grain output %	Grain yield gr., per 1 m ²
Control (without treatment)	18,8	45,2	1,8	550	46,0	251,7
Raxil KC 0,5 l/t	18,1	44,2	1,8	642	51,3	328,5
Fuldazon 0,1 kg/ha	17,8	42	1,6	642	47,3	304,2
Agrotiram 0,2 kg/ha	18,5	18,5	1,7	656	45,5	299,5
Rootkat 250 ml/t	18	18	1,6	630	46,2	291,7
Suprild 25 ml/t	14,9	36,6	1,15	639	47,1	301,5

The field experiment revealed the following main results (Table 3):

- The number of spikelets in an ear observed in the control -18.8, and the values of other cases are close to it with a slight difference.
- The number of grains in an ear, in the control is maximum, and in other cases it is lower and close to each other.
- The grain weight of one ear hardly differs.
- The weight of the total mass, in gr., is in all cases virtually similar, although the control shows a little lower.
- Grain yield in%, in the case of treatment with Raxil gives the maximum result, and in the rest, including control, the differences are minimal.
- Grain yield gr / m² in control is 251.7. In comparison with those treated with preparations, it is much lower. The yield dynamics is visualized in Fig. 1.

Fig. 1.

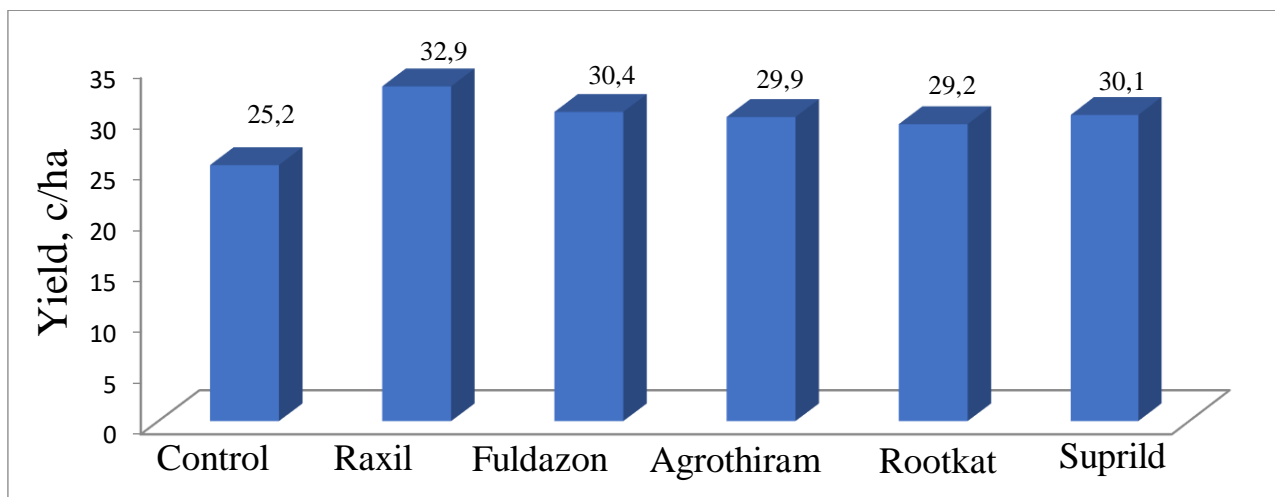


Fig. 1. Average grain yield in experiment, c / ha

The lowest yield was obtained in the control - 25.2 c / ha. The treatment of seeds with Raxil (Tebuconazole) at the consumption rate of 0.5 l / t made it possible to obtain - 32.9 (Fig. 1) c / ha, this is 7.7 c / ha more than in the control (Fig. 2), and with Fuldazon (Benomyl) 30.4 c / ha, the yield gain was 5.2 c / ha. With the use of Agrothiram (Thiram), it was 29.9 c / ha, which is 4.7 c / ha more than in the control. With the use of the biological product Rootkat - 29.2 c / ha, it is 4 c / ha more, and with Suprild - the yield gain was 4.9 c / ha.

Fig. 2.

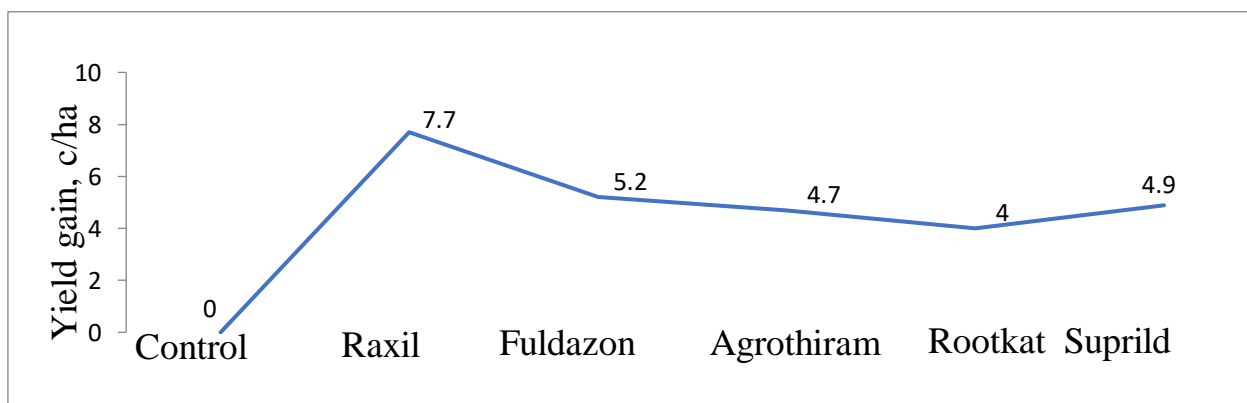


Fig. 2. Average yield gains relative to control, c / h

6. Discussion of results

The research conducted gives grounds to recommend disinfection of “Intensive” sort wheat with Raxil and / or biological products Rootkat and Suprild, since they give the most positive result.

Similar results have been reported in the United States of America on the use of Tebuconazole. The authors of the study showed that much less crop is infected with Fusarium head blight than in untreated variants. Scientists of the Latvian Research Center for Plant Protection conducted field experiments on the action of the fungicide T3, which included Tebuconazole, on Cobra

sort winter wheat on 30 m² plots. The preparation showed a significant effect on the winter wheat yield. At the same time, it is necessary to take into account the conditions for the cultivation of winter wheat and use of intensive technology in accordance with agrotechnical requirements [22]. According to Russian scientists who have studied the preventive and curative fungicide "Bunker" which includes Tebuconazole, it is possible to obtain 100% plant survival, at the temperature of -6⁰C [23]. That enables to make the conclusion about the efficiency of the preparation to increase the resistance of

plants to stress factors of the environment, including low temperatures.

The results of this study are well concurred with those known in the literature, given above. In all studies, the positive efficacy of fungicides has been proved, on which the research should be continued. In particular, to continue the work on the selection of optimal combination of fungicides and biological products for various varieties of wheat.

7. Conclusion

The obtained data on the crop yield confirm the results of the analysis of the yield structure. The lowest yield was obtained in the control - 25.2 c / ha. The seed treatments with Raxil preparation, with 6% Tebuconazole and recommended consumption of 0.5 l / t enabled to obtain 32.9 c / ha, where the yield gain was 7.7 c / ha more than in the control, and Fuldazon, which active substance is Benomyl brought to the higher crop capacity up to - 30.4 c / ha, which is 5.2 c / ha more than in the control.

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ABOUT SOME SOLUTIONS TO THE PROCESS OF SALT MOTION IN SOILS

Abstract. *To study the movement of water in soils and soils, the theory of filtration is used, which describes the considered movements in the form of differential equations in partial derivatives of the second and third orders under the corresponding initial-boundary conditions. Particular and important importance in the study of such problems is given to the analytical and approximate analytical method for their solution. With the help of these models, particular solutions of moisture movement for a three-dimensional non-stationary problem are determined.*

Keywords. *Irrigated land, moisture content in the soil, salinization, irrigation problem, groundwater flow, groundwater speed, dissolving salts, filtration theory, differential equations, partial derivatives of the second and third orders, initial-boundary conditions, analytical and approximate analytical methods of solution.*

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О НЕКОТОРЫХ РЕШЕНИЯХ ПРОЦЕССА ДВИЖЕНИЯ СОЛИ В ПОЧВАХ

Аннотация. *Для исследования движения воды в почвах и грунтах используется теория фильтрации, которая описывает рассматриваемые движения в виде дифференциальных уравнений в частных производных второго и третьего порядков при соответствующих начально-краевых условиях. Особое и важное значение при исследовании таких задач уделяется аналитическому и приближенно-аналитическому методам их решения. С помощью этих моделей определяются частные решения движения влаги для трехмерной нестационарной задачи.*

Ключевые слова. *Орошаемые земли, влажность почвы, засоление, проблема орошения, сток грунтовых вод, скорость грунтовых вод, растворение солей, теория фильтрации, дифференциальные уравнения, частные производные второго и третьего порядков, начально-граничные условия, аналитические и приближенные аналитические методы решения.*

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ТОПУРАКТАГЫ ТУЗДУН КЫЙМЫЛЫНЫН ПРОЦЕССИНИН КЭЭ БИР ЧЫГАРЫЛЫШТАРЫ ЖӨНҮНДӨ

Аннотация. *Топурактагы жана жер кыртышындагы суунун кыймылын изилдөө үчүн фильтрация теориясы колдонулат, ал тиешелүү баытпакы-чектик шарттарда экинчи жана үчүнчү тартиптеги жеке туундуларда дифференциалдык теңдемелер түрүндө каралып жаткан кыймылдарды сүрөттөйт. Мындай маселелерди изилдөөдө өзгөчө*

маанилүү, аларды чечүүнүн аналитикалык жана болжолдуу аналитикалык ыкмалары берилет. Бул моделдердин жардамы менен үч өлчөмдүү стационардык эмес маселе үчүн нымдуулуктун кыймылынын конкреттүү чыгарылыштары аныкталат.

Ачыкч сөздөр. *Сугат жерлери, кыртыштын нымдуулугу, шордуулугу, сугат маселеси, жер астындагы суулардын агындысы, жер астындагы суулардын ылдамдыгы, туздун эриши, чыпкалоо теориясы, дифференциалдык теңдемелер, экинчи жана үчүнчү даражадагы жекече туундулар, баштапкы-чектик шарттары, чечүүнүн аналитикалык жана болжолдуу аналитикалык ыкмалары.*

Introduction

At present, the use of automation in irrigated agriculture is promising. By regulating the moisture content in the soil, one can simultaneously influence the thermal, air and salt regimes of soils. To avoid the negative consequences of irrigation of secondary salinization, over-wetting of soils, it is necessary to use some reclamation techniques. These include artificial drainage, leaching, and special agricultural technology. Salinization control is an old irrigation problem that has not yet been resolved. Its successful solution largely depends on the availability of a quantitative description of the processes of movement of salts in soil and groundwater on irrigated areas. Only such a description makes it possible to predict confidently and optimally manage it.

The question of the origin of readily soluble salts and saline soils has been resolved in sufficient detail and convincingly [11]. The qualitative picture of soil salinity is as follows: precipitation that falls in mountainous areas seeps into soils and grounds, forms a flow of groundwater, which, moving downward under the influence of gravity, are enriched with salts-products of the weathering of rocks. When entering the plain, the flow of groundwater approaches the soil surface, and some of it is dispersed into the atmosphere due to transpiration and evaporation. As the distilled water evaporates, the concentration of salts in the capillary rim increases. As a result of an increase in the concentration of salts in the mouths of the capillaries, a concentration gradient appears, which causes a reverse diffusion flow of salts into the groundwater, which are enriched with salts

and increase their salinity as they move downstream. Salts with a low migration ability are precipitated at higher elevations of the relief. The more mobile salts move further down and remain in the soil or reach the base of the underground runoff, in which they significantly lose the rate of movement of groundwater. These waters are spent mainly for evaporation, which leads to the accumulation of salts in soil and groundwater and groundwater. Natural drainage and increased evaporation are most characteristic of the natural conditions under which soil salinization occurs. Irrigation of soils with such conditions accelerates the development of salinity. The area of saline and potentially saline lands is large. Due to the fact that territories with good natural drainage and favorable relief have already been developed for irrigation, then the further growth of irrigated lands will occur in areas with potential soil salinity.

That is why the fight against salinization is of great relevance to this day. The salinization process is influenced by many environmental factors. For a successful study of the salinization process, it is necessary to single out the main factors that determine the direction of the "salinization - desalinization" processes. There are three such factors: the intensity of evaporation, the intensity of filtration, the energy of the flow of groundwater. Without stopping in detail, we know that they all depend on the climate, the type of soil, vegetation, the depth of groundwater, human economic activity, the energy of the groundwater flow. Moreover, all these factors can be calculated numerically, i.e. migration of salts can also be

considered from a quantitative point of view. In [8, pp. 59-64], the analysis of existing mathematical models of salt transfer processes in soil, based on the laws of physicochemical hydrodynamics of porous media, is given, critical analysis of scientific research on convective diffusion, salt dissolution, sorption and ion exchange in rocks.

Materials and methods

In the study of the movement of water in soils, the theory of filtration is used [5, p. 7-8], which describes the considered motions in the form of partial differential equations of the second and third orders with the

$$\frac{\partial W}{\partial t} = \frac{\partial}{\partial x} \left(D(W) \frac{\partial W}{\partial x} \right) + \frac{\partial}{\partial y} \left(D(W) \frac{\partial W}{\partial y} \right) + \frac{\partial}{\partial z} \left(D(W) \frac{\partial W}{\partial z} \right) \tag{1}$$

where W - humidity per unit volume, $D(W)$ – diffusion coefficient, x, y, z – spatial coordinates, t – time.

To study equation (1), the following conditions are usually set:

- initial condition: $W(x, y, z, 0) = F_0(x, y, z)$ (2)
- the boundary conditions are sufficiently idealized, for the boundary of the soil adjacent to the groundwater is set $W(x, H, z, t) = F_1(x, z, t)$ (3)

The statement that at the lower level the soil is moisture insulated and the flow into the groundwater is zero is imperfect, but it is still often used. Thus, on the “soil-air” boundary, a 2-kind condition is formulated $D(W) \frac{\partial W}{\partial x} \Big|_{y=0} = 0, D(W) \frac{\partial W}{\partial z} \Big|_{y=0} = 0$ (4)

Equation (1) is non-linear, so there are various methods for linearizing it. Expanding $D(W)$ by a power series, we obtain the equation for the zero approximation

$$\frac{\partial W_0}{\partial t} = D_0 \left(\frac{\partial^2 W_0}{\partial x^2} + \frac{\partial^2 W_0}{\partial y^2} + \frac{\partial^2 W_0}{\partial z^2} \right) \tag{5}$$

Based on the group properties of differential equations, we find solutions to equation (5) in the form $W_0 = (t + t_0)^m f_0(\mu)$ (6)

where μ - is a self-similar variable $\mu = \frac{x^2 + y^2 + z^2}{4D_0(t + t_0)}$ (7)

Determining the partial derivatives of the function W_0 and substituting them into equation (5), we obtain an ordinary differential equation of the second order

$$\mu f_0''(\mu) + \left(\mu + \frac{3}{2} \right) f_0'(\mu) - m f_0(\mu) = 0 \tag{8}$$

Equation (8) is a degenerate hyper geometric equation. In the vicinity of the singular point $\mu = 0$, linearly independent solutions of equation (8) will have the form

$$f_{0_1} = \exp(-\mu) F \left(\frac{2m+3}{2}, \frac{3}{2}, \mu \right) \tag{9}$$

$$f_{0_2} = \exp(-\mu) \mu^{-\frac{1}{2}} F \left(m + 1, \frac{1}{2}, \mu \right) \tag{10}$$

Then, the general solution of equation (8) will be written in the form

$$f_0(\mu) = (t + t_0)^m \exp(-\mu) \left[C_1 F \left(\frac{2m+3}{2}, \frac{3}{2}, \mu \right) + C_2 \mu^{-\frac{1}{2}} F \left(m + 1, \frac{1}{2}, \mu \right) \right] \tag{11}$$

and the general solution of equation (5), taking into account (6) and (7) as

corresponding initial-boundary conditions. Particular and important in the study of such problems is given to the analytical and approximate analytical method for their solution. The procedure for finding analytical solutions for the problems of filtration and infiltration of fluidity is associated with certain mathematical difficulties and the more valuable are new methods of obtaining exact solutions [4, pp. 20-22]. In the general case, the movement of moisture for a three-dimensional non-stationary problem is modeled by the equation of moisture transfer of the following form [7, pp. 115-118]:

$$W_0(x, y, z, t) = (t + t_0)^m \exp\left(-\frac{x^2+y^2+z^2}{4D_0(t+t_0)}\right) \left[C_1 F\left(\frac{2m+3}{2}, \frac{3}{2}, \frac{x^2+y^2+z^2}{4D_0(t+t_0)}\right) + C_2 \left(\frac{x^2+y^2+z^2}{4D_0(t+t_0)}\right)^{-\frac{1}{2}} F\left(m+1, \frac{1}{2}, \frac{x^2+y^2+z^2}{4D_0(t+t_0)}\right) \right] \quad (12)$$

Research results

Using the properties of a degenerate hypergeometric function, we find the cases when linearly independent solutions are representable in terms of algebraic polynomials. From equality (9) and (10) it is seen that solution (9) can be reduced to a finite polynomial for $m = -\frac{3}{2}; -\frac{5}{2}; -\frac{7}{2}; \dots; -\frac{2n+1}{2}; \dots, -\frac{2n+1}{2}; \dots$, and solution (10) at $m = -1; -2; -3; \dots; -n; \dots$, where $n \in N$. As you can see, these particular solutions cannot be simultaneously written, in polynomials for different values of "m". Let us determine the exact solutions of equation (5), when the solution (9) can be represented in terms of an algebraic polynomial, while the arbitrary constant C_2 in solution (11) is set equal to zero.

For $m = -3/2$ solution (9) is written as $f_{0_1}(\eta) = (t + t_0)^{-3/2} \exp(-\eta)$, and for the required function W_0 the solution has the form

$$W_0(x, y, z, t) = C_1(t + t_0)^{-3/2} \exp\left(-\frac{x^2+y^2+z^2}{4D_0(t+t_0)}\right) \quad (13)$$

$$\text{for } m = -5/2 \text{ we have } f_{0_1}(\eta) = (t + t_0)^{-5/2} \exp(-\eta) \left(1 - \frac{2}{3}\eta\right) \quad (14)$$

$$\text{then we get } W_0(x, y, z, t) = C_1(t + t_0)^{-5/2} \exp\left(-\frac{x^2+y^2+z^2}{4D_0(t+t_0)}\right) \left(1 - \frac{x^2+y^2+z^2}{6D_0(t+t_0)}\right) \quad (15)$$

$$\text{for } m = -7/2 \text{ we have } f_{0_1}(\eta) = (t + t_0)^{-7/2} \exp(-\eta) \left(1 - \frac{4}{3}\eta + \frac{4}{15}\eta^2\right) \quad (16)$$

$$\text{then we get } W_0(x, y, z, t) = C_1(t + t_0)^{-7/2} \exp\left(-\frac{x^2+y^2+z^2}{4D_0(t+t_0)}\right) \left(1 - \frac{x^2+y^2+z^2}{3D_0(t+t_0)} + \frac{(x^2+y^2+z^2)^2}{60D_0^2(t+t_0)^2}\right) \quad (17)$$

$$\text{for } m = -9/2 \text{ we have } f_{0_1}(\eta) = (t + t_0)^{-9/2} \exp(-\eta) \left(1 - 2\eta + \frac{4}{5}\eta^2 - \frac{8}{105}\eta^3\right) \quad (18)$$

$$\begin{aligned} \text{then we get } W_0(x, y, z, t) &= C_1(t + t_0)^{-9/2} \exp\left(-\frac{x^2+y^2+z^2}{4D_0(t+t_0)}\right) \cdot \\ &\cdot \left(1 - \frac{x^2+y^2+z^2}{2D_0(t+t_0)} + \frac{(x^2+y^2+z^2)^2}{20D_0^2(t+t_0)^2} - \frac{(x^2+y^2+z^2)^3}{840D_0^3(t+t_0)^3}\right) \end{aligned} \quad (19)$$

Now we write down when the second linearly independent solution (10) is reduced to an algebraic polynomial.

$$\text{For } m = -1 \text{ we have } f_{0_2}(\eta) = (t + t_0)^{-1} \exp(-\eta) \eta^{-1/2} \quad (20)$$

then the required function takes the form

$$W_0(x, y, z, t) = C_2 \exp\left(-\frac{x^2+y^2+z^2}{4D_0(t+t_0)}\right) \sqrt{\frac{4D_0}{(x^2+y^2+z^2)(t+t_0)}} \quad (21)$$

$$\text{For } m = -2 \text{ we have } f_{0_2}(\eta) = (t + t_0)^{-2} \exp(-\eta) \eta^{-1/2} (1 - 2\eta) \quad (22)$$

$$\text{then } W_0(x, y, z, t) = C_2 \exp\left(-\frac{x^2+y^2+z^2}{4D_0(t+t_0)}\right) \sqrt{\frac{4D_0}{(x^2+y^2+z^2)(t+t_0)^3}} \left(1 - \frac{x^2+y^2+z^2}{2D_0(t+t_0)}\right) \quad (23)$$

$$\text{For } m = -3 \text{ we have } f_{0_2}(\eta) = (t + t_0)^{-3} \exp(-\eta) \eta^{-1/2} \left(1 - 4\eta + \frac{4}{3}\eta^2\right) \quad (24)$$

$$\begin{aligned} \text{then } W_0(x, y, z, t) &= C_2 \exp\left(-\frac{x^2+y^2+z^2}{4D_0(t+t_0)}\right) \sqrt{\frac{4D_0}{(x^2+y^2+z^2)(t+t_0)^5}} \left(1 - \frac{x^2+y^2+z^2}{2D_0(t+t_0)}\right) \cdot \\ &\cdot \left(1 - \frac{x^2+y^2+z^2}{D_0(t+t_0)} + \frac{(x^2+y^2+z^2)^2}{12D_0^2(t+t_0)^2}\right) \end{aligned} \quad (25)$$

$$\text{For } m = -4 \quad f_{0_2}(\eta) = (t + t_0)^{-4} \exp(-\eta) \eta^{-1/2} \left(1 - 6\eta + 4\eta^2 - \frac{8}{15}\eta^3\right) \quad (26)$$

$$W_0(x, y, z, t) = C_2 \exp\left(-\frac{x^2 + y^2 + z^2}{4D_0(t + t_0)}\right) \sqrt{\frac{4D_0}{(x^2 + y^2 + z^2)(t + t_0)^7}} \cdot \left(1 - \frac{3(x^2 + y^2 + z^2)}{2D_0(t + t_0)} + \frac{(x^2 + y^2 + z^2)^2}{4D_0^2(t + t_0)^2} - \frac{(x^2 + y^2 + z^2)^3}{120D_0^3(t + t_0)^3}\right) \quad (27)$$

If the second arbitrary constant is not equated to zero, then for $m = -3/2$ we have the following solution

$$W_0(x, y, z, t) = (t + t_0)^{-\frac{3}{2}} \exp\left(-\frac{x^2 + y^2 + z^2}{4D_0(t + t_0)}\right) \cdot \left(C_1 + C_2 \cdot \sqrt{\frac{4D_0(t + t_0)}{(x^2 + y^2 + z^2)}} \cdot \left(1 - \sum_{n=1}^{\infty} \frac{(x^2 + y^2 + z^2)^n}{(2n-1)n!(4D_0(t + t_0))^n}\right)\right) \quad (28)$$

Similarly, for $m = 0$, we obtain

$$W_0(x, y, z, t) = \left(C_1 + C_2 \exp\left(-\frac{x^2 + y^2 + z^2}{4D_0(t + t_0)}\right) \cdot \left(1 + \sum_{n=1}^{\infty} \frac{2^n (x^2 + y^2 + z^2)^n}{1 \cdot 3 \cdot \dots \cdot (2n-1)(4D_0(t + t_0))^n}\right)\right) \quad (29)$$

and for $m = -5/2$

$$W_0(x, y, z, t) = (t + t_0)^{-\frac{5}{2}} \exp\left(-\frac{x^2 + y^2 + z^2}{4D_0(t + t_0)}\right) \cdot \left(C_1 \left(1 - \frac{x^2 + y^2 + z^2}{6D_0(t + t_0)}\right) + C_2 \sqrt{\frac{4D_0(t + t_0)}{(x^2 + y^2 + z^2)}} \left(1 - \frac{3(x^2 + y^2 + z^2)}{4D_0(t + t_0)} + 3 \sum_{n=1}^{\infty} \frac{(x^2 + y^2 + z^2)^{n+1}}{(2n-1)(2n+1)(n+1)!(4D_0(t + t_0))^{n+1}}\right)\right) \quad (30)$$

Conclusions

As a result, we have identified a number of particular solutions of equation (5). Analysis of the obtained solutions shows that with decreasing «m» the number of terms of the algebraic polynomial increases.

Another solution to equation (5) can be found in the form of a product of two functions

$$W_0 = \omega(t) \cdot f_0(ax + by + cz), \text{ где } a, b, c - \text{const} \quad (31)$$

as a result, the general solution is represented in the form

$$W_0(x, y, z, t) = \left(C_1 \exp\left(-\frac{\lambda(ax + by + cz)}{\sqrt{D_0(a^2 + b^2 + c^2)}}\right) + C_2 \exp\left(\frac{\lambda(ax + by + cz)}{\sqrt{D_0(a^2 + b^2 + c^2)}}\right)\right) \cdot \exp(\lambda^2 t) \quad (32)$$

Thus, a number of exact solutions have been found for equation (5). To determine the integration constants C_1 and C_2 , it is necessary to use the initial-boundary conditions of the types (2), (3) and (4), which are usually set explicitly.

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**IMPORTANCE OF HOMEGARDENS IN A CHANGING CLIMATE IN THE
TERRITORY OF THE KARA-BAK AYIL-OKMOTU IN BATKEN**

***Abstract.** Agroforestry is a land-use management system in which trees or shrubs are grown around or among crops or pastureland. The homegardens play a significant role in the livelihood of local people in the Kara-Bak Ayil-Okmotu. They are small-sized, about 0.1-0.2 ha of land. Each household satisfies mainly its own subsistence needs. To know the importance of homegardens, we conducted a questionnaire survey and focus group discussions among farmers. A total number of 73 farmers with different backgrounds consisting of 51% women and 49% men in seven villages were selected using random sampling techniques. According to the results, the main crops in homegardens are tomato (84%), potato and carrot (55%), cucumber, cabbage, pepper (50-52%) and onion (44%). Garlic, beans, clover and corn are also cultivated in small quantities.*

There were 17 different woody and fruit trees and shrub species found. The distribution of these species was identical in all villages. An apricot tree is dominating up to 97% of homegardens. Other species as apples (71%), cherry plum (61%) and peach (47%) are the most favourable fruit tree species. A Kokand cherry (26%), black plum (22%) and almond (17%) trees are getting more popular among farmers due to their economic benefits. Moreover, walnut, grape and pistachio and pomegranate trees are very seldom, but there is a considerable potential to propagate as promising income sources. Other species as mulberry, poplar, elm and willow trees are also widespread and used as construction material or deadwood.

***Key words:** agroforestry, homegardens, farmers, apricot*

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**ЗНАЧЕНИЕ ДОМАШНИХ САДОВ В УСЛОВИЯХ МЕНЯЮЩЕГОСЯ КЛИМАТА
НА ТЕРРИТОРИИ КАРА-БАК АЙЫЛ-ОКМОТУ В БАТКЕНСКОМ РАЙОНЕ**

***Аннотация.** Агролесоводство — это система управления землепользованием, в которой деревья или кустарники выращиваются вокруг или среди сельскохозяйственных культур или пастбищ. Домашние сады играют важную роль в обеспечении средств к существованию местного населения Кара-Бакского Айыл-Окмоту. Они небольшого размера, около 0,1-0,2 га земли. Каждое домохозяйство удовлетворяет в основном свои собственные потребности.*

С целью узнать о важности домашних садов, мы провели анкетный опрос и обсуждения в фокус-группах среди фермеров. Всего в семи сёлах методом случайной выборки было отобрано 73 фермера из различных социальных групп, включая 51% женщин и 49% мужчин. Согласно полученным результатам, основными сельскохозяйственными культурами в домашних садах являются томаты (84%), картофель и морковь (55%), огурцы, капуста, перец (50-52%) и лук (44%). Также в небольших объемах выращиваются чеснок, фасоль, клевер и кукуруза.

Было установлено 17 различных видов древесных и плодовых деревьев и кустарников. Распределение этих видов было одинаковым во всех сёлах. Абрикосовое дерево преобладает до 97% домашних садов. Другие виды, такие как яблоня (71%), алыча (61%) и персик (47%)

являются наиболее благоприятными видами фруктовых деревьев. Черешня (26%), черная слива (22%) и миндаль (17%) становятся все более популярными среди фермеров, так как они считаются экономически выгодными. Кроме этого, пока редко встречающиеся грецкий орех, виноград, фисташковые и гранатовые деревья имеют значительный потенциал для их распространения в качестве перспективных источников дохода. Другие виды деревьев, такие как тутовник, тополь, вяз и ива, также широко распространены и используются в качестве строительного материала или сухостоя.

Ключевые слова: Агроресководство, домашние сады, фермеры, абрикос.

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**БАТКЕН РАЙОНУНДАГЫ КАРА-БАК АЙЫЛ ӨКМӨТҮНҮН АЙМАГЫНДАГЫ
ӨЗГӨРҮЛҮП ТУРГАН КЛИМАТТЫН ШАРТТАРЫНДА ҮЙ ЖАНЫНДАГЫ
ЖЕМИШ БАКТАРЫНЫН МААНИСИ**

Аннотация. Агротокой чарбасы – бул жерди пайдаланууну башкаруу болуп эсептелет. Мында бак-дарактар жана бадалдар айыл чарба өсүмдүктөрү менен жайыттардын айланада өстүрүлөт. Үйлөрдөгү жемиш бактары Кара-Бак Айыл Өкмөтүндөгү жергиликтүү элдин жашоосун камсыз кылууда маанилүү ролду ойнойт. Алардын аянттары анча чоң эмес, болжол менен 0,1-0,2 га. Ар бир чарбакер негизинен өзүнүн керектөөлөрүн канааттандырышат.

Өзөктүү сөздөр: агротокой чарбасы, үй алдындагы жемиш бактар, фермерлер, чоң өрүк.

Introduction

Agroforestry is a land-use management system in which trees or shrubs are grown around or among crops or pastureland. The practice of cultivating trees on farms alongside other agricultural production has a long history around the world. Thus, agroforestry is a new name for old practices.

Agroforestry bridges the gap that often separates agriculture and forestry by building integrated systems that address both environmental and socio-economic objectives. Agroforestry can improve the resiliency of agricultural systems and mitigate the impacts of climate change (Brown et al., 2018). Based on the results of climate change resilience studies (Fay et al., 2010) the country was ranked third among the countries in Eastern Europe and Central Asia that are most vulnerable to climate change. This is because agriculture in the country is sensitive to climate change.

Batken is one of the remote, mountainous and border districts, where 100% of the population live in the rural area and rely on

agriculture as the main source of their incomes. The Kara-Bak Ayil Okmotu is one of the vulnerable self-local governments in Batken region due to its relatively large population of poor and socially disadvantaged people, high density, transboundary status making the area prone to inter-border conflicts, scarce natural resources, food insecurity and food shortage, high unemployment and migration rate. In general, 17977 inhabitants from seven villages, where the extreme poverty rate is 40.7%, the highest indicator among rural districts of Batken (KBAO, 2017).

The Kara-Bak Ayil Okmotu is located at an average altitude 900 m above sea level (except Zardaly village-1700 m) exuding a warm temperate climate. According to the Batken meteorological station, an average annual temperature is 25 degrees in July and -2 degrees in January is typical. There is significant rainfall throughout the year. The amount of precipitation increases with the increase in elevation above sea level. The average annual precipitation is 1040 mm per year, the highest is 69.4 mm in March,

whereas the lowest is 14 mm in September. Further, according to a soil map of the State Soil-Agrochemical Station in Batken (2021), the predominant soil type on the territories of the Kara-Bak Ayil Okmotu (except Zardari village) is a typical sierozem soil. It occupies about 75% of the territory with an average of 1.1 humus content. The remaining 25% of soil consists of meadow sierozem soil.

According to CIAT and World Bank (2018) the climate change adaptation in agricultural sector in the period up to 2070, it is expected that yields in such arid areas as Batken region will be further decreased primarily due to high temperatures and water scarcity. The development of homegardens, which are the important agroforestry practices, would be one of the most conspicuous land-use approaches across landscapes and agroecological zones in such a changing climate. Hence, homegardens aim to balance the social, economic, ecological, and cultural needs of present and future generations and to maintain and conserve agroforestry resources besides offering multiple uses. In other words, homegardens support greater farm income and increase land productivity by sustaining food production while mitigating the negative effects of climate change, enhancing wood production, and combating land degradation.

Therefore, the main goal of this study was to carry out a rapid assessment of available local homegardens practices, identify existing challenges and local capacities to develop the homegardens in near future.

Methods and tools

- A desk review study was conducted to gather secondary data from published and unpublished sources;
- A transect walk provided mapping information beyond that collected

during the initial phase and verified the information on the sketch map;

- Interview and Key Informant Interviews (Calub, 2003) were used to explore the farmers' practical skills in farming, food security issues at a household level, challenges and strengths in homegardens' development and their willingness to learn and improve their livelihood;
- Focus group discussions were conducted in each village on their homegardening practices, challenges and future visions in homegardens' development.

Results and discussion

Based on our study on agroforestry systems, different types of agroforestry systems can be found. Homegardens agroforestry system is one of the most prevalent types of land use systems involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial crops and invariably livestock within the compounds of individual houses, the whole tree-crop, and the animal unit is being intensively managed by family labour (Kumar and Nair, 2006). These gardens are planted and maintained by members of the household; their products are intended primarily for household consumption.

Homegardens can be found in all regions in Kyrgyzstan, and they are varied according to the location, climatic conditions and agrobiodiversity. Among others, homegardens in Kara-Bak Ayil Okmotu are extremely important for the livelihood of local people. They are small-sized about 0.1-0.2 ha of land. Each household produces mainly for its own subsistence needs.

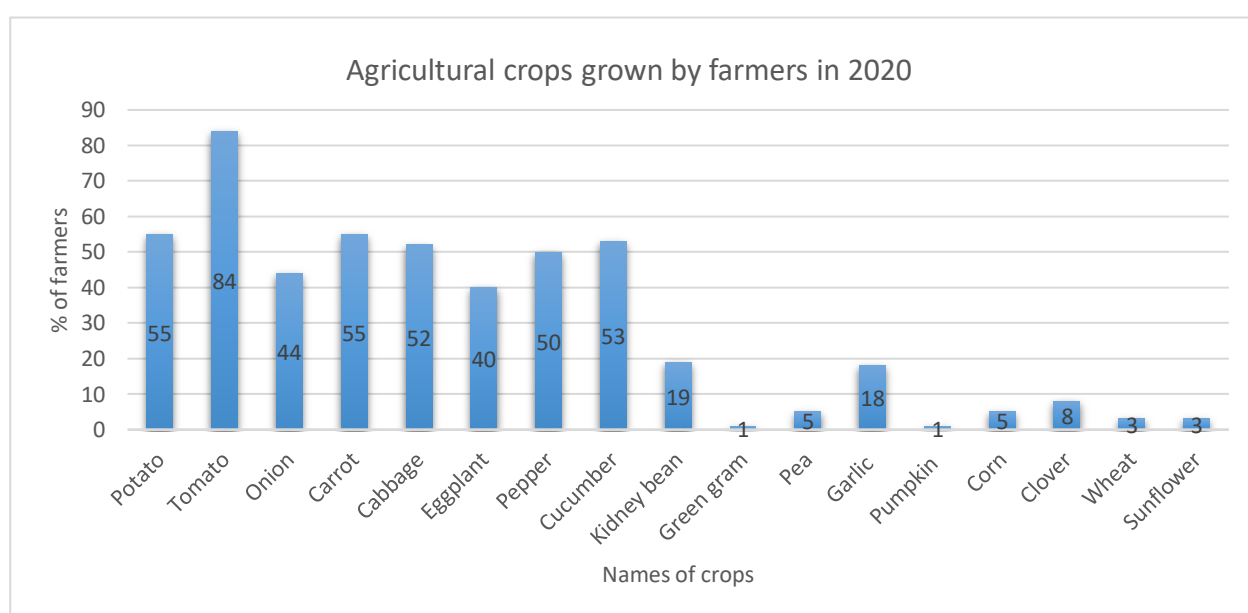
— AGRONOMY —

The most common homegardens of villagers are rotated around the apricot trees. Typically, apricot trees are planted in rows and supplementary trees such as apple or cherries, which are rarely planted along the fences. In between trees, fodder crops are cultivated each year without following the crop rotation scheme. It is common to find vegetables being cultivated in remaining open spaces.

What farmers grow in their homegardens?

A total number of 73 farmers with different backgrounds consisting of 51% women and 49% men in seven villages were selected by using random sampling techniques. The analyzed data has been used to address the objectives and questions of this study, as demonstrated below.

According to the results, the main crops in studied homegardens are tomato (84%), potato and carrot (55%), cucumber, cabbage, pepper (50-52%) and onion (44%). Garlic, beans, clover and corn are also cultivated in small quantities.



(Fig.1). *Figure 1. Agricultural crops grown by farmers in homegardens in 2020*

If we look at crops in different villages, the crops are more or less equally distributed, except for some crops. For instance, potato is cultivated in Zardali up to 91%, where the soil is relatively fertile, while in Kyzyl-Bel village the rate reaches up to 38% in relatively poor and salty soil. Surprisingly, the species richness of crops in Zardali was as high as in Kara-Bak village due to its inaccessibility and farmers try to diversify their homegardens as much as possible at 1750 MASL (Fig. 2).

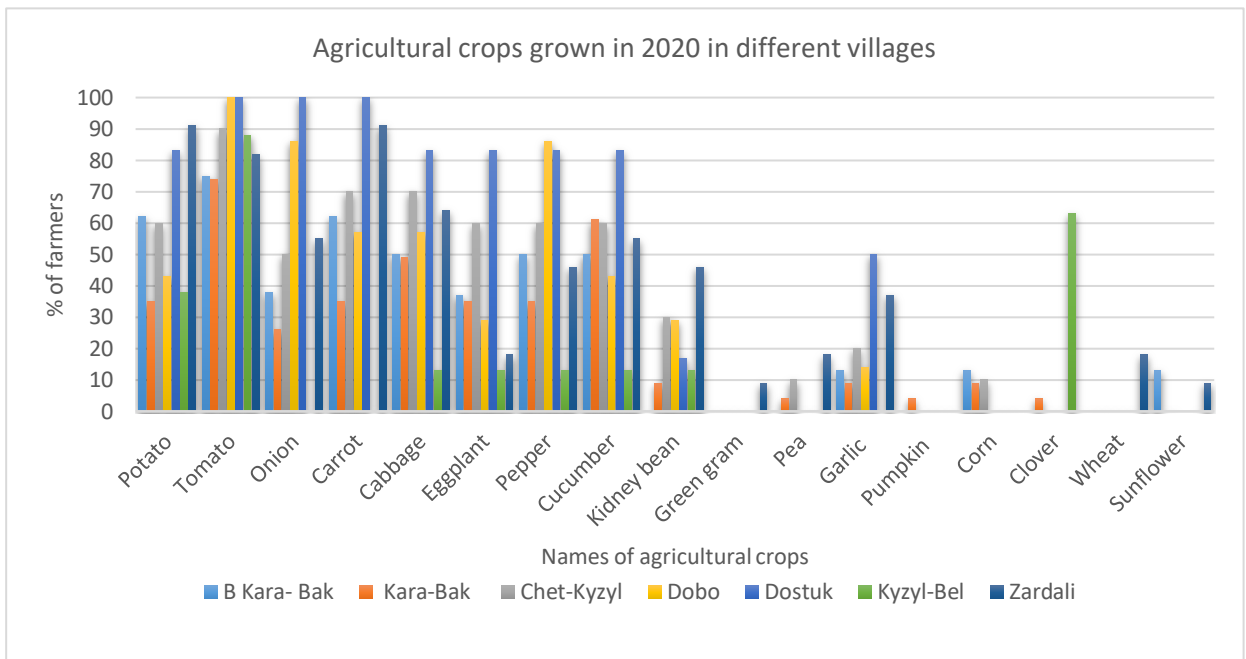
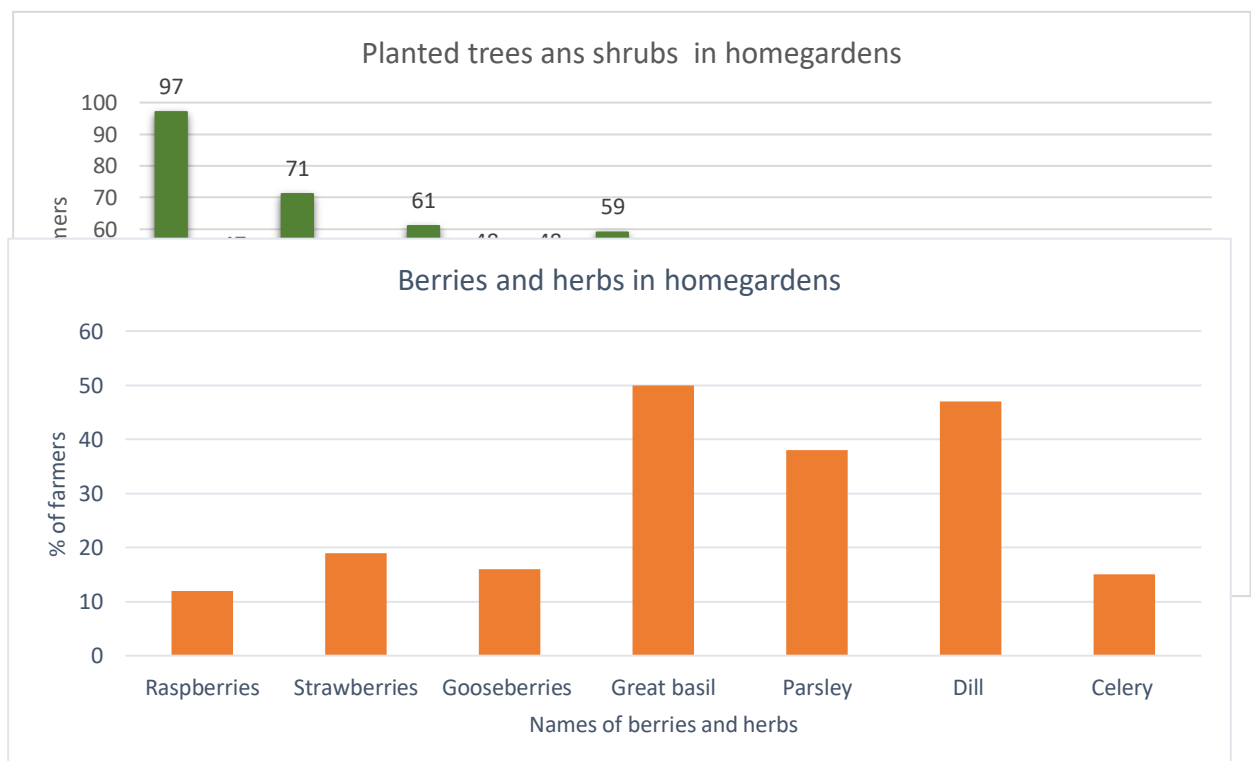


Figure 2. Agricultural crops grown by farmers in homegardens of seven villages

In the study sites, there were 17 different woody and fruit trees and shrub species found. The distribution of these species was identical in all villages. An apricot tree is dominating up to 97% of homegardens. Other species as apples (71%), cherry plum (61%) and peach (47%) are the most favourable fruit tree species. A Kokand cherry (26%), black plum (22%) and almond (17%) trees are getting more popular among farmers due to their economic benefits.

Moreover, walnut, grape, pistachio and pomegranate trees are very limited, but there is a considerable potential to propagate as promising income sources. Other species as mulberry, poplar, elm and willow trees are also widespread as means of construction materials or deadwood (Fig. 3).

Figure 3. Planted trees and shrubs in homegardens



The next question was on whether farmers plant berries or cultivate herbs. The results demonstrate that 40-50% of people use herbs as great basil, dill or parsley in their kitchen during the vegetation period (Fig 4). The majority of respondents perceived that herb consumption helps to prevent and manage heart disease, cancer and diabetes. Further, 20% of farmers cultivate strawberries, while raspberries and gooseberries are used approximately 10% only. However, many female respondents showed their interest in propagating all types of berries if they learn how to do it.

Figure 4. Berries and herbs in homegardens

What farmers sell from their homegardens?

The most profitable fruit is an apricot. Based on our survey, 25 farmers (34% of out all respondents) sold dried apricots and earned between 5000-120000 soms in 2020, despite a bad harvest year (Fig. 5).

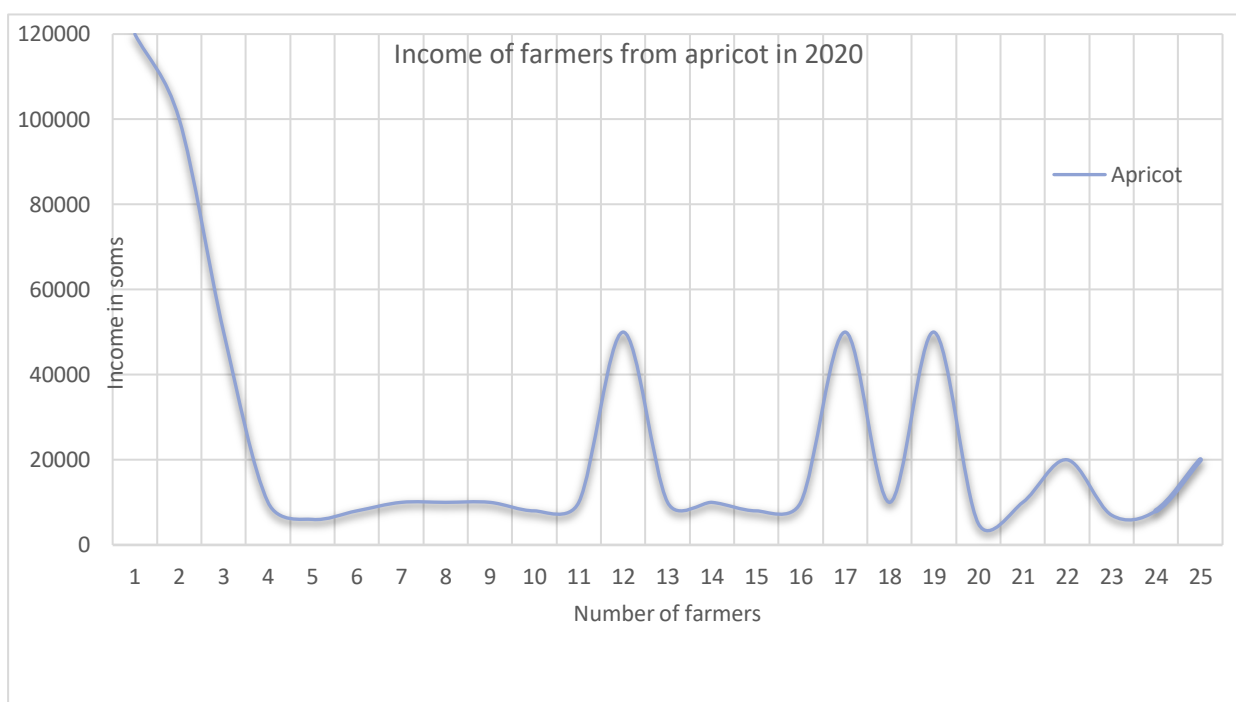


Figure 5. Income of farmers from apricot in their homegardens

Three farmers in Bai Kara-Bak village mentioned that they sold their dried apricots for ten soms per kg in 2020 to Tajik wholesalers, while two farmers in Kyzyl-Bel stated that they sold for about 180 soms per kg. Thus, it heavily depends on species of apricots and the quality of drying methods.

According to East Fruit (2019), the area of apricot orchards occupies more than 10 thousand hectares of land in Batken oblast. There are about ten varieties of apricots growing in the region. The most popular local varieties of apricot are "Suuhany", "Ak

oruk", "Isfarak", "Kandek", "Ashkana" and "Kurmayy". An average of 40,000 tons of dried fruit are produced annually from Batken, out of which 80-90% of the produce is bought up by Tajik for a low price and sold in Russia or Kazakhstan under the Tajik brand. In other words, the Tajiks get 6-8 more profits. This is due to the fact that today there are not enough mini enterprises for the processing and packaging of apricots. Another problem is that entrepreneurs need a large number of fruits at once, but Kyrgyz farmers may not be able to harvest such

volumes of the crops at once in small-scaled farmlands and homegardens.

There are some initiatives in support of the development of value chains. For example, in 2018, a new dried fruit processing factory named “Altyn-Aimak” was launched in Kara-Bak AA by the Agro Horizon project.

At present, the factory is producing organic products with some fully employed workers.

Furthermore, as shown in Fig. (6) three farmers earned 7000 soms on average by selling unprocessed apple fruits in 2020. This seems to be a good sign of household income diversification.

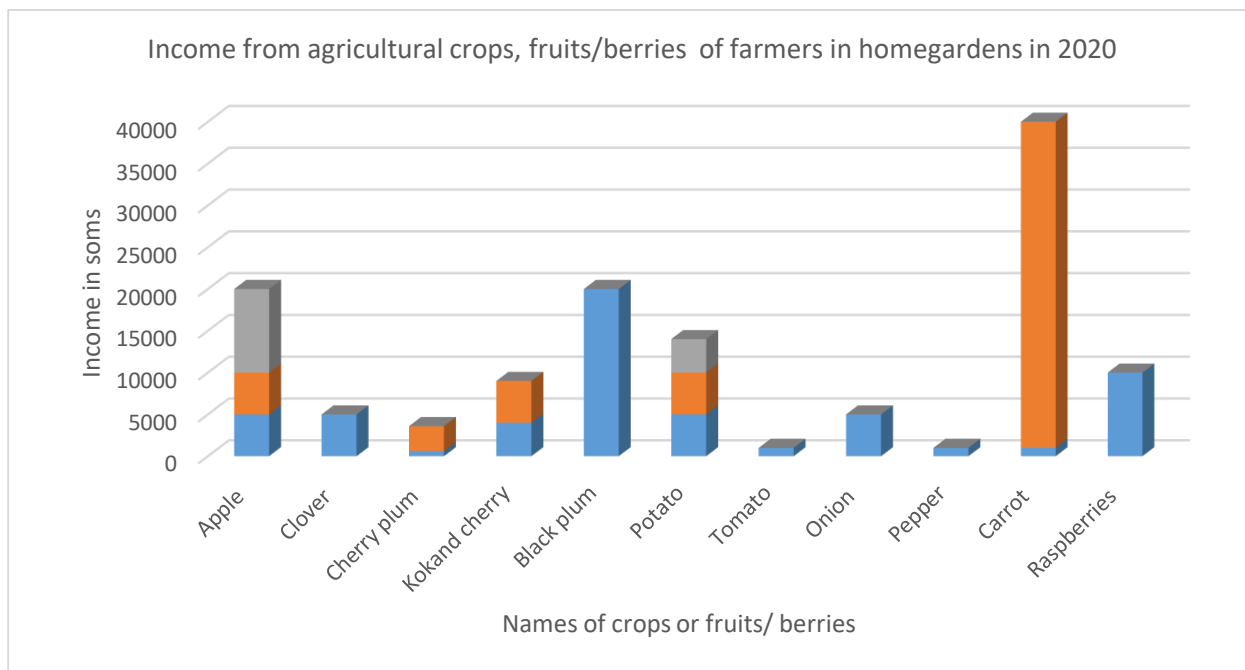


Figure 6. Income of farmers from agricultural crops in homegardens in 2020

At the national level, apples are the most cultivated fruit in Kyrgyzstan, growing on about a third of household plots. Over 135500 tonnes are produced annually. Concerning other fruits, apples have the highest value exports (ILO, 2018).

Other fruits, such as Kokand cherry likewise profitable in the region. Only two farmers earned up to 5000 soms each in 2020, but there is a high potential to make a good revenue even in homegardens, as many farmers revealed. According to the World Bank (2020), Kokand cherry yields in Kyrgyzstan have been steadily increased since 2007 by exporting to the Russian Federation, Kazakhstan and China.

Moreover, in 2018, 14 cherry producers mostly from the Batken region, had already signed supply agreements with Chinese partners. In 2018, Kyrgyzstan exported a total of 68.7 tons of cherries worth 217,800 \$ to

this market. In addition, over the past three years, China and Kyrgyzstan have strengthened cooperation on sanitary and phytosanitary measures, expanding the potential for exports of cherries and other horticultural products.

A black plum is one of the rarest grown trees in homegardens. However, farmers realize its economic significance, hence, most of them are so curious to get more and more information to convince themselves to plant this tree. For instance, one farmer earned approx. 20000 soms in 2020. Plums are less popular in Kyrgyzstan than apricots. Nevertheless, according to the World Bank (2020), between 2013 and 2017, the country exported an average of 4000 tons of plums per year. Prunes have a competitive advantage in terms of production efficiency, as their production cost in Kyrgyzstan is very low.

Further, about 90% of all plum production is concentrated in the Jalal-Abad region. The main type/variety of plum grown is called "Hungarian» according to some reports, it accounts for up to 90%t of the production. Additionally, some farmers in Kara-Bak Ayil Okmotu are progressive in carrot production. In our study, two farmers earned from 1000 to 40 000 soms. Other vegetables as tomato, onion, potato were sold in open markets in small quantities. Furthermore, one of the active farmers demonstrated that she earned 10000 soms by selling raspberries to neighbours during one vegetation period.

Problem of farmers in their homegardens' development

In general, seven focus group discussions in seven villages were organized. The results demonstrate that farmers/local people are knowledgeable about the existing problems in their homegardens that should be addressed. One of the biggest dilemmas in homegardens farming is a shortage of irrigation water complicated by climate change in villages. In this case, water-efficient technologies are key to improving farmers' livelihoods. Drip irrigation system shows multiple benefits in terms of adaptation and productivity. Accordingly, many farmers are eager to apply this system if they are supported in terms of finance and knowledge (training).

The next concern was poor soil fertility. Most farmers have limited knowledge of soil fertility. Some of the mechanisms they use to improve soil fertility include crop rotation schemes, mulching, organic and mineral fertilizers. Further, our farmers do not practice a no-tillage (minimum) farming system. Therefore, an approach of conservation agriculture is an area to explore as a possible recommendation for the selected villages, to educate farmers to optimize the short and long-term ecological and economic benefits.

Access to quality seeds for farming is also another difficult task. Farmers usually continue using seeds long after their productivity potential is lost. The achievement in improved crop varieties and quality plays an important role in food production and hence ensuring food security. Thus, rather than promoting traditional farming practices when farmers rely on a single crop or tree species, the responsible government organizations have to focus on diversification of crops, which are more beneficial and grow different varieties of high-value trees and other desired fruit trees by farmers.

In addition, there is a huge gap in farmers' knowledge in plant protection. For instance, they apply "Taifun" for potatoes – a Chinese-branded insecticide for about 30 soms per package (30 gram). Although specialists do not recommend this insecticide, it remains popular due to its price and recommendations from sellers at Veterinary shops. Hence, various capacity building activities should be organized for farmers to increase crop production by preserving the environment and improving people's health.

Furthermore, our survey results demonstrate that the farmers have difficulties clarifying when, where, from whom to seek agricultural information and advanced farming techniques. Thus, the establishment of a training center would be one of the important initiatives not only in the Kara-Bak Ayil Okmotu, but also in neighboring districts. The training center can be used as a hub for education, resources and training, enabling farmers to develop the skills needed to farm organically and in ways that make the best use of scarce water resources, promote biodiversity, generate income and be resilient to climate change effect.

Conclusion

- They know their problems and needs, but the accessibility of information is limited (from whom to ask and where to go);
- High motivation of farmers to learn and improve their homegardens and farmlands;
- Conservation agriculture approach is needed to apply;
- Diversification of fruit trees and crops is required;
- Integrated plant protection methods should be enhanced among farmers;
- Knowledge in planning and value chain of produced products also should be one of the crucial components of farmers' learning;
- Agroforestry systems, especially, development of homegardens should be strengthened;

A training centre should be established, which can be used as a hub for education, resources and training, enabling farmers to develop the skills needed.

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**KNAU BRIEF ASSESSMENT OF THE ROOT SYSTEM IN VARIETY APPLES
DEPENDING ON THE TYPE OF ROOT, IN THE CHUI SK VALLEY, KYRGYZSTAT**

Abstract. *The article discusses the issue of the quality of the root system from the type of rootstock for ancient varieties of apple trees by the method of root cuttings. The root system of all rooted samples was studied, their morphological characteristics were given. According to the main indicators of the root system, all the test objects were compared with each other and the plants with the highest characteristics of the roots were isolated from the studied apple varieties.*

Key words: *apple tree, stock, rooting, root, mass of the root system Introduction.*

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**КРАТКАЯ ОЦЕНКА КОРНЕВОЙ СИСТЕМЫ У СОРТОВЫХ ЯБЛОНЬ В
ЗАВИСИМОСТИ ОТ ТИПА ПОДВОЯ В ЧУЙСКОЙ ДОЛИНЕ КЫРГЫЗСТАНА**

Аннотация. *В статье обсуждается вопрос качества корневой системы от типа подвоя для стародревних сортов яблонь методом корневого черенкования. Изучена корневая система всех укоренившихся образцов, приведена их морфологическая характеристика. По основным показателям корневой системы сравнили между собой все испытываемые объекты и выделили из изучаемых сортов яблони растения с наиболее высокими характеристиками корней.*

Ключевые слова: *яблоня, подвой, укоренение, корень, масса корневой системы.*

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**КЫРГЫЗСТАНДЫН ЧУЙ ӨРӨӨНҮНДӨ ПОДВОЙДУН ТИБИНЕ ЖАРАША
АЛМАНЫН СОРТТОРУНУН ТАМЫР СИСТЕМАСЫНА КЫСКА БАА БЕРҮҮ**

Аннотация. *Макалада алманын эски сорттору үчүн тамырды калемчелөө ыкмасы менен сабактын тибине жараша тамыр системасы маселеси талкууланат. Бардык тамырланган үлгүлөрдүн тамыр системасы изилденген, анын морфологиялык мүнөздөлүшү келтирилген. Тамыр системасынын негизги көрсөткүчтөрү боюнча алманын изилденген сортторунан тамырлары эң жогорку мүнөздөлгөн түрлөрү бөлүп каралды.*

Өзөктүү сөздөр: *алма багы, сабак, тамырлоо, тамыр, тамыр системасынын массасы.*

Currently, the priority problem of horticulture is the organization of its sustainable development, the solution of which is associated with the development and creation of profitable perennial plantations [1]

To create profitable perennial plantations, the method of vegetative propagation is used.

Of all the methods of vegetative propagation of an apple tree, propagation of varietal apple trees by root cuttings, depending on the types of rootstock, is of great interest, since this is a relatively simple, fast and effective way of propagation. Modern technology of growing intensive apple tree plantations provides for the use of low-growing types of rootstocks, which have great control over grafted varieties. The size of the fruit tree, early

maturity, yield, fruit quality, labor productivity in the garden and the unit cost of production depend on the stock. The range of clonal rootstocks has recently increased significantly due to the breeding work of domestic and foreign researchers. Clonal rootstocks are characterized by genetic homogeneity and therefore have the same effect on the grafted variety. The most widespread in the world are only about 30 species of apple rootstocks and their clones. First of all, these are the rootstocks of the M and MM series. [2]

The introduction of low-growing clonal rootstocks, which are most adapted to the conditions of certain territories, will increase the profitability of fruit nurseries and orchards.

The purpose of the research is to highlight the best introduced apple stock, which surpasses the zoned ones in winter hardiness, disease resistance, shoot-forming ability, providing a high yield of standard cuttings. Purpose of the study: selection of apple hybrids for use as rootstocks that are not inferior in rooting rate to those zoned in the Central Black Earth Region. Research objectives: To study and select, according to the degree of rooting by green cuttings, hybrids and forms of apple tree rootstocks. Evaluate and characterize hybrid forms by the quality of the root system.

Materials and methods. All surveys and studies were carried out according to generally accepted methods: "Program and methodology for the study of varieties of fruit, berry and nut crops" [4]. The assessment of the root system in plants was determined according to Budagovsky's five-point scale: 1 - there are no roots on the cuttings; 2- rooting is unsatisfactory (3-4

weak roots or only rudiments); 3- rooting is satisfactory (3-4 large roots or several roots extending from the stem); 4-rooting is good (there are many large and small roots on the cuttings); 5- rooting is very good (a lot of densely spaced large and small roots depart from the cutting. [3]

Planting scheme for cuttings 10 × 5 cm (200 pcs / m²), planting depth - 2.5-3.0 cm, threefold repetition

The weight of the roots was determined by the gravimetric method.

Research results

To accomplish the assigned tasks, research was carried out at KNAU on the territory of the educational farm, which is located in the Sukuluk district of the Chui valley of the Kyrgyz Republic. The land mass of the institute is located at an altitude of 703 above sea level. The soil conditions of this site are dark gray soils, which are characterized by a high content of phosphorus, potassium and calcium and very high magnesium, humus 2.4% and pH - close to neutral. Low carbonate content As an object of research, we used stock MM106 on which the apple cultivar Golden Delishest was budded, Kirgiz winter stock on M26 stock, MIX Rashida, Arm 18-Renet Burkhard, Zhetysu kandil Sinap.

As a result of the work carried out on vegetative propagation of apple rootstocks, root cuttings were obtained by root-own plants. All studies were carried out over two years. The control sample in the experiment was a clonal stock of an apple tree (MM-106)

In the studied apple rootstocks, an assessment of the root system was made (table 1)

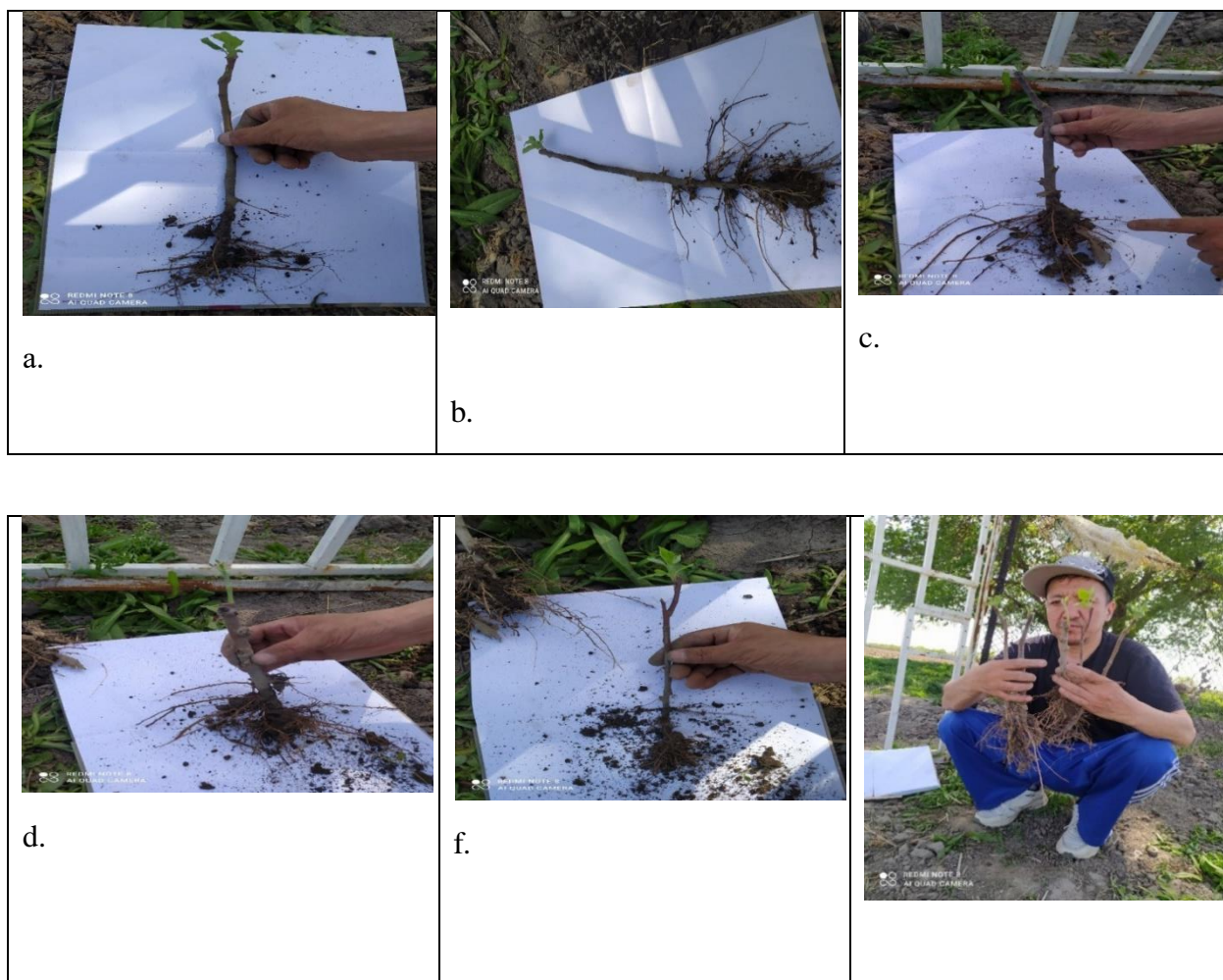
Table 1

Ballpoint assessment of the root system of apple rootstocks

Rootstock type	Root system assessment, score		Average value over the years of research
	2020	2021	
ARM18	3,5	3	3,25
ZHETISU5	3,5	3	3,25
M9	4,5	4	4,25
MM106 κ	5	4,8	4,6
M26	4	4	4

When evaluated on a five-point scale, the maximum score was for root cuttings in the stock MM106, M9, M26, and low for the stocks ARM18 and ZHETISU.

Figure 1 shows the root system of the root cuttings studied by the rootstocks.



Studied rootstocks: root cuttings a.- M9; b. - ARM18; V.- M26; - MM106; - ZHETISU 5

Figure 1 shows that in all root cuttings for all rootstocks, a superficial root system is formed, except for the root cutting of the rootstock APM18, which more closely resembles a tap root system.

In comparison with each other, a more developed root system was noted in the MM106 rootstock, all other forms of apple rootstocks had a less developed root system. All root cuttings of the studied rootstocks are superior in rooting to the root cuttings of the ARM18 stock (5-15%).

To compare the root cuttings of the studied rootstocks, we calculated the biomass of the bark system (table 2)

table 2

Root system weight of root cuttings depending on the type of rootstock

Rootstock type	Root system weight, g		Average weight of system roots, g
	2020y.	2021y.	
ARM18	51,6	55,2	55,4
ZHETISU5	55,2	57,6	57,6
M9	67,2	69,6	68,4
MM106 κ	69,6	74,4	72,0
M26	62,4	60,0	61,2

Thus, among the studied apple rootstocks, the root cutting of the MM106k stock had a more developed root system, slightly worse than the M9 stock.

Conclusion

From the studied group of apple tree rootstocks, over the years of observation, the forms of root cuttings were identified, which showed the worst result - the rootstocks ARM18 and ZHETISU. These are preliminary results.

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PRELIMINARY ASSESSMENT OF THE FORMATION OF BIOMETRIC PARAMETERS IN OCCULATORS AFTER ROOT CUTTING IN THE CHUA VALLEY OF KYRGYZSTAN

Summary. *On the basis of KNAU, studies were carried out in order to identify the influence of clonal rootstocks on the biometric indicators of apple eyepieces. Objects of research are apple tree rootstocks MM106, M26, M9, ARM18, ZHET5. Apple varieties Goldin Delishest, Kandil Sinap, Rashida, Ranet Burgardt were tested as a scion. Kyrgyz winter.*

Key words: *reproduction, clonal rootstocks, apple tree, biometric indicators, seedlings, leaf area, length of the formation shoot.*

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ПРЕДВАРИТЕЛЬНАЯ ОЦЕНКА ФОРМИРОВАНИЯ БИОМЕТРИЧЕСКИХ ПОКАЗАТЕЛЕЙ У ОКУЛЯНТОВ, ПОСЛЕ ОБРЕЗКИ ПОДВОЯ В ЧУЙСКОЙ ДОЛИНЕ КЫРГЫЗСТАНА

Аннотация. *На базе КНАУ проводили исследования с целью выявления влияния клоновых подвоев на биометрические показатели окулянтов яблони. Объекты исследований – клоновые подвои яблони MM106, M26, M9, ARM18, ЖЕТ5. В качестве привоя испытывали сорта яблони Гольдин Делишест, Кандиль Синап, Рашида, Ранет Бургардт. Кыргызское зимнее.*

Ключевые слова: *размножение, клоновые подвои, яблоня, биометрические показатели, саженцы площадь листа, длина побега формирования.*

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КЫРГЫЗСТАНДЫН ЧУЙ ӨРӨНҮНДӨ ПОДВОЙДУ КЕСКЕНДЕН КИЙИН ОКУЛЯНТТАРДАГЫ БИОМЕТРИКАЛЫК КӨРСӨТКҮЧТӨРДҮ КАЛЫПТАНДЫРУУГА АЛДЫН АЛА БАА БЕРҮҮ

Аннотация. *КУАУнун базасында клондук подвойлордун алма багынын окулянттарынын биометрикалык көрсөткүчтөрүнө тийгизген таасирин билүү максатында изилдөөлөр жүргүзүлгөн. Изилдөөлөрдүн объекттери алма багынын MM106, M26, M9, ARM18, ZHET5 клондук подвойлору. Привой катары алма багынын Гольден Делишес, Кандиль Синап, Рашида, Бургардт Ранети, кыштык Кыргыз сорттору сыналды.*

Өзөктүү сөздөр: *көбөйтүү, клондук подвойлор, алма багы, биометрикалык көрсөткүчтөр, жалбырактын аянты, өнүмдүн узундугу.*

Introduction

The exit of horticulture from a critical state is possible only on the basis of the creation of plantings of an intensive type with an optimal combination of natural-climatic and production-economic factors. The most

economically justified, based on the experience of world gardening, are currently orchards on low-growing rootstocks. Gardens of this type enter fruiting earlier, quickly increase the yield, are more productive and give high-quality fruits, and also allow more efficient use of land

resources by increasing the density of plantings and increasing the yield of fruits per unit area. The expansion of the area under gardens on low-growing clonal rootstocks in modern conditions is mainly constrained by the insufficient production of appropriate planting material for the reconstruction of existing plantings and the establishment of new ones.

The purpose of the research is to increase the efficiency of obtaining planting material for apple trees based on low-growing clonal rootstocks for creating intensive-type orchards.

Objective: further research in the direction of assessing the influence of clonal rootstocks on biometric indicators of apple-tree eyepieces on low-growing rootstocks.

-application of budding depending on the type of rootstock and varieties of apple trees;

-growth and development of grafted apple seedlings

Research conducted in 2021-. on the basis of the Uchkhoz KNAU KR.

In April 2021, the rootstocks were trimmed in all variants of the experiment. The air

temperature was 16°C, the humidity was 65–65%, the southwestern wind was from 2 to 6 m. S.

Research methodology

Determination of the leaf area was carried out by a mathematical method. The method is based on the correspondence between the shape of the investigated sheet and the simplest geometric figure describing the sheet.

Results and Discussions

The initial stage of apple growing technology is the cultivation of planting material on clone stands. The quality of the garden as the main means of production in horticulture depends on what is grown in the nursery and what seedlings the garden will be planted with.

The survival rate of the cultivated apple trees was 99%.

The objects of the study were clonal rootstocks of an apple tree and their influence on the biometric parameters of apple tree eyepieces. The experiment was performed in triplicate (Table 1)

Table 1

The influence of the stock on the formation of biometric indicators of apple eyepieces in the Chuy valley of the Kyrgyz Republic

Rootstock	Grafted variety apple trees	Shoot length of formation, cm	Shoot length at the end of the growing season, cm	The number of leaves on the shoot of formation, PCS	Leaf area, cm ²
MM106	Golden Delishest	3	118, 67	5	4,46
	Kandil Sinap	4	95	5	4,46

___ AGRONOMY ___

	Kyrgyz winter	3	117	6	3,45
	Rashida	2	115,5	4	4,46
	Ranet Burger	3	117,8	4	4,46
<i>M26</i>	Golden Delishest	0,9	116,5	5	4,46
	Qandil Sinap	2,2	95	4	4,46
	Kyrgyz winter	2,8	98	3	4,46
	Rashida	1	96	4	4,46
	Ranet Burger	0,8	95	5	4,46
M9	Golden Delishest	1,3	77	4	4,46
	Qandil Sinap	3	86	3	4,46
	Kyrgyz winter	2,2	94	5	4,46
	Rashida	1	86	5	4,46
	Ranet Burger	1	86	5	4,46
ARM 18	Golden Delishest	1	79	4	4,46
	Qandil Sinap	1	108	6	4,46
	Kyrgyz winter	0,9	90	5	4,46

___ AGRONOMY ___

	Rashida	3,2	87	5	4,46
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	Ranet Burger	2	73	4	4,46
JET 5	Golden Delishest	1	78	3	4,46
	Qandil Sinap	2	89	5	4,46
	Kyrgyz winter	1,5	88	3	4,46
	Rashida	0,5	98	4	4,46
	Ranet Burger	1.	89	3	4,46

During the year of observations, the height of plants on low-growing clonal stocks of seedlings on stock MM106 of variety Golden Delishest-118, cm, on stock M26-116.5, on stock M9 -77 on stock AWP 18-79, on stock ZhET 5 -78. the result for growth in height for the Golden Delishest variety is the MM106 rootstock, the second position is the M26 rootstock, and the rest of the differences are almost not noted.

In the Kandil Sinap variety, the maximum growth was noted on the rootstock AWP 18-108cm, in the rest the height is almost the same regardless of the rootstock.

Variety Kirgizskoe Zimnoe, the maximum growth was recorded on the rootstock MM16-117 cm; on the other rootstocks, the shoot height does not differ significantly.

In the Rashida variety, the highest height was noted on the MM106 rootstock - 115.5 cm; on the other rootstocks, the shoot height did not differ significantly.

The Ranet Burger variety has a very high shoot height of MM106 - 115.5 cm, on other rootstocks, the shoot height does not differ significantly.

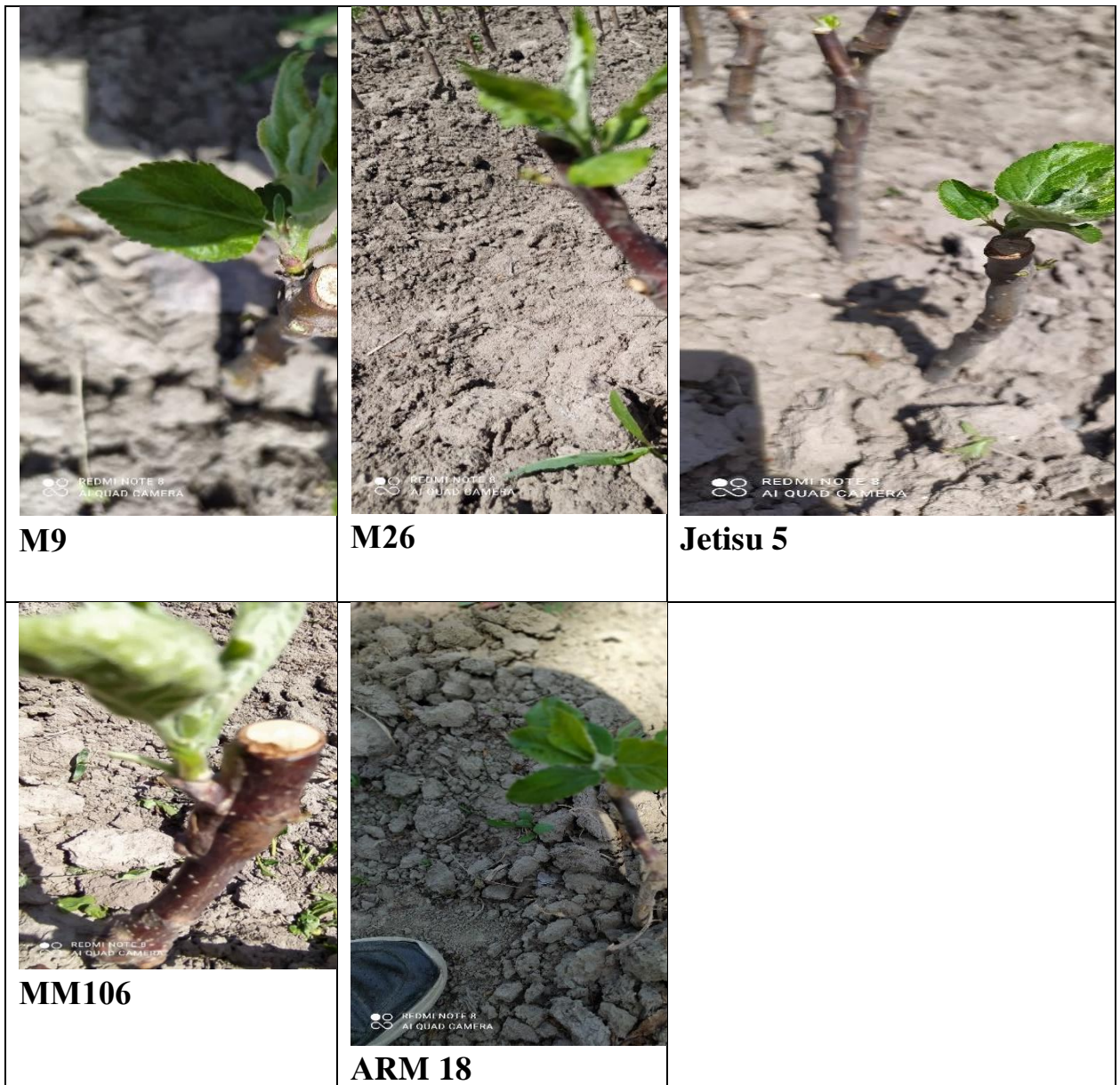


Fig. 1. Shoot formation length

As can be seen from the figure, for variety Goldin Delhi sixth, the maximum length of the shoot formation on the MM106 rootstock is 3 and the number of leaves is e, the minimum value is on the ZHETISU 5 rootstock; in the Kandil Sinap variety, the maximum value is noted on the MM106 rootstock, and the minimum value on the ZHETISU 5 rootstock. In other varieties, the best results were obtained on the MM106 rootstock.

Conclusions

The features of the growth of oculants on different rootstocks were revealed. The best results were obtained on the MM106

rootstock. Significantly superior in all characteristics for all varieties of apple trees

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**BIOLOGICAL REGULATION OF THE ORIENTAL FRUIT MOTH
BASED ON PHEROMONE MONITORING**

Abstract: *The seasonal flight dynamics of Grapholita molesta Busck. (Lepidoptera, Tortricidae) butterflies was studied using pheromone traps in the conditions of the Chui Valley of Kyrgyzstan. The trapping data showed that the oriental fruit moth develops in three or four, overlapping each other, generations in the central part of the Chui Valley of Kyrgyzstan (Sokuluk and Alamedin districts). At the same time, the latest generation, depending on the weather conditions, can be either full or optional. The placement of traps at the rate of 10 pcs. / ha allows to regulate the density of pest population due to the massive capture of males, both in peach and apple orchards.*
Keywords: *oriental fruit moth, pheromone monitoring, biological regulation of pest abundance.*

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**БИОЛОГИЧЕСКАЯ РЕГУЛЯЦИЯ ВОСТОЧНОЙ ПЛОДОЖОРКИ
НА ОСНОВЕ ФЕРОМОННОГО МОНИТОРИНГА**

Аннотация: *В условиях Чуйской долины Кыргызстана с помощью феромонных ловушек изучали сезонную динамику лёта бабочек Grapholita molesta Busck. (Lepidoptera, Tortricidae). Данные отлова показали, что в условиях центральной части Чуйской долины Кыргызстана (Сокулукский и Аламединский районы) восточная плодожорка развивается в трех-четырёх, наслаивающихся друг на друга, поколениях. При этом, последнее поколение в зависимости от развития погодных условий может быть как полным, так и факультативным. Размещение ловушек из расчёта 10 шт./га позволяет регулировать плотность популяции вредителя за счёт массового отлова самцов, как в персиковом, так и в яблоневом садах.*
Ключевые слова: *восточная плодожорка, феромонный мониторинг, биологическая регуляция численности вредителя.*

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**ЧЫГЫШ МӨМӨ ЖЕГИЧИН ФЕРОМОНДУК МОНИТОРИНГ АРКЫЛУУ
БИОЛОГИЯЛЫК ЖОЛ МЕНЕН ЖӨНГӨ САЛУУ**

Кыскача мазмуну: *Кыргызстандын Чүй өрөөнүнүн шартында феромондук тузакчаларды колдонуу менен чыгыш мөмө жегичинин (Grapholita molesta Busck) көпөлөктөрүнүн учуусунун мезгилдик динамикасы изилденди. Тузакчаларды колдонуу боюнча Кыргызстандын Чүй өрөөнүнүн борбордук бөлүгүндө (Сокулук жана Аламүдүн райондорунда) чыгыш мөмө жегичтин көпөлөктөрүнүн үч-төрт, муундан өнүгөөрү аныкталды. Ошол эле учурда, акыркы муундун өнүгүүсү, аба ырайынын шарттарынын өзгөрүүсүнө жараша, толук же толук эмес өнүгүүсү мүмкүн. Тузактарды 10 даана/га өлчөмүндө жайгаштыруу, шабдалы жана алма бактарында мөмө жегичтин эркек көпөлөктөрүнүн массалык түрдө кармалышынын эсебинен анын популяциясынын жыштыгын жөнгө салууга мүмкүндүк берет.*
Өзөктүү сөздөр: *чыгыш мөмө жегичи, феромондук мониторинг, зыянкечтин санын биологиялык жол менен жөнгө салуу.*

Introduction

The oriental fruit moth, *Grapholitha molesta* (Busck, 1916) is a dangerous pest of fruit crops, and an object of external and internal quarantine. In the Kyrgyz Republic plantations, it damages young shoots of quince plants up to 53%, peach - 44%, apple fruits - 35%, apricot - 10%, plum - 12%, cherry - 8%, pear - 3%. In recent years, the oriental fruit moth has been registered on 46.3% - 53.1% of the peach areas of surveyed 1.6 thousand hectares, with shoots damage of 1.0 - 6.8% on 13.9 - 22.6% of trees [4]. The pest reservoirs are the homestead plots, where sometimes the shoots damage reaches 50% or more.

The oriental fruit moth is a relatively new pest for the gardens of the Chui Valley. There is no exact data on the penetration ways of this quarantine pest into the republic. However, there is an assumption that it was first imported to Kyrgyzstan, in particular, to the southern regions of the republic from Uzbekistan in the middle of the last century [2].

The distinctiveness of the species is that the caterpillars can feed on shoots or fruits during the season. One caterpillar can damage up to 15 shoots, causing their excessive branching, thereby, reducing the commercial qualities of seedlings; damaged fruits rot and fall off prematurely. In the southern regions, crop losses can reach up to 90%. The oriental fruit moth gives 3-4 generations per season. They overlap on one another, as a result, all stages of the fruit moth development occur simultaneously from spring to autumn. The oriental fruit moth differs from all other fruit moths by an ability to feed inside the shoot and the presence of several caterpillars [2, 9]. According to our observation, the percentage of damaged fruits in peach and apple

orchards (2018 - 2019) reached 10-15%, in untreated areas of the orchard up to 40%.

Research materials and methods

The monitoring was carried out to observe the *G.molesta* flight dynamic. The research was carried out in the apple and peach orchard in 2012-2015. The traps were placed when the daily average air temperature was above 12 °C. This temperature is the threshold for the beginning of the first generation butterflies flight. Delta-type glue traps are equipped with a synthetic sex pheromone (8-dodecenyl acetate+dodecanol at a dose of 3.3 mg/dispensary) were used to monitor and catch the dynamic of oriental fruit moth. Three traps were hung out on the array, placed diagonally on the plots, with a distance not less than 20m between them, at a height of 2-2.5m from the ground. Once every 3-5 days an inspection of traps and accounting of captured butterflies were carried out for monitoring purposes[4]. During visual examination, along with the placement of traps, an attention was paid to the characteristic signs of damage by the oriental fruit moth – fading apical shoots on a peach, as well as the release of gum drops on fruits and shoots.

Research results

With the help of monitoring, we found out that the oriental fruit moth develops in three to four generations in the conditions of the central part of the Chui Valley. This is confirmed by long-term observations. At the same time, the IV generation, depending on temperature indicators, can be either complete or optional. This generation has no practical significance, since the low night temperatures are not favorable for the development of eggs and caterpillars. The intensive flight of the overwintered (first) generation butterflies falls on the third decade of April – the first decade of May - the

flowering period of gardens. Intensive flight of the second generation of oriental fruit moth is registered in the third decade of May – the first decade of June. The flight of the third generation butterflies is more extended compared to the previous two, and takes place from the third decade of June to the first decade of August. Furthermore, the number of the pest decreases, and at the end of September, only few individuals fell into the traps. Thus, with the help of pheromone traps, it is possible to determine the number and periods of butterflies flight. In almost all years of an observation, the most intense flight of the III generation butterflies occurred in the I and II decades of September. According to the number of oriental fruit moths, the graphs of the flight dynamic were built. Using this data, it is possible to organize effective protection of the garden in a timely manner.

In different years, depending on weather conditions, the number of oriental fruit moths both increased and decreased. The active age of males of the eastern fruit moth varied from 7-9 to 25-30 individuals/trap on average in 2018-2019. In all years of observation, the capture of butterflies lasted from the first decade of April to the second decade of September. The second and third generations were the most numerous. Despite the fact that the duration of catching butterflies in pheromone traps per season differed by year, the catch for all the years was continuous. The number of generations was determined only by the peaks and troughs of trapping. In our experiments, the capture of butterflies in the trap varied from 1.3 to 15 individuals per trap over a week (on average per generation, the capture of individuals per trap reached 12.1-31), which indicates a pest density is significantly exceeds the threshold in comparison with the economic threshold of damage (5 males/trap in 5 days) [4], requiring protective measures.

Pheromone traps with synthetic sex pheromone are relatively effective remedy to establish the fight timing against the oriental fruit moth, they can be used both for monitoring populations and reducing its number by mass trapping and sterilization of males.

Since this insect damages only the fruits of the apple tree, the appearance of the pest falls on the period of pre-flowering or the start of the trees blossom. For the control of the moth, a good effect is obtained by processed with Admiral 10 KE (active ingredient pyriproxifen 10%) pheromone traps without glue inserts, in a concentration of 10% at a dose of 3 ml / L. The biological efficiency when placing 10 traps / ha reaches 75.0-86.0% in the experiment. With a low number of oriental fruit moth (less than three butterflies per trap per day), in order to combat, it is possible to hang glue pheromone traps in the garden at the rate of 10 traps / ha in production gardens.

Conclusions

1. Based on the capture data of males of the oriental fruit moth *Grapholitha molesta* Busck. for the entire research period, during the vegetation the oriental fruit moth develops in three or four, overlapping each other, generations in apple orchards (with additional planting of peach plants) in the central part (Sokuluk and Alamedin districts) of the Chui Valley of Kyrgyzstan.
2. Pheromone traps with synthetic sex pheromone are relatively effective remedy to establish the fight timing against the oriental fruit moth, and can be used both for monitoring populations and reducing its number by mass trapping and sterilization of males.

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RESEARCH OF THE LEVEL OF ACCUMULATION OF HEMAGGLUTININS IN THE ALLANTOIC FLUID IN THE EEC OF THE ND VIRUS INFECTED WITH THE KG-1/16 STRAIN

Abstract *Many studies indicate that the cause of the emergence and spread of the Newcastle disease virus is a bird in which the pathogen is in the body, but there are no external signs. And yet, the main method of combating this infection is vaccination, and the emergence of new variants and serotypes requires constant improvement of the technology for the preparation of preventive and diagnostic means for effective control. However, despite the efforts of the International Organizations for Animal Health, BN continues to expand its distribution area. Therefore, for the timely control and localization of infection, as well as prevention of mass spread, research was carried out to develop a vaccine against ND. In our studies, using the strain Chicken / Kyrgyzstan / 2015 / kg1-16 isolated by us earlier, we study and analyze the data obtained on the infectious dose and the optimal age of developing chicken embryos, which are used for the reproduction of the Kg-1/16 strain. In order to use these data for subsequent experiments on the development of a vaccine against Newcastle disease.*

Keyword *Newcastle disease virus, chicken embryos, allantoic fluid, hemagglutinins.*

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ИЗУЧЕНИЕ УРОВНЯ НАКОПЛЕНИЯ ГЕМАГГЛЮТИНИНОВ В АЛЛАНТОИСНОЙ ЖИДКОСТИ В РКЭ

Аннотация. *Многие исследования указывают, как причину возникновения и распространения вируса болезни Ньюкасла представляет птица, у которой в организме возбудитель болезни, но внешних признаков нет. И все же основным методом борьбы с указанной инфекцией является вакцинация, а появление новых вариантов и серотипов требует постоянного совершенствования технологии приготовления средств профилактики и диагностики для эффективной борьбы. Однако, несмотря на усилия Международных организаций по охране здоровья животных, БН продолжает расширять ареал своего распространения. Поэтому для своевременной борьбы и локализации инфекции, а также предупреждения массового распространения были проведены исследования по разработке вакцины против БН. В наших исследованиях, используя выделенный нами ранее штамм Chicken/Kyrgyzstan/2015/kg1-16, мы изучаем и анализируем полученные данные о заражающей дозе и оптимальный возраст развивающихся куриных эмбрионов, которые используются для репродукции штамма «Kg-1/16». Для того, чтобы использовать эти данные для последующих опытах по разработке вакцины против болезни Ньюкасла.*

Ключевые слова: *вирус болезни Ньюкасла, куриные эмбрионы, аллантоисная жидкость, гемагглютинины.*

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АЛЛАНТОИДУК СУЮКТУКТА ГЕМАГГЛЮТИНИНДЕРДИН РКЭдэ ТОПТОЛУУ
ДЕҢГЭЭЛИН ИЗИЛДӨӨ

Аннотация. Көптөгөн изилдөөлөр Ньюкасл оорусунун вирусунун пайда болушунун жана жайылышынын себеби - бул оорунун козгогучу организмде болгон канаттуулар, бирок сырткы белгилери жок экенин көрсөтүп турат. Бирок, бул инфекция менен күрөшүүнүн негизги ыкмасы эмдөө болуп саналат, ал эми жаңы варианттардын жана серотиптердин пайда болушу эффективдүү күрөшүү үчүн профилактикалык жана диагностикалык каражаттарды даярдоо технологиясын дайыма өркүндөтүүнү талап кылат. Бирок, Эл аралык жаныбарлардын саламаттыгын сактоо уюмдарынын аракеттерине карабастан, VN өзүнүн жайылтуу аймагын кеңейтүүнү улантууда. Ошондуктан, инфекцияны өз убагында көзөмөлдөө жана локализациялоо, ошондой эле массалык жайылышын алдын алуу үчүн НДке каршы вакцинаны иштеп чыгуу боюнча изилдөөлөр жүргүзүлдү. Биздин изилдөөлөрүбүздө мурда биз тарабынан бөлүнүп алынган *Chicken /Kyrgyzstan /2015/ kg1-16* штаммынын жардамы менен, биз Kg көбөйүү үчүн колдонулган тоок эмбриондорун өнүктүрүүнүн оптималдуу жашы жана инфекциялык дозасы боюнча алынган маалыматтарды изилдеп, талдап жатабыз «Kg-1/16» штамм. Бул маалыматтарды Ньюкасл оорусуна каршы вакцинаны иштеп чыгуу боюнча кийинки эксперименттер үчүн колдонуу үчүн.

Негизги сөздөр: Ньюкасл оорусунун вирусу, тоок эмбриондору, аллантоикалык суюктук, гемагглютининдер.

Introduction The situation in the world with regard to viral diseases of animals remains rather tense. Evolutionary processes, ecological and climatic changes in the habitat cause the emergence of new pathogens and changes in the biological properties of the circulating ones, overcoming species barriers of susceptibility with the possible formation of natural reservoirs of pathogens. Therefore, improving the means and methods of controlling the epizootic situation of viral infections is an urgent task, especially for pathogens of especially dangerous and exotic diseases.

Dangerous infectious diseases of birds, which include Newcastle disease (ND), are of particular relevance for the Kyrgyz Republic due to the possibility of transcontinental spread. Geographically, Kyrgyzstan is on the path of the seasonal migration of wild birds, which creates the danger of introducing pathogenic pathogens into the territory of the republic.

Newcastle disease (pseudo plague of birds) is a highly contagious disease of chickens and

turkeys. The symptoms of the disease are quite varied. It can be acute, sometimes causing the death of all sick birds within 3-4 days, and subclinical, depending on the virulence of the epizootic strain, immunological state, age of the bird and the presence of concomitant infections.

The disease, according to the WHO classification, belongs to the list of diseases belonging to class A. This category of diseases, also called conventional or highly dangerous, according to the modern definition of the OIE (OIE), means "infectious" (vector-borne) diseases that have the ability to dangerous and rapid spread to state borders. They are accompanied by severe public economic and health implications, negatively affecting international trade in animals and animal products.

Outbreaks of the disease result in huge economic losses due to high mortality, loss of egg production, the high cost of disease eradication policies used to control the disease in countries where it is exotic and the

trade embargo imposed on animal products by international community (OIE, 2012).

According to the degree of pathogenicity of Newcastle disease virus strains, there are velogenic - highly pathogenic, mesogenic - medium pathogenicity and lentogenic - low pathogenicity, or avirulent. In addition, field strains of viruses can differ in tropism (the ability to infect individual organs and systems of the body). There are viscerotropic, enterotropic, pneumotropic and polytropic epizootic strains.

We isolated the Newcastle disease virus from poultry in the territory of the Kyrgyz Republic and received the name Chicken / Kyrgyzstan / 2015 / kg1-16. Phylogenetic analysis of the isolated Newcastle disease virus strain was classified as virulent by amino acid cleavage of a protein site and mesogenic by determining the minimum lethal dose. A phylogenetic comparison of previously identified strains with the Chicken / Kyrgyzstan / 2015 / kg1-16 isolate showed that the isolate forms a cluster with Chinese strains that are different from the previously identified strains in the Kyrgyz Republic. To study the origin of the virus, phylogenetic analysis is the best method. Since this method can provide answers to questions about the source of transboundary infections such as Newcastle disease.

Poultry breeding is carried out by poultry farms, peasant farms and the population in personal subsidiary plots. In the Kyrgyz Republic in 2010-2020. the number of poultry in farms of all categories is increasing every year.

To combat Newcastle disease, along with general veterinary and sanitary measures, specific prevention is carried out. Vaccination of poultry provides immunity to disease 48–96 hours after vaccination. Vaccines are administered by aerosol, oral, ocular and intramuscular methods. Vaccination is carried out in safe and

disadvantaged farms. All clinically healthy birds should be vaccinated at the most appropriate age. The choice of vaccines and vaccination schemes is determined taking into account the epizootic situation.

Methods During the research work, the following methods were used: hemagglutination reaction (RHA) - based on the fact that some types of viruses have the ability to adsorb on the surface of erythrocytes of different species of animals (and birds), causing them to stick together and form agglutinate (direct RHA). The hemagglutination test (HA) was carried out in our work in accordance with the WHO guidelines for the diagnosis and control of Newcastle disease (1996). To detect antigen in feces and in organs and tissues of dead animals and viruses in infected cell culture, RHA was used, which was placed in micro (0.025 ml-1 drop) and macro (0.25 ml) modifications at room temperature. To do this, 0.025 ml (1 drop) was added to all wells of the panel of the Tokachi or Titertek instrument and two-fold dilutions of the test material were made. Then, 1 drop of 0.5% erythrocyte suspension was added to all wells.

During the cultivation of Newcastle disease viruses, embryos were infected with virus-containing material in the allantoic cavity according to the standard technique. Before infection, eggs with embryos were incubated at a temperature of $(37.0 \pm 0.5) ^\circ\text{C}$ and relative air humidity $(55 \pm 5)\%$ in incubators and also in thermal rooms specially equipped with racks for placing and turning trays with eggs. After infection, the embryos were incubated mainly in thermostats at the same temperature and humidity parameters. The timing of incubation of the infected was adjusted during the experiments.

Results To resolve the issue of choosing the optimal infecting dose of the Newcastle disease virus strain for EEC, an experiment was conducted to study the level of accumulation of hemagglutinins in AF EEC infected with various doses of "Kg-1/16". For this purpose, ten 10-day embryos were infected in AP with a vaccinated suspension of the indicated strains at doses of 1.5×10^5 ;

1.5×10^4 ; 1.5×10^3 and 1.5×10^2 EID50 in a volume of 0.2 cm³. The level of accumulation of hemagglutinins was assessed in AF samples from each embryo in quantitative RHA. The number of embryos affected by the virus was also taken into account. The generalized results of the experiment are presented in table 1.

Table 1- Hemagglutinin accumulation level in the allantoic fluid in EEC infected with different doses of NB virus.

Doses of the virus EID50	Virus strain Kg-1-16	
	Number of affected EEC	HA titers
$1,5 \times 10^5$	10	712±95
$1,5 \times 10^4$	10	696±110
$1,5 \times 10^3$	8	420±36
$1,5 \times 10^2$	7	146±30

At the next stage of research, it seemed appropriate to study the level of accumulation of hemagglutinins in the AF of the embryo, depending on their age. In the experiments, EEC of 7-, 9-, 11- and 13-days of age were used, which were injected with 0.1 cm³ of virus-containing

The age of embryos, day.	The level of GA accumulation in AF of embryos of different age infected with the strain "Kg-1/16" ND virus
7	230±82
9	460±149
11	563±125
13	512±93

materials of the strain "Kg-1/16", diluted with saline before the content in the specified volume of the optimal dose of the virus, established in previous studies. After appropriate incubation for 71 hours, AF samples from embryos were examined in quantitative GA and the optimal age of embryos for virus reproduction was determined in Table 2.

Table 2 - The optimal age of embryos for virus reproduction was determined

Discussions Long-term domestic and foreign practice shows that success in preventive and health-improving antiepidemiologic work in relation to diseases of birds largely depends on the correct understanding of their essence,

the scientific substantiation of the causes of diseases of this group. In the choice of diagnostic approaches to decipher the occurrence and spread of diseases, in the assessment of the results obtained, certain

methodological difficulties often arise. Currently, when Newcastle disease occurs, it is necessary to differentiate from the following infections: avian influenza, infectious laryngotracheitis, mixoplasmiasis and chicken cholera. Analysis of literature data in recent years has shown that Newcastle disease is widespread. Many studies indicate how the cause of the emergence and spread of this virus is a bird in which the causative agent of the disease is in the body, but there are no external signs. And yet, the main method of combating this infection is vaccination, and the emergence of new variants and serotypes requires constant improvement of the technology for the preparation of preventive and diagnostic means for effective control. However, despite the efforts of the International Organizations for Animal Health, BN continues to expand its distribution area. Therefore, for the timely fight and localization of the infection, as well as the prevention of mass spread, studies were carried out on the development of a vaccine against BN. In our studies, using the strain Chicken / Kyrgyzstan / 2015 / kg1-16 isolated by us earlier, we study and analyze the data on the infectious dose and the optimal age of developing chicken embryos, which are used for the reproduction of the Kg-1/16 strain. In order to use these data for subsequent experiments on the development of a vaccine against Newcastle disease.

Conclusion The data in Table 1 indicate that the infectious doses of the studied strain of the NB virus are of the order of 1.5×10^5 ; 1.5×10^4 EID₅₀ according to the tested indicators (the level of HA accumulation and the number of embryos affected by the virus) turned out to be equivalent. From the data in Table 2, it follows that only after infection of 7-day embryos, the level of accumulation of GA and AF was significantly lower than during infection of older embryos. However, from embryos infected at the age of 13, the

amount of vaccinated suspension obtained was noticeably less (by 1–2 cm³); moreover, uric acid deposits were observed in some of the embryos, which negatively affected the quality of vaccinated raw materials.

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OPTIMIZATION OF THE CONDITIONS FOR STAGING PCR SHEEP POX AND GOATS POX

Abstract. *The Veterinary Service of the Kyrgyz Republic needs new and rapid diagnostic techniques that ensure the results at the molecular level. Smallpox of sheep and goats is a viral, acutely contagious disease characterized by fever, symptoms of intoxication, the development of papular-pustular rash on the skin and mucous membranes, high mortality of animals, especially young animals. For timely and timely diagnosis in animals, the conditions for the application of the molecular biological PCR method have been optimized in order to timely stop and stop sheep pox. In the initial denaturation stage, the optimal temperature is 95°C, cycle time 5 minutes, number of cycles 1, in the denaturation stage 94°C, 45 seconds, annealing temperature 55°C 1 minute, elongation 72°C, 1 minute, 35 cycles in total, in the final elongation stage at 72°C for 5 minutes, 1 cycle.*

Keyword: *sheep pox and goats pox, molecular biological PCR method, DNA, primers.*

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ОПТИМИЗАЦИЯ УСЛОВИЙ ПОСТАНОВКИ ПЦР ОСПЫ ОВЕЦ И КОЗ

Аннотация. *Ветеринарной службе Кыргызской Республики необходимы новые и быстрые методы диагностики, обеспечивающие получение результатов на молекулярном уровне.*

Оспа овец и коз - вирусная, остро протекающая контагиозная болезнь, характеризующаяся лихорадкой, явлениями интоксикации, развитием на коже и слизистых оболочках папулезно-пустулезной сыпи, высокой смертностью животных, особенно молодняка. Для ранней и своевременной диагностики оспы у животных оптимизировали условия постановки молекулярно-биологического метода ПЦР, чтобы в дальнейшем своевременно проводить купирование и ликвидацию оспы овец. В стадии начальной денатурации оптимальным является t 95°C, время цикла 5 минут, число циклов 1, в стадии денатурации 94°C, 45 секунд, температура отжига 55°C 1 минуту, элонгация 72°C, 1 минуту, всего 35 циклов, в стадии завершающей элонгации при 72°C в течении 5 минут, 1 цикл.

Ключевые слова: *оспа овец и коз, молекулярно-биологический метод ПЦР, ДНК, праймеры.*

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КОЙ ЖАНА ЭЧКИНИН ЧЕЧЕГИН ПЦР КОЮУ ШАРТТАРЫНДА ОПТИМАЛАШТЫРУУ

Аннотация. *Кыргыз Республикасынын Ветеринардык кызматына молекулярдык деңгээлде натыйжа берген жаңы жана тез диагностикалык методдор керек.*

Кой-эчкинин чечеги – ысытма, интоксикация симптомдору, териде жана былжыр челдерде папулярдуу-пустулярдуу исиркектердин пайда болушу, малдын, өзгөчө жаш малдын көп өлүшү менен мүнөздөлүүчү вирустук, курч жугуштуу оору. Малдын чечекти эрте жана өз убагында диагностикалоо үчүн кой чечекти өз убагында токтотуу жана

жоюу максатында молекулярдык биологиялык ПЦР ыкмасын орнотуу үчүн шарттар оптималдаштырылган. Алгачкы денатурация стадиясында оптималдуу температура 95°C, цикл убактысы 5 мүнөт, циклдердин саны 1, денатурация стадиясында 94°C, 45 секунд, күйдүрүү температурасы 55°C 1 мүнөт, узартуу 72°C, 1 мүнөт, бардыгы 35 цикл, акыркы узартуу стадиясында 72°C 5 мүнөт, 1 цикл.

Негизги сөздөр: кой жана эчкинин чечеги, молекулярдык биологиялык ПЦР ыкмасы, ДНК, праймерлер.

Introduction Sheep pox is an acute contagious disease of small ruminants, characterized by fever, papular-pustular lesions of the skin and mucous membranes, high mortality of animals, especially young animals. The massive spread of the disease is facilitated by the late diagnosis of the disease, poor knowledge of animal owners about the clinical signs of smallpox disease, lack of information about unfavorable points and control over the movement of flocks, insufficient implementation of veterinary and sanitary measures.

In this regard, solving the issues of early diagnosis of smallpox using molecular biological methods based on polymerase chain reaction for the timely relief and elimination of sheep pox is an urgent task. [1, 2].

Place of research and methods: In our studies, we used the molecular biological method of PCR (polymerase chain reaction):

DNA isolation, amplification, detection of the result. We also used the ClustalW BioEdit and Gene Script programs.

Results and discussions Sheep pox and goats pox (Lat. - Variola ovina; Eng. - Sheep pox) - is a highly contagious especially dangerous disease characterized by fever and the formation of papular-pustular lesions in the epithelium of the skin and mucous membranes. The causative agent of the disease is a DNA virus belonging to the Poxviridae family, genus Capripoxvirus. All isolated in different countries strains of sheep pox virus are antigenically identical. The virus is cultivated in primary and subcultures of kidney and testicle cells of lambs, kids and calves. In cases of generalized and complicated course, the death of sheep reaches more than 50% of the number of cases. In sick animals, the virus is localized mainly in pockmarks located on the skin. (picture 1).



Picture 1 Smallpox papules on hairless areas of lamb skin

Sheep pox is a highly contagious disease, it is extremely important to timely and accurately diagnose possible outbreaks in a quick and

reliable laboratory diagnosis, after signs of the disease appear on farms.

To achieve specificity and sensitivity of PCR in our studies, we followed the rules for selecting primers with a nucleotide sequence

of 18 to 25 nucleotide bases, that is, a complementary part of the genetic material under study. [3].

The efficiency of the developed PCR technique largely depends on the quality of the isolated nucleic acid. Used kits for fast and universal sample preparation (“Biocom Company”, Russia), and recruitment Wizard Genomic DNA Purification Kit (Promega, CIHA).

The DNA extraction procedure using each of these kits is simple to perform and takes 40-50 minutes. To isolate DNA from samples of nasal discharge and milk, we used a kit for accelerated sample preparation. With a universal sample preparation kit, we performed DNA isolation from whole blood and serum samples. According to the manufacturer's instructions, it is recommended to use 10 µl of isolated DNA for PCR, but according to our data, 5 µl of starting material was sufficient. [4,5].

To optimize the conditions for setting up PCR, a series of preliminary experiments

were carried out, during which the following factors were taken into account: annealing temperature of primers, time of denaturation, synthesis, concentration of primers, magnesium ions and amount of template. In the course of the experiments, the optimal temperature regime for PCR was selected when amplifying fragments of the genome of sheep and goat pox viruses. [7].

Further, the selection and optimization of individual primers for the polymerase chain reaction, detection and typing of the pathogen of sheep and goat pox was carried out. Using special computer programs and using information from international computer data banks, a specific fragment of the DNA genome was selected, suitable for primer annealing. The length of the oligonucleotide primers was 20-23 bp. Alignment of nucleotide sequences was performed using a network program ClustalW BioEdit and Gene Script (table. 1). [8].

Table 1 - Characteristics of the developed primer

Primer 1	GGTCGCGAAATTCAGATGT	20	137 bp
Primer 2	TGAGCCATCCATTTCCAAC	20	107 bp

In order to prevent possible nonspecific reactions, the optimal concentration of primers was selected. The amount of primers in the reaction mixture varied from 0.1 to 0.3 µl. Thus, the optimal primer content, 0.2 µL, provided the maximum sensitivity with the minimum consumption of reagents, while a twofold decrease in the primer content worsened the PCR sensitivity. [9].

A 10% suspension was prepared from the pathological material in Hanks solution, which was clarified by centrifugation. The pathological material was first ground, then ground in a porcelain mortar with a pestle with the addition of glass sand and physiological solution at a rate of 1:10 (pH 7.2 - 7.4) until a homogeneous mass was obtained. The resulting suspension, after freezing twice at -20-40°C, was centrifuged at 1500 rev. within 30 minutes. The supernatant was passed through “Millipore” filters (USA) pore diameter 0.22 µm. Penicillin (1000 U / ml), streptomycin (1000 µg / ml), and gentamicin (200 µg / ml) were added to the filtrate. In order to optimize the conditions for setting up PCR, preliminary PCR reactions were carried out (table 2).

Table 2 - Calculation of the composition of the reaction mixture for setting up PCR (per sample)

	Concentration	Stock	100 µl	20 µl
Buffer	1x	5x	10 µl	4 µl
MgCl ₂ (25-mM)	2.5 mM	25 mM	10 µl	2 µl
dNTP's (10-20 µM)	0.2 mM	10 mM	2.0 µl	0.4 µl
Primer 1	by 0.1 µM	10 µM	by 1 µl	0.2 µl
Primer 2	by 0.1 µM	10 µM	by 1 µl	0.2 µl
Polymerase	0.05 u/µl	5 u/µl	1 µl	0.2 µl
Polymerase				3 µl
Dionized water			before 100 µl	12.4 µl

In the course of the experiments, the optimal temperature regime for PCR was selected during amplification of fragments of the genome of sheep and goat pox viruses (table 3). To detect the resulting PCR product, a 2.5% agarose gel in 1x TAE buffer with ethidium bromide was used. The results were accounted for in the BIO-RAD GelDoc XR™ + imaging system. The presence of a fragment of the calculated length indicated the presence of virus DNA in the test sample. The samples were transferred to thermal cycle and amplified in PCR thermal cycle Mini Opticon (Bio-Rad) (picture 2). [11, 12].

Table 3 - Temperature, annealing time and number of cycles

Modes	Temperature	Time	Number of cycles
Initial denaturation	95 ⁰ C	5 minute	1 cycle
Denaturation	94 ⁰ C	45 sec.	35 cycles
Annealing	55 ⁰ C	1 minute	
Elongation	72 ⁰ C	1 minute	
Final elongation	72 ⁰ C	5 minute	1 cycle

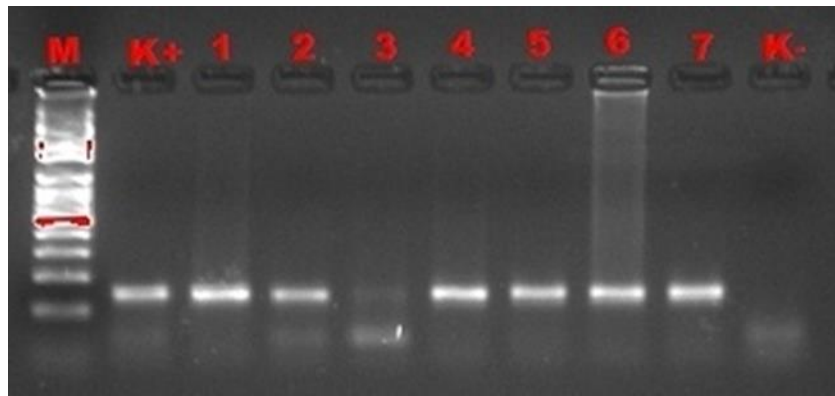


Fig. 2. Electrophoregram of amplified DNA during PCR optimization of sheeppox virus

Note: M - DNA marker "AXYGEN", K + - positive, 1 - nasal washout, 2 - conjunctival washout, 3 - blood, 4 - oral cavity washout, 5 - dry crusts from sick animals, 6 - lymph nodes, 7 - suspension from the lungs, K- - negative control.

Thus, in order to timely arrest and eliminate sheep pox using PCR, we have developed a method for detecting the genome of sheep pox and goats in the blood using one pair of primers, with which it is possible to indicate sheep pox and goats in the analyzed material.

The genome of the smallpox virus consists of a simple linear DNA of 130-300 bp, encoding ≈200 genes. The ends of the genome contain a terminal U-shaped loop with several tandem repeating sequences and form an inverted terminal repeat (ITR). [13].

The specificity of the test systems is determined exclusively by the structure of the primers. As a rule, unique and most conserved regions of the genome are used for their creation, in which there are no homologies with any other objects. The main characteristics of the primers are presented in table. 4.

Table 4 - Main characteristics of PCR primers

Primer	Melting temperature, °C	Annealing temperature, °C	Content G+C, %	Fragment length, (bp)
Praimer 1	60	55	50	149
Praimer 2	60	55	55	

Conclusion Based on a comparative analysis of known nucleotide sequences, primers were selected for different regions of the sheeppox virus genome. The oligonucleotide length was 20-23 bp, the alignment of the nucleotide sequences was performed using the ClustalW network program, Bio Editb GeneScript. The conditions for setting up PCR (temperature conditions, reaction mixture) were optimized. In the initial denaturation stage, the optimum temperature is 95 ° C, the cycle time is 5 minutes, the number of cycles is 1; in the denaturation stage, respectively 94 ° C,

45 seconds, annealing temperature 55 ° C for 1 minute. Elongation 72 ° C, 1 minute, total 35 cycles. In the final elongation stage 72 ° C, 5 minutes, 1 cycle.

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MOLECULAR TYPING OF CANINE PARVOVIRUS OCCURRING IN KYRGYZSTAN BY PCR

Abstract. *The present study was aimed at molecular typing of Canine parvovirus (CPV) occurring in Kyrgyzstan using PCR based assays. CPV-2a and CPV-2b types were detected by PCR in 37 out of 56 faecal samples/rectal swabs. All the 37 samples found positive by PCR assay were subjected to typed PCR assay with CPV-2ab and CPV-2b primer pairs. Twenty-seven samples were characterized as CPV-2b type and ten sample was identified as CPV-2ab type. Nineteen clinical samples found negative by CPV-2ab and CPV-2b primers were subjected to another PCR assay with CPV-VP primer pair for detecting CPV-VP. Though three samples responded to this PCR, indicating the absence of CPV-2ab, CPV-2b in Kyrgyzstan. It was inferred that CPV-2b was the most prevalent CPV type in Kyrgyzstan. It was further concluded that the CPV-2 variants (CPV-2a, CPV-2b and CPV-VP) currently circulating in the field worldwide could be diagnosed by employing PCR assays.*

Keywords: *PCR, canine parvovirus, CPV-2ab, CPV-2b, CPV-VP.*

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МОЛЕКУЛЯРНОЕ ТИПИРОВАНИЕ ПАРВОВИРУСА СОБАК В КЫРГЫЗСТАНЕ С ПОМОЩЬЮ ПЦР

Аннотация. *Настоящее исследование было направлено на молекулярное типирование парвовируса собак (CPV), встречающегося в Кыргызстане, с использованием анализов на основе ПЦР. Типы CPV-2a и CPV-2b были обнаружены с помощью ПЦР в 37 из 56 образцов фекалий и ректальных мазков. Все 37 образцов, положительных с помощью ПЦР-анализа подвергали типизированному ПЦР-анализу с парами праймеров CPV-2ab и CPV-2b. Двадцать семь образцов были охарактеризованы как тип CPV-2b, а десять образцов были идентифицированы как тип CPV-2ab. Девятнадцать клинических образцов, оказавшихся отрицательными по праймерам CPV-2ab и CPV-2b, подвергали другому анализу ПЦР с парой праймеров CPV-VP для обнаружения CPV-VP. Хотя три образца ответили на этот анализ ПЦР отрицательно, что указывает на отсутствие CPV-2ab, CPV-2b в Кыргызстане. Было сделано предположение, что CPV-2b был наиболее распространенным типом CPV в Кыргызстане. Далее был сделан вывод, что варианты CPV-2 (CPV-2a, CPV-2b и CPV-VP), циркулирующие в настоящее время в полевых условиях во всем мире, могут быть диагностированы с помощью анализов ПЦР.*

Ключевые слова: *ПЦР, парвовирус собак, CPV-2ab, CPV-2b, CPV-VP.*

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КЫРГЫЗСТАНДА ПЧР МЕНЕН ИТТЕРДИН ПАРВОВИРУСУНА МОЛЕКУЛЯРЛЫК ТИП БЕРҮҮ

Аннотация. Бул изилдөө ПЧР негизиндеги анализдерди колдонуу менен Кыргызстанда пайда болгон ит парвовирусунун (CPV) молекулярдык түрүнө типтештирүүгө багытталган. CPV-2a жана CPV-2b түрлөрү ПЧР аркылуу 56 заң жана ректалдык мазоктун 37 түрүндө табылды. ПЧР анализинин жардамы менен табылган бардык 37 үлгүнү CPV-2ab жана CPV-2b праймерлеринин жуптары менен типизацияланган ПЧР анализине дуушар болушту. Анын ичинен 27 үлгү CPV-2b тибине мүнөздөлдү, ал эми 10 үлгү CPV-2ab тибине аныкталды. CPV-2ab жана CPV-2b праймерлерине дал келбеген 19 клиникалык үлгүнү, CPV-VP аныктоо үчүн CPV-VP праймер жуптары менен башка ПЧР анализи боюнча 3 үлгү тең терс жыйынтык көргөзгөндүктөн, Кыргызстанда CPV-2ab жана CPV-2b түрү жок экенин көрсөтү. Жыйынтыгында, дүйнө жүзүндө азыркы учурда талаа шартында кайталанып аткан CPV-2 варианттары (CPV-2a, CPV-2b жана CPV-VP) ПЧР анализинин жардамы менен диагноз коюуга болот деген тыянак чыгарылды.

Негизги сөздөр: ПЧР, ит парвовирусу, CPV-2ab, CPV-2b, CPV-VP.

Introduction. Canine parvovirus (CPV) is responsibly for a severe, highly contagious gastroenteric disease in pups. The canine parvovirus 2 (CPV-2) belongs to the family Parvoviridae. The genome consists of a single molecule of linear single stranded DNA, 5.2 Kb in size. It is a non-enveloped, icosahedral symmetric virus whose single stranded DNA encodes two capsid proteins (VP1 and VP2) and two non-structural proteins (NS1 and NS2). VP1 and VP2 are translated from alternative splicing of the same RNA [1]. VP2 mainly comprises the icosahedral capsid of CPV, and only a few amino acid substitutions in its sequence can alter relevant biological characteristics to the virus [2]. CPV-1 is known as minute viruses of canines and is usually not associated with the clinical disease. CPV-2 was derived from Feline panleucopaenia virus (FPLV) or from FPLV like viruses in wild animals by natural genetic mutation. Genetic analysis of parvovirus DNA obtained from number of wild carnivore isolates supports this hypothesis [3].

CPV-2 was first identified in the late 1970s when outbreaks of fatal myocarditis and

haemorrhagic gastroenteritis were observed in young puppies worldwide [4]. Few years after its successful spreading, the original form of CPV-2 was completely replaced by CPV-2a; a new type with the ability to efficiently infect and cause disease in both dogs and cats [5]. CPV-2a mainly differs from the original type 2 in five amino acid changes in VP2 protein. In 1984, another antigenic variant emerged as a new CPV type, designated as CPV-2b, which is currently co-circulating with the CPV-2a within dog populations around the world. The antigenic variants CPV-2a and CPV-2b differ by two amino acids in the VP2 protein Asn-426 to Asp and Ile-555 to Val [6]. Presently, the original CPV-2 no longer circulates in dog population, whereas the CPV-2a and CPV-2b are distributed worldwide [7, 8].

A novel CPV mutant (Glu-426) produced by a glutamate substitution in the 426th position was detected in year 2000 in Italy [7, 9] and named CPV-2c. Later, CPV-2c had also been reported from United Kingdom [10], United States [11] and very recently in Portugal [12]. Polymerase chain reaction (PCR) is considered as the most reliable diagnostic

technique having high degree of sensitivity and specificity in detecting CPV from faecal samples [7]. PCR based molecular typing of CPV also helps to gain new insights into pathogenesis of CPV-2 types (CPV-2a, CPV-2b and CPV-2c) and is extremely useful to understand antigenic differences between CPV types 2a, 2b or 2c.

Research objectives and results obtained.

Canine parvovirus was isolated in Kyrgyzstan for the first time in 2016 [13]. Occurrence of canine parvovirus infections in Kyrgyzstan were reported previously by Nurgaziev R.Z. et al. (2002) [14]. CPV-2b was found to be the most prevalent type compared to CPV-2a in Kyrgyzstan [15]. The prevalence of CPV-2c had not been documented so far in Kyrgyzstan and therefore the present study was undertaken to find out the prevalence of different variants of CPV-2 (CPV-2a, CPV-2b and CPV-2c) associated with the field cases of canine parvovirus infections in Kyrgyzstan.

Faecal samples or rectal swabs from CPV suspected dogs were collected from Veterinary Clinics, Agricultural University, nurseries and situated in and around Bishkek. The faecal samples/rectal swabs obtained from the suspected dogs were emulsified in 1 ml of 0.1 M PBS of pH 7.4 and centrifuged at 6000 rpm for 15 min at 4°C. The supernatant was collected and stored at -40°C until further use.

The processed samples were screened by primer pair CPV-2ab (F) 5'-gaagagtgggtgtaaataatt-3' and 2ab (R) 5'-gaagagtgggtgtaaataatt-3' that amplified a 681 bp fragment of the gene encoding capsid protein VP2 of both CPV-2a and CPV-2b types [16]. Hundred microliters of processed clinical samples were used for the preparation of template DNA by boiling at 96°C for 10 min and chilling immediately on crushed ice for few min. It was then centrifuged at 10,000 rpm for 10 min in a refrigerated centrifuge.

The supernatant was diluted (1:3) in distilled water to reduce residual inhibitors of DNA polymerase activity. The reaction mixture (50 µ) consisted of 4 µ of 5x Taq PCR buffer (containing 15 mM magnesium chloride), 1 pmol each of CPV-2ab (F) and CPV-2ab (R) primers, 0,4 mM dNTPs each, 0,2 unit of Taq DNA polymerase and nuclease free water to make up the volume. Template DNA amounting to 2 µ was added to the reaction mixture. The conditions for the PCR assay were initial denaturation at 94°C for 5 min, followed by 30 cycles of denaturation at 94°C for 30 s, annealing at 55°C for 2 min and synthesis at 72°C for 5 min, with the final extension at 72°C for 5 min. The PCR amplification was carried out in an automated thermal cycler (Applied Bios stems 2720 Thermal Cycler, Germany) and the products were analyzed by electrophoresis in 2.5% agarose gel.

Subsequently, a multiplex PCR for detection of CPV-2b type utilizing primer pairs CPV-2b (F)/CPV-2b (R) developed by Senda et al. [16] and Pereira et al. [14], respectively was attempted. The sequence of the primer used was CPV-2b (F) 5'-ctttaaccttctgtaacag-3' and CPV-2b (R) 5'-catagttaaattggtatctac-3' with the expected product size of 429 bp. The samples were subjected to multiplex PCR following the similar protocol as described above for primer pair CPV-2ab.

The screened samples, which were found negative by PCR with CPV-2ab primers (which amplified only CPV-2a and CPV-2b types but not CPV-2c), were then subjected to another PCR using primer pair CPV-VP (F) 5'-gagtgatggagcagttcaacc-3' and CPV-VP (R) 5'-cgctccccccgtcctgct-3' [9] that amplified a 992 bp fragment of the gene encoding capsid protein VP2 of CPV-2a, CPV-2b and also CPV-2c types. The conditions for the CPV-VP PCR assay were initial denaturation at 94°C for 2,5 min, followed by 36 cycles of denaturation at 94°C

for 40 s, annealing at 55°C for 45 s and synthesis at 72°C for 45 s, with the final extension at 72°C for 5 min. The PCR products generated with primer pair CPV-VP (F)/CPV-VP (R) the digested products were analyzed in 2.5% agarose gel [7, 9].

Conclusions of the study. Fifty-six (56) samples were screened by PCR assay using CPV-2ab primer pair. Ten samples yielded a single DNA amplicon of 681 bp (Fig. 1). All the 37 samples found positive by PCR assay

using CPV-2ab primer pairs were subjected to typed PCR assay. Out of 37 samples, 3 samples yielded two specific amplicons of 681 and 429 bp responding to both CPV-2ab and CPV-2b primers, respectively, and therefore characterized as CPV-2b types. One sample generated only one amplicon of 681 bp responding to only CPV-2ab primer and not responding to CPV-2b primer and was categorized as CPV-2a (Fig. 2).



Fig. 1 Agarose gel electrophoresis pattern of CPV-2ab specific PCR product of 681 bp of clinical samples assay using CPV-2ab primers. 1 to 3 Clinical samples, 4 Negative control.

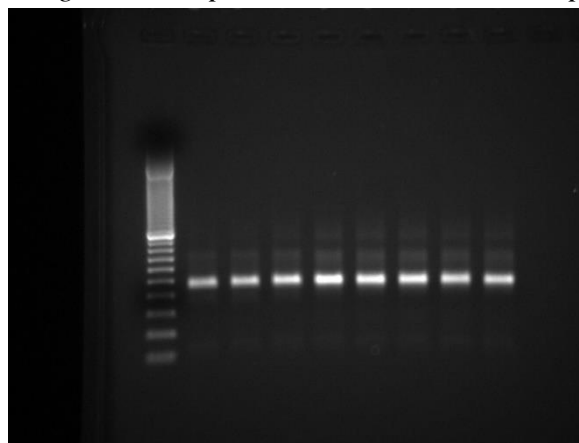


Fig. 2. Agarose gel electrophoresis pattern of CPV-2b specific PCR product of 429 bp of clinical samples assay using CPV-2b primers. 1 to 7 Clinical samples, 8 Positive control, 9 Negative control.

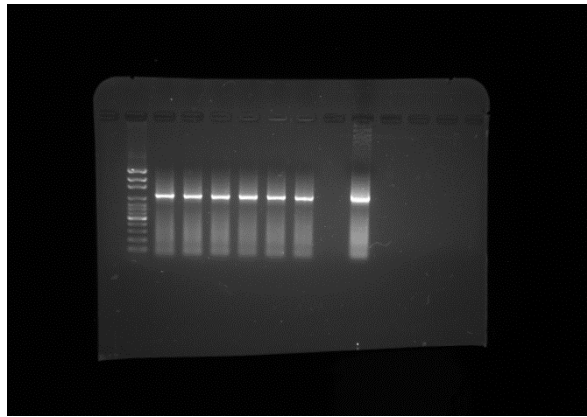


Fig. 3. Agarose gel electrophoresis pattern of CPV-VP specific PCR product of 992 bp of clinical samples assay using CPV-VP primers. 1 to 6 Clinical samples, 7 Negative control, 8 Positive control.

Nineteen clinical samples found negative by CPV-2ab primers were subjected to another PCR assay with CPV-VP primer pair. In these study, only five samples out of 19 samples (negative by CPV-2ab primers) yielded specific DNA amplicon of 992 bp with CPV-VP primer pair (Fig. 3). But all the five products amplified by CPV-VP primer pair digestion indicating that they are not of CPV-2ab type and may be either CPV-2c type. This finding was of studies conducted in Kyrgyzstan, which showed that the CPV-2b was the prevalent strain in Kyrgyzstan. Molecular typing of clinical samples by PCR based assays also did reveal only partially involvement of CPV-2c type in the field cases of canine parvovirus infections in Kyrgyzstan.

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NEOPLASMS OF REPRODUCTIVE SYSTEM IN DOGS

Abstract. *Today problems of the reproductive system of dogs are widespread. Lack of timely provision of assistance affects the state of the reproductive system, in the future, all this leads to neoplastic changes in the organs of the reproductive system.*

The article considers and monitor oncological diseases of the reproductive organs in dogs and analyzes morphological features of reproductive system neoplasms in dogs. The frequency of occurrence, age characteristics and morphological pictures of tumoral and tumor-like cystic formations of internal and external genitals in dogs were determined on the basis of collected material.

Neoplasms of reproductive system in dogs are in the third place in terms of prevalence among cancer diseases and constitute 13% of all tumors. In our study, tumors of the external genitalia dominated 51%, while tumors of uterus, ovary and testis were (14-16%) and urethral tumors 5%. Benign neoplasms from smooth muscles (60%) and epithelial tissue were most frequently diagnosed.

The main clinical signs of neoplasms of the reproductive system in dogs are: general oppression, weakness, fever and lack of appetite. The beginning of tumor development is often asymptomatic.

Keywords: neoplasms of reproductive system, cyst, teratoma, seminoma, histopathology, ovariogysterectomy.

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НОВООБРАЗОВАНИЯ РЕПРОДУКТИВНОЙ СИСТЕМЫ У СОБАК.

Аннотация. *Проблемы репродуктивной системы собак имеют широкое распространение. Не своевременное оказание помощи влияет на состояние репродуктивной системы, в дальнейшем все это приводит к неопластическим изменениям органов половой системы.*

В статье рассмотрены онкологические заболевания репродуктивных органов у собак и проанализированы морфологические особенности новообразований органов репродуктивной системы у собак. На основании собранного материала определены частота встречаемости, возрастные характеристики и морфологические картины опухолевых и опухолеподобных кистозных образований внутренних и наружных половых органов у собак.

Новообразования органов репродуктивной системы у собак по распространенности среди онкологических заболеваний стоят на третьем месте и составляют 13% всех опухолей. В нашем исследовании преобладали опухоли наружных половых органов 51%, тогда как, опухоли матки, яичника и семенника составили (14-16%) и опухоли уретры 5%. Наиболее часто диагностированы доброкачественные новообразования из гладких мышц (60%) и эпителиальной ткани.

Основными клиническими признаками новообразований репродуктивной системы у собак бывает: общее угнетение, слабость, повышенная температура тела и отсутствие аппетита. Начало развития опухоли часто проходит бессимптомно.

Ключевые слова: новообразования репродуктивной системы, киста, тератома, семеновиома, гистопатология, овариогистерэктомия.

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ИТТЕРДИН РЕПРОДУКТИВ СИСТЕМАДАГЫ ЖАҢЫ ПАЙДА БОЛУУЧУЛАР

Аннотация. *Иттердин репродуктивдүү системасынын ылаңдары кеңири таралган. Өз убагында ветеринардык жардам көрсөтпөө репродуктивдүү системанын абалына таасир этет жана неопластикалык өзгөрүүлөргө алып келет.*

Макалада иттердин репродуктивдүү органдарынын онкологиялык оорулары каралып, анализделип, иттердин репродуктивдүү системасынын туюк жараларынын морфологиялык өзгөчөлүктөрүн талдоо жүргүзүлгөн. Топтолгон материалдардын негизинде иттердин ички жана тышкы жыныс органдарынын туюк жара жана шишик сымал кистоздорунун пайда болуу жыштыгы, жаш өзгөчөлүктөрү жана морфологиялык сүрөттөрү аныкталган.

Онкологиялык оорулардын арасында таралышы боюнча иттердин репродуктивдүү системасынын туюк жаралары үчүнчү орунда турат жана бардык шишиктердин 13%ын түзөт. Биздин изилдөөбүздө 51% тышкы жыныс органдарынын шишиктери басымдуулук кылса, жатындын, энелик бездин жана урук безинин шишиктери (14-16%) жана уретранын шишиктери 5% түзгөн. Көбүнчө жылмакай булчуңдардын (60%) жана эпителий кыртышынын ырбабас туюк жаралары аныкталган.

Иттердин репродуктивдүү системасынын туюк жараларынын негизги клиникалык белгилери болуп төмөнкүлөр саналат: жалпы алсыздык, ысытма жана табиттин жоктугу. Туюк жара баишталышы көбүнчө симптомсуз болот.

Негизги сөздөр: *репродуктивдүү системанын туюк жаралары, киста, тератома, семинома, гистопатология, овариогистерэктомия.*

Introduction

The growth of oncological diseases in dogs is growing rapidly every year. Our previous studies [1,2,3] showed that in Bishkek, dogs most often have tumors of the breast (37,7%), skin (32%) and neoplasms of the reproductive system (13%).

The analysis of scientific literature shows that of the total number of dogs suffering from cancer, tumors of mammary and reproductive system is up to 50.0%, whose aggressiveness and metastasis often leads to death, even after radical surgery [4,5].

Other authors argue that genital tumors in dogs have been diagnosed in 12% of all diseased animals [6,7].

Uterine and ovarian neoplasms are rarer than external genital tumors [8] among dogs. The true prevalence is unknown, as data are based mainly on studies of necropsy material and biopsy. According to Klein 2001, tumors of external genitalia account for up to 3% of neoplasms in dogs [9].

Primary neoplasms of the urinary tract are rare in dogs [10,11,12,13].

Most neoplasms of reproductive systems are benign, of epithelial origin [14.15.16]. These are fibromyomas, papillomas, lipomas, adenomas [17]. Among malignant tumors, transmissible venereal sarcoma prevails (more than 50% of all malignant tumors of vagina, about 30% - uterus body), myosarcoma, fibrosarcoma, adenocarcinoma are less common. Squamous cell cancer (vagina) and angiosarcoma (uterine body) are even less frequently detected [18].

The average age of affected dogs is 8-10 years [19,20,21,22].

According to clinical physicians, long-term hormonal disorders cause the occurrence of genitourinary tumors [23,24]. The main promoters are lack of free mating, false gestation and use of hormonal drugs affecting estrus.

At present, diagnostics and treatment of reproductive system tumors in dogs is one of

the problems for veterinarians. This is explained by increase in registration of reproductive system tumors, frequent relapses and increase of mortality rate.

The aim of our study was to study the morphological features of reproductive system tumors in dogs.

Materials and methods

The study was performed on 37 dogs of different breeds in veterinary clinics of Bishkek city with various pathologies, reproductive system neoplasms and acute symptomatology. General clinical examination of dogs, including ultrasound diagnostics, was carried out. Histological examination was carried out in the laboratory of Department on VSI, Histology and Pathology.

The studies were performed on tumors or tissue samples from genital tumors obtained by surgery. Tissue samples were fixed in 10% formalin, dehydrated and embedded in paraffin. Paraffin blocks were cut on 4 μ m slides, stained with hematoxylin and eosin.

In accordance with generally accepted histological criteria, a diagnosis was made based on a microscopic examination.

Results and discussion

Tumors of the reproductive system accounted for 37 cases (13%) of the total number of diagnosed neoplasms (281 cases).

Tumors of external genitalia amounted to 19 (51%), tumors of uterus 6 (16%), tumors of ovary and testicles 5 for each (14% for each) and urethral tumors 2 (5%) cases. Benign tumors were confirmed in 22 (60%) dogs and malignant tumors in 15 (40%). During our study we found that tumors of genitals in dogs occur in different age groups, but are more often observed at the age of 6-9 years, this is due to functional activity of genitals during this period. Genital tumors were found in 16 males (43%) and 21 females (57%).

According to the literature, in this study there was no clear propensity of a certain breed to develop any type of genital neoplasms.

According to prevalence and localization of tumor process in dogs covered by study the following categories were established:

Group I: Uterine tumors were found in 6 dogs, they were located in uterus - 3, and in cervix - 3. In one case, a tumor of cervix was found during a caesarian operation, the dog could not give birth as tumor covered the cervix. Puppies died, they were matured, but not developed. In our observations, the source of uterine tumor development are smooth muscles and epithelial tissues. In 3 out of 6 cases we diagnosed benign tumors (fibroid, tubular adenoma) and in the remaining 3 cases malignant tumors from epithelial endometrial cells - moderately differentiated adenocarcinoma.

Constant secretions of different nature, combined with hyperemia and edema of vagina and vulva in all malignant forms were noted in the anamnesis. In 2 cases, the condition of dogs after the operation was severe, and in one case it was fatal.

The average age of dogs with uterine neoplasms was 9 years.

In one case, a Central Asian shepherd dog (7 years old) was found to have a tumor in the uterus with ovarian damage. An ovarian hysterectomy was performed followed by a pathomorphological study (Fig. 1). Histological diagnosis: moderately differentiated uterine adenocarcinoma. There is a follicular cyst in the ovary. Corpus luteum cyst. Due to high metastatic potential of this type of tumor, the prognosis is poor. There is a high risk of fatal outcome in the post-surgery period. Tumor node is represented by glandular - papillary structures in chaotic arrangement, clusters of tumor cells, in some places - layering of cells on each other. Numerous mitosis figures were noted in observations.



Fig. 1.A. Macroscopic structure of moderately differentiated uterine adenocarcinoma.

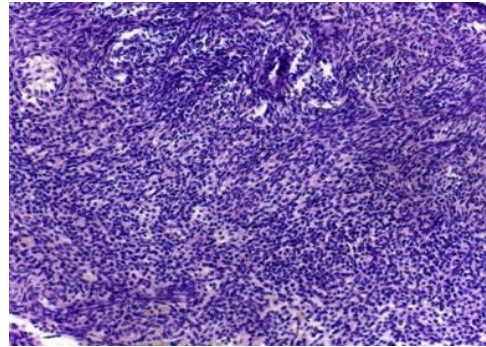


Fig. 1.B. Histological structure of moderately differentiated uterine adenocarcinoma. Hematoxylin & eosin staining. Increased 200 times.

Group II: Ovarian tumors in our studies are presented as serous, papillary cystadenoma 1 for each, follicular and serous cyst 1 for each, and teratoma 1 case. They were observed in dogs older than 8 years, only teratoma was detected in a dog of 4 years, in the form of abdomen mass.

A dog of Poodle breed (9 years old) has an ovarian tumor in the form of unilocular cyst, with a flat surface, on the section there are papillary sprouts like cauliflower, diameter 15 by 22 cm, with brown contents. The mass of tumor after weighing was 415 g, i.e. about 15% of the total mass of the dog. Histological diagnosis: Serous ovarian cystoadenoma (Fig. 2).

Epithelium growth without signs of atypia was microscopically noted. The ciliated epithelium is represented by single-row cubic, pear-shaped cells with an elongated nucleus. Connective-tissue stroma with a large number of vessels is located under the epithelium.



Fig. 1.A. Macroscopic structure of moderately differentiated uterine adenocarcinoma.

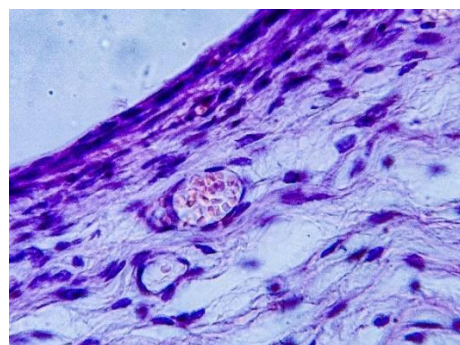


Fig. 2.A. Macroscopic structure of serous cystoadenoma.

The 2nd case of neoplasia on ovaries in a dog of 8 years, German shepherd dog has the form of multichamber cystic formation. Papillary projections are revealed on the inner surface. Both ovaries are lesioned. Histological diagnosis: Borderline papillary cystadenoma (Fig. 3).



Fig. 3.A. Macroscopic structure of papillary cystadenoma.

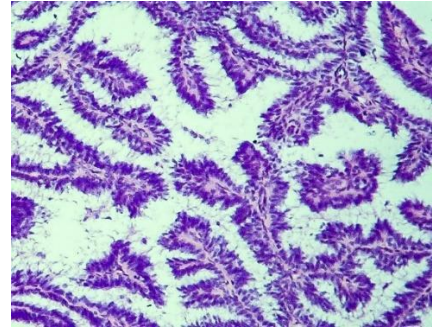


Fig. 3.B. Histological structure of papillary cystadenoma. Hematoxylin & eosin staining. Increased 100 times

In microscopic examination, the papillary cystadenoma is represented by numerous papillary formations, which are unevenly arranged, merging with each other in some places. Proliferative changes in the cover epithelium are evident. Papillary projections have a connective tissue stroma, elongated form of epithelial cells and blood vessels.

Group III. Tumors of testicles were found in 5 dogs aged 9 to 12 years. Malignant tumors- 4 (seminoma -3, embryonic cancer -1) and in one case it is teratoma. The shape and size of tumors were different, with a seminoma the tumor is a single node with a smooth, even surface, on the sections the tissue is of glandular consistency, the volume of lesion is mainly one testis. In most of them (3 cases), cryptorchidism was detected and the tumor developed in undescended testis. In one case, metastasis of seminoma to inguinal lymph nodes was observed.

The seminoma is microscopically determined by giant cells, rounded, with clear borders and separated by connective tissue septum. The polymorphism of nuclei and cytoplasm of cells are dark colored and a decrease in number of lymphocytes in the stroma is observed (Fig. 4).

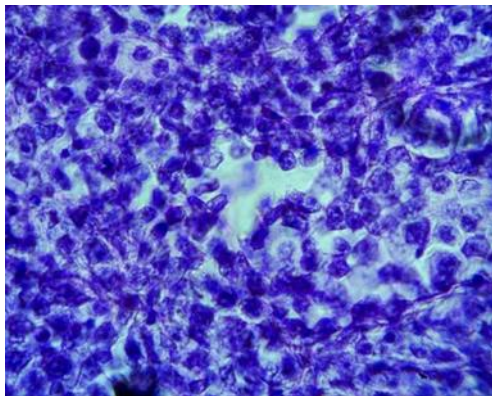


Fig. 4.A. Microscopic structure of seminoma. Hematoxylin & eosin staining. Increased 400 times.

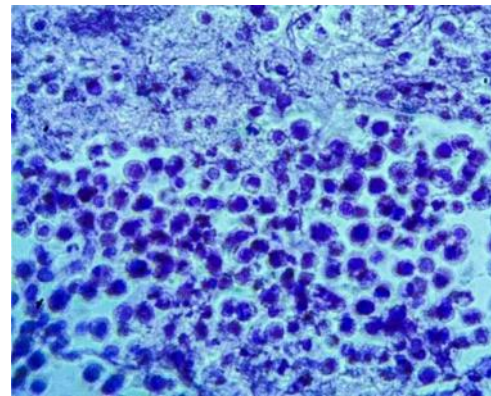


Fig. 4.B. Microscopic structure of metastasis of seminoma are on the inner thigh. Hematoxylin & eosin staining. Increased 400 times.

Group IV. Tumors of external genitalia. There are only 19 cases of tumors of external genitalia. Most external genital tumors in dogs were benign (63%) and malignant (37%). Among malignant tumors, lymphomas prevailed (Fig. 6) - 5, and

non-keratinizing squamous cell carcinoma - 1 and non-differential cancer - 1 case.

In females, neoplasms of external genitalia were localized in inner side, as well as in vaginal opening. Mainly there were benign tumors of

smooth muscles (fibroma, leiomyoma, angiofibroma) of fibrolipom, tubular adenoma, hemangioma. Macroscopically they are in the form of dense neoplasms of various sizes, in some cases with ulcers.

Clinically observed symptoms of intoxication: depression, skin pallor, loss of appetite, a serous-bloody or purulent discharges, constipation, in some cases, urinary disorder.

Urethral tumors were observed only in 2 females: transient cell cancer and hemangioma.

In a mongrel dog, 11 years old found a mass in vagina of multiple shapes, light pink color, spread throughout the vulva. It has the form of a dense node and cartilaginous consistency. Histological diagnosis – Fibroma. The bundles of connective tissue fibers have different shapes and are arranged chaotically. The cellular elements located in loose stromas have a spindle-like shape. Tissue atypism. The nuclei are hyperchromic (Fig. 5).



Fig. 5.A. Macroscopic picture of vaginal fibroma.

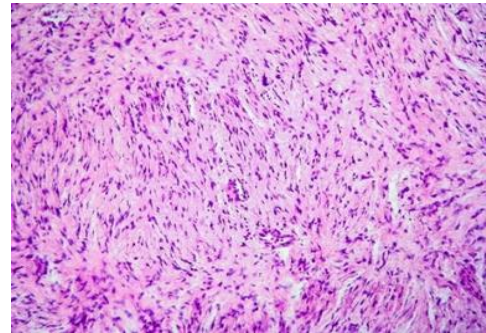


Fig. 5.B. Histological picture of vaginal fibroma. Hematoxylin & eosin staining. Increased 100 times.



Fig. 6.A. A mongrel dog. It is 4 years old. Macroscopic evidence of malignant lymphoma in the vaginal mucous membrane of a dog.

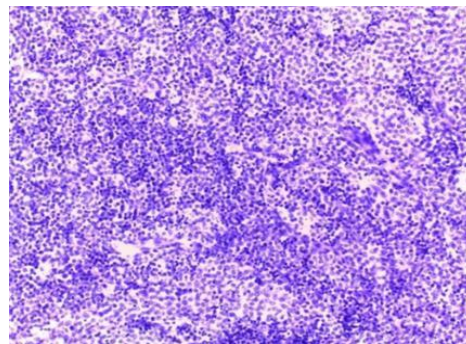


Fig. 6.B. Histological structure of malignant lymphoma in dogs. Hematoxylin & eosin staining. Increased 200 times. Tumor lymphatic cells consisting of lymphocytes and blanket cells.

Conclusions

During the study, reproductive system neoplasms were detected in 37 dogs of

different breeds and accounted for (13%) of the total number of diagnosed neoplasms. External genital tumors amounted to 19 cases (51%), tumors of uterus 6 (16%), tumors of

ovary and testis by 5 for each (14%) and urethral tumors 2 (5%). Benign tumors were 22 (60%) and malignant 15 (40%).

Histological study found that tumors of reproductive system in dogs are mostly benign (60%). More often benign tumors from smooth muscles (fibroma, leiomyoma) are diagnosed, and among malignant forms lymphoma, adenocarcinoma and seminoma were more common.

Surgical treatment of benign tumors leads to full recovery, but as for malignant tumors the prognosis is unfavorable.

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HISTOLOGICAL STRUCTURE OF LYMPHOID TISSUE AND ORGANS OF CALVES

Abstract. *In this article the histological structure and cellular composition of Trachea-associated lymphoid tissue (TALT), Bronchus-associated lymphoid tissue (BALT), lymph nodes and spleen has been examined in clinically healthy calves. It has been found that the morphofunctional state of TALT and BALT corresponds to a state of relative rest, and the lymph nodes and T-dependent and B-dependent zones of spleen are in a state of moderate functioning.*

Key words: TALT, BALT, lymph nodes, spleen, histology, cells, calves.

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ГИСТОЛОГИЧЕСКОЕ СТРОЕНИЕ ЛИМФОИДНОЙ ТКАНИ И ОРГАНОВ У ТЕЛЕНКА

Аннотация. *В данной статье исследовано гистологическое строение и клеточный состав трахея-ассоциированной лимфоидной ткани (далее ТАЛТ), бронхо-ассоциированной лимфоидной ткани (далее БАЛТ), лимфатических узлов и селезенки у клинически здоровых телят. Установлено, что морфофункциональное состояние ТАЛТ и БАЛТ соответствует состоянию относительного покоя, а лимфатических узлов и селезенки Т-зависимые и В-зависимые зоны находятся в состоянии умеренного функционирования.*

Ключевые слова: ТАЛТ, БАЛТ, лимфатические узлы, селезенка, гистология, клетки, телята.

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МУЗООЛОРДУН ЛИМФОИДДИК ТКАНДАРЫНЫН ЖАНА ОРГАНДАРЫНЫН ГИСТОЛОГИЯЛЫК ТҮЗҮЛҮШҮ

Аннотация. *Бул макалада клиникалык жактан дени сак музоолордун трахея менен ассоциацияланган лимфоиддик тканынын (мындан ары ТАЛТ), бронхтор менен ассоциацияланган лимфоиддик тканынын (мындан ары БАЛТ), лимфа түйүндөрүнүн жана көк боорунун гистологиялык түзүлүшү жана клеткалык курамы изилденген. ТАЛТ жана БАЛТтын морфофункционалдык абалы салыштырмалуу тынч абалда болору, ал эми лимфа түйүндөрдүн Т-көз каранды жана В-көз каранды зоналары жана көк боордун Т-көз каранды зонасы салыштырмалуу орточо иштөө абалында болору аныкталган.*

Өзөк сөздөр: ТАЛТ, БАЛТ, лимфа бездер, көк боор, гистология, клеткалар, музоолор.

Introduction. The presence of Trachea-associated lymphoid tissue (TALT) in animals has been proven, but their structure and function have been studied fragmentarily and insufficiently. The study of TALT in animals is necessary for the development of oral, nasal and conjunctival vaccinations and

for better protection of the corresponding animal species from various infections [7].

Broncho-associated lymphoid tissue (BALT) is a part of the MALT. Study of the BALT is important for animals, because they often have respiratory infections. Until now, methods of immunization against a complex

of diseases, which often have a multifactorial etiology, have not been uniformly successful. It should be recognized that respiratory immunity is better associated with local immune responses and BALT in the lungs promotes these responses. Therefore, knowledge about BALT should help in development of methods to stimulate local respiratory immunity. BALT was not found in newborn calves, but an increasing number of lymphoid nodules and lymphoid aggregates have been found in calves from 4 to 18 months, and a decrease in their number in old cattle. BALT is located under the epithelium of the large bronchi, in the submucosa of the small bronchioles, and it extends from the epithelium to the adventitia of the bronchioles. Organized lymphoid nodules with primary and secondary follicles and unorganized aggregates of lymphocytes can be found in lung tissue [3].

A ring of lymphoid tissue, which plays a key role in the induction of immune responses, is present in the pharyngeal mucosa, where a huge amount of harmful antigens enters in the body during feeding and respiration [9,5]. The tonsils are the main components of this mucosa-associated lymphoid tissue. In cattle, there are five tonsils: pharyngeal, nasal, located in the nasopharynx, lingual, palatine tonsils and rudimentary tonsils of the soft palate in the oropharynx. Interestingly, the lymphoid tissue of the laryngopharynx of cattle lacks any macroscopically visible tonsils [8,4]. The presence of larynx-associated lymphoid tissue in young cattle has been proven [6].

The histological structure and cellular composition of BALT, intestinal-associated lymphoid tissue (IALT), lymph nodes and spleen were studied in adult yaks [1] and in adult cattle [2].

Analysis of literature data on the topic under study shows the relevance of studying the morphology and cellular composition of trachea-associated lymphoid tissue (TALT), Bronchous-associated lymphoid tissue (BALT), lymph nodes and spleen in calves.

The aim is to study the histological structure and cellular composition of TALT, BALT, lymph nodes and spleen in clinically healthy calves.

Object and research methods

The objects of histological studies were the trachea, lungs, lymphoid tissue associated with the trachea and bronchial system of the lungs, as well as regional lymph nodes of the lungs and the spleen of clinically healthy calves that were kept in farms of the Chui region. During the veterinary examination, they did not have respiratory disorders in the form of coughing, discharge from nasal openings and shortness of breath. In total, 5 calves from 4 to 9 months underwent by pathological autopsy. After the autopsy of the calves, an autopsy report was drawn up. The trachea, lungs, regional lymph nodes of the lungs, and the spleen of calves have been thoroughly examined. Pieces from the above organs were fixed in formalin for histological studies. The studies were carried out in the laboratory of histology of veterinary and sanitary examination, histology and pathology department of the KNAU named after K.I. Scriabin. Pieces taken from organs were fixed in 10% formalin aqueous solution for 48 hours. They were then embedded in paraffin wax according to a conventional embedment technique to obtain paraffin blocks. Histological sections with a thickness of 3-5 μm were prepared from paraffin blocks. To stain histological sections, hematoxylin-eosin stains were used. Stained histological sections were examined under a light microscope. The study of histological preparations was carried out using a binocular microscope LEICA ICC 50 HD at a

magnification of 40, 100 and 200. Microphotography was performed using a digital camera of this microscope.

Research results

Trachea-associated lymphoid tissue. In the lamina propria, there are lymphoid follicles, which so-called trachea-associated lymphoid tissue (TALT) (Fig. 1). Normally TALT is in

a state of relative rest, i.e. there are no lymphoid follicles with light centers. Lymphoid follicles have a round or oval shape without a pronounced mantle zone and a light center (Fig. 1). There are single division of lymphoblasts noted in the lymphoid follicles. The cellular composition of TALT is represented mainly by lymphocytes, then by plasma cells and macrophages.

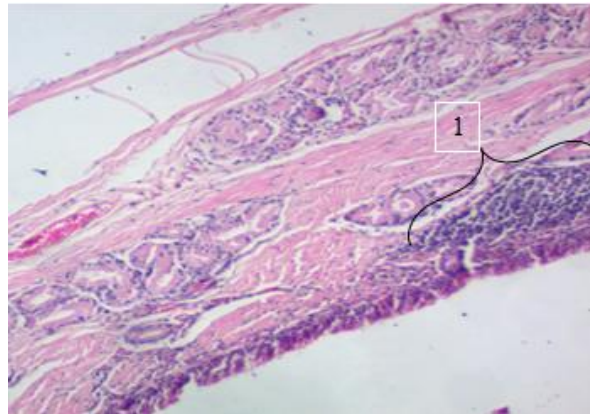


Fig. 1. Clinically healthy calf. Cross histosection of trachea. 1. Tracheal- associated lymphoid tissue located under the mucous membrane. Hematoxylin-eosin. x 100.

Broncho associated lymphoid tissue. There is a broncho (or pulmonary) associated lymphoid tissue BALT (or LALT) In the lungs. There is various sizes in the form of lymphoid formations located along the small bronchi and bronchioles (Fig. 2a), and like diffusely spread lymphoid cells around the vessels, in the interstitium and in the parenchyma, which perform the function of immune surveillance in the lung tissue. The inner surface of the alveoli is covered with alveolocytes, which forms a continuous epithelial lining of the alveoli. The walls of the alveoli also secreted capillaries, smooth muscle cells, macrophages and single lymphocytes (Fig. 2b).

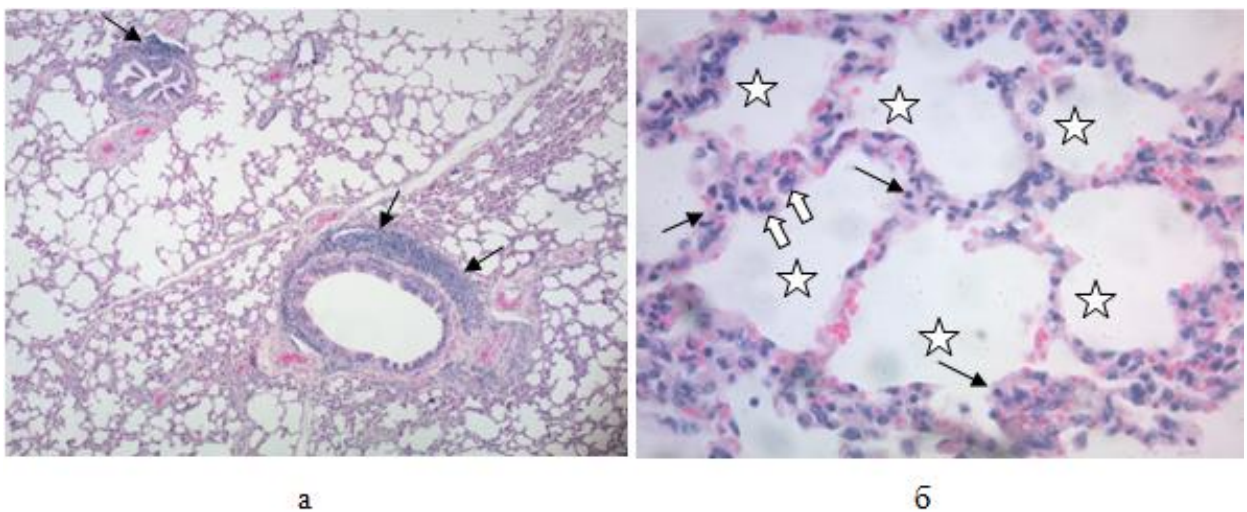


Fig. 2. Histosection of clinically healthy calf's lungs. **a.** Pulmonary-associated lymphoid tissue around two small-caliber bronchi (indicated by black arrows). Hematoxylin and eosin. x 40. **b.** Alveolar cavities (5-pointed stars),

alveolar walls, consisting of alveolocytes, erythrocytes, lymphocytes and macrophages (black arrows) and 2 macrophages in the alveolar cavity (white arrows). Hematoxylin-eosin. x 400.

BALT is normally in a state of relative rest, which is explained by the absence of lymphoid follicles with light centers. Lymphoid follicles have a round or oval shape without a pronounced mantle zone and a light center (Fig. 3). In the lymphoid follicles, the division of lymphoblasts is noted. The cellular composition of BALT is represented mainly by lymphocytes, then by plasma cells and macrophages.

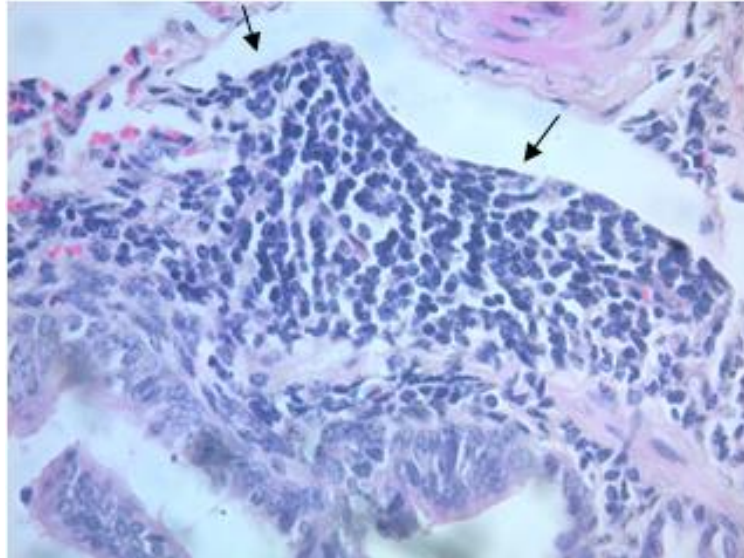


Fig. 3. Clinically healthy calf's lungs . Lung-associated lymphoid tissue around the bronchus in a state of relative rest (indicated by arrows). Hematoxylin and eosin. x 400.

Calf's lymph nodes. Histologically, the calf's lymph node consists of the stroma (capsule, trabeculae), parenchyma (cortex and medulla) and sinuses. The cortex is represented by lymphoid follicles (B-dependent zone) and paracortical zones (T-dependent zone) (Fig. 4a). Lymphoid follicles are located in the cortical area (Fig. 4a). In morphofunctional terms, they can be divided into actively functioning lymphoid follicles, lymphoid follicles in a state of relative rest, and newly formed follicles. Lymphoid follicles contain lymphocytes of various sizes, macrophages, plasma cells and blast cells.

The paracortical zone is located between the B-dependent zone and the medulla and it is represented by diffusely localized lymphocytes. Lymphocytes (small, medium and large), plasma cells and macrophages have been found (Fig. 4a). The medulla of the lymph nodes consists of cords and sinuses, where lymphocytes, macrophages and plasma cells are located (Fig. 4b).

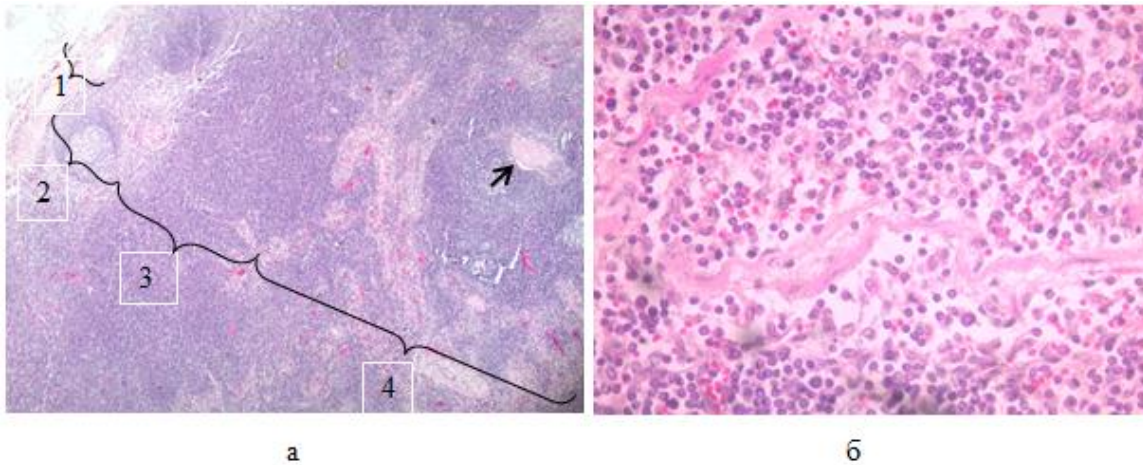


Fig. 4. Lymph node in a clinically healthy calf **a**. 1. Capsule. 2. Lymphoid follicles (B-zone). 3. Paracortical zone (T-zone). 4. Medulla of the lymph node. Trabecula (arrow). Hematoxylin and eosin. x 40 **б**. Lymph node medulla of a clinically healthy calf. Lymphocytes, macrophages, plasma cells and erythrocytes. Hematoxylin and eosin. x 400.

Spleen. Histologically, the spleen is represented by the stroma and pulp. The organ stroma consists of a capsule and trabeculae (Fig. 5a). The spleen pulp is represented by white and red pulp. The white pulp is formed from cells of lymphoid tissue, which form periarterial diffuse infiltrates and lymphoid follicles. T-dependent zones of the white pulp of the spleen are localized around the arteries in the form of diffuse infiltration and consist mainly of small lymphocytes. The B-dependent zone of the white pulp is localized near the T-dependent zone and is represented by lymphoid follicles (Fig. 5a).

Lymphoid follicles can be in different morphological and functional states. There are lymphoid follicles with a pronounced light center, mantle and marginal zones (Fig. 5a). There are lymphoid follicles with a dense accumulation of lymphoid cells without pronounced zones and with a loose arrangement of lymphocytes. The red pulp consists of sinuses and cords, where erythrocytes are mainly located in large numbers. The red pulp also showed the presence of macrophages, lymphocytes, plasma cells and cells in a state of apoptosis (Fig. 5b).

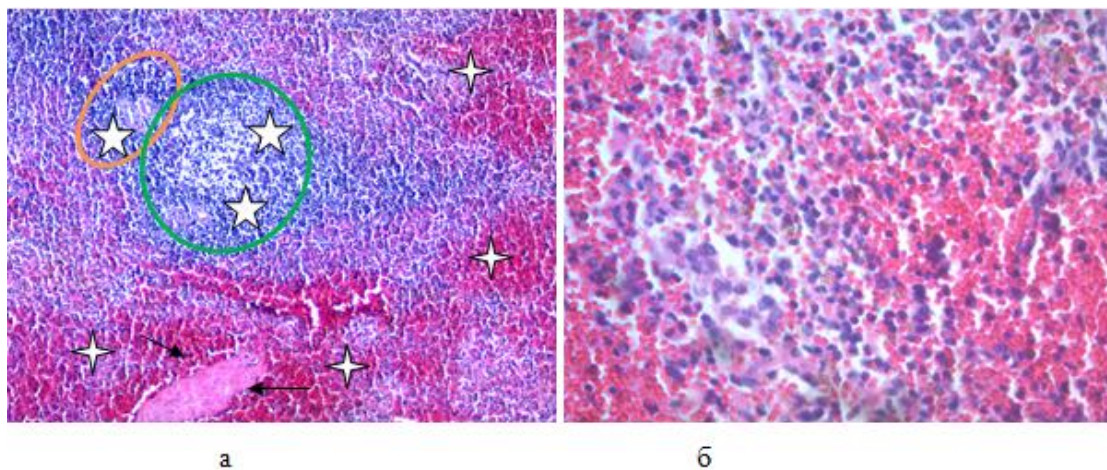


Fig. 5. Spleen in a clinically healthy calf **a**. White (5-pointed stars) and red (4-pointed stars) pulp, spleen trabecula (arrows). The small oval circle of color indicates the T-dependent zone, and the large oval circle indicates the B-dependent zone of the white pulp. Hematoxylin and eosin. x 100. **б**. Red pulp. Erythrocytes, lymphocytes, macrophages and plasma cells are located in the sinuses. Hematoxylin and eosin. x 400.

Conclusion

1. In the trachea and bronchial system of the lungs in a clinically healthy calf, there are a trachea-associated lymphoid tissue and a broncho-associated lymphoid tissue. Their histological structure and cellular composition are described.

2. The functional state of both the trachea-associated lymphoid tissue and the lung-associated lymphoid tissue of the calf corresponds to the state of relative rest.

3. The histological structure and cellular composition of the lymph nodes are described in a clinically healthy calf. The functional state of the organ corresponds to the state of moderate functioning.

4. The histological structure and cellular composition of the spleen are described in a clinically healthy calf. The functional state of the organ corresponds to the state of moderate functioning.

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MORPHOLOGICAL CHANGES IN THYMUS DURING LARVAL ECHINOCOCCOSIS IN CATTLE

Abstract. *In this article, in a comparative aspect, we investigated the morphological and immunohistochemically changes in the thymus during larval echinococcosis in cattle. It was found that during this parasitic disease, there is an involution of the thymus parenchyma and its replacement with adipose tissue occurs. The pattern of the cortex and medulla of the thymus parenchyma is erased, the number of T-lymphocytes are reduced and the proliferative activity of thymoblasts are weakened.*

Key words: *larval echinococcosis, thymus, morphological changes, immunohistochemistry, T-lymphocytes, proliferation, cattle.*

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МОРФОЛОГИЧЕСКИЕ ИЗМЕНЕНИЯ В ТИМУСЕ ПРИ ЛАРВАЛЬНОМ ЭХИНОКОККОЗЕ У КРУПНОГО РОГАТОГО СКОТА

Аннотация. *В данной статье в сравнительном аспекте исследованы морфологические и иммуногистохимические изменения в тимусе при ларвальном эхинококкозе у крупного рогатого скота. Установлено, что при данном паразитарном заболевании происходит инволюция паренхимы тимуса и замещение ее жировой тканью, рисунок коркового и мозгового вещества паренхимы тимуса стирается, количество Т-лимфоцитов уменьшено и пролиферативная активность тимобластов ослаблена.*

Ключевые слова: *ларвальный эхинококкоз, тимус, морфологические изменения, иммуногистохимия, Т-лимфоциты, пролиферация, крупный рогатый скот.*

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БОДО МАЛДЫН ЛАРВАЛЬДЫК ЭХИНОКОККОЗУНДА ТИМУСТАГЫ МОРФОЛОГИЯЛЫК ӨЗГӨРҮҮЛӨР

Аннотация. *Бул макалада бодомалдын ларвальдык эхинококкозунда тимустагы морфологиялык жана иммуногистохимиялык өзгөрүүлөр салыштырмалуу аспекте изилденген. Бул паразитардык ылаңда тимуста төмөнкүдөй өзгөрүүлөр аныкталган: тимустун паренхимасынын инволюциясы жана анын май тканы менен алмашуусу, тимустун паренхимасынын кыртыштуу жана мээ затынын морфологиялык жактан сүрөтү жоголот, Т-лимфоциттердин саны азайат жана тимобласттардын пролиферативдик активдүүлүгү начар.*

Өзөктүү сөздөр: *ларвальдык эхинококкоз, тимус, морфологиялык өзгөрүүлөр, иммуногистохимия, Т-лимфоциттер, пролиферация, бодо мал.*

Introduction. Larval (cystic) echinococcosis (hydatid disease) is a parasitic disease of humans and animals, which is caused by the larval stage of *Echinococcus granulosus* and is one of the urgent problems of scientific research in Kyrgyz Republic [2,8].

In intermediate hosts, this invasion is mostly asymptomatic and is usually detected during pathological examination or during the slaughtering of animals for meat [10]. According to Sakamoto T. (1987), echinococcal cysts in cattle were classified as 58 % unicameral, 22 % polymorphic, 0.5 % multichamber and 1.5 % involutive cysts [9]. In the Republic of North Ossetia-Alania, larval echinococcosis is found in various organs of cattle and liver damages is 79.81 ± 1.65 %, lungs 68.23 ± 1.91 %, spleen 6.05 ± 0.98 % and heart 5.51 ± 0.95 %. Simultaneous damage to the liver and lungs was 32.60 ± 1.92 % [1]. Echinococcal cysts in cattle up to 63.2 % are acephalocysts, and 36.8 % are fertile [3]. Echinococcal bubbles were localized both on the surface and in the thickness of the cattle's liver and lungs. The sizes of echinococcal bubbles varied from a few millimeters to 10-15 cm in diameter. The number of blisters in the affected organs varied greatly [6]. Echinococcal cysts in humans are often detected by surgeons during organ operations and are confirmed by histological examination. They are usually located in the liver (55–70 %), lungs (15–35 %), or the brain (1.7 %) [4]. However, echinococcosis can develop in almost any part of the body, but the disease is rare in the mediastinum (0.1 %) [11]. Clinically, mediastinal cysts are difficult to diagnose. They remain asymptomatic for many years until the cyst grows larger. [5] Echinococcal cysts are very rare in the mediastinum. A 13-year-old patient was admitted to the hospital due to chest pain and cough. Chest X-ray and computed tomography revealed a uniform cystic mass measuring 7.5×7 cm in the anterior mediastinum. A thymectomy was

performed after a left thoracotomy to complete the pericystectomy. The histological diagnosis was echinococcal cyst [7].

In the literature there are no data on morphological changes in the thymus with larval echinococcosis.

Purpose of the study is a comparative study of morphofunctional changes in the thymus in larval echinococcosis in cattle.

Object and research methods

The objects of the study were the lungs and thymuses affected by echinococcal bladders, as well as the lungs and thymuses from clinically healthy animals. After the slaughtering of the animal and veterinary examination, they took pieces from the above organs (3 heads in each group), which were fixed in a 10 % neutral formalin solution. For histological and immunohistochemical studies, paraffin blocks were prepared from pieces of affected organs after passage in increasing concentration of alcohol to obtain histological sections with a thickness of 3-8 microns. Hematoxylin-eosin was used to stain histological sections. For immunohistochemical studies, PAP and ABC methods were used using the following primary antibodies: Polyclonal Rabbit Anti-Human T-cell, CD 3 antibody for detecting T-lymphocytes (PAP), Monoclonal Mouse Anti-Proliferating Cell Nuclear Antigen, Clone PC10 antibody for detecting cell proliferation (PAP). The histological preparations were read using a LEICA ICC 50 HD binocular microscope. Microphotography was performed using a digital camera of this microscope.

Results of research

The thoracic lobe of the thymus was examined from cattle, where the lungs were

affected by larval echinococcosis (Fig. 1). Visually, the thymus is in dense consistency, in gray-white color and has a lobular structure. Outside, it is covered with a shiny

capsule, which is surrounded by fatty tissue. On the cut, the parenchyma has a homogeneous lobular pattern (Fig. 1).

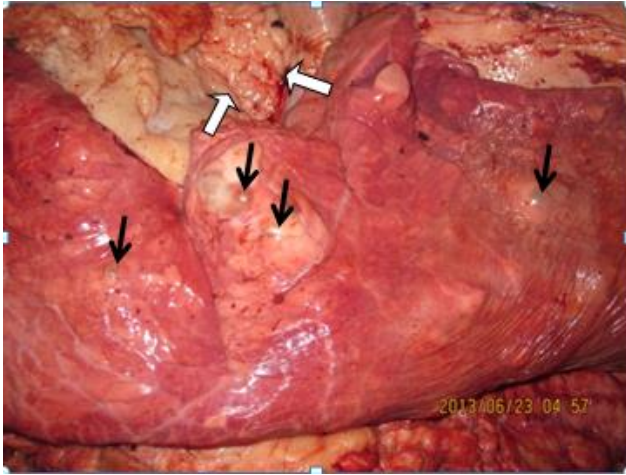


Fig. 1. Larval echinococcosis of the cattle's lungs. Echinococcal cysts in the lungs are indicated by black arrows. Thoracic lobe of the thymus (indicated by the white arrow).

Histologically, the thymus in clinically healthy cattle consists of a capsule, interlobular septa and parenchyma. In the thymus parenchyma there are lobules in which the cortex and medulla are clearly differentiated (Fig. 2a). In the cortex, thymocytes are densely located. The medulla is distinguished by a light color due to the loose arrangement of thymocytes. In the medulla, in addition to thymocytes, thymic bodies or Hassal's little bodies are secreted. The presence of adipose tissue can be

observed between the lobules of the thymus (Fig. 2a).

In case of larval echinococcosis, the thymus is subject to pronounced involution, which on histological sections is characterized by a decrease in the area of the thymic parenchyma and the presence of a sufficient amount of adipose tissue (Fig. 2b); there is no cortical substance in some lobules of the thymus. In some places, the thymus parenchyma is completely replaced by adipose tissue.

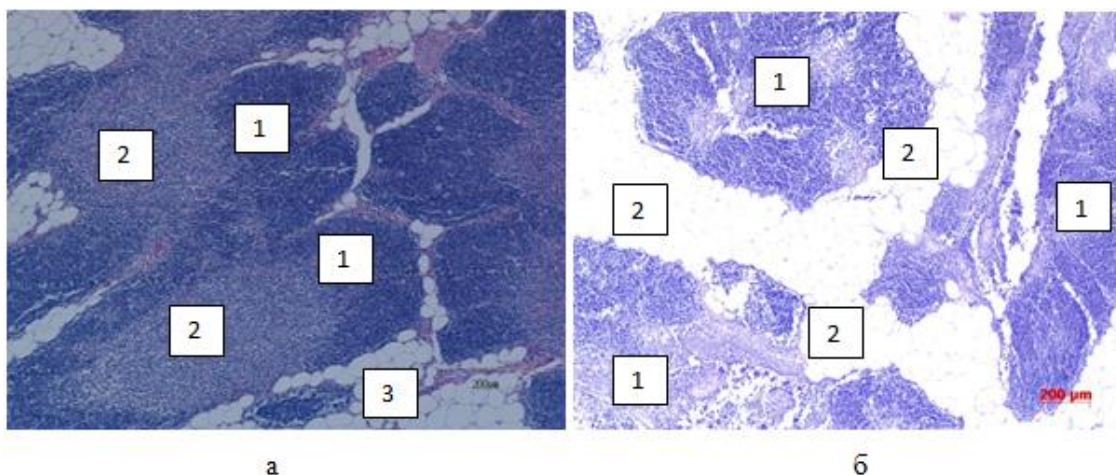


Fig. 2. a. Norm. Paraffin sections of cattle's thymus. Active morphofunctional state of the thymus. The cortical (1) and medullary (2) substance of the thymus is clearly expressed. A small part of the thymus parenchyma is replaced by adipose tissue (3). Hematoxylin and eosin. 200 µm. 6. Paraffin sections of cattle's thymus with larval echinococcosis of the lungs. The thymus parenchyma (1) is replaced by adipose tissue (2). Hematoxylin and eosin. 200 µm.

In the thymus parenchyma of clinically healthy cattle, especially in the cortex, there are large numbers of T-lymphocytes (Fig. 3a). In case of larval echinococcosis, which is accompanied by involution of the thymus, the number of T-lymphocytes in its parenchyma is reduced and the cortical and medullary substance does not differ in the lobules (Fig. 3b).

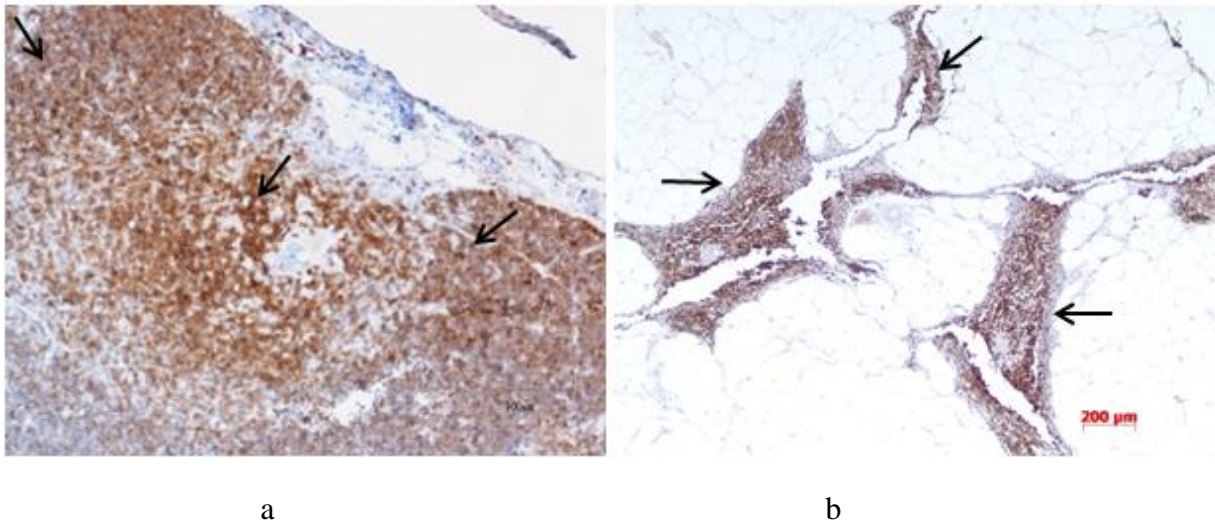


Fig. 3. a. Norm. Cattle's thymus. A large number of T-lymphocytes are located in the cortex of the thymus (T-lymphocytes are colored brown and indicated by arrows). Anti CD 3 antibody. PAP method. 100 µm. b. Involution of the thoracic lobe of the thymus of cattle with larval echinococcosis. In the thymus, the cortical and medulla are not distinguished and a small number of T-lymphocytes in its parenchyma (T-lymphocytes are colored brown and indicated by black arrows). Anti CD 3 antibody. PAP method. 200µm

In the thymus parenchyma in clinically healthy cattles, especially in the cortex, an intense proliferation of thymoblasts are noted (Fig. 4a). In case of larval echinococcosis in the thymus parenchyma, there is a weak proliferation of thymoblasts (Fig. 4b).

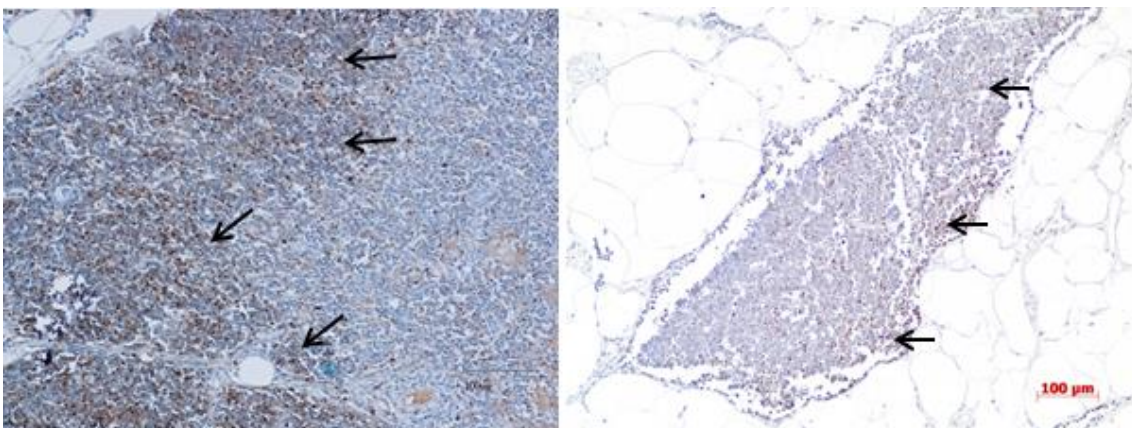


Fig. 3.a. Norm. Cattle's thymus. Intensive proliferation of thymoblasts in the cortex of the thymus (thymoblasts are colored brown and indicated by arrows). Anti PCNA antibody. PAP method. 100µm. b. Involution of the thoracic lobe of the cattle's thymus with larval echinococcosis. Weak proliferation of thymoblasts (thymoblasts are brown and indicated by arrows). Anti PCNA antibody. PAP method. 100µm.

Conclusions

An analysis of the results of comparative studies of the thymus in clinically healthy cattle and with larval echinococcosis allows us to come to the following conclusions:

1. In case of larval echinococcosis of cattle, involution of the thymus parenchyma and its replacement with adipose tissue are noted.
2. Involution of the thymus parenchyma is accompanied by the disappearance of the cortex and medulla, a decrease in the number of T-lymphocytes and a weakening of the proliferative activity of thymoblasts.

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ASSESSMENT OF VETERINARY AND SANITARY SERVICE IN THE MARKETS OF BISHKEK

Abstract: *The article gives assessment of veterinary and sanitary laboratories in the markets of Bishkek and their activity. It presents results of researches conducted in these laboratories. The article gives the analysis of reporting data on food safety of animal products as poultry, fish and honey. The results showed that the methodology of veterinary and sanitary researches in the markets is conducted in accordance with the requirements of veterinary and sanitary inspection and epizootic situation in regions. Technical support and working conditions in market laboratories are satisfactory.*

Key words: *veterinary and sanitary control, markets, food, research methods, examination, technical security, brucellosis, parasitic diseases.*

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ХАРАКТЕРИСТИКА ВЕТЕРИНАРНО-САНИТАРНОГО ОБСЛУЖИВАНИЯ РЫНКОВ ГОРОДА БИШКЕК

Аннотация. *В статье дана характеристика ветеринарно-санитарных лабораторий на рынках г. Бишкек и их деятельности. Приводятся результаты проводимых в этих лабораториях исследований. Дан анализ отчетных данных по пищевой безопасности продуктов животного происхождения, птиц, рыбы, меда. Результаты показали, что методология ветеринарно-санитарных исследований на рынках проводится в соответствие с требованиями ветеринарно-санитарной экспертизы и эпизоотической ситуации в регионах. Техническое обеспечение и условия работы в лабораториях рынков удовлетворительные.*

Ключевые слова: *ветеринарно-санитарный контроль, рынки, продукты питания, методы исследований, экспертиза, техническая обеспеченность, бруцеллез, паразитарные болезни*

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БИШКЕК ШААРЫНДІГЫ БАЗАРЛАРЫНДАГЫ ВЕТЕРИНАРДЫК САНИТАРДЫК КӨЗӨМӨЛГӨ БАА БЕРУУ

Аннотация: *Илимий макалада Бишкек шаарынын базарларындагы ветеринардык-санитардык лабораторияларына жана алардын иш алып баруусуна мүнөздөмө берилген. Ушул лабораторияларда жүргүзүлгөн изилдөөлөрдүн жыйынтыгы көрсөтүлгөн. Жаныбарлардын, канаттуулардын, балыктардын, балдын тамак-аш коопсуздугу боюнча отчетторуна анализ берилген. Базарлардагы ветеринардык-санитардык изилдөөлөрдүн ыкмалары, аймактардагы ветеринардык-санитардык экспертиза жана эпизоотиялык кырдаалынын талаптарына дал келүүсүнүн жыйынтыгын көрсөткөн. Техникалык жабдуулар жана базардын лабораторияларынын жумуштук шарттары канааттандырылгыч.*

Өзөктүү сөздөр: *Ветеринардык-санитардык көзөмөл, базарлар, тамак азыктары, изилдөө ыкмалары, техникалык жабдуулар, бруцеллез, паразитардык ыландар.*

Introduction

Epidemiological situation in the regions is mainly determined by activity of veterinary laboratory in the markets of settlements. The veterinary and sanitary control of saleable food products is carried out in these laboratories. Veterinary laboratories carry out the veterinary and sanitary examinations and determine food safety of animal products: meat, meat products, milk, dairy products, etc.

The focus of these examinations depends on epizootic situation in the areas where these products come from. The quality of conducted examinations depends on many factors – regulated research methods, laboratory equipment, control over these laboratories, etc. Results of these researches serve as the basis for conclusion in which direction to improve the work of these laboratories.

They conduct scientific researches with the purpose to detect or establish situations on veterinary, sanitary quality of production. Researchers from the Perm Krai found that deterioration of the situation with parasitic diseases on their territory was due to decrease in examination of slaughter animals (Dorgelinsky et al., 2017), similar results were obtained by Novosibirsk researchers (Troshkina and Zubareva, 2018).

Now they attach a great importance to researches on antibiotic content in food (Kalnitskaya, 2010).

Many scientists, such as Trofimov, Nigmatzanov (2014); Stepanov (2018) and etc.; Drozhkin, Butko (2016) and others also studied the issues of veterinary and sanitary examination of laboratories in markets and food safety.

Veterinary control is in all countries of the world where there is a sale of food products. In our city there are 3 large markets, which receive products from different areas. All these markets have their own veterinary laboratories, which conduct veterinary and sanitary examination of saleable food products. The basic requirements to these

laboratories were established at the time of their creation. But time is changing, and the epizootic situation in the regions is changing too, living conditions are changing, and technical equipment and methodological approaches to research are improving. Therefore, questions arise about the current state of veterinary and sanitary services in our city markets. All these questions we raised in the process of studying the activity of these laboratories.

Research materials and methods

The object of the research were the laboratories, methods of examinations conducted by the laboratories, qualification of specialists, equipment, instruments, as well as annual and semi-annual reports. Study of veterinary examinations was through insight into methods, as well as comparative comparison, technical equipment of laboratories, which was used before and now, that is, the level of technical equipment. Analysis of reporting data and conclusions about the work of veterinary laboratories in the markets, veterinary and sanitary condition of products selling in the markets, was conducted by comparison of applied methods in veterinary and sanitary researches and their results.

Research results

There are three major markets in the city. They are Osh, Alamedin and Orto-Sai.

Osh market sells products from Sokuluk district, Alamedin market - from Alamedin district, Ysyk-Ata, Sokuluk and Moskovsky districts, Orto-Sai market - mainly from Moskovsky, Alamedin, and based on agreement, from other districts.

Each market has its own laboratory with high skills professionals.

The VSE laboratory in **Osh market** has undergone significant changes in recent years to improve laboratory conditions, researches and technical equipment. They renovated the premises, purchased new equipment, and improved procedures for appropriate

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researches. In this regard, the preparations are under way for accreditation.

Currently, there are now veterinary and sanitary researches on food safety of meat, fish, fish products, milk and dairy products, eggs, as well as products of plant origin in this laboratory. Organoleptic, bacteriological, serological, oviscopic and biochemical tests are used.

The equipment and methods of conducted researches in this laboratory have being improved. Previously, the markets used areometer to determine milk density; acidity was determined by the Turner degree method, fat content by butyrometer, etc. At present, they use lacto scope "Lactan" (Fig. 1), which immediately determines eight parameters. There is also a device to determine antibiotics (Fig. 2), which provides accurate indicators as well as trichinelloscope (Fig. 3) and nitrate tester (Fig. 4).



Fig.1. The Lactoscope "Lactan"



Fig. 2. Device to determine antibiotics



Fig. 3. The Trichinelloscope



Fig. 4. The Nitrate tester

They examine milk for brucellosis, mastitis, bacterial count, fatness, density, acidity. It is mandatory to examine milk for brucellosis, because our republic is brucellosis insecure and people can be infected through milk. We present the results of milk examination in Table 1.

Table 1: Results on veterinary and sanitary examination of milk 2015 -2019.

Indicator	2015	2016	2017	2018	TOTAL:
Conducted examinations	12031	14330	15739	16302	58402
Conducted laboratory researches	22680	30154	33234	38870	124938

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Brucellosis	11	19	11	34	75
Nonconformity to sanitary requirements	106	121	55	34	316
Other nonconformities	88	102	55	34	279
Removed from sale (kg)	118 (0,98%)	245 (1,71%)	55 (0,35%)	212 (1,30%)	630 (1,08%)
Recycled	118	245	55	212	630

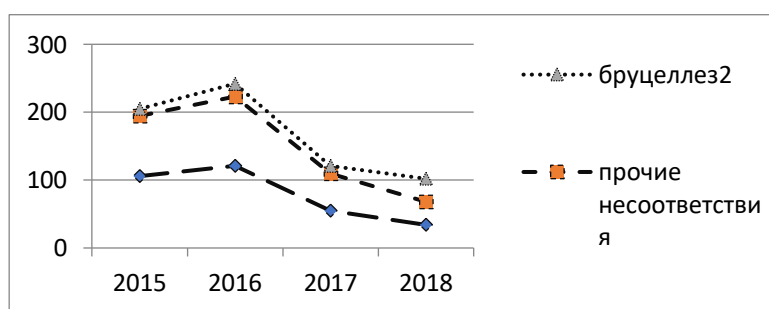
According to data of Table 1, the number of conducted milk examinations has increased in the period of 2015 - 2018.

Sanitary indicators of products selling in the market, according to the report have been improving for these 4 years. This is explained, firstly, by the fact that the results of examinations are sent to the relevant veterinary authorities, which take measures to eliminate these shortcomings, and secondly, by the fact that this milk is recycled, and the farms suffer economic losses and are forced to improve sanitary conditions in producing dairy products.

As can be seen from the table, they register every year the milk that gives a positive reaction to brucellosis and the number of detected positive samples is unstable.

In general, the indicators of milk removed from sale are also unstable, as the reasons for recycling are different.

The above table shows that milk in this market is disposed of due to positive reaction to brucellosis, non-conformity to sanitary requirements and other non-conformity to VSE requirements. These three indicators are in the graph (Fig.5).



. Fig. 5. Graph of milk examination results for brucellosis, detection of nonconformity to Sanitary requirements and other discrepancies in the laboratory of Osh market

According to the graph, all these three indicators are quite synchronous, only the figures of other inconsistencies are slightly decreasing in recent years, unlike the other two.

Two indicators, which characterize the proportion between the number of milk examinations and the number of removed from sale, are presented in the graph (fig. 6).

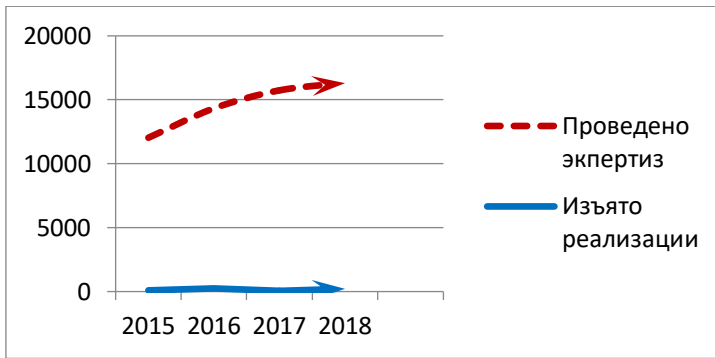


Fig. 6. Graph of milk examination results on the conducted examinations and removed from sale by the laboratory in Osh market.

In this graph we see that the number of examinations is increasing and the amount of milk removed from sales is approximately at the same level.

They examine meat by examining internal organs for changes typical for different infectious and invasive animal diseases. Particular attention is paid to the examination for anthrax, brucellosis, septic diseases. The heart, esophagus, diaphragm and chewing muscles are examined for measles. A new model of trichinelloscope to detect trichinosis is used in examination of pork and horsemeat. There were positive cases of echinococcosis detected. In all cases of positive results for infectious and invasive diseases act according to the instructions.

Honey examination is also conducted in market laboratories of Bishkek. In this case, they determine diastasis number, i.e., the saturation of honey with enzymes; there is a strict control to detect various falsification of honey, in particular, cane or beet sugar. They identify a residual amounts of antibiotics, pesticides, heavy metals, which can get into honey for various reasons, including the treatment of sick bees, although mainly apiary owners take into account all these

factors and try to provide high quality product.

Recently, fish meat and fish products are in great demand among the population, but unfortunately, among fish there are diseases of helminthic, bacterial and non-contagious etiology, which reduce the quality of products. They use organoleptic tests in examination of fish, in suspicious cases additional tests are conducted.

A new model of nitrate tester is used to determine nitrates in fruits and vegetables.

The activity of **Alamedin and Orto-Sai** markets is similar to Osh market. The laboratories of these markets also have modern equipment, but in Alamedin market the laboratory is just partially provided with new equipment, although it was repaired. As a result, employees have to use old methods, which take more time. Orto-Sai market has the same problems, but the conditions are even worse than in Alamedin market - the premises are small and require major repairs.

Below we present the results of laboratory researches of milk for one and a half years 2019-2020 in Alamedin market (Table 2)

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Table 2: Results of veterinary and sanitary examination of milk and dairy products in Alamedin market for one and a half years 2019-2020

Year	Examinations conducted						Recycled milk due to non-compliance with VSE requirements, l
	Milk		Acidity, density, fat, purity		Brucellosis		
	total	laboratory researches	milk	dairy products	milk	sour cream	
2019	2559	8481	3312	2025	814	282	520
2020 (6 months)	8426	16670	8244	7052	1374	-	257

This table shows that non-compliance with sanitary standards in this market is detected more often than in Osh market.

Below are given results of veterinary and sanitary examination of milk in Orto-Sai market for 2020, for half year see Table 3.

Table 3: Results of veterinary and sanitary examination of milk, Orto-Sai market in the 1st half of 2020.

Year	Examinations conducted						Recycled milk due to non-compliance with VSE requirements, l
	Milk		Acidity, density, fat, purity		Brucellosis		
	total	laboratory researches	milk	dairy products	milk	sour cream	
2020 (6 months)	3633	10534	2976	2939	744	-	251

The tables above show that the number of examinations is increasing in all markets.

Discussion

For food safety, the veterinary service provides for strict control of foodstuffs in laboratories of Bishkek markets in order to sell only quality products to the population.

We decided to conduct a study to determine whether the activities of these laboratories

meet the VSE requirements to such laboratories. For this purpose, we studied their methodological approaches, technical equipment and examination results.

Methodical expediency of examinations conducted in laboratories was compliant with the requirements of VCE and epizootic situation in the region.

In general, material and technical support of Osh laboratory is on adequate level - for the last three years this laboratory has undergone significant changes – it has been repaired, working conditions have been improved, it has been provided with modern equipment, devices, and necessary chemical reagents. Reorganization of operational procedures of the laboratory was carried out according to new requirements and preparation for accreditation is underway. All this affects the quality and quantity of conducted examinations.

Other markets also have basic sets of instruments and reagents for laboratory examinations. However, work needs to be done to improve their conditions.

Equipment, dishes and reagents used for veterinary and sanitary examination of milk, honey and plant products are available in all markets.

The work in laboratories is carried out at proper level, and employees professionally and qualitatively cope with their duties.

Foodstuffs with poor sanitation and infectious and invasive diseases positive are identified in these markets.

Conclusion

Researches in the markets are conducted in accordance with the rules of veterinary and sanitary examination and epizootic condition of the region.

Laboratories are provided with qualified professionals.

Technical equipment in Osh market is at proper level, Alamedin and Orto-Sai markets require improvement.

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**COMMERCIALLY VALUABLE FISHES OF KYRGYZSTAN AND THEIR
INTRODUCTION**

Abstract. *The state of ichthyofauna in water bodies of Kyrgyzstan and fishing in them. Reasons for changes in number and proportion of fish species, reasons for deterioration of fishing capacities opportunities, changes, reduction in fishing. All this is due to social and environmental conditions, as well as because of human interference in the natural current ichthyocenosis of water bodies. The processes of fish introduction into natural and artificial reservoirs of Kyrgyzstan, i.e., stocking their ponds with various fish species from other reservoirs.*

Key words: *water reservoirs of Kyrgyzstan, fish, fishing, introduction*

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**ПРОМЫСЛОВЫЕ РЫБЫ КЫРГЫЗСТАНА
И ПРОЦЕССЫ ИХ ИНТРОДУКЦИИ**

Аннотация. *Состояние ихтиофауны водоемов Кыргызстана, рыбного промысла в них. Причины изменения количества, соотношения видов рыб, причин ухудшения состояния их промысловых возможностей, изменения, ухудшения рыбного промысла. Это все находится в связи с социальными, экологическими условиями, а также следствием вмешательства человека в естественный, сложившийся в природе, ихтиоценоз водоёмов. Процессы интродукции рыб в естественные и искусственные водоемы Кыргызстана, то есть заселение своих водоемов рыбой других видов, из других водоемов.*

Ключевые слова: *водоемы Кыргызстана, рыба, рыбный промысел, интродукция*

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**КЫРГЫЗСТАНДЫН БААЛУУ БАЛЫКТАРЫ ЖАНА АЛАРДЫ
ИНТРОДУКЦИЯЛОО ПРОЦЕССТЕРИ**

Аннотация. *Кыргызстандын суу объектериндеги ихтиофаунанын баалуу балыктары абалы. Балыктардын түрлөрүнүн катышынын санынын өзгөрүшүнүн себептери, алардын баалуулук мүмкүнчүлүктөрүнүн абалынын начарлашынын жана өзгөрүшүнүн себептери. Мунун баары социалдык, экологиялык шарттарга, ошондой эле жаратылышта табигый калыптанган суу объектилеринин ихтиоценозуна адамдын кийлигишүүсүнүн таасирлерине байланыштуу. Кыргызстандын табигый жана жасалма суу объектилерине балыктарды интродукциялоо процесстери, тактап айтканда, өзүбүздүн суу объектилерине башка түрдөгү балыктарды башка суу объектилеринен алып келип өстүрүү.*

Өзөктүү сөздөр: Кыргызстандын суу объектилери, балык, баалуу балыктардын, интродукция

Introduction

Fish is the most important source of food for all people. People have settled near water bodies - rivers, lakes, seas. The aquatic environment is always inhabited by fishes.

In Kyrgyzstan, there are lakes, rivers, ponds and fishes inhabiting them. In the customs of Kyrgyz people, fish did not belong to the food in demand; meat was more valuable; however, modern people have begun to eat fish, and nowadays it is becoming popular.

We have a mountainous lake Issyk-Kul, the largest lake in the country. In addition, there are such mountainous lakes as Son-Kul, Chatyr-Kul, Sary-Chelek and others. Our rivers are mostly mountainous with sources located highly in the mountains. There are also water reservoirs, inhabited by fishes. However, species composition, number of fishes in water bodies, fishing, processes of introduction change constantly depending on the ecological state, human intervention in the natural processes of fish life cycle in water bodies.

Uncontrolled commercial fishing has led to decrease in number of fishes, especially those species that are in demand. In addition, based on scientific researches, scientists started to think about improving the species composition of fishes in lakes, and they introduced various fish species from other places of origin. As a result, fish brought from other regions were introduced into water bodies where a certain biocoenosis had already formed, and this led to unexpected consequences. In addition, the fish itself adapted to new conditions, changing its morphometric and physiological features. An example of such change due to human interference in the natural environment of lakes is a dramatic reduction in Issyk-Kul dace/chebachok (*Leuciscus sehmidtii* Her) in

Lake Issyk-Kul [6]. Two factors played a role here - the introduction of predatory fish - pike-perch (*Sander lucioperca*) in the lake, and the second factor is illegal fishery of it.

The study of fishing activities of people in natural water bodies and issues of fish introduction are of both scientific and social importance.

Researchers study the issues on maximum commercial fish production and control over conservation and improvement of natural resources [10]; maximum commercial fish production, issues on conservation of species diversity [3, 13].

Many researches are focused on introduction and study of fish-biological and morphometric features of fish grown in lakes and ponds [5, 14, 15, 17].

While studying these issues, they concluded that the current state of the Pike-perch (*Sander lucioperca*) population is normal, but in case of catch increase (TAC), it is necessary to improve habitat conditions [18]. Note: TAC is a scientifically substantiated value of annual production (catch) of aquatic bioresources (ABR) of particular species in certain areas, established taking into account the peculiarities of this species.

Thus, from literature data it can be seen that human economic activity has a great influence on fish populations in water bodies, which can lead to changes in their number, disappearance of some fish species, changes in biological and morphometric features of fishes, so it is necessary to keep under control the state of water resources and their inhabitants.

Materials and methods

The object of the research is water resources of the Kyrgyz Republic.

To study the availability of water bodies, fishery activities in them, state of fish farms,

we used the information of state authorities, data in press publications, scientific literature, information of local residents and our own observations in the areas of water bodies and carried out comparison and analysis of the received data. Reference material was used to determine fish species caught by local residents.

We considered these issues by studying the materials starting from the 30s of the last century.

Results and discussion

Lakes: Kyrgyzstan is a mountainous country and, as some authors and people note, a country of clean water. There are many lakes here and they are mostly mountainous. First of all, these are Lake Issyk-Kul (height is 1600m above sea level), Lake Son-Kul (3016 m), Chatyr-Kul (3520 m), Sary-Chelek (1878 m), Kara-Suu (2022 m), Kulun (2856 m) and others.

Lake Issyk-Kul is the second largest brackish lake in the world after the Caspian Sea. This lake, despite the fact that it is located high in the mountains, is not frozen.

In Issyk-Kul, there are 22 fish species, 10 of which were imported, and 12 are indigenous. According to [1, 6, 7, 10], Amurdarya trout (*Salmo trutta*), Schmidt dace /chebak (*Leuciscus sehmidtii* Her), Issyk-Kul dace /chebachok (*Leuciscus bergi* Kaschkarov), Turkestan gudgeon (*Gobio gobio lepidolaemus* Kessler), Issyk-Kul marinka (*Schizothorax pseudaksaensis issikyli* Berg), scaled osman (*Diptychus maculatus* Berg), Severtsov osman (*Diptychus sewerzowi* Kessler) and naked Osman (*Diptychus dybowskii* Kessler), common carp (*Cyprinus carpio*), stone loach (*Nemachilus stoliczkai elegans* (Kessl)) and gray loach (*Nemachilus dorzalis*(Kessl)), inhabited this lake. According to [8], currently there are only 30 species, of which 13 are well established.

Since the 30s of the last century, they stocked the Issyk-Kul and other lakes by various fish species to improve the species composition of lakes, that is, there were processes of introduction. As noted by [7] in Lake Issyk-Kul, imported or established fish include Sevan trout (*Salmo issiko-gegarkuni Lushin*), rainbow trout (*Salmo gairdneri* Rich) common whitefish (*Coregonus lavaretus ludoga*), Baikal omul (*Coregonus autumnalis migratorius Georgi*), topmouth gudgeon (*Pseudorasbora parva*), tench (*Tinca tinca*), oriental bream (*Abramis brama orientalis Berg*), goldfish (*Garassius auratus gi gibelio* (Bloch)) and pike perch (*Sander lucioperca*). According to [8], in addition to those listed, there are peled (*Coregonus peled*), striped bystryanka (*Alburnoides taeniatus Kessler*), spotted thick-lip loach (*Triplophysa strauchii*).

In the result of introduction and social changes (disintegration of the USSR and gaining the independence by the republic), there were great changes in fish farming.

Due to introduction of pike-perch (*Sander lucioperca*) into Lake Issyk-Kul, the number of dace (*Rutilus rutilus lacustris*), though not commercial, but popular among the population, decreased. [8] gives the following figures: in the 50-60s of the last century the catch of dace (*Rutilus rutilus lacustris*) was 9391 centners, and in the 80-ies - 1500 centners per year. But even by the prices and quantity of the sold dace it can be seen that its number has dramatically decreased - the price increased to the level of such valuable fish as salmon. The population believes that the cultivation of pikeperch has led to decrease in dace number [14]. Kustareva L. has the same opinion.

According to our observation and population survey, the main commercial fish in lake Issyk-Kul are trout (Fig.1), whitefish (Fig.2), pikeperch (Fig.3) and roach (Fig.5), bream (Fig.4), Schmidt dace/ chebak (Fig.6), Issyk-

Kul dace/ chebachok, common carp, minnow, osman, marinka in small amounts.



Fig. 1. Sevan trout (*Salmo issykogegarkuni*) Captured in the Lake Issyk-Kul, 2020.



Fig. 2. Common whitefish (*Coregonus lushini lavaretus ludoga*).



Fig. 3. Pikeperch (*Sander lucioperca*). Captured in the Lake Issyk-Kul 2020.



Fig. 4. Bream (*Abramis brama*). Captured in the Lake Issyk-Kul 2020.



Fig. 5. Roach (*Rutilus rutilus*). Captured in the lake Issyk-Kul, 2020.



Fig. 6. Schmidt dace/chebak (*Leuciscus bergi Kaschkarov*). Captured in the lake Issyk-Kul, 2020.

Son-Kul Lake is a mountainous lake freezing for a long period. It is covered with ice almost all year round, only for 3-4 months the ice melts in it. This location did not create conditions for fish habitat, so it was considered as fish-free lake, but in recent years, more than 7 species of fish were introduced there. Of these, peled (*Coregonus peled*), whitefish (*Coregonus lushini lavaretus ludoga*), naked Osman (*Diptychus dybowskii Kessler*) were successfully adapted and now they are object of commercial fishery [2].

But during the collapse of the USSR the regulatory authorities had no capacity to control the fishery and due to this fact there appeared many poachers, which aggressively caught fish with nets, and this led to declining number of fish in the lake. At present, there is a moratorium on Son-Kul Lake [1]. Lake Sary-Chelek is a freshwater lake. It itself is a natural reserve and is located on the territory of the State Biosphere Reserve of universal importance. This lake is home for

marinka (*Schizothorax*), common carp (*Cyprinus carpio*) and other fishes.

There are also a number of small mountain lakes, and according to local residents, they are abounded by fishes, as access to them is difficult.

Rivers: there are over 40000 rivers and streams in the Kyrgyz republic.

The largest river in the republic is Naryn, which is 802 km long. This river is located in the surroundings of Naryn city, the average altitude is about 2500 m above sea level.

The main interest among commercial fish of this river is trout (*Salmonidae*) of three species, Osman (*Diptychus*) of four species and marinka (*Schizothorax*) of four species.

The Chu River is the second largest and most important river in the country. It originates in the Teskei Ala-Too Mountains, flows through the Boom Gorge, and then through the Chu Valley and ends with a “blind end”. Its length is 1156 km [7].

In Chu river there are such fish as Amudarya trout (*Salmo trutta oxianus*), less often Sevan trout (*Salmo issiko-gegarkuni Lushin*), which comes here from the Orthotokoi reservoir, in addition to silver carp (*Hypophthalmichthys*), Issyk-Kul and naked Osman (*Diptychus dybowskii Kessler*), catfish (*Silurus glanis*). The Chu River is considered the richest in number and species diversity of fishes in the country. There are more than 34 fish species there, 17 of them have been introduced [7, 8]. The Kokomeren River is formed due to merge of the rivers Susamyr and West Karakol, it stretches for 200 km in the gorges of the Inner Tien Shan and flows into Naryn river. It is very attractive for fishermen. Firstly, because it flows in a very picturesque place, and secondly, it is full of fishes. There are Amudarya trout (*Salmo trutta oxianus*), common marinka (*Schizothorax*), snakeheads, Osman (*Diptychus*), and according to fishermen its weight can be up to 3 kg. Locals and fishing enthusiasts note

that in spring and autumn, there are a lot of fish due to large number of live food in the river during this time of year.

In general, there are many rivers and rivulets in Kyrgyzstan, and they mainly relate to mountain streams because their sources are in the mountains and, therefore, water in them is pure. Alpine rivers contain fish, which belong to natural ichthyofauna, as fishing in high mountains is difficult.

Water reservoirs: Water bodies, as habitats for fishes and fishing, include reservoirs, the creation of which is associated with the construction of hydropower plants. There are 34 such water reservoirs in Kyrgyzstan now. Basically, they are built in the channels of large rivers and they are damming and pumped.

The main water reservoirs of fishery significance are Toktogul, Kurpsay, Tashkumyr, Shamaldysay (Naryn River cascade), Orthotokoiskoe (Chu River), Kirovskoye (Talas River), Papanskoye (Ak-Buura River) [8].

In Soviet times, Toktogul and Orthotokoy reservoirs were among the fishery reservoirs of state importance in relation to fishing. Fishes to these reservoirs came from the rivers on which they were built, but at the same time, work was carried out to improve species composition in them, so there were introductions of valuable, commercially viable fishes. Therefore, the species and quantitative composition of ichthyofauna of the reservoirs was changing all the time.

Toktogul Reservoir (284 km²) is a large fishery reservoir. Its ichthyofauna was formed from those fishes that inhabited in the flooded area. They are marinka (*Schizothorax*), Tibetan stone loach (*Nemacheilus stoliczkai*), Kushakevich loach (*Nemachilus kuschakewitschi Hers*), Turkestan catfish (*Glyptosternon reticulatum*) [6, 8]. Later there were introductions of such fishes as Syrdarya dace

(*Leuciscus squalisculus*), pike asp (*Aspiolucius esocinus*), Severtsov' Osman (*Diptychus sewerzowi* Kessler).

At present, due to poaching activity there is now less fishes and commercial fishes in this water reservoir are common carp (*Cyprinus carpio*), pikeperch (*Sander lucioperca*), rainbow trout (*Oncorhynchus mykiss*). In addition, there are goldfish (*Carassius*), silver carp (*Hypophthalmichthys*), marinka (*Schizothorax*), grass carp (*Ctenopharyngodon idella*), and they even say there are shrimps. In 1982, it was stocked by sturgeon, but it is still very few and has no fishing value.

Orthotokoy reservoir (2320 ha) is located on the border of Naryn and Issyk-Kul regions. Original ichthyofauna is marinka (*Schizothorax*), stone loach (*Nemachilus stoliczkai elegans* (Kessl)), minnow and river-fish naked Osman (*Gymnodiptychus dybowskii*). They are of little commercial value, but may serve as a food source for bigger fishes. Specialists believe that this water reservoir can be stocked by trout (*Salmonidae*) and whitefish (*Coregonus lavaretus*) as there are suitable conditions for them. Previously, the reservoir was stocked by brood fish and fingerlings of naked Osman (*Diptychus dybowskii* Kessler), common carp (*Cyprinus carpio*) and Sevan trout (*Salmo issiko-gegarkuni Lushin*), which were commercial fishes. But during the collapse of the USSR, the control and maintenance over the reservoir decreased, while poaching catches increased, and now, according to fishermen, there are very few fishes. Local residents are doing their best to improve habitat conditions of fishes in this water reservoir and increase their stock. At the national level the activity is also under way to improve the species and quantity of fish fauna in this water reservoir. In 2019, the water reservoir was stocked by more than 800

thousand fingerlings of common whitefish (*Coregonus lavaretus*).

Such water reservoirs as Kirovskoe and Nizhne-Alarchinskoe are also important for commercial fisheries.

Objects of fishery are artificial ponds, the network of which is increasing, as fish farming in Kyrgyz republic is under the process of development. They are objects of commercial production, area for rest and fishing by population. The most popular fish species here are such as rainbow trout (*Oncorhynchus mykiss*), common carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idella*), less often sturgeon (*Acipenser*), catfish (*Silurus glanis*), silver carp (*Hypophthalmichthys*), goldfish (*Carassius*), sazan (*Cyprinus carpio*).

Introduction processes

Introduction processes in fishery management are inevitable, as people always strive to improve and increase fish production.

In Kyrgyz republic the processes of introduction were carried out everywhere - many lakes, rivers and reservoirs were stocked by valuable fish species. But there were almost no scientific researches in this area in Kyrgyz republic.

Conclusions

1. Water bodies of Kyrgyzstan are represented by natural resources (lakes, rivers). They are characterized by clear water from mountain glaciers with low temperatures. Water reservoirs and ponds are artificial.

2. The main commercial fishes, both in natural and artificial reservoirs are common whitefish (*Coregonus lavaretus*), trout (*Salmonidae*) (3 species), peled (*Coregonus peled*), pike-perch (*Sander lucioperca*), carp (*Cyprinus carpio*), roach (*Rutilus rutilus*), Baikal omul (*Coregonus autumnalis migratorius Georgi*), grass carp (*Ctenopharyngodon idella*), tench (*Tinca*

tinca), bream (*Abramis brama*), silver carp (*Hypophthalmichthys*) and common carp (*Cyprinus carpio*).

3. The main species in the ponds with artificial breeding are rainbow trout (*Oncorhynchus mykiss*), silver carp (*Hypophthalmichthys*), grass carp (*Ctenopharyngodon idella*), goldfish (*Carassius*), less often catfish (*Silurus glanis*), sturgeon (*Acipenser*).

4. Fish species, which were introduced from other regions, include Sevan trout, rainbow trout (*Oncorhynchus mykiss*), whitefish (*Coregonus lavaretus*), Baikal omul (*Coregonus autumnalis migratorius Georgi*), topmouth gudgeon (*Pseudorasbora parva*), tench (*Tinca tinca*), oriental bream (*Abramis brama*), goldfish (*Carassius*) and pike-perch (*Sander lucioperca*).

5. The conditions of reservoirs in Kyrgyz republic are favorable for salmon fish and it is demonstrated by their biological characteristics and fertility.

6. In some cases, the introduction of fish into natural reservoirs with its ichthyocenosis gave unpredictable and sometimes unintended consequences (a rapid decrease in Issyk-Kul dace (*Leuciscus bergi* in *Issyk-Kaschkarov*) because of breeding there pikeperch (*Sander lucioperca*), which was not present in natural conditions.

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**MORPHOLOGICAL CHARACTERISTICS OF THE ANIMALS' MUSCLE TISSUE
 STORING IN REFRIGERATION EQUIPMENT**

Abstract. Among food products, meat and meat products occupy an important place, since they are the main sources of complete proteins. Muscle tissue is the most important of the histological tissues that form meat as a food product. The types and sizes of muscle fibers are important factors affecting muscle growth potential and meat quality. Their variability depends on several factors, such as muscle type, breed of animals, physical activity, and they can undergo morphological or metabolic changes throughout the life of animals and after slaughter. The article presents a study of the striated muscle tissue of the bull's hind leg within 2 hours 30 minutes after slaughter and after 10 days of storage in a refrigerator at a temperature of + 1С⁰. Studies have shown morphological changes in muscle fibers (a weak swelling of the fibers with the preservation of cross striation) in the early periods after slaughter (2 hours 30 minutes) and 10 days after storage in the refrigerator. Prolonged exposure to low temperature (storage in the refrigerator for 10 days) led to a compact arrangement of muscle fibers, their thickening, diffuse staining of the sarcoplasm, the disappearance of cross striation and nuclei, which is explained by the process of autolysis.

Keywords: muscle tissue, autolysis, refrigeration, sarcoplasm.

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**МОРФОЛОГИЧЕСКАЯ ХАРАКТЕРИСТИКА МЫШЕЧНОЙ ТКАНИ
 ЖИВОТНЫХ ПРИ ХРАНЕНИИ В ХОЛОДИЛЬНЫХ УСТАНОВКАХ**

Аннотация. Среди продуктов питания мясо и мясопродукты занимают важное место, так как они являются основными источниками полноценных белков. Мышечная ткань - важнейшая из гистологических тканей, образующих мясо как пищевой продукт. Типы и размеры мышечных волокон являются важными факторами, влияющими на потенциал роста мышц и качество мяса. Их изменчивость зависит от некоторых факторов, таких как тип мышц, порода животных, физическая активность, и они могут претерпевать морфологические или метаболические изменения на протяжении всей жизни животных и после убоя. В статье представлено исследование поперечнополосатой мышечной ткани задней ноги бычка в сроки 2 часа 30 минут после забоя и через 10 суток хранения в холодильнике при температуре +1С⁰. Исследования показали морфологические изменения в мышечных волокнах (установлено слабое набухание волокон при сохранности поперечной исчерченности) в ранние сроки после забоя (2 часа 30 минут) и через 10 дней после хранения в холодильнике. Длительное действие низкой температуры (хранение в холодильнике в течение 10 суток) привело к компактному расположению мышечных волокон, их утолщению,

диффузному окрашиванию саркоплазмы, исчезновению поперечной исчерченности и ядер, что объясняется процессом аутолиза.

Ключевые слова: мышечная ткань, аутолиз, замораживание, саркоплазма.

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МУЗДАТКЫЧТАРДА САКТООДО МАЛДЫН БУЛЧУҢ ТКАНДАРЫНА МОРФОЛОГИЯЛЫК МҮНӨЗДӨМӨ

Аннотация. Тамак азыктарынын ичинде эт жана эт азыктары маанилүү орунду ээлейт, анткени алар толук баалуу белоктордун негизги булактары болуп эсептелет. Булчуң тканы – гистологиялык ткандардын эң маанилүүсү, ал этти тамак-аш азыгы кылат. Булчуң булаларынын типтери жана өлчөмдөгү булчуңдарынын өсүш потенциалына жана эттин сапатына таасир этүүчү маанилүү факторлордон болушат. Алардын өзгөрмөлүүлүгү айрым факторлорго жараша болот, алсак булчуңдун тиби, малдын тукуму, физикалык активдүүлүк. Алар өмүр бою, союлгандан кийин да морфологиялык жана метаболикалык өзгөрүүлөргө дуушар болушат. Изилдөөдө союлгандан 2 жарым саат өткөндөн кийин жана +1°C температурада муздаткычта сактагандан кийин букачардын арткы буттарынын туурасынан ткандары көрсөтүлгөн. Изилдөөлөрдөн булчуң булаларынын морфологиялык өзгөрүүлөрүн байкадык. Төмөнкү температурада узак сактоо булчуң булаларынын компакттуу жайгашуусуна, алардын жооноюсуна, саркоплазманын диффуздук боюлушуна ж.б. алып келди.

Өзөктүү сөздөр: булчуң тканы, аутолиз, тоңдундуруу, саркоплазма.

Introduction Livestock is a structure-forming and most socially significant branch of agriculture in Kazakhstan, which is engaged in breeding farm animals and poultry. Among food products, meat and meat products occupy an important place, since they are the main sources of complete proteins. Muscle tissue is the most important of the histological tissues that form meat as a food product. It forms the basis of the animal's body weight. Without muscle tissue, the idea of meat is unthinkable. The chemical components of this particular part of the meat give it a specific taste, smell and color [1].

It is well known that skeletal muscle tissue is composed of three types of muscle fibers. The variety of fiber types is based on differences in contractile, metabolic, morphological and physiological characteristics [2].

Throughout an animal's life, exercise, diet, temperature, weight, age, and growth promoting

agents affect the physiological balance of muscle tissue and then fiber characteristics [3]. Long-term preservation of the quality of food is the main problem not only for agricultural producers, but also a strategic task for any state. Meat is a valuable food product, the main source of protein, without which the growth and development of cells, tissues, organs and their vital activity are impossible. It contains a variety of minerals, vitamins, which are also necessary for the normal functioning of the human body. Therefore, attention to this product is not waning. One hundred grams of boiled meat, included in the daily human diet, gives about 200 kilocalories. This is half the amount of protein the body needs. Nutrients in meat are concentrated in muscle and adipose tissue, very little in connective tissue. Therefore, the less connective tissue in meat, the higher its nutritional value. Meat is an extremely favorable breeding ground for microbes and therefore

quickly deteriorates. To preserve the meat for future use, it is salted, smoked or frozen. Basically, meat products are preserved by freezing. But all the same, early postmortem changes occur in organs and tissues after slaughter [4, 9,10].

The main reason for this process is autolysis - digestion, dissolution of cells under the influence of enzymes without the participation of microorganisms. In each organ, parenchymal elements are first affected, later fibrous structures [5, 6, 7].

Autolysis of intact skeletal muscle tissue has been studied in sufficient detail and its various aspects are presented in a number of reviews and monographs [8].

But in the literature there is not enough data on histological changes in muscle tissue when they are fixed by freezing.

Research objectives and results obtained

Study the structural changes in muscle tissue during the freezing process. The object of the study was the striated muscle tissue of the outer surface of the hind leg (thigh) of the goby within 2 hours and 30 minutes after slaughter and after 10 days of storage in a refrigerator at a

temperature of + 1C⁰. The muscle tissue was fixed in a 10% solution of neutral formalin. After histological tracing, paraffin sections with a thickness of 7-8 μm were stained with hematoxylin-eosin and azure 2 eosin. Statistical processing of the data obtained was carried out according to G.G. Avtandilov [6,7], using the arithmetic mean, mean error, Student's t test. Differences between the mean values P <0.05 were considered significant.

Research findings We examined individual fibers and their bundles, cut longitudinally and transversely, taken from animals - three bulls of 15 months of age. The preparations show interlayers of loose fibrous connective tissue with its cellular elements, fibers and vessels - endomysium and perimysium. On the longitudinal sections of the muscle fibers during this period, the sarcolemma, the nuclei under it, the longitudinally extending myofibrils and in some places the transverse striation on the lateral sections of the fibers are clearly visible. The bundles include from 3-4 to 10-15 or more muscle fibers, more often with a crimped course and a thickness of 35 ± 3 μm (Figure 1).

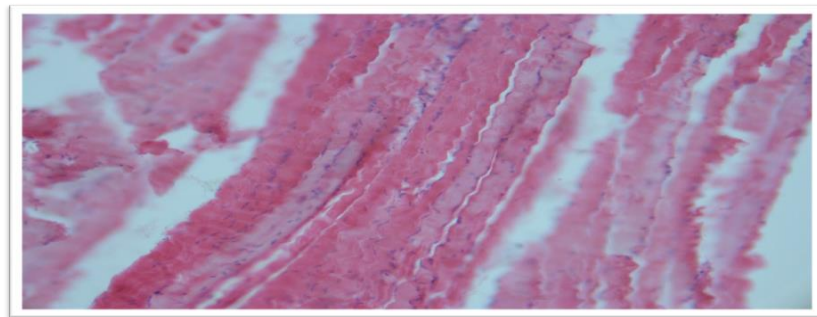


Figure 1. A convoluted course of muscle fibers. Longitudinal section of muscle fibers within 2 hours 30 minutes after slaughter. Hematoxylin-eosin staining. Magnification 200x.

On the transverse sections of muscle fibers, their rounded oval shape, sarcolemma, nuclei located on the periphery, and very thin myofibrils are clearly visible, are clearly visible (Figure 2). Consequently, the morphological structure of the striated muscle fibers of fresh beef fixed in formalin and subjected to histological processing is close to the natural stepwise change in the structure of muscles after the death of the animal in the first hours.

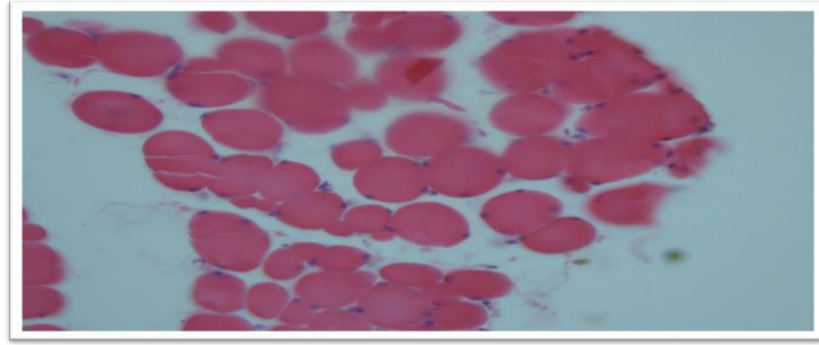


Figure 2. Cross section of muscle fibers within 2 hours 30 minutes after slaughter. Myofibrils are indistinguishable. Hematoxylin-eosin staining. Magnification 400x.

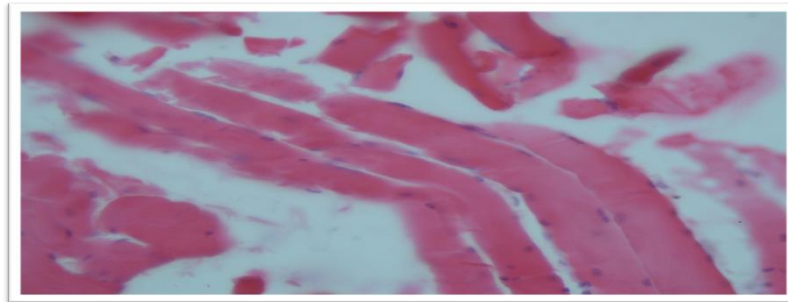


Figure 3. Longitudinal section of muscle fibers within 10 days after storage in the refrigerator. Smoothed rectilinear course of muscle fibers. Hematoxylin-eosin staining. Magnification 400x.

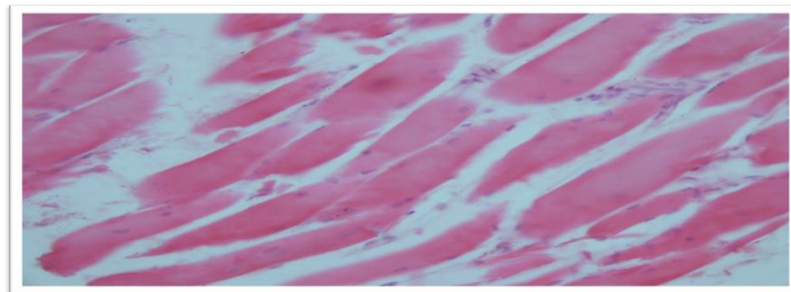


Figure 4. Longitudinal section of muscle fibers within 10 days after storage in the refrigerator. Homogeneous sarcoplasm with a lighter central part. Hematoxylin-eosin staining. Magnification 400x.

Within 10 days after storage in the refrigerator, muscle fibers and their longitudinal bundles have a smoother rectilinear course (Figure 3). The thickness of the fibers is reliably increased, amounting to 45 ± 4 microns, which is probably due to the gradual action of cold and their compression. The sarcolemma of the fibers is very weakly visible, in places it does not

differentiate at all, the nuclei are rare, more often they are completely absent, although they are very clearly visible in the endomysium and connective tissue layers (Figure 4).

The transverse striation in the fibers is not revealed at all. The sarcoplasm is gamogenic and is lighter in the central part than along the periphery of the fiber (Figure 5). Such

"enlightenment", a weak diffuse staining of the sarcoplasm and the disappearance of nuclei, is primarily associated with the influence of physical and biogenic factors (slaughter, the effect of low temperature). All this leads to a gradual disruption of morphological structures, cessation of ATP synthesis, activation of proteolytic enzymes associated with the breakdown of lysosomes and the action of hydrolytic enzymes. On the cross sections of

muscle fibers, attention is drawn to their irregular, often angular, rounded - oval shape (Figure 6). The sarcoplasm is homogeneous and lighter in the central part, the nuclei are almost not detected. Individual fibers in bundles are located more compactly, closer to each other, which is probably due, first of all, to the effect of low temperature (Figure 7). No destructive changes in the structure of the fibers were found.

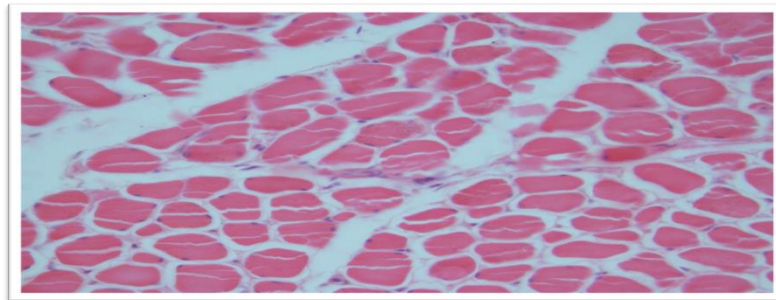


Рисунок 5. Longitudinal section of muscle fibers within 10 days after storage in the refrigerator. The fiber thickness is increased. The sarcolemma is not differentiated in places. Hematoxylin-eosin staining. Magnification 400x.

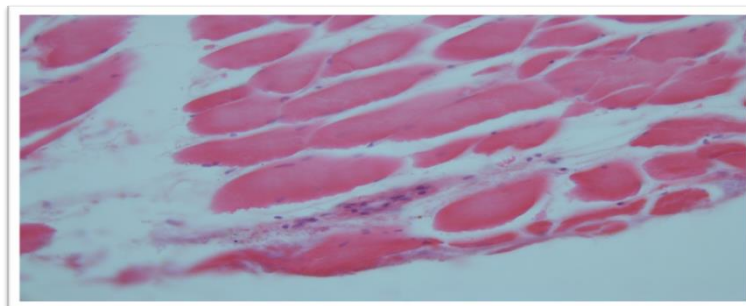


Рисунок 6. Cross section of muscle fibers within 10 days after refrigerated storage. Angular - oval shape of muscle fibers. Hematoxylin-eosin staining. Magnification 400x.

Thus, within 2 hours 30 minutes after slaughter, changes in muscle fibers during autolysis occur only from the side of organelles, which is expressed by weak swelling of the fibers while maintaining the transverse striation. Long-term action of low temperature (storage of meat in refrigerated chambers) leads, first of all, to morphological changes in the structure of skeletal muscle fibers - shape, compact

arrangement of fibers, which is consistent with the data of N.V. Mishchenko (2011), their thickening, diffuse staining of sarcoplasm, disappearance of transverse striation and nuclei. This is explained by N.V. Yamshchikova et al., (2011) by the autolysis process after thawing of muscle tissue. However, no obvious destructive changes in the fibers, their destruction and disintegration, disordered arrangement and

transformation into a shapeless mass, both in the longitudinal and in the cross section, were noted.

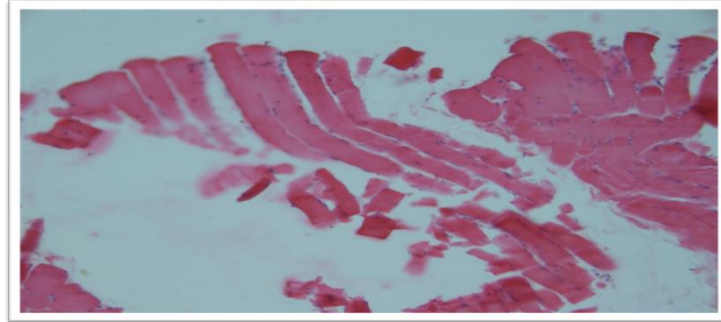


Рисунок 7. Longitudinal section of muscle fibers within 10 days after storage in the refrigerator. Compact arrangement of individual muscle fibers. Hematoxylin-eosin staining. Magnification 200x.

The main task of the meat industry is to provide the population with high quality chilled meat. However, due to the lack of development of the raw material base, the uneven production of meat throughout the year and the need to create reserves, a significant part of it has to be frozen and stored in low-temperature conditions. The activity of enzymes in the case of freezing and subsequent storage of meat slows down sharply, but does not stop even at very low temperatures. With the rapid freezing of steamed beef, a change in the course of autolytic processes is possible due to the development of the so-called "cold" muscle contracting, which leads to an increase in meat rigidity and a decrease in its functional and technological properties. The value of meat products in human nutrition is determined primarily by the fact that it is designed to provide the body with food products, which are the main source of human protein nutrition. Meat and meat products contain, in addition to proteins, other important constituents necessary for the normal functioning of the human body. Cold processing of meat and their storage at certain low temperatures is one of the most modern methods of preventing or slowing down the spoilage of these products. During refrigeration, the greatest

preservation of the original native properties of meat and offal is achieved. Cold storage ensures minimal changes in the nutritional value and flavor of the meat. The aim of the scientific work was to elucidate the structural changes in muscle tissue during the freezing process. Thus, within 2 hours 30 minutes after slaughter, changes in muscle fibers during autolysis occur only from the side of organelles, which is expressed by weak swelling of the fibers while maintaining the transverse striation.

The article presents a study of the striated muscle tissue of the bull's hind leg within 2 hours 30 minutes after slaughter and after 10 days of storage in a refrigerator at a temperature of + 1C⁰. Studies have shown morphological changes in muscle fibers (a weak swelling of the fibers with the preservation of cross striation) in the early periods after slaughter (2 hours 30 minutes) and 10 days after storage in the refrigerator. Prolonged exposure to low temperature (storage in the refrigerator for 10 days) led to a compact arrangement of muscle fibers, their thickening, diffuse staining of the sarcoplasm, the disappearance of cross striation and nuclei, which is explained by the process of autolysis.

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DISTRIBUTION OF IXODIC MITES IN THE CHUY VALLEY

Abstract. *The study of the distribution of ixodid ticks in the Chuy valley was carried out. The greatest distribution of ticks was found in the territories adjacent to Bishkek city and the Tokmak State Wildlife Refuge. The dominance of ticks in the territories adjacent to Bishkek city was determined: Ixodes persulcatus, Ixodes ricinu, Rhipicephalus bursa and Boophilus calcaratus. The dominance of ticks of the species Dermacentor marginatus was revealed on the territory of the Tokmak State Wildlife Refuge. A high percentage of damage among cattle (39%), small ruminants (34.8%) and dogs (20.3%).*

Keywords: *ticks, species, ixodids, argazids, gamazids, prevalence, extensiveness*

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РАСПРОСТРАНЕНИЕ ИКСОДОВЫХ КЛЕЩЕЙ В ЧУЙСКОЙ ДОЛИНЕ

Аннотация. *Проведено изучение распространения иксодовых клещей в Чуйской долине. Наибольшее распространение клещей обнаружено в прилегающих к г. Бишкек территориях и Токмакского государственного заказника. Определено доминирование в прилегающих к г. Бишкек территориях клещей вида: Ixodes persulcatus, Boophilus calcaratus и Ixodes ricinu, Rhipicephalus bursa и Boophilus calcaratus. На территории Токмакского государственного заказника выявлено доминирование клещей вида Dermacentor marginatus. Высокий процент поражения среди крупного рогатого скота (39%), мелкого рогатого скота (34,8%) и собак (20,3%).*

Ключевые слова: *клещи, виды, иксодовые, аргазиды, гамазиды, распространенность, экстенсивность.*

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ЧУЙ ӨРӨӨНҮНДӨ ИКСОДДУК КЕНЕЛЕРДИН ТАРАЛЫШЫ

Анотация. *Иксодит (жайыт) кенелери Чуй облусунунда таркалышы жана ошондой эле Бишкек шаарына жакын жайгаашкан жерлеринде, Токмоктогу мамлекеттик заказниктин чөйрөсүндө изилдөөнүн жүргүзүүнүн жыйынтыгы. Кенелердин жогорундагы түрлөрүн тастыктоодо: Ixodes persulcatus, Boophilus calcaratus, Ixodes ricinu, Rhipicephalus bursa, Boophilus calcaratus аныктанды. Токмоктогу мамлекеттик заказникте кенелердин арасынан көп кездешкени Dermacentor varginatus кенеел болуп чыкты. Арасынан бодо малда (39%), кой – эчкиде (34.8%), ал эми иттерде (20%) аныкталды.*

Өзөктүү сөздөр: кенелдө, түрлөрү, жайыт кенелер, кошар кенелери, гамазоид кенеси, таркалышы, экстенсивдүүлүк.

Introduction

The variety of ticks is very great, they have mastered all continents and climatic zones. Most parasitic ticks effectively transfer pathogens of infectious diseases in humans and animals. The spectrum of diseases carried depends on the locality and the type of tick.

Over the past decades, the range of ixodid ticks has changed and expanded. Most of them belong to the group with a pasture type of parasitism. These are representatives of the genera *Ixodes*, *Dermacentor*, *Haemaphysalis*, *Rhipicephalus*, and some *Hyalomma*. According to Bardzimashvili E.A. [1] The faunal complex of ixodid ticks in Kyrgyzstan is 42 taxa. New taxa for the fauna of the republic: *Anomalohymalaja cricetuli*, *D. ushakovae*, *R. sanguineus*. New species, almost all of which are rare and few in number, mono- and oligoxenic, with the exception of *D. ushakovae*, *R. turanicus*, which dominate the faunistic complexes of ixodids in the Issyk-Kul depression and Chuy valley. According to Fedorova S.Zh. [2] The biodiversity of ixodid ticks is currently 28 species, of which 15 are ectoparasites of domestic and farm animals. Over the past decades, the ixodid fauna of Kyrgyzstan has been replenished with new species representing an epidemiological danger.

In Kyrgyzstan, the causative agents of viral encephalitis, borreliosis, anaplasmosis, rickettsia and others have been identified in ticks *Ixodes persulcatus* from the middle mountains of the Kyrgyz ridge. The causative agent of borrelia was detected in 37.5%. A

high percentage of tick infestation is an indicator of the presence of a natural focus of tick-borne borreliosis near Bishkek city and its potential epidemiological danger. *Anaplasma* and *rickettsia* DNA were found in 2.8 and 0.7% of the examined ticks, respectively. 27.6% of ticks contained the DNA of two or more microorganisms, and five different variants of mixes were identified. *Borrelia-rickettsial* combinations were more common than others [2]. Thus, as a result of the bite of one tick, a person runs the risk of contracting a coinfection, in addition to tick-borne encephalitis, with several other infectious diseases.

Purpose: to study the distribution of parasitiform mites and determine their natural foci.

Materials and methods

Ticks captured by animals were used as research material. Conducting counts of the number of epidemically significant vectors and assessing the level of their infection with pathogens of natural focal infections of various etiologies are necessary when planning measures to predict the epidemiological situation in a particular territory. To this end, it is important to select the main observation points, taking into account the structure of the population, the nature of the biotopic distribution and seasonal peaks in the activity of ixodid ticks and their hosts in various landscapes. The collection of blood-sucking insects was carried out in the following planned territories:

1. Bishkek and the territory adjacent to the city
2. Ala-Archinsky gorge of Alamudun region
3. Alpine camp of Issyk-Ata region
4. Tokmak State Wildlife Refuge (Ieshoz)

Карта запланированных участков сбора эктопаразитов

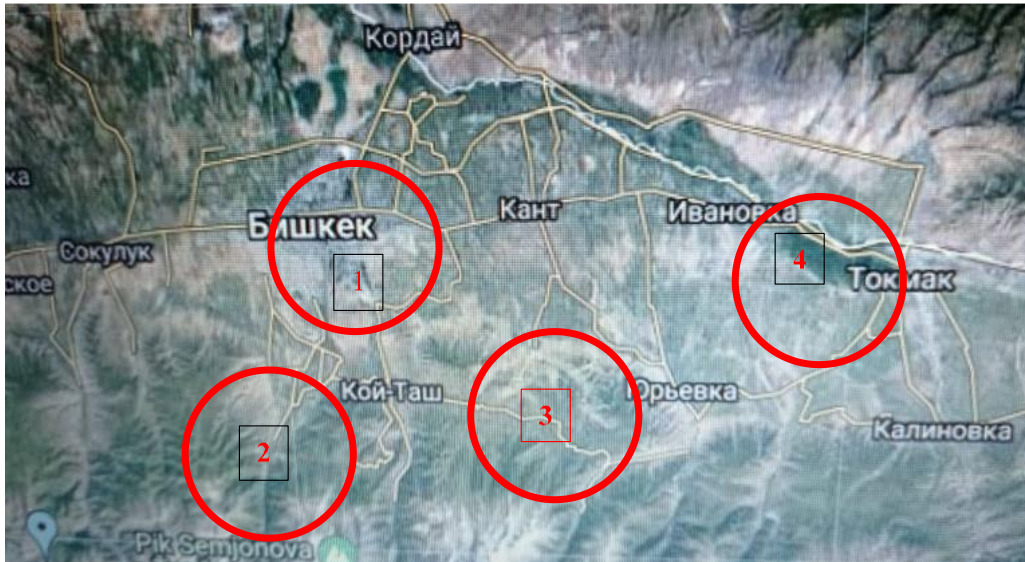


Figure 1 - Map of the collection site of ticks

Research results

During the study, we identified the following species from the ixodite families: *Ixodes ricinus*, *Ixodes persulcatus*, *Haemaphysalis punctata*, *Boophilus calcaratus*, *Hyalomma scupense*, *Dermacentor marginatus*, *Rhipicephalus bursa*, *Dermanasus galinae* as well as bloodsuckers in sheep *Melophagus ovinus* and winged bloodsuckers of horses *Hippobosca equina*.

In the territories adjacent to the city of Bishkek, the distribution of ticks of the following species was mainly found: *Ixodes persulcatus*, *Boophilus calcaratus* and *Ixodes ricinu*. In the southern part of the city, there is a plot of land where animals from the settlements of Zher-Ghazar and Vostok of the Alamudun region are grazed. Among these animals, ticks of the species *Ixodes ricinus* and *Rhipicephalus bursa* were found, which suggests the dominance of these tick species in these territories. In the eastern and northern parts of the city, in the villages of Lebedinovka and Kara-Zhigach, mites of the species *Ixodes persulcatus* and *Boophilus calcaratus* are mainly found among animals. In the village of Orto-Sai, Alamudun district, a large number of bloodsuckers of the species *Melophagus ovinus*

were found in sheep, and winged bloodsuckers of the species *Hippobosca equina* were found among horses. In the western part of the city, ticks were not found on animals during the study period.

In the floodplain of the Ala-Archa River (area of the Ala-Archinsky gorge of the Alamudun region), mainly *Hyalomma scupense* ticks were collected on sheep and dogs. The number of collected ticks of this species on animals gives us grounds to assert that this type of parasite is dominant in the biotope of this ecosystem.

On the territory of the Tokmok State Wildlife Refuge and the territory adjacent to the city of Tokmok (with Ak-Beshim), the dominance of ticks of the species *Dermacentor marginatus* was revealed. Animals from the surrounding villages are grazed on the territory of the state sanctuary, therefore it can be argued that this territory is a hotbed of ticks.

On the territory of the Alpine camp of the Issyk-Ata region (on the territory of the Koy-Tash rural district), the dominance of ticks of the *Boophilus calcaratus* species was revealed.

Ixodes ricinus. Collected in the village. Zher-Kazar of the Alamudun district of the Chui region.

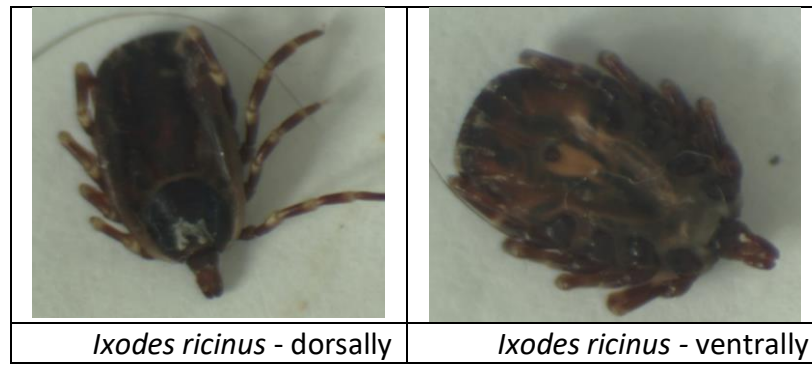


Figure 2 - *Ixodes ricinus*

Ixodes persulcatus. Collected on sheep in the village. Lebedinovka Alamudunsky district.

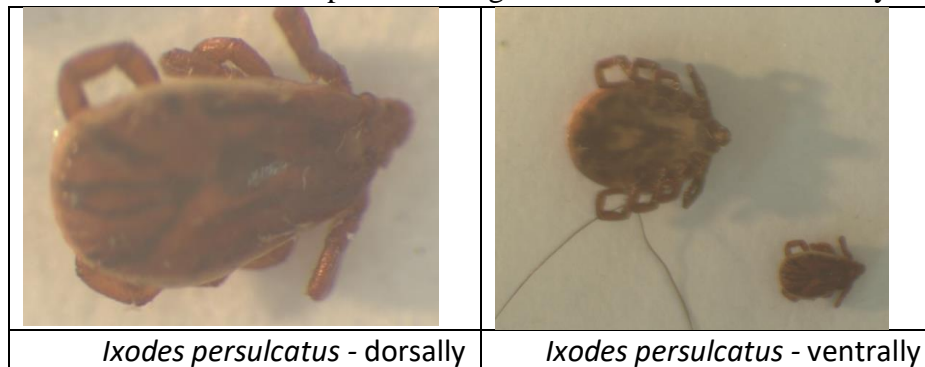


Figure 3- *Ixodes persulcatus*

Boophilus calcaratus. Collected on sheep in the village. Kara-Zhigach of the Alamudun region. Ticks were located mainly in the head area. On average, one animal had from 5 to 16 ticks. Mostly nymphs of the 3rd stage of development were encountered.

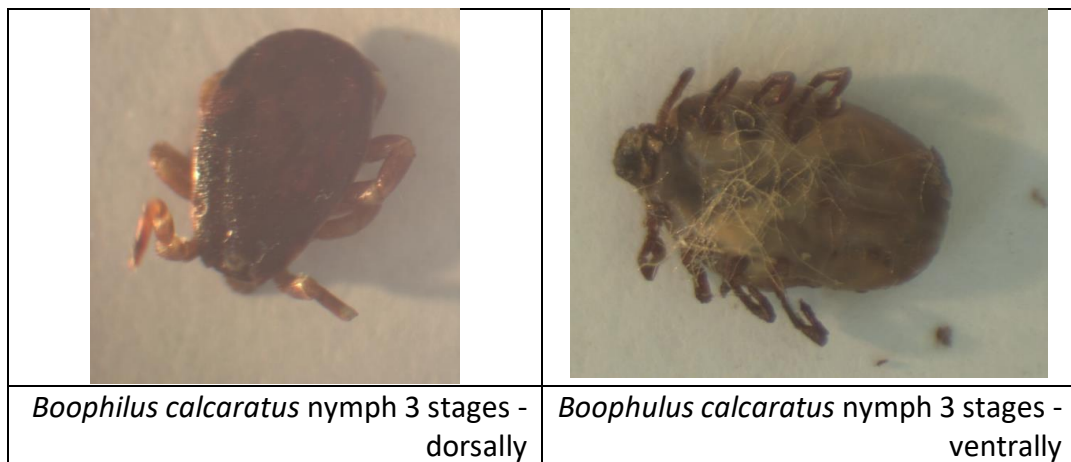


Figure 4 - *Boophilus calcaratus* nymph 3 stages

Hyalomma scupense were collected from sheep and dogs in the village. Kashka-Suu (region of Ala-Archinsky gorge of Alamudunsky region).

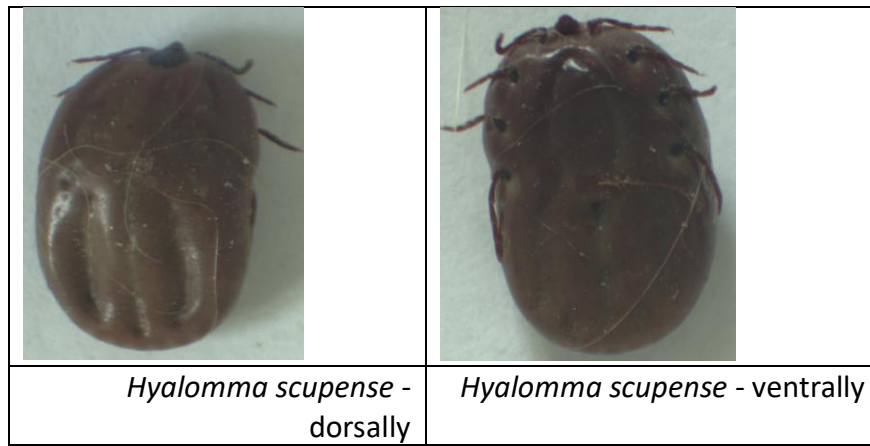


Figure 5 - *Hyalomma scupense*

Dermacentor marginatus mites were collected from sheep and cattle in the Tokmak region, with Ak-Beshim.

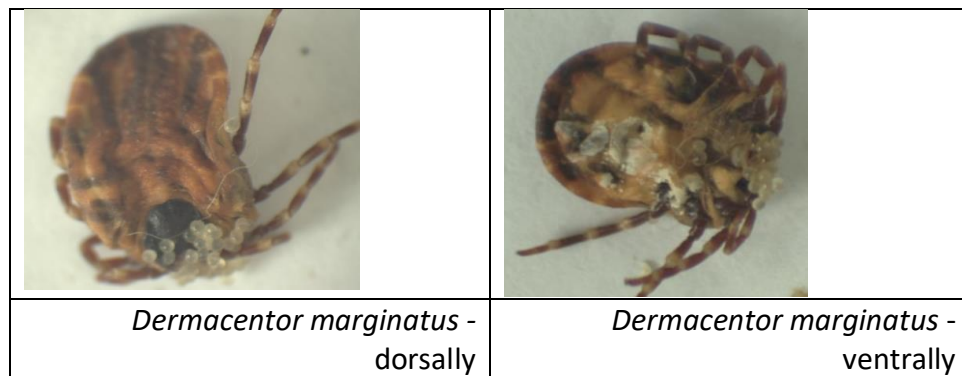


Figure 6 - *Dermacentor marginatus*

Ticks of the species *Rhipicephalus bursa* were removed from small ruminants and dogs in the village. East of Alamudun region.

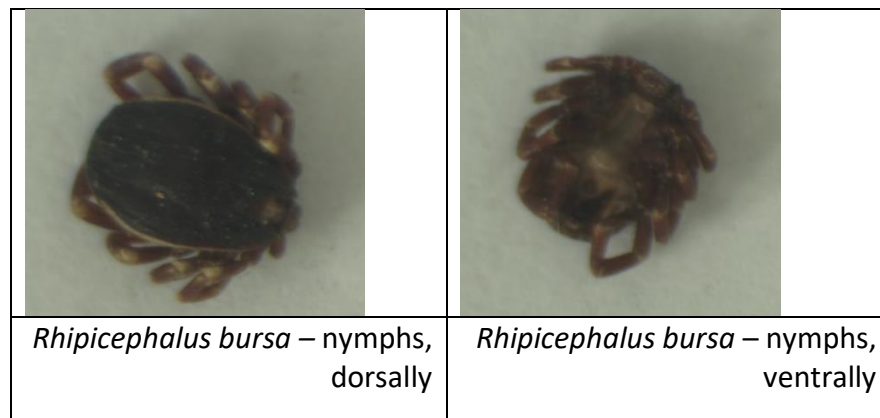


Figure 7 - *Rhipicephalus bursa*

Two dogs of different breeds infected with *Haemaphysalis punctate* ticks were delivered to the clinic in Bishkek. Ticks were located mainly in the head area.



Figure 8 - *Haemaphysalis punctate*

A total of 1351 hematophageal ectoparasites (ticks and bloodsuckers) were collected in the Chuya valley. Collected 1046 ticks, of which ixodid - 451, argazid - 279 and gamazid - 316 specimens. The percentage of animals affected by hematophageal ectoparasites in the study area was 14.3%. Table 1 shows the data on the distribution of hematophages among animals in the study area.

Table 1 - summary data on the number of ticks on animals in the planned territory of the Chui Valley

Ticks and bloodsuckers	Animal species	Collected ticks			
		larvae	nymph	imago	total
Ixodids: <i>Ixodes ricinus</i> ; <i>Ixodes persulcatus</i> ; <i>Haemaphysalis punctate</i> ; <i>Boophilus calcaratus</i> ; <i>Hyalomma scupense</i> ; <i>Dermacentor marginatus</i> ; <i>Rhipicephalus bursa</i> .	cattle	-	6	92	98
	small ruminants	-	43	188	231
	horses	-	4	39	43
	chickens	9	11	20	40
	dogs	2	6	31	39
Argazids: <i>Alveonassus lahorensis</i> ; <i>A. Persicue</i> ; <i>Alveonassus canestrini</i> .	cattle		8	24	32
	small ruminants		12	164	176
	horses		5	24	29
	chickens	3	9	13	25
	dogs		6	11	17
Hamazoids: <i>Dermanyssus gallinae</i>	cattle	11	29	276	316
Bloodsuckers: <i>Melophagus ovinus</i> ; <i>Hippobosca equine</i> .	small ruminants	-	-	238	238
	horses	-	-	67	67
Total	all	25	139	187	1351

At the same time, the percentage of damage to animals in the study area by hematophage ectoparasites was 14.3% ($657/4593 \cdot 100$). A large number of ectoparasites have been found on sheep and goat and poultry. Ixodid and argas mites were found in 231 and 176 small ruminants, respectively. At the same time, the extensiveness of infection with ixodic ticks in this animal species was 34.75%, and the extensiveness of infection with argazids was 12.05%. We associate the low percentage of damage to animals by argas mites with the predominant keeping of

animals during the period of our observation (September-November), not in a room where ectoparasites are localized, but in the wild. A large number of gamasid mites were collected on chickens - 316 specimens, however, the extensive rate of tick infestation in birds was 11.86%. A large number of bloodsuckers were found in sheep - 238 specimens, with an extensiveness of lesions of 10.93%.

The analysis carried out for the infestation of animals by ticks is shown in Table 2.

Table 2 - infestation by ticks and bloodsuckers of animals in the studied area of the Chuy valley

Ticks and bloodsuckers	Animal species	Number of animals examined		Collected total ticks	Extensiveness %	Abundance index	Intensity
		Total	Number of ticks on animals				
Ixodids	cattle	110	43	98	39,1	0,89	2,28
	small ruminants	751	261	231	34,8	0,3	0,89
	horses	139	13	41	9,4	0,3	3.15
	chickens	677	14	40	2,1	0,06	2,86
	dogs	118	24	39	20.3	0,3	1.6
	Total	1795	355	449	19.8	0,25	1,36
Argazids	cattle	185	9	32	4,8	0,17	3,6
	small ruminants	846	102	186	12,1	0,22	1,2
	horses	151	8	29	5,3	0,19	3,6

	chickens	13	5	25	38.5	1,9	5
	dogs	2	2	17			
Hamazoids	chickens	700	83	316	11,8	0,45	3,8
Bloodsucs	small ruminants	750	82	238	10,9	0,32	2,9
	horses	151	11	67	7,3	0,44	6,1

From the above table No. 2 it can be seen that the high extent of the lesion of cattle by ixodic ticks is 39.1%, while the index of the abundance of ectoparasites among the studied animals was 0.89, the indicator of the intensity of the lesion of animals by ticks was 2.28. The intensity of infection reached up to 23 ticks per animal. The high extensiveness of the lesion by ixodic ticks is also visible on small ruminants, however, the tick abundance index (0.3) and the intensity (0.89) are significantly lower than in cattle. A high indicator of the intensity of lesions by ixodic ticks in horses was 3.15 and reached up to 13 specimens per animal. Also, a high intensity of infection by ixodic ticks in birds was revealed - 2.86.

Argas mites, the extent of the lesion is relatively high in birds - 38.5%, as well as a high abundance index - 1.9 and the intensity of the lesion - 5. Among small ruminants, the extensiveness of the lesion by these types of ticks was 12.1, while the abundance index was 0.22, and the intensity of the lesion was 1.2. Almost the same infestation by argas mites in cattle and horses, the extensiveness was 4.8 and 5.3, respectively, the abundance index was 0.17 and 0.19, respectively, the intensity was 3.6 in both animal species. High infestation by gamasid mites in birds, while the extensiveness of the lesion was 11.8%, the abundance index was 0.45, and the intensity was 3.8.

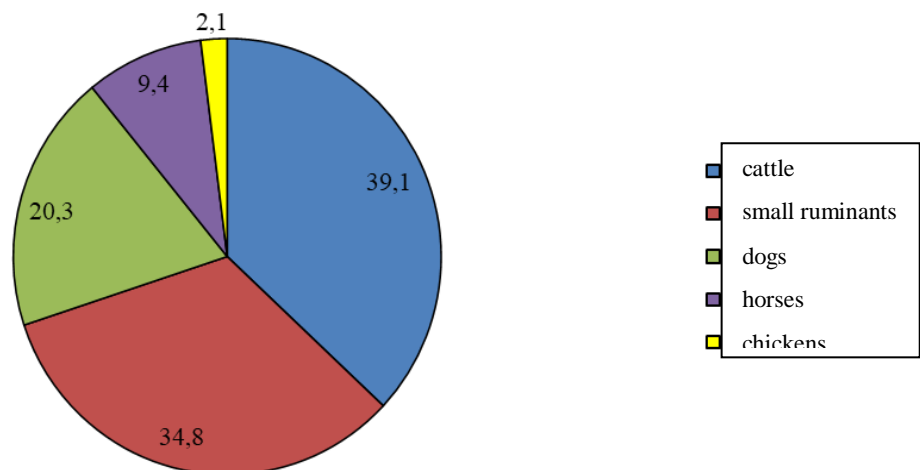


Figure 9 – diagram of the extensiveness of ixodic ticks on various animal species

The diagram clearly shows the infestation of animals by ixodid ticks. A large percentage of extensiveness is observed in both cattle (39.1%) and small ruminants (34.8%). Examination of the dogs revealed the extent of the lesion was 20.3%. In horses and chickens, a low infestation by these types of ticks was noted, 9.4% and 2.1%, respectively.

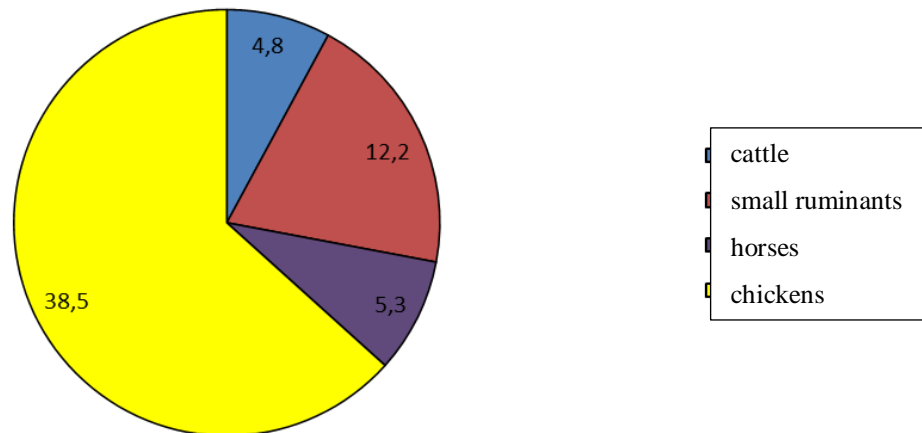


Figure 10 – diagram of the extensiveness of argas mites on various animal species

For argas mites, for clarity of the defeat of various animal species, a diagram is presented (Figure No. 11). The diagram of the extensiveness of the destruction of animals by argas mites shows that a large percentage of the affected is observed in birds (38.5%), which is apparently associated with the constant maintenance of chickens in poultry houses and the seasonal activity of aragic parasites. The extensiveness of the lesion is significantly less in small ruminants (12.2%), horses (5.3%) and cattle (4.8%). The low incidence of argas ticks is apparently associated with the collection of this type of ticks on animals from the end of September (the first specimens began to appear on animals) and November, when the animals are still predominantly located outside the premises where these types of parasites are localized.

Conclusion

In the territories adjacent to the city of Bishkek, the prevalence of ticks of the following species was found: *Ixodes persulcatus*, *Boophilus calcaratus* and *Ixodes ricinus*, *Rhipicephalus bursa* which suggests that these tick species dominate in these territories.

In the area of the Ala-Archinsky gorge of the Alamudun region, mainly *Hyalomma scupense* ticks were collected on sheep and dogs. The number of collected ticks of this species gives us grounds to assert that this species of parasite is dominant in the biotope of this ecosystem.

On the territory of the Tokmak State Wildlife Refuge, the dominance of ticks of the species *Dermacentor marginatus* has been revealed; therefore, it can be argued that this territory is a hotbed of tick distribution. In total, 1046 ticks were collected in the Chuy valley during the planned expedition in 2020, of which 451 ixodids, 279 argazids and 316 gamazids were collected. The percentage of animals affected by hematophageal ectoparasites in the study area was 14.3%.

The study of the planned sites showed that in the studied territories there is a wide distribution of ticks, potential carriers of infectious diseases. At the same time, a high tick rate is observed in the area of the Tokmak State Wildlife Refuge, where tick samples were found mainly among cattle. Extensive distribution of ticks reaches more than 39%, while the abundance index of *Dermacentor marginatus* was 0.89, and the intensity of damage to one animal was 2.28.

A large number of ixodid ticks were found on sheep and goats, the extent of infection with ixodid ticks in this animal species was 34.75%. Examination of the dogs revealed the extent of the lesion was 20.3%. In horses and chickens, a low infestation by these types of ticks was noted, 9.4% and 2.1%, respectively. A large number of argasid and gamasid ticks were found on chickens - 186 and 316 specimens, respectively, however, the extent of bird infestation by ticks was 12.1 and 11.86%, respectively.

Conclusions

1. The greatest distribution of ticks was found in the territories adjacent to Bishkek and the Tokmak State Wildlife Refuge.
2. In the territories adjacent to Bishkek, a variety of dominance of ixodid ticks was found and is mainly represented by the following species: *Ixodes persulcatus*, *Boophilus calcaratus* and *Ixodes ricinus*, *Rhipicephalus bursa* and *Boophilus calcaratus*.
3. On the territory of the Tokmak State Wildlife Refuge, the dominance of ticks of the species *Dermacentor marginatus* was revealed.
4. A high percentage of animals affected by ticks is observed in the Tokmak State Wildlife Refuge and is 39%.
5. High incidence was found among small ruminants and dogs (34.75% and 20.3%, respectively)

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SECTION III. GIDROMELIORATION

UDC 711.5:502/504

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**IMPROVEMENT OF METHODOLOGICAL APPROACHES TO THE
ORGANIZATION OF THE TERRITORY IN COMBINATION WITH ENVIRONMENT
PROTECTION MEASURES**

Annotation. *On the territory of the republic, agricultural lands and forest resources are particularly susceptible to over-exploitation and anthropogenic impact, which is reflected in the development of degradation processes and a decrease in biological and economic productivity. The most dangerous factors leading to land degradation are erosion and destruction of the soil structure, salinization, salinity, flooding and waterlogging, loss of humus and chemical pollution. In mountainous areas, deforestation, soil plowing and cattle overloading of pastures on mountain slopes lead to intensive destruction of the soil cover, the formation of mudslides, landslides and avalanches.*

Keywords. *erosion, water erosion, wind erosion, salinity, solonetzic, flooding and waterlogging.*

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**СОВЕРШЕНСТВОВАНИЕ МЕТОДИЧЕСКИХ ПОДХОДОВ ОРГАНИЗАЦИИ
ТЕРРИТОРИИ В КОМПЛЕКСЕ С ПРИРОДООХРАННЫМИ МЕРОПРИЯТИЯМИ**

Аннотация. *На территории республики особенно подвержены чрезмерной эксплуатации и антропогенному воздействию земли сельскохозяйственных угодий и лесного фонда, что отражается на развитии процессов деградации и снижении биологической и экономической продуктивности. Наиболее опасными факторами, приводящими к деградации земель, являются эрозия и разрушение почвенной структуры, засоление, солонцеватость, подтопление и заболачивание, потеря гумуса, загрязнение химикатами. В условиях горных территорий вырубка лесов, распашка почв и перегрузка скотом пастбищ на склонах гор приводит к интенсивному разрушению почвенного покрова, образованию селей, оползней и лавин.*

Ключевые слова. *эрозия, водная эрозия, ветровая эрозия, засоление, солонцеватость, подтопление и заболачивание.*

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**ЖАРАТЫЛЫШТЫ КОРГОО ИШ-ЧАРАЛАРЫ МЕНЕН БИРДИКТЕ АЙМАКТЫ
УЮШТУРУУНУН МЕТОДИКАЛЫК БЫКМАЛАРЫН ӨРКҮНДӨТҮҮ**

Аннотация. *Республиканын аймагындагы айыл чарба багытындагы жана токой фондусунун жерлерин өзгөчө ашыкча эксплуатациялоого жана антропогендик жактан туура эмес таасирге дуушар болушат, бул биологиялык жана экономикалык*

өндүрүмдүүлүгүнүн процесстерин өнүктүрүү боюнча бузулушун жана азайышын чагылдырат. Жерлердин бузулуусуна алып келген эң коркунучтуу факторлор бул эрозия, топурак түзүмүнүн бузулушу, шор басуу, туздоо, суу каптоо жана жердин сазга айлануусу, гумустун азаюусу, химикаттар менен топуракты булгоо болуп саналат. Тоолуу аймактардын шарттарында токойлорду кыюу, кыртышты казуу жана тоо боорлоруна мал жаяу топурак кыртышынын интенсивдүү бузулушуна, селдердин, жер көчкүлөрдүн жана кар көчкүлөрдүн пайда болушуна алып келет.

Ачкыч сөздөр. *эрозия, суу эрозиясы, шамал эрозиясы, шор басуу, туздоо, суу каптоо жана сазга айлануу.*

Introduction Kyrgyzstan is a mountainous republic. Here more than 80% of the territory is located over 1500 meters above sea level (mountains 94%, among them: high mountains 70%, others 24%, and plains 6%). The peculiarity of the republic is rather harsh extreme natural conditions and high vulnerability of mountain ecosystems. Hence, the contrast of its territory in terms of relief, climatic conditions, vegetation, a variety of indigenous soil forming rocks, as well as significant areas of land are located on slopes prone to erosion processes.

The damage caused by erosion, especially to agriculture, is enormous. As a result of erosion processes, in a relatively short period of time, the upper fertile horizons, which have been formed for hundreds and thousands of years, are destroyed and carried away. In the process of erosion, along with soil particles, humus and plant nutrition elements are lost, the structure is destroyed, which in turn causes deterioration of the physical properties and chemical composition of soils, decreases the biological activity of soils. Soils become dense, their moisture capacity and water permeability decrease, and this leads to a decrease in their water-holding capacity. All this leads to a decrease in soil fertility. Waste lands appear with highly eroded soils.

Methods and materials Soil erosion is most strongly developed in areas with deeply dissected relief. In such areas, most of the agricultural land is located on steep slopes, and there is a runoff of water, soil washout and soil erosion takes place. In general,

Kyrgyzstan is a particularly dangerous territory in terms of erosion. The area of eroded lands is about 6.5 million hectares. The main part of the territory, for more than 80% has terrain slopes exceeding 2° and 66.3% is more than 5 °. But even a small amount of precipitation or water flushing during irrigation on unprotected soils with slopes up to 1-2° can cause the development of erosion processes. There are 5 983 524 hectares of land subject to water and wind erosion, 2 269 755 hectares are slightly washed, 2 432 737 hectares are medium washed, 990 599 hectares are strongly washed away.

With the slope runoff of precipitation, damage to crops occurs by trickle washouts. With concentrated precipitation runoff on the slope, there are washouts that do not smooth out during the next tillage. Washouts destroy agricultural crops and damage the root system of perennial plantings. Also washouts contribute to an increase in precipitation runoff and consequently an increase in soil drought. With concentrated precipitation runoff, the washouts grow into ravines.

Ravines spoil arable land, orchards, vineyards and other agricultural land. They lead to the formation of large areas of waste land, increase soil drought. The growing ravine network causes the destruction of roads and various structures. Thus, precipitation runoff, flushing and erosion of the soil cover cause great economic damage. There is a decrease in the yield of agricultural crops and a decrease in the area of agricultural land. This leads to an increase in

the cost of production and a decrease in revenue.

There is a close connection between all the factors that create the possibility for the erosion. Even considering the influence of individual factors on the development of erosion, we should always keep in mind that in reality all phenomena and processes in nature are closely interrelated.

With one combination of climate conditions, relief, geology, soil and vegetation cover, erosion does not occur at all; with another combination, there may be a slight danger for its occurrence; with the third combination, erosion not only manifests itself, but also has a catastrophic character.

The relief, soil cover and vegetation, affecting the development of erosion, changes over time under the influence of erosion processes. This is one of the manifestations of the natural relationship of cause and effect. Therefore, natural conditions must be considered in close connection with the changes that occur as a result of the erosion processes.

The soil washed away from the slopes and taken out of the ravines in the form of sediments is deposited at the foot of the slopes, along the gullies and valleys. Sediments cause

Qualitative characteristics of arable land in the Kyrgyz Republic

Altogether r:	Total:	Osh	Jalal-Abad	Batken	Chuy	Talas	Naryn	Issyk-Kul	Regions		
									Saline		
147 830	96 932	19236	4689	10425	43896	2456	155898	332	weak		
	21 116	1044	1563	3465	13323	373	1267	83	average		
	29 782	5212	1563	3468	13712	1361	1656	2810	strong		
98 861	67 428	3900	1359	3777	39518	3504	12063	3307	weak	Solonetzic	
	23 075	1300	453	1259	16226	492	2390	955	average		
	21 075	1300	453	1259	4167	105	950	124	strong		
673 616	411 825	61157	67795	23169	63424	33847	59903	102530	weak	Eroded	
	219 151	21841	24212	8417	60387	39823	29796	34675	average		
	42 640	8841	11294	5050	3616	7542	4728	1569	strong		
29 625	9 064	7040	640	1056	190	138	-	-	weak	Swampy	
	20 015	1320	120	198	18317	60	-	-	average		
	546	440	40	66	-	-	-	-	strong		
358 120	221 817	40915	33918	17799	12042	19086	71140	26917	weak	Rocky	
	57 850	13432	16959	8900	1003	7617	6419	3500	average		
	78453	6819	5653	2966	51	53999	7185	1780	strong		

damage and sometimes death of crops. Sediments from ravines, as well as from slopes with heavily washed soils, greatly impair soil fertility along gullies and valleys. Sediment deposition in ponds, lakes and reservoirs causes their rapid siltation. It reduces flood protection and irrigation role of reservoirs, as well as their fish productivity. When water is taken for irrigation, rapid siltation of irrigation channels occurs. The growth of riverbed sediments leads to the rise of groundwater in floodplain lands. With a high concentration of salts, this causes soil salinization.

The areas of saline and brackish soils on the territory of Kyrgyzstan amount to 3 780 220 hectares, including 7 738 60 hectares in the agricultural zone and 3 006 360 hectares in the pasture zone. From the total area of saline soils, solonchic soils are on 281 501 hectares.

Research result As a result of sedimentation at the foot of the slopes, along gullies and valleys, deterioration of irrigation conditions, soil salinization and flooding of the territory during flooding of rivers, sharply reduces the gross harvest of agricultural crops.

To prevent erosion, it is necessary to exclude field work along the slopes. On slopes with increased steepness, all types of field work (plowing, sowing, cultivation, harrowing, harvesting) are mainly carried out only across the slope.

Emphasizing the importance of transverse soil cultivation on slopes, it should be noted that with an increase in the steepness of slopes and the intensity of rainfall, the efficiency of transverse soil cultivation significantly decreases. Cross cultivation of soils is a general agricultural and anti erosion measure, nevertheless other methods of preventing erosion should be applied as well. One of the important reserves for further increasing the yield of agricultural crops, reducing the cost of production and preventing erosion is the differentiated selection of crops in crop rotation in accordance with the conditions of the relief, soil cover and microclimate.

With an increase in the steepness of slopes in the structure of crop rotations, it is necessary to reduce the proportion of row crops, and to

increase the least labor intensive crops the annual continuous sowing and especially perennial grasses. These crops provide the best soil erosion protection.

On the slopes of 0-2°, where the soil has good fertility and water supply, row crops such as corn, potatoes, fodder and beet crops should be placed. The absence of steep slopes excludes the erosion processes.

On the soils of larger slopes of 2-5°, it is more expedient to cultivate cereal crops, such as wheat and barley, since they are less conducive to erosion in comparison with row crops. Since the soils on these slopes are still subject to slight washout and erosion, it is recommended to sow perennial grasses in these areas. Soils located on areas with slopes of 5-10° should be used only with the use of conservation crop rotations. Otherwise, these lands will fall out of agricultural use.

It is advisable not to plow plots with slopes of more than 10°, but if plowed, then using a complex of techniques of cavity and terrace farming. Irrigation erosion might appear on steep slopes. The washout of irrigated soils, produced by irrigation water, at slopes higher than 5°, is many times higher than the washout on dry land. This urgently requires the introduction of progressive irrigation methods that do not lead to soil washout and erosion. It is necessary to abandon uncontrolled irrigation, which, along with soil washout, cause the formation of deep gullies, which turn into ravines.

For maximum retention of precipitation and prevention of erosion, the soil cultivation system on the slopes should contribute to an increase in soil permeability, the creation of an anti-erosion nanorelief on the slopes, and an increase in the soil protective role of the vegetation cover.

It is possible to increase the permeability of soils by loosening, cracking, rolling and other methods that create conditions for maximum absorption of precipitation at the place of their fallout. The traditional methods of slope territory management, used to date, did not create a basis for protecting the soil from water and wind erosion, but often contributed to its development.

In most cases, the positioned line elements of the territory design often run along the slopes

and obliquely, at an angle to the contours. When snowmelt, they concentrate the runoff of melt water, contribute to the formation of gullies and ravines.

Erosion causes great damage to areas with mountainous and hilly relief, as well as areas located on low relief elements. Agriculture, transport, hydraulic structures, fisheries, utilities and many other sectors of the industrial complex suffer from erosion. First of all, it is necessary to explore well the territory in which the erosion occurs, to know its outer contour and the geological structure of the surface shell. Without such knowledge, it is impossible to understand the reasons that caused erosion, and correctly outline the ways to eliminate it. To fight against soil erosion, anti erosion agricultural technology plays the main role, as well as the implementation of reclamation and hydraulic engineering measures. The correct application of these measures will help eliminate both the causes of erosion and its consequences.

Conclusions

On lands prone to erosion, it is necessary to introduce progressive methods of irrigation, agro technical, hydro technical and forest reclamation and erosion measures to prevent and weaken erosion processes. Thus, the correct anti erosion organization of the territory makes it possible to preserve soil fertility from destruction by water and winds and create conditions for its most effective use in obtaining high and stable yields of agricultural crops.

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**LAND RESOURCES MANAGEMENT AT THE ADMINISTRATIVE AND
TERRITORIAL LEVEL**

Abstract. *The implementation of land reform in the Kyrgyz Republic is aimed at ensuring food security of the state. Land and agrarian transformations primarily involved the transformation of land ownership, and subsequently the formation of a socially oriented market economy and the provision of full economic and economic independence to rural commodity producers. The Republic has chosen the evolutionary path of agrarian transformations.*

Keywords: *land reform, land and property complex, land management, efficiency, category of land, land, forms of ownership.*

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**УПРАВЛЕНИЕ ЗЕМЕЛЬНЫМИ РЕСУРСАМИ НА АДМИНИСТРАТИВНО-
ТЕРРИТОРИАЛЬНОМ УРОВНЕ**

Аннотация. *Реализация земельной реформы в Кыргызской Республике направлена на обеспечение продовольственной безопасности государства. Земельные и аграрные преобразования в первую очередь предполагали преобразование собственности на землю, а в последующем формирование социально-ориентированного рыночного хозяйства и предоставления сельским товаропроизводителям полной хозяйственной и экономической самостоятельности. Республика выбрала эволюционный путь аграрных преобразований.*

Ключевые слова: *земельная реформа, земельно-имущественный комплекс, управление земельными ресурсами, эффективность, категория земель, угодья, формы собственности.*

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**АДМИНИСТРАТИВДИК-АЙМАКТЫК ДЕНГЭЭЛДЕ ЖЕР РЕСУРСТАРЫН
БАШКАРУУ**

Аннотация. *Кыргыз Республикасында жер реформасын ишке ашыруу мамлекеттин азык-түлүк коопсуздугун камсыз кылууга багытталган. Жер жана агрардык өзгөрүүлөр биринчи кезекте жерге болгон менчиктин өзгөрүүсүн, андан кийин социалдык багыттагы рынок чарбасынын калыптанышын жана айыл чарба өндүрүүчүлөрүнө толук экономикалык жана чарбалык көз карандысыздыкты камсыз кылууну болжолдогон. Республика агрардык кайра куруулардын эволюциялык жолун тандап алды.*

Өзөктүү сөздөр: жер реформасы, жер -мүлк комплекси, жер ресурстарын башкаруу, эффективдүүлүк, жер категориясы, айыл чарба жерлери, менчиктин формалары.

Introduction The accelerated development of the republic economy by increasing the efficiency of land use and water resources as part of the land and property complex is associated with the formation of an economic mechanism for regulating their use. This is fundamental in the implementation of the state land and agricultural policy.

All economically developed countries of the world located in the arid zone, in the management of land and water resources, their use and protection prioritize the agricultural lands. Productive agricultural lands (arable land, perennial plantings, fallow, hayfields, pastures) stand out among them.

This is due to the fact that agricultural land, and particularly the arable land, is not only a sphere of living space and habitat for people, but also the main source of food for the population, fodder for animal husbandry, raw materials for the processing industry.

At the same time, rational and efficient use of agricultural land and irrigation water ensures food security of the republic, employment and maintenance of the traditional way of life of the rural population, creates conditions for stable development and increasing the sustainability of the population.

Considering the ongoing processes of soil degradation, land desertification, using of agricultural land for non-agricultural purposes, their protection, reproduction of soil fertility are the most important tasks in the field of ecology and environmental protection. The developed and substantiated recommendations for the organization of rational use and protection of land and water resources in agricultural land use ensures the economic efficiency of land use, preventing and stopping the development of erosion processes, salinization and alkalization. At

the same time, they contribute to the reproduction of soil fertility, the restoration of ecological balance, the involvement of reclamation and unsettled lands in agricultural turnover, and the solution of social issues

Methods and materials The main purpose of the work is to conduct an analysis on the study of modern land management at the administrative-territorial level in the Chui region.

Research results Proper organization of land complex management contributes to the development of various administrative-territorial entities. For example, the Chui region is the main producer of agricultural food products. At the same time, it is a region with a very complex soil reclamation environment, since the main massifs of saline, solonetzic and eroded lands are concentrated here.

Land administration is the process that manages land resources to ensure both maximum economic benefits and social welfare in the context of sustainable ecosystem functioning. Therefore, it is necessary to solve issues of management and rational use of land resources at the territorial level, which is a decisive factor in the development of agricultural production in the region. However, this cannot be done without a comprehensive study of the quantitative and qualitative state of land resources.

Great attention has always been paid to the problem of land management in the republic, its administrative-territorial entities. However, the issues of increasing the efficiency of land use resources and their management in market conditions require further exploration. It consists of:

- assessing land resources and determining the need for them at the administrative-territorial level;
- management of demand, supply and efficient use of land resources;
- in improving the regulatory framework for resolving of land disputes issues and regulating economic instruments in the use of land resources;
- managing information exchange, expanding knowledge, and informing the public.

Land management at various administrative and territorial levels is based on the land legislation of the Kyrgyz Republic and other laws of the Kyrgyz Republic in the field of rational use and protection of land resources. The main one is the Land Code of the Kyrgyz Republic No. 46 dated June 2, 1999, amended on March 17, 2021 No. 33, as well as the Law of the Kyrgyz Republic "On the Administrative Territorial Structure of the Kyrgyz Republic" dated April 25, 2008 No. 65, amended on July 8, 2019 No. 83[1-10].

The administrative territorial structure of the Kyrgyz Republic is the division of the territory into administrative and territorial units in order to organize effective public administration and local self-government. An administrative territorial unit is a territory defined by law, including the territory of one or more settlements and other uninhabited territories in which state authorities or local self-government bodies carry out the state administration or self-government, respectively.

The administrative territorial units of the republic include: oblast, district, city, village area. Therefore, land management is carried out not only in the country as a whole, but also within the framework of administrative territorial entities (oblast, district, city, village area). The administrative and territorial division of the republic clearly reflects the economic connection of valleys,

intermountain depressions, foothill and mountainous territories. There is a clear relationship between natural and economic areas.

The object of the research is the Chui region of the Kyrgyz Republic. A region is an administrative-territorial unit that unites the territories of regional significance cities, as well as districts located on the territory of this region, the state administration is carried out there taking into account the interests of local communities and the competence of local self-government bodies.

The Chui depression is located within the borders of Kyrgyzstan. The valleys of the Chon-Kemin and Kichi-Kemin rivers adjoin it from the east. Together with the halts of the Kyrgyz Ala-Too, the Chui region was formed with the same name. There are 1984.4 thousand hectares of land within the administrative boundaries of the Chui region. The Chui oblast combines the character of a flat and mountainous territory. It stretches from west to east and occupies the space between the northern slopes of the Kyrgyz Range in the south and the Chu-Ili Mountains and the Chu River in the north.

The territory of the Chui region rises from the north (400 m above sea level) to the south (1000 – 1100 m) and from the west (750 m) to the east (1400 m). A characteristic feature for mountainous, foothill, foothill-valley and foothill-plain territories is manifested here is high-altitude zonality.

Eight administrative territorial units are formed in the region: Kemin, Chuy, Issyk-Ata, Alamudun, Sokuluk, Moskov, Zhayyl, Panfilov districts and village areas. According to the current legislation, state registration of the availability and use of land in the Kyrgyz Republic is carried out by categories of land and holdings. In accordance with the data of the "Cadastre" State Institution the area of the land fund of

the Chui region as of January 1, 2020 is 311,800 hectares. lands. (table 1)

Table 1.

Distribution of the land fund of the Chui region by land categories as of January 1, 2020

Distribution of land by categories			
№	Land categories	Area, thousand hectares	Total area %
1	Agricultural lands	1216,9	64,18
2	Lands of settlements	55,7	2,80
3	Industry, transport, communications and defense lands	49,9	2,50
4	Specially protected natural territory lands	138,7	6,97
5	Forest fund lands	55,3	2,80
6	Water fund lands	8,8	0,04
7	Reserve lands	403,9	20,30
	Total	1989,4	100

Table 1 shows the distribution of the land fund of the republic by land categories as of January 1, 2021.

Agricultural lands act as the main means of production in agriculture, have a special legal regime and are subject to special protection aimed at preserving their area, preventing the development of negative processes and increasing soil fertility. The area of agricultural land in the Chui region is 1216.9 thousand hectares (64.18%).

The land area of settlements in the region is 55.7 thousand hectares (2.80%). The land of industry, transport, communications, defense and of other purposes in the whole region is 49.9 thousand hectares (2.50%). The lands of specially protected natural territories

occupies 138.7 thousand hectares, or 6.97%. As of January 1, 2020, the total area of the forest fund is 55.3 thousand hectares or 2.80%. The land of the water fund of the region is 8.8 thousand hectares (0.04% of the total area of the land fund). The reserve land for 2020 is 403.9 thousand hectares (20.30%).

To understand the nature of the use of the land fund, it is necessary to consider the structure of lands. Land holdings are the main element of state land registration and are subdivided into agricultural and non-agricultural land.

Table 2.

Distribution of the of the Chui region land fund by agricultural lands as of 01.01.2020

№	Type of agricultural land	Area, thousand hectares	Total area %
1	Arable land	410,2	31,5
2	Perennial plantings	7,5	0,6
3	Deposit	10,7	0,8
4	Hayfields	21,2	1,6
5	Pastures	851,3	65,4
	Total	1300,9	100

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As of January 1, 2020, the area of agricultural land in all land categories was to 1300.9 thousand hectares or 65% of the total area of the region. The arable land occupies 410.2 thousand hectares or 31.5%, perennial plantings and deposits occupy an insignificant area - 7.5 thousand hectares (0.6%) and 10.7 thousand hectares (0.8%), respectively. The largest area falls on pastures, which is 851.3 thousand hectares or 65.4% and 21.2 thousand hectares or 1.6% are occupied by hayfields.

Table 3.

Distribution of lands of the Chui region by the ownership types as of 01.01.2020.

№	Ownership types	Area, thousand hectares	Total area %
1	Private property	394,7	19,83
2	State property	1579,8	74,41
3	Municipal property	14,9	0,75
	Total	1989,4	100

The implementation of the basic laws and principles of land management is carried out in the process of forming the stages of the management process. The main stages of the process of any control system are: collection and processing of information; analysis of information; diagnosis and prognosis, systematization (synthesis), goal setting; development of results.

These patterns include the general principles of the land administration system.

The general principles include:

1. Priority of state land management. The land management system functions at all interrelated levels, comprehensively implementing a unified state land policy
2. A differentiated approach to the management of land of different categories and administrative territorial entities. According to this principle, the legal support of land management should be carried out taking into account their economic, natural and social characteristics.
3. The principle of rational use of land. The state's land policy should focus on the formation of a set of factors that ensure the growth of production efficiency.
4. Unity of land administration and territorial administration. It is determined here that the

land is the most important factor in the effective development of the territory.

5. Organizational consistency of land use and territorial management. The principle is that the management system should ensure an increase in the efficiency of the system of objects and subjects of land relations, their fulfillment of certain rights and obligations for the use of land resources, the formation of the correct organization of the management system for the normal functioning of the industrial complex as a whole.

6. Improving the functions and methods of land management is ensured by the introduction of the achievements of scientific and technological progress in the land management system.

7. Differentiation of land management functions between executive and representative authorities of one administrative territorial entity.

8. Division of functions between different departments at different administrative territorial levels. For example, between the territorial bodies of the state agency for land resources, architecture, housing and communal services, state property management

Conclusions All principles must be followed in the implementation of the land

administration system at each administrative territorial level. When developing the goals and objectives of the research program, it is necessary to determine with sufficient accuracy the methods for implementing each principle in order to form an economically effective land management system.

However, only in the presence of the necessary regulatory legal framework, it is possible to manage land resources at various administrative-territorial levels in the context of the formation of market relations. At the same time, it is necessary to ensure the development and adoption of the Laws of the Kyrgyz Republic "On State Land Cadastre", "On Land Management" and other normative legal documents regulating land relations.

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HOUSING AFFORDABILITY ANALYSIS IN THE REAL ESTATE MARKET IN THE KYRGYZ REPUBLIC

Annotation: *Analysis of the current conditions of the lodging market development shows that the instruments of implementation of the state housing policy, considering the provision of social housing or the acquisition of housing by citizens in ownership, are insufficient to meet the current demand for housing. The existence of a category of citizens with moderate incomes, those with incomes below average, but not to be classified as poor, as well as increased mobility of the able-bodied population increases the demand for residential premises under employment contracts, which is particularly important in connection with the dynamic creation of industrial clusters, technology parks, the development of special economic zones.*

Key words: *Real estate, land, rent, analysis, housing.*

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АНАЛИЗ ДОСТУПНОСТИ ЖИЛЬЯ НА РЫНКЕ НЕДВИЖИМОСТИ В КЫРГЫЗСКОЙ РЕСПУБЛИКЕ

Аннотация: *Анализ современных условий развития жилищного рынка свидетельствует, что инструменты реализации государственной жилищной политики, предусматривающие предоставление социального жилья либо приобретение гражданами жилья в собственность, являются недостаточными для удовлетворения текущего спроса на жилье. Наличие категории граждан с умеренными доходами, то есть доходами ниже средних, но не позволяющими гражданам быть отнесенными к категории малоимущих, а также повышение мобильности трудоспособного населения увеличивает спрос на жилые помещения по договорам найма, что особенно актуально в связи с динамичным созданием промышленных кластеров, технопарков, развитием особых экономических зон.*

Ключевые слова: *Недвижимость, земельный участок, аренда, анализ, жилье.*

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КЫРГЫЗ РЕСПУБЛИКАСЫНДА КЫЙМЫЛСЫЗ МҮЛК РЫНОГУНДА ТУРАК ЖАЙДЫН ЖЕТКИЛИКТҮҮЛҮГҮН ТАЛДОО

Аннотация: *Мамлекеттик турак жай саясатын ишке ашыруу инструменттери, социалдык турак-жай берүү же жарандар тарабынан турак-жайды менчигине сатып алууну караган учурдагы турак үй суроо-талаптары жетиштүү канааттандырбайт, аны турак-жай рыногун заманбап шарттарда өнүктүрүү талдоосу күбөлөндүрөт. Орточо кирешеси бар жарандардын категорияларынын болушу, башкача айтканда, кирешелери ортодон төмөн, бирок аз камсыз болгон жарандардын категориясына кирбеген, эмгекке*

жөндөмдүү калктын мобилдүүлүгүнүн жогорулашы турак жайды жалдоо келишимдери боюнча суроо-талапты көбөйтөт, өнөр жай кластерлеринин ийкемдүү түзүлгөндүгүнө байланыштуу, техникалык парктардын, өзгөчө экономикалык зоналардын өнүгүшүнө өзгөчө актуалдуу болуп саналат.

Ачкыч сөздөр: *Кыймылсыз мүлк, жер участкагу, ижара, талдоо, турак жай.*

Introduction: as known, residential real estate performs two functions simultaneously: - means of production (land, administrative, industrial, commercial and other buildings and premises, as well as other structures);

- an item of consumption for people for living purposes (land plots (provided for the construction of an individual residential building - IRB), residential buildings, apartments, cottages).

Provision of social housing for the population of the country is one of the main tasks of the state. According to the sanitary norm adopted in the Kyrgyz Republic, the size of living space per person is at least 12.0 sq.m. For example, in the CIS member states, this norm is 18.0 sq.m per person. At the moment, more than 82.3 thousand families are on the waiting list as those in need of residential premises.

Methods and materials Real estate is the basis of personal existence for citizens and serves as the basis for their economic activities.

The realization of the right to residential real estate is carried out through the construction and acquisition of residential premises. According to article 63 of the Housing Code of the Kyrgyz Republic, citizens can have a residential house (part of a house) on the right of private ownership, use it for residence and residence of their family members. They have the right to instill in the house other

citizens, as well as to rent it out on the terms and in accordance with the procedure established by civil legislation.

Currently, legal relations with real estate objects (land plots, houses) are regulated by the norms of the Constitution of the Kyrgyz Republic, Land, Civil Codes, the Law of the Kyrgyz Republic "On state registration of rights to real estate and transactions with it" and other special legislation of the Kyrgyz Republic. The Program of the Government of the Kyrgyz Republic "Affordable Housing 2015-2020" has also been developed (approved by the Resolution of the Government of the Kyrgyz Republic dated August 5, 2015 No. 560), the purpose of which is to create conditions for increasing the availability of housing in the Kyrgyz Republic. It is implemented through the following measures:

- construction of affordable housing in the required numbers, in all regions of the country;

- provision of affordable mortgage mechanisms for the purchase of housing;

- involvement of the country banking system in affordable mortgage lending programs with its refinancing mechanism.

Research result The main problem in this area is the limited financial capacity of budgets of all levels for the construction and purchase of housing for social hiring, as well as for the provision of social benefits and other measures of state support for housing.

Hosing security in the Kyrgyz Republic

The level of hosing provision of the population						
Indicator	2015	2016	2017	2018	2019	2020
Kyrgyz Republic	13	13,1	13,2	13,1	13	13,25
Batken region	13	12,3	12,2	12,1	12,2	12,67
Jalal-Abad region	12,7	13,6	14,4	14,2	14,1	14,22
Issyk-Kul region	16,5	16,4	15,6	15,5	15,5	15,90
Naryn region	13	12,9	12,9	12,8	12,7	12,88
Osh region	10,9	10,8	10,7	10,6	10,6	10,65
Talas region	14,3	14,2	14,2	14,1	14	14,27
Chui region	14,8	14,6	14,4	14,2	14,2	14,41
Bishkek city	12,6	12,5	13	12,9	13	13,37
Osh city	13,4	13,4	13,2	13,2	12,9	13,16

As the objects of civil law transactions the real estate, has a value. Necessary to conduct the analysis of residential real estate prices to establish its significance.

The main areas of activity for solving the tasks are the following:

- this Program establishes criteria for housing affordability for citizens, depending on location, taking into account the amount of wages in the region, the solvency of the population and other factors:

- for apartments in a multi-stored building with a total area of up to 80 square meters;

- for individual residential buildings with a total area of up to 150 square meters;

The cost of one square meter of housing should not exceed 60,000 soms;

- formation of financial mechanisms to ensure increased housing affordability;
- creation of an affordable housing fund;
- state support of citizens in improvement of housing conditions.

The main form of support for citizens is the provision of social payments for construction of houses, including individual hosing (buying of house on the primary housing market), including the opportunity of partial or full payment of the initial payment when obtaining a mortgage loan for these

purposes. Nevertheless, during the implementation of the program, potential consumers of it face such a problem as a shortage of ready-to-move housing and space for new construction.

Many people have a question: does the city need a large-scale construction? The answer to this question are the families considered as needing better housing conditions – 16040. Thanks to the Program, the demand for new residential areas is growing, which makes it possible to increase the pace of construction of new houses. In order to solve this issue in Bishkek, special attention is paid to low-rise buildings, which is according to the author is one of the methods of solving the problem of shortage of ready-made housing. Thus, the State Agency for Architecture, Construction and Utilities under the Government of the Kyrgyz Republic took measures to attract foreign investment in the construction of affordable housing. In accordance with the Decree of the Government of the Kyrgyz Republic "On experimental design and construction of microdistrict 15 "Jal-Artis" in Bishkek city" dated December 19, 2006 No. 862, started the designing and construction of the microdistrict 15 "Jal-Artis", where 400 apartments out of planned 1,392 apartments were identified as social housing, for distribution on the terms of long-term

mortgage lending at 10 percent per annum, with a maturity of 15 years, to employees of public sector institutions who are supposed to receive state support in the form of subsidizing the initial mortgage payment in the amount of 30 percent of the housing cost. It is necessary to consider other methods that affect the pace of development. Such as: reasonable planning and definition of zones for the development of construction areas streamlining the flow of land development. Low-rise construction, which is a priority in Bishkek in economy class, implies the definition of development zones with the demolition of dilapidated housing. All these measures contribute to the successful implementation and even acceleration of subprogram implementation.

In order to solve the housing problems of citizens and employees of budgetary organizations, the Bishkek City Mayor's Office commissioned a 90-apartment residential building for veterans of the Great Patriotic War and employees of budgetary organizations in the Vostok-5 microdistrict in 2011, the estimated cost of which was 65987.9 thousand soms. In 2009, a 45-apartment residential building in the residential district "Jal-29" with an estimated cost of 31545.9 soms and a 90-apartment residential building with an estimated cost of 129680.9 thousand soms were commissioned.

The object of the impact of the "Affordable Housing 2015-2020" target program is development of the affordable housing market in order to solve housing issues of population and to create comfortable living conditions for residents of the Kyrgyz Republic and Bishkek.

The provision of affordable housing is carried out on preferential terms primarily for employees of the public sector of the Bishkek City Hall. The lists of people applying for this housing are established by the authorized

structural subdivision of the Bishkek City Hall.

Currently, 3.5 thousand families are on the waiting list for free housing in Bishkek, about 200 citizens receive housing annually under this program on the terms of social hiring, Citizens who live on the area less than the accounting rate of 10 square meters have the right to stand in line for free housing. Financing of housing construction under this program is carried out from the budgets of all levels.

At this stage, the study of the directions of real estate market formation of is carried out, the study of existing real estate objects, their condition from the standpoint of market conditions.

This stage is associated with the execution of a number of expertise: research of the location of real estate objects; assessment of the real estate market; study of the legal status of the real estate object; audit of the technical condition of the real estate object; economic location study of the real estate object; study of the distinctive features of the management of the real estate object.

Conclusions From the point of view of the analysis of housing affordability in the study of the real estate market, the following trends should be noted:

- to study the level of value for real estate objects in order to calculate the average market rental rate by types of real estate;
- to investigate the trends and dynamics of the formation of the real estate market in the region;
- marketing study of the market in the republic in order to establish more effective ways of promoting real estate on the market;
- study the real estate market in order to calculate the price of immovable property according to the market price;

- to study the effectiveness of investing in real estate in order to establish the most profitable investment alternatives.

As an objects of civil law transactions the residential real estate, is increasingly involved in market (purchase and sale, pledge, lease, exchange) and non-market (donation and universal succession, i.e. inheritance) legal relations.

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ASSESSMENT OF WATER RESOURCES OF THE NARYN STATE NATURAL RESERVE AND STATE NATURAL PARK "SALKYN-TOR"

Abstract: This article considers the issues of assessing water resources. Any assessment is associated with the concept of value. The value of resources lies in the fact that the consumer properties of resources as means of production determine the possibility of the existence of various groups and types of assessments. And, therefore, the subject of economic assessment of water resources is their consumer properties. When determining the objective value of resources, incl. and water, socially necessary costs for the protection and reproduction of resources are also taken into account. These methodological approaches are the theoretical basis for determining the objective price of all natural resources in their economic assessment.

Key words: Value of resources, consumer properties of resources, objective price of natural resources, water resources, economic assessment of water resources

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«САЛКЫН-ТӨР» МАМЛЕКЕТТИК ЖАРАТЫЛЫШ ПАРКЫНЫН ЖАНА НАРЫН МАМЛЕКЕТТИК ЖАРАТЫЛЫШ КОРУГУНУН СУУ РЕСУРСТАРЫН БААЛОО

Аннотация: Бул макалада суу ресурстарын баалоо маселелери талкууланат. Ар кандай баа баалуулук түшүнүгү менен байланыштуу. Ресурстардын баалуулугу өндүрүш каражаты катары ресурстардын керектөө касиеттери баалоонун ар кандай топторунун жана түрлөрүнүн бар болуу мүмкүнчүлүгүн аныктоодо. Жана, демек, суу ресурстарына экономикалык баа берүү предмети алардын керектөө касиеттери болуп саналат. Ресурстардын объективдүү баасын аныктоодо, анын ичинде, жана суу, ресурстарды коргоо жана көбөйтүү үчүн социалдык керектүү чыгымдар да эске алынат. Бул методологиялык ыкмалар алардын экономикалык баалоосунда бардык жаратылыш ресурстарынын объективдүү баасын аныктоонун теориялык негизи болуп саналат.

Негизги сөздөр: Ресурстардын баалуулугу, ресурстардын керектөө касиеттери, жаратылыш ресурстарынын объективдүү баасы, суу ресурстары, суу ресурстарына экономикалык баа берүү.

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**ОЦЕНКА ВОДНЫХ РЕСУРСОВ НАРЫНСКОГО ГОСУДАРСТВЕННОГО
ПРИРОДНОГО ЗАПОВЕДНИКА И ГОСУДАРСТВЕННОГО ПРИРОДНОГО
ПАРКА «САЛКЫН-ТОР»**

***Аннотация:** В данной статье рассматриваются вопросы оценки водных ресурсов. Любая оценка связана с понятием ценности. Ценность ресурсов заключается в том, что потребительные свойства ресурсов как средств производства определяет возможность существования различных групп и видов оценок. И, следовательно, предметом экономической оценки водных ресурсов являются их потребительские свойства. При определении объективной ценности ресурсов, в т.ч. и водных, учитываются также общественно-необходимые затраты на охрану и воспроизводство ресурсов. Эти методологические подходы являются теоретической основой определения объективной цены всех природных ресурсов при их экономической оценке.*

***Ключевые слова:** Ценность ресурсов, потребительские свойства ресурсов, объективная цена природных ресурсов, водные ресурсы, экономическая оценка водных ресурсов.*

Protected areas provide a range of ecosystem services. One of the most significant of the many services is the services provided by water resources. Water is an important component of the environment, which is both a limited, renewable and vulnerable natural resource. It also acts as an integral technological component in the production process. At the same time, water resources are a national wealth that is in the exclusive ownership of the state. The use of water resources should be carried out strictly on a legislative basis, which presupposes the development of an appropriate economic, legal and environmental mechanism, assuming their rational use and effective protection.

The experience gained abroad in methodological approaches to the economic assessment of water resources and ecosystem services related to water resources is important for the introduction into the practice of nature management in Kyrgyzstan. The priority in the practice of water resources management remains the interests of natural resource users, rather than maintaining the ecosystem functions of water bodies.

Despite the fact that water is an integral part of human life support, his economic activity, the services of natural aquatic ecosystems from an economic point of view are not taken seriously enough. Therefore, often, like many types of natural resources, they are subject to modification, overexploitation and, as a result, their degradation. Analysis of the ecological state of natural resources and investment projects for the use of natural resources, incl. of aquatic ecosystems shows that most plans for their operation and inversion projects do not include economic impacts on the integrity of ecosystems, on the maintenance and conservation of various ecosystem services.

This is a direct consequence of the lack of economic valuation of ecosystem services in Kyrgyzstan. This assessment is primarily necessary for the rational use, restoration and conservation of the water basin of any region and the inclusion of this issue on the agenda of state bodies. The relevant decision-making authorities (government bodies) take into account only the direct economic benefits from the use of natural resources, often the market value of the products produced. And other benefits that are of no less important value, but do not have a price or value, are not

taken into account. Therefore, when assessing ecosystem services, incl. and water, it is necessary to proceed from the concept of "total economic value", which includes all types of service values.

Water has a consumer value if there is a necessary need, which it, as a natural resource, can satisfy, having a certain set of consumer properties. Ecosystem services related to water are different from other services. Water resources provide the following types of functions:

1. Providing;
2. Regulatory;
3. Cultural;
4. Supportive.

The main **providing** ecosystem services for these ecosystems are water resources used for drinking, household needs and irrigation of crops. Aquatic ecosystems also support economically important products such as wood for fuel and industrial production, plant and animal food, medicinal herbs, and others. Water is also an important source for electricity generation.

The **regulating services** of aquatic ecosystems consist primarily of climate regulation, water and air quality, water self-purification, carbon sequestration, erosion prevention, reclamation and soil filtration, sediment retention and biodiversity support by providing them with habitats, flood prevention, flood and landslide mitigation, pollination of aquatic plants. Various ecosystems are formed around water basins such as forests, pastures, agricultural and wetlands.

Cultural services. For water basins of mountain ecosystems of protected areas, tourism and recreation functions, educational services and scientific value, as well as the aesthetic function of natural objects are also important. Historical monuments, places of pilgrimage, which carry cultural, aesthetic and tourist value, are of particular value. In addition, ecosystems around water basins differ significantly in areas where water resources are formed and in areas of their use.

In the areas of formation and upstream of rivers, the main ecosystem services include mainly regulating and supporting services, while the main ecosystem products (providing services) are provided in the middle reaches and estuaries.

Supporting services. This service is expressed in the following functions: sedimentation, photosynthesis, circulation of substances, maintaining biodiversity, preventing the spread of alien species in the presence of water obstacles, creating a micro- and mesoclimate, maintaining the hydrological regime of the surrounding area, etc.

The issue of price formation for water as a natural resource is still relevant and controversial. There are many methodological approaches to solving water resources assessment. One and the same water source in relation to different consumers has a different level of quality and quality assessment. In other words, its price depends on the direction of use.

Today, as a payment for water as a natural resource in our country, national tariffs set by the government are used. Using the specially protected territories of the Naryn region as the initial data of the objects of our study, we will calculate the cost of ecosystem services related to water resources, taking into account all the functions provided by these resources, leading to significant differences in the forms and mechanisms of payment.

The Naryn State Reserve was first organized in the Naryn region as a state order in accordance with the decision of the executive committee of the Naryn Regional Council of Workers' Deputies dated May 21, 1975 No. 3 on the basis of the Resolution of the Council of Ministers of the Kyrgyz SSR dated December 29, 1972 No. 532. The state reserve was created in accordance with the Laws on Nature Protection of the Kyrgyz SSR in order to preserve and reproduce valuable species of wild animals, plants and to protect rare geological formations. The territory of the reserve at the moment is 105,519 of them: 36160 hectares - a reserved zone, 809 hectares - a maral breeding

nursery, 68550 hectares - a protected zone. The reserve is located on the territory of Naryn and At-Bashinsky districts. The reserve is located from 2060m to 4000m above sea level.

The basis of the hydrographic network of the territory of the reserve is the Naryn River with a number of numerous left-bank tributaries. They originate from the glaciers and snowfields of the high-mountainous zone of the Naryntoo ridge. These include rivers: Iirisuu, Karatash, Kashkasuu, Chetbulak, Baibiche, Bashbulak, Jyrgalbai, Bokbai, Chon-Tepshi, Tepshi, Taldy, Chon-Taldy, Umot, Kashkasuu, Akbai, Ulan. All of them are typically mountainous, relatively short in length (10-15 km), shallow, stony, with a channel width of 0.5 to 1.5 m.

The Naryn River flows in a latitudinal direction from east to west along the northern border of the reserve. The river belongs to the basin of the Syr-Darya river and is a stormy stream with a steep drop, a rocky bed, a winding channel. It flows through narrow

mountain gorges, cluttered with boulders and debris of rocks of moraine origin. The length of the river bed within the reserve is 120 km. The average width of the river ranges from 30 to 40 m, in the area of the city of Naryn it is 45 m. the average speed of the current is 1.46 m / s, the maximum is 4.18 m / s. the average water level in the river is 1.1 m, low water level is 0.5 m, in the leash is 2.5-3.0 m. The main source of food for the river and its tributaries is the glaciers and snowfields of the high-mountain zone. Groundwater and rainfall are less important. The highest water level is observed in the spring and the first half of the summer, the lowest in the autumn-winter period.

On the territory of the reserve there are several small reservoirs (0.4-0.6 hectares) of glacial origin, located in a high-mountainous zone at the sources of small rivers. They are shallow: a saucer of a prominent shape, freezes to the bottom in winter. There are over 70 springs in the reserve. They mainly perform supportive services.

Table 1 - Data for calculating the volume of water resources of the Naryn State Nature Reserve

Name of the river	Basin area in km ²	Average weighted height in m.	Average annual flow rate in m ³ / s	Average flow module in l / s km ²
Big Naryn	5710	3720	47,2	8,27

Calculation of the volume of water resources of the Big Naryn River: Water discharge in the river is 47.2 m³ / sec. Water volume per year: 47.2 x 3600 = 169920 m³ / hour x 24 = 4078080 m³ / day x 365 = 1488499200 m³ / year.

On the territory of the reserve, the big Naryn river is not used for irrigation, but this river is the main source of irrigation water and the basis of energy throughout Central Asia, including in our country.

The setting of water charges is influenced by many critical issues in the field of irrigated agriculture. Factors such as operation and maintenance, reorganization of farms and water user associations, rehabilitation and modernization of systems, increased competition for available water between

other industries and water users have a significant impact on water prices.

To determine the cost of a water resource, we will estimate this volume at 3 tyiyn per 1 m³ in accordance with the Law of the Kyrgyz Republic "On setting tariffs for services for the supply of irrigation water for 1999", which is in effect to this day: 1488499200 x 3 = 44654976 soms. According to our calculations, the annual cost of water in the Bolshoi Naryn River amounted to 44,654,976 soms.

The Salkyn-Tor State Natural Park is located in the central part of the Middle Naryn Valley on the territory of the Naryn District, Naryn Region. The length of the territory, the park from north to south is about 5 km, from east to west 22 km. The total area of the territory

is 10,419.0 hectares, including the forested area of 2316.5 hectares. The State Natural Park "Salkyn-Tor" was created on the basis of the Decree of the Government of the Kyrgyz Republic No. 249 dated May 25, 2001, on an area of 10397.0 hectares in order to preserve in its natural state a typical unique natural complex of the Inner Tien Shan. The natural park is a nature conservation, research and recreational institution, and belongs to the category of specially protected natural areas of the Kyrgyz Republic and represents an important component of the Inner Tien Shan ecosystem.

The hydrogeographic network of the park territory is formed by numerous rivers originating from glaciers and snowfields formed from avalanches of the Naryn-Too ridge. These include rivers and streams: Teke-Sekirik, Alysh, Kur-Sai, Kurgak, Dyubeli, Kuu-Dongoch. All of them are typically mountainous, relatively short in length from 1 to 15 km, shallow, some temporary, rocky channels, 0.5 to 2 m wide. Groundwater rainfall is of lesser importance, the highest water level is observed in spring and first half of summer, the smallest in the autumn-winter period.

On the territory of the park in the tract At-Jailoo, Dyubeli there are reservoirs with an area of about 0.5-1.0 hectares of glacial origin, the reservoirs are not deep, in winter they freeze to the bottom. There are also about 30 springs in the park. Groundwater has good drinking qualities, clean, fresh.

Assessment of water in the Teke-Sekirik river. The Teke-Sekirik stream flows completely into the Naryn River, replenishing the supplies of irrigation water and hydro resources of the republic. It is not used for irrigation of farmland in Naryn and nearby villages. Water consumption in the Teke-Sekirik brook on 08/12/21 - 0.22 m³ / sec. $0.22 \times 3600 = 792$ m³ / hour $\times 24 = 19008$ m³ / day $\times 365 = 6937920$ m³ / year. The volume of water in the Teke-Sekirik brook was 6937920 m³ / year. For its assessment, we also use, as in the previous case, tariffs of 3 tyin per 1 m³ in accordance with the Law of the Kyrgyz Republic "On setting tariffs for services for the supply of

irrigation water for 1999". In accordance with this tariff, the cost of water in the Teke-Sekirik stream is: $6937920 \times 3 = 208138$ soms.

Assessment of water in the river Alysh. The water consumption in the Alysh brook is 0, 24m³ / sec. The volume of water is: $0.24 \text{m}^3 / \text{s} \times 3600 = 8640 \text{m}^3 / \text{hour} \times 24 = 204360 \times 365 = 75860400$ m³ / year. The Alysh stream provides 527 people with clean drinking water to the village of Alysh and a livestock house, as well as lands of 112 hectares in the village of Alysh and 65 hectares in the village of Kenesh with irrigation water during the growing season. The standard consumption of drinking water per person per month is 6.39 m³, then 76.68 m³ of water will be consumed per person per year. Drinking water tariffs in the villages of Naryn oblast are 11.69 soms per person per year [2,ir]. The waters of the r. Alysh provides 527 people. The cost of drinking water was: $527 \times 76.68 \times 11.69 = 472397$ soms.

To estimate the volume of water used in agriculture, we use the tariffs for irrigation water of the State Agency for Water Resources in the Kyrgyz Republic (source: <https://www.water.gov.kg>) in the amount of 6.9 tyin per 1 cubic meter. 204360 m³ is the monthly volume of water. We calculate for the irrigation period the volume of water used in agriculture (2 and 3 quarters or 6 months): $6321700 \times 6 = 37930200$ m³. Irrigation water cost: $37930200 \times 6.9 = 2617184$ soms.

From the volume of water for the remaining 6 months, 37930200 m³, we subtract the volume of water used for drinking: $37930200 - 76.68 = 37930123.32$ m³. This volume is used for agricultural production not only in our republic, but also abroad, as well as in the energy sector of the country. We will also estimate this volume at 3 tyins per 1 m³: $37930123.32 \times 3 = 1137904$ soms. Thus, the cost of water in the Alysh stream is: $472397 + 2617184 + 1137904 = 4227485$ soms.

Assessment of water in the Dobilu river. Water consumption in the Dobilu brook - 0.34m³ / sec. Water volume: $0.34 \times 3600 = 1224 \times 24 = 29376 \times 365 = 10722240$ m³ / year. The Dobilu Stream provides 1610

people and their livestock with clean drinking water, as well as 561 hectares of land during the growing season. The volume of drinking water: $1610 \times 76.68 \times 11.69 = 1443187$ soms. The volume of irrigation water used during the growing season is: $893520 \times 6 = 5361120$ m³. Its cost is: $5,361,120 \times 6.9 = 369,917$ soms.

From the volume of water for six months, we subtract the volume of water used for drinking and find the volume of water that flows into the Naryn River and replenishes the country's water resources: $893520 \times 6 = 5361120 - 76.68 = 5361043.32$ m³. We estimate this volume at the rate of 3 tyiins per 1 m³: $5361043.32 \times 3 = 160831$ soms. The total cost of water in the Dobolu River is: $1443187 + 369917 + 160831 = 1973\ 935$ soms.

There are many small sources of clean drinking water on the territory of the park, which contribute to the preservation of the vital activity of biodiversity, performing a regulatory function. These sources provide drinking water to residents of the Kenesh village in the amount of 645 people. The water is sucked out through the pumps and 2 reservoirs are replenished, each with a capacity of 300 m³. 126 families live in the village. Each family pays 100 soms every month for water. Total for the year the amount of payment for water is $126 \times 100 \times 12 = 151,200$ soms.

According to our calculations, the state natural park "Salkyn-Tor" has water resources in the amount of 6,560,758 soms.

Currently, the development of a market economy in our country, as well as foreign and domestic experience in the use of natural resources, as well as the results of our research, convince us of the urgent need for an economic assessment of water resources and the introduction on this basis of value relations with all its consumers. And, of course, the main problem in this case is to establish the correct approach to the economic assessment of natural resources, including water resources. The results of our research also allow us to conclude that the goals of the economic assessment of water

resources are determined by the ultimate goals of their use. The introduction of an economic assessment of water resources is one of the important and necessary conditions for the preservation of quality and quantity, their careful and rational use, and the transition to a green economy in the present and future.

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SECTION IV. ANIMAL HUSBANDRY

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HERITABILITY AND VARIABILITY OF TRAITS IN COWS DEPENDING ON BREED

Annotation. *The article discusses the issues of heritability and variability of traits in cows, depending on breed. It was revealed that in terms of milk productivity, crossbred animals surpass purebred cows, at the same time, purebred cows have superiority in milk fat content. It has been established that there is a negative relationship between live weight and milk yield, between milk yield and fat content, and, on the contrary, there is a positive relationship between live weight and the amount of milk fat. The authors found that the older the lactation of the cows, the milk yield is better inherited than during the first lactation. Analyzes of the obtained research results confirm the heritability of fatty milk content and milk yield in the offspring of sire bulls obtained with moderate types of mating have a higher heritability coefficient, which must be taken into account in selection and breeding work.*

Keywords. *Milk yield, milk fat, heritability, variability, inbreeding, correlation coefficient.*

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НАСЛЕДУЕМОСТЬ И ИЗМЕНЧИВОСТЬ ПРИЗНАКОВ У КОРОВ В ЗАВИСИМОСТИ ОТ ПОРОДНОСТИ

Аннотация. *В статье рассматриваются вопросы наследуемости и изменчивости признаков у коров в зависимости от породности. Выявлено, что по молочной продуктивности помесные животные превосходят коров чистопородных, вместе с тем у чистопородных коров превосходство по жирности молока. Установлено, что отмечается отрицательная связь между живым весом и коэффициентом молочности, между величиной удоя и жирности молока и, на против существует положительная взаимосвязь между живым весом и количеством молочного жира. Авторами выявлено, что чем старше лактация коров надои молока более лучше наследуется нежели чем за первую лактацию. Анализы полученных результатов исследований подтверждают наследуемость жирномолочности и удоя в потомстве быков-производителей, полученных при умеренных типах спаривания имеют более высокий коэффициент наследуемости, что необходимо учесть при селекционно-племенной работе .*

Ключевые слова. *Удой, жирность молока, наследуемость, изменчивость, инбридинг, коэффициент корреляции.*

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УЙЛАРДАГЫ БЕЛГИЛЕРДИН ТУКУМУНА ЖАРАША ТУКУМ КУУЧУЛУГУ ЖАНА КУБУЛМАЛУУЛУГУ

Аннотация. *Макалада тукумга жараша уйлардагы белгилердин тукум куучулук жана өзгөрмөлүүлүгү маселелери талкууланат. Сүт продуктуулугу боюнча аргындаштырылган малдар таза кандуу уйлардан ашып түшөрү, ошол эле учурда сүттүн майлуулугу боюнча таза кандуу уйлар артыкчылыкка ээ экендиги аныкталды. Тирүүлөй салмак менен сүттүн, сүттүн майлуулугунун ортосунда терс, тескерисинче, тирүүлөй салмак менен сүттүн*

майлуулугунун ортосунда позитивдүү байланыш бар экендиги аныкталды. Авторлор уйлардын лактациясы канчалык улгайса, сүттүн саап алуусу биринчи саанга караганда жакшы тукум куучулука тургандыгын аныкташкан. Алынган изилдөөлөрдүн натыйжаларынын талдоолору орточо жупталуу түрү менен алынган асыл тукум букалардын тукумундагы майлуу сүттүн тукумдуулугун жана сүттүүлүгүн тастыктайт, тукум куучулук коэффициенттери жогору болот, бул селекциялык жана асыл тукум иштеринде эске алынууга тийиш.

Өзөктүү сөздөр. Суттун саандуулугу, суттун майлуулугу, тукум куучулук, езгеруш-тук, инбридингдик, корреляция коэффициенти.

Relevance of the topic. The most important national economic problem of the republic, in connection with the transition to market relations, is the production of high-quality livestock products at the lowest cost.

Cattle breeding in Kyrgyzstan has been and remains one of the most important branches of animal husbandry, which until recently developed quite intensively. Suffice it to say that many advanced farms fed from 4500 to 5000 kg of milk per lactation for each forage cow. Today, the former positions have been lost, although the number of livestock remains approximately at the level of the 90s, productivity has significantly decreased, the live weight of young animals is low in terms of growth periods, the reproductive qualities of animals have deteriorated, and in many farms and peasant farms, purposeful selection and breeding work has practically ceased. In recent years, a lot of cattle breeds of different productivity directions have been imported into the Republic, which also crossed with the Alatau cattle breed, which undoubtedly affected the biological, economically useful and breeding qualities, the knowledge of which is of interest in its further improvement.

As you know, the selection of dairy and beef cattle has its own specific features, therefore, when breeding it, it is necessary to

take into account the presence of difficult-to-combine traits (dairy and meat), which include: the amount of milk yield, the content of fat and protein in milk, the quality of the udder and its suitability for machine milking, weight of animals, early maturity, etc. Until now, their compatibility, variability and interrelation have been insufficiently studied, on which the efficiency of selection largely depends.

Scientific novelty of research. For the first time in the republic, the heritability and variability of traits in cows of the Alatau breed and their hybrids were studied.

Research location. The studies were carried out at the State Pedigree Breeding Plant for Breeding the Alatau breed of cattle "ONITS" KNAU named after K.I. Skryabin.

Research results. Dairy and beef cattle breeding in many zones of the republic was based mainly on the breeding of the domestic breed - the Alatau. It should be noted that in the process of formation, improvement, the Alatau breed was exposed to both positive and negative factors, was influenced by changes in the direction of breeding work.

We have carried out studies to study the heritability and variability of traits in cows of the Alatau breed and their crosses with Schwyz. Table 1 shows data on the productivity of cows, depending on the breed.

Table 1. Comparative indicators of cow productivity

Breed	Productivity				
	Milk yield, kg	% fat	Milk fat, kg	Live weight, kg	Milk content
Alatau	3648	3,82	139,4	526	6,93
Alatau-Swiss crossbreeds	3845	3,77	144,9	552	6,96

From the data in the table it can be seen that in many respects the Alatau-Shvitsy hybrids are superior to their peers, for example, in terms of milk yield by 197 kg and milk fat by 5.5 kg. At the same time, the Alatau breed surpasses its contemporaries in terms of milk fat content by 0.05%.

Next, we studied the relationship of the breeding traits, the data of which are given in table 2.3.

analysis of the data in Table 2 shows that there is a general tendency of negative

relationships between live weight and milk production ratio, between milk yield and milk fat content and, on the contrary, there is a positive relationship between live weight and the amount of milk fat. A deviation from the general trend in the relationship between various breeding traits of combined cattle breeds indicates the absence of strict regularities in the correlation between various traits.

Table 2. The relationship of breeding traits in cows of the Alatau breed

Correlation between	Lactation		
	1	2	3 and older
Live weight and milk production	-0,01+0,10	-0,18+0,10	-0,13+0,06
. Live weight and milk yield	+0,38+0,10	+0,14+0,10	+0,51+0,05
Live weight and kg of milk fat	+0,39+0,16	-0,01+0,10	+0,47+0,01
Milk yield and% fat	-0,12+0,12	-0,02+0,13	+0,12+0,06

Table 3. The relationship of breeding traits in Alatau-Shvitsy crossbreeds

Correlation between	Lactation		
	1	2	. 3 and older
Live weight and milk production	-0,20+0,10	-0,58+0,07	-0,26+0,07
Live weight and milk yield	+0,33+0,09	+0,03+0,10	+0,34+0,07
Live weight and kg of milk fat	+0,26+0,09	+0,07+0,10	+0,31+0,07
Leave and% fat	+0,33+0,09	-,34+0,09	-,11+0,08

With a deep analysis of the materials obtained, presented in tables 2 and 3, it can be concluded that not for all lactations, the data on the relationship between various breeding traits are reliable, therefore there is no doubt about the existence of a strict system in the correlation between individual traits.

In domestic and foreign literature, there are numerous data on the heritability of milk yield and milk fat in cows of various breeds. On average, in most breeds of the dairy

direction of productivity, the heritability coefficient of milk yield is in the range of 0.2-0.3. A number of scientists who have conducted research on heritability note that the heritability of the level of milk production is not something unchanged, and depends on the environment, the level of milk production of the herd, age and other characteristics of the animal's organism. In connection with the above, we studied the heritability of milk yield and fat content of milk in the Alatau breed, the data of which are given in table 4.

Table 4. Heritability of milk yield in Alatau cows for 1-stage lactation

Indicators	Milk yield in 305 days	
	1-lactation (n-58 head)	. 3 and older (n-39 goals)
Correlation coefficient (r)	0.181	0.276
Correlation coefficient error (mr)	0.035	0.043
Heritability (h ²)	0.362	0.552

From the data in the table it can be seen that indicators of milk yield for 3 lactations and older are inherited better than for the first. The fat content of milk, in comparison with the milk yield, is characterized by greater stability, which is confirmed by the data in Table 5.

Table 5. Milk productivity of cows and its variability

Indicators	n	M+m	Coefficient C + mr
Milk per lactation	58	3150+30,3	24,4+0,64
Milk for 3 lactation and over	39	4230+45,8	23,5+0,77
Fat content of milk for 1 lactation	58	3,81+0,01	5,30+0,14
Milk fat for 3 lactation and older	39	3,84+0,01	6,19+0,20

Next, we determined the heritability of fat content in cows' milk, the data of which are given in table 6.

Table 6. Heritability of fat content of milk of cows

Indicators	1 lactation (n-58)	3 lactation and older (n-39)
Correlation coefficient - r	0.115	0.190
Correlation coefficient error (mr)	0.037	0.044
Heritability (h ²)	0.23	0.38

The phenotypic variability of the fat content in milk of cows is several times less than the variability of milk yield. However, this does not mean that the genetic variability of the percentage of fat in milk is how many times less. Numerous studies in the field of variability in the productivity of cows have established that the total variability of the fat content in milk is due to a greater influence of heredity than the heritability of milk yield and ranges from 0.4 to 0.76 for most cattle breeds.

Our research has revealed that milk yield is inherited better than butterfat. This is explained by the fact that for many years of

painstaking work in breeding and improving the Alatau cattle, the selection was mainly aimed at increasing milk yield, rather than milk fat content.

At the same time, we studied the effect of different types of mating on the heritability of individual traits. At the same time, the coefficient of heritability of milk yield and milk fat content in the offspring of 4-inbred sires used in the herd of the farm was calculated as a doubled value of the correlation coefficient between the indicators of mothers and their daughters. The data obtained in this case are shown in table 7.

Table 7. Heritability of milk yield and fat content in milk of daughters of inbred sires

Indicators	Inbreeding degree		
	1-11; 11-11	III-11; III-1Y	1Y-1Y; 1Y-Y
Number of daughters	17	12	14
Including those inbred on the ancestor of the line,%	29	31	52
Milk yield	0,04	0,12	0,26
Fat content of milk	0,13	0,58	0,54

Analyzing the heritability of butterfat and milk yield in the offspring of sires obtained with different types of mating, it can be noted that sires of moderate types of mating have a higher coefficient of heritability.

Based on our research, the following conclusions can be drawn:

1. Selection and breeding work among the cows of the Alatau breed and their crossbreeds with the Swiss on the main traits took place in a different direction, which led to a change in the production types of cows.
2. When breeding and improving the Alatau cattle for many years, the selection was aimed at increasing milk yield, which led to a better heritability of milk yield than butterfat.

3. The great variability of individual traits (milk yield, milk fat content) in the offspring of producers obtained by close inbreeding is caused by the fact that inbreeding was carried out on animals with unstable inclinations, having ancestors in their pedigrees with a large range of productivity.

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SOME ASPECTS OF PRODUCTIVITY AND HEALTH OF SHEEP, ON WINTER PASTURES

Annotation: The scientific article presents the indicators of productive action and some clinical data on the impact on the health of ewes of innovative methods of extending the autumn-winter pasture period in Northern Kazakhstan. In the zone of Northern Kazakhstan, the main source of green fodder is summer natural pastures, but due to the short period of pasture maintenance, the need for its artificial lengthening has matured.

Keywords: sheep, lambs, diet, pastures, frozen food, productivity, growth and development

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НЕКОТОРЫЕ АСПЕКТЫ ПРОДУКТИВНОСТИ И ЗДОРОВЬЯ ОВЦЕМАТОК, НА ЗИМНИХ ПАСТБИЩАХ

Аннотация: В научной статье приведены показатели продуктивного действия и некоторые клинические данные по влиянию на здоровье овцематок инновационных методов продления осенне-зимнего пастбищного периода в условиях Северного Казахстана. В зоне Северного Казахстана основным источником зеленых кормов являются летние естественные пастбища, но в связи коротким периодом пастбищного содержания созрела необходимость его искусственного удлинения.

Ключевые слова: овцематка, ягнята, рацион, пастбища, замороженный корм, продуктивность, рост и развитие.

Cold preservation of plants is a promising means for their preservation and use. However, this issue has been little studied, but one thing is clear that due to the great plasticity of plants to changing environmental conditions, the possibilities of practical use of cold as a preservative are truly unlimited. An increase in the grazing period, as the cheapest and most economical, is made due to the summer sowing of spring rapeseed on the farm plots, with further mowing into windrows with the onset of stable cold weather in the second half of October. The article provides an

approximate diet for feeding the broodstock of sheep, as well as methods for grazing and feeding frozen green mass. A review of the literature on the use of scientifically grounded, low-cost technologies that combine biological characteristics, adaptive capabilities of sheep to natural-climatic and forage resources in the area of their breeding is given. One of the tasks of the research carried out in 2018-2019 in the Atameken peasant farm of the Burabay district of the Akmola region within the framework of the PCF of the Ministry of Agriculture of the Republic of Kazakhstan was to study the

effect of frozen by natural cold green feed on the reproductive ability of ewes, their milk production, as well as the safety of lambs up to skips and 12 months. Analysis of the data obtained showed that the diet received by the experimental group did not have a negative effect on the reproductive ability of ewes. In the compared groups, there was no difference in the number of cases of reproductive disorders during the lambing period. The positive effect of frozen food on the safety of lambs was noted, which is explained by the greater milkiness of the queens. So, the ewes of the experimental group in the first month of lactation had a higher milk yield by 160 g or 10.9%. Some of the studied clinical parameters of ewes of both the experimental and control groups, with a slight difference, were within the physiological norm. At the same time, the study of these parameters made it possible to establish that the frequency of respiration and pulse in the experimental group was lower by 2.8 ($P < 0.05$) and 2.4 units than in the group of control animals, which is apparently associated with the processes of thermoregulation. animals.

The efficiency and competitiveness of sheep breeding are determined by a number of factors, the leading place among which is the selective improvement of breeds, the rational use of genetic resources, the use of scientifically grounded low-cost technologies that combine biological characteristics, adaptive capabilities of sheep, natural-climatic and fodder resources in the breeding zone.

A number of modern studies are devoted to the development of technological methods that provide a reduction in material costs and at the same time allow an increase in the yield of sheep-raising products, to improve its quality [1,2]. (Aboneev V.V., 2012; Zarytovsky V.S. et al. 1990;).

One of the technological methods influencing the quantity and quality of sheep breeding products is the improvement of natural and the creation of cultural pastures. More than half of the total increase in live weight of cattle and sheep, as well as wool,

is obtained on pasture fodder around the world.

Grazing by animals is the most economical, modern and efficient way of continuous and continuous process of converting crop resources into animal products.

Improving the feeding system, which should be based on a deeper knowledge of the basics of sheep nutrition, can play the greatest role in increasing the productivity of animals. Therefore, when feeding animals, it is necessary to take into account not only the amount of given feed, but also the quality, which can significantly affect the level of balanced rations.

Under the existing system of keeping sheep, their rations in the winter period consist mainly of roughage, coarse-stemmed hay, straw and a small amount of concentrated feed. The use of these feeds in their natural form leads to large losses, and their distribution to animals is difficult to mechanize. This leads, firstly, to the irrational use of roughage, since the consumption of straw does not exceed 40% and additionally part of the roughage in the form of scraps goes to waste; secondly, it leads to a decrease in labor productivity due to unnecessary transportation, additional costs of manual labor, repetition of the same operations for feeding different fodders.

In the zone of Northern Kazakhstan, the main source of green fodder is summer natural pastures, but due to the short period of pasture maintenance, the need for its artificial lengthening has ripened.

Cold preservation of plants is a promising means for their preservation and use. However, the issue has been little studied, but one thing is clear that due to the great plasticity of plants to changing environmental conditions, the possibilities of practical use of cold as a preservative are truly unlimited.

So, according to some reports, green fodder is biologically valuable also in that only they contain chlorophyll, which is necessary for animals for the intensive work of the hematopoietic organs. The body of an animal is able to accumulate chlorophyll and

then use it sparingly. However, if animals for a long time (5-6 months) do not receive food with the presence of chlorophyll, or at least the products of its decay, then according to GG Belehov [3], the body is weakened and exposed to various diseases.

Particular importance in providing animals with green food should be given in the late autumn and winter periods, when animals, due to their absence, receive relatively less nutrients than in summer.

In sheep breeding, the level of feeding of queens is carried out taking into account the needs of their body in the amount and types of feed in different physiological periods of life, based on the established feeding norms. Therefore, in order to get high productivity from animals in Table 1. Ewes feeding diet

The name of the feed and the content of the diet	Groups of queens	
	Control	Experienced
Grain – grass hay, kg	1,0	0,5
Corn silage, kg	3,0	=
Frozen green mass, kg	=	4,5
Barley shit, kg	0,5	0,5
Table salt, g	19	19
The diet contains:		
Feed units, kg	1,62	1,62
Digestible protein, g	130	139

To equalize the diet, the experimental queens were additionally fed with hay and concentrates. Usually, ewes were fed before pasture, so that the frozen mass was not eaten on an empty stomach. The animals were grazed for two months with the onset of persistent cold weather and were subsequently fed from copen.

For accurate and objective accounting of productivity indicators, conformation and other data, the experimental and control groups of sheep were selected according to the method of analogues (by live weight, phenotype, wool cut, age), which were marked with special marks.

SI Novopashina, Yu.D. Kvitko, M.Yu. Sannikov and others [4] note that adequate feeding plays an important role in maintaining good health and high productivity of animals. More efficient use

accordance with their genetic potential, it is necessary to provide them with a complete, balanced feeding.

It was in this direction that scientific research was carried out on the influence of artificial autumn-winter pastures on the health and productivity of ewes and their offspring. Summer crops of spring rape with the onset of stable cold weather (the second half of October) were mowed into swaths and left under the snow for further feeding to the sheep. To study the productive effect of frozen food, two groups of ewes were formed, the control one - receiving the traditional feeding ration and the experimental one - the green mass of spring rape preserved by natural cold (table 1).

of dietary nutrients, including protein, is confirmed by high productivity, reproductive capacity and milk production of queens.

Fertility of queens depends on many factors, the main of which are breed, age, fatness, timing of estrus and lambing [5].

In this regard, one of the tasks of our own research was to study the effect of green food frozen by natural cold on the reproductive ability of ewes, their milk production, as well as the safety of lambs before beating and 12 months.

Analysis of the data obtained shows that the diet received by the experimental group did not have a negative effect on the reproductive ability of ewes (table 2). In the compared groups, there was no difference in the number of cases of reproductive disorders during the lambing period.

Table 2. Reproductive capacity of queens and safety of lambs

Indicator	Group	
	control	experienced
Inseminated queens, naked	100	112
Hugged queens, naked: including normally aborted stillbirths	96	110
	94	108
	-	2
	2	-
Remained yalov, goal	4	2
Fertility per 100 embracing queens, %	135,4	134,5
Received lambs total, goal	130	148
Safety of lambs from birth to beating, goal.	124	142
Safety of lambs from birth to beating, %	95,4	95,9
Safety of lambs from birth to 12 months, goal	110	128
Safety of lambs from birth to 12 months., %	84,6	86,5

Analyzing the data in Table 2, it can be noted that the fertilization of queens within the groups varied from 96 to 98.2%. In turn, this indicator in the experimental group compared to the control group was 2.2% higher. But, in terms of fertility per 100 embracing queens, the experimental group was inferior to the control group I uterus by 0.9%.

Thus, we have not revealed a negative effect of frozen feed on the reproductive ability of queens.

It is known that the reproductive ability of animals is not limited only to fertility. Profitable management of the industry is possible only with high preservation of young animals (M.F. Ivanov, 1949, V.A. Moroz, 2015) [6, 9].

E.A. Kuleshova [7] dealt with the problem of increasing the productivity and viability of young animals in the first days of life. According to the author, this is largely due to the conditions of feeding and maintenance.

The safety of young animals is one of the most important economic indicators of reproduction. It is estimated as the percentage of animals preserved by a certain age from the number available at the beginning of the accounting period. In practice, safety is taken into account from birth to beating.

The animals of the experimental group outperformed the peers of the control group

in terms of safety before beating by 0.5%, and by the age of 12 months this indicator was 1.9% higher, which can be attributed to the increased milk content of ewes whose lambs consumed more nutrients with milk, which affected the resistance of the resulting young and the percentage of its safety. This is evidenced by the research of N.D. Chistyakov, I.N. Bronnikov, V.I. Chavrenko and others. [8] who found that with an increase in the milk content of ewes, more nutrients and minerals are released with milk, which affects the growth and development of lambs.

In the future, groups of queens and offspring were kept in the same flock by lambing, which provided them with equal conditions of maintenance and feeding. The method of keeping queens and lambs before entering the pasture is kosher-basic, with lambs entering the pasture after being beaten at the age of 4 months, they were in the same flock.

The milk of sheep in the first one and a half to two months of the lambs' life serves as the main source of energy. Therefore, the growth and development of lambs depends on the milk content of the queens. This is especially important when growing two or more lambs under the uterus. The dairy productivity of sheep has a high genetic and phenotypic variability. The peak of milk productivity falls on 20-30 days after lambing. It is very important to assess the

milk production of queens to determine the increase in the live weight of lambs before weaning, making regular weighing (Moroz V.A. et al., 2015) [9].

V.V. Mungin [10] revealed that optimization of queen diets contributes to an increase in the fertility of queens by 13.4%, lactation of lactating individuals by 14.5% ($P < 0.01$), an increase in fat and protein in milk by 0.22% and 0.18%, the amount of polyunsaturated acids by 32.2% ($P < 0.05$).

In the first days of life, lambs feed on their mother's milk, so the mother's milk has a great direct impact on the growth and

development of lambs in the first month of life. The milk production of queens is determined by the growth of lambs in the first month of their life. Lambs spend from 4.5 to 6 kg of mother's milk per 1 kg of growth, therefore, for each breed of the herd, it is necessary to determine its own level of milk consumption for the growth of lambs.

We tend to explain the positive effect of frozen food on the safety of lambs by the greater milk content of queens. Thus, the sheep of the experimental group in the first month of lactation had a higher milk content of 160 g or 10.9% (Table 3).

Table 3. Live weight gain of lambs and milk production of queens.

Indicator	Group	
	control	experienced
Live weight of lambs aged, kg:		
at birth	4,2±0,01	4,3±0,01
1 month	12,9±0,53	14,1±0,37*
4 months	24,9±0,41	26,4±0,39*
Live weight gain of lambs in 4 months:		
absolute, kg	20,7±0,31	22,1±0,3
relative, %	497,1±0,35	514,0±0,4
average daily, g	173,1±3,97	183,9±4,0
Average daily lactation of queens in 1 month of lactation, g	1466,7±93,2	1626,7±59,2

* - $P < 0,05$

Apparently, this provided a significantly high increase in the live weight of lambs in the first month of life by 1.2 kg or 9.3% ($P < 0.05$). The best provision of young animals in the early period of ontogenesis with mother's milk had a positive effect on the dynamics of the live weight of lambs until the moment of their culling. By this period, they were 1.5 kg or 6.0% ($P < 0.05$) heavier than their peers from the control group due to 6.2% larger average daily gains.

Since adaptation is based on the ability of body systems to respond to paratypical factors by changing productivity, as well as the intensity of physiological and biochemical parameters (L.N.Skorykh, 2012) [11], to assess the effectiveness of technological techniques and justification, we conducted studies that allowed us to identify the degree of adaptation of sheep to

the environment, to study their physiological and biochemical parameters in terms of their ability to fully realize their hereditary potential.

The second half of the pregnancy of ewes and especially the last month, when the most intensive growth of the fetus occurs, also has a certain effect on physiological and biochemical processes.

In this regard, the study of the effect of frozen green feed on the physiological, biochemical and clinical parameters of sheep and their offspring seems relevant.

The studied parameters were within the physiological norm. At the same time, the study of these parameters allowed us to establish that the respiratory rate and pulse rate in the experimental group were 2.8 ($P < 0.05$) and 2.4 units less than in the control animal group (Table 4).

Table 4. Clinical indicators of pregnant queens (n=10).

Indicator	Group	
	control	experienced
Body temperature, °C	39,3±0,04	39,7±0,05
Respiratory rate, min.	29,5±0,75	26,7±0,69*
Pulse rate, min.	78,4±1,73	76,0±0,82

Note: * $P < 0,05$

The observed phenomenon seems to be related to thermoregulation processes: experienced animals performed fewer respiratory movements to maintain optimal body temperature and remove excess heat, and at the same time, respectively, the pulse rate was lower.

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SECTION IV. MECHANIZATION

UDC 518+636.32/38:619:576.89

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**USING A HELIACOLLECTOR TO MAINTAIN THE TEMPERATURE REGIME OF
ACARICIDAL FLUID**

Annotation. *In this article, a mathematical description of the processes, changes in temperature, mass and concentration of acaricidal emulsion in the process of bathing sheep in a bath is carried out for the purpose of therapeutic and prophylactic treatment against ectoparasites. Using the energy balance equations, equations for changing the temperature of the working fluid in the bath are obtained, and the time for which the maximum allowable temperature of the working fluid is reached is determined. Dependences, changes in the mass and concentration of acaricide of the working emulsion on the number of treated sheep, depending on the length of the wool, were obtained for different values of the volume of the bath. To optimize the processes occurring in the working emulsion when bathing sheep, according to the above equations, a program was created that makes it possible to carry out the corresponding calculations on a computer.*

Key words: *sheep bathing bath, working emulsion, wool length, number of sheep, balance controls, acaricidal substance, ectoparasites.*

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**ИСПОЛЬЗОВАНИЕ ГЕЛИОКОЛЛЕКТОРА ДЛЯ ПОДДЕРЖАНИЯ
ТЕМПЕРАТУРНОГО РЕЖИМА АКАРИЦИДНОЙ ЖИДКОСТИ**

Аннотация: *В данной статье, выполнено математическое описание процессов, изменения температуры, массы и концентрации акарицидной эмульсии в процессе купания овец в ванне. Используя уравнения баланса энергии получены зависимости изменения температуры рабочей жидкости в ванне, определено время, за которое достигается максимально, допустимое значение температуры рабочей жидкости. Получены зависимости, изменения массы и концентрации акарицида рабочей эмульсии от количества обработанных овец в зависимости от длины шерсти при разных значениях объема ванны.*

Ключевые слова: *ванна для купания овец, рабочая эмульсия, длина шерсти, количество овец, уравнения баланса, акарицидное вещество, эктопаразиты.*

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**АКАРИЦИДДИК СУЙУКТУКТУН ТЕМПЕРАТУРАЛЫК РЕЖИМИН САКТОО
ҮЧҮН ГЕЛИОКОЛЛЕКТОРДУ КОЛДОНУУ**

Аннотация. *Бул макалада койлорду ваннага салуу процессиндеги температуранын, массасынын жана акарициддик эмульсия концентрациясынын өзгөрүшүнүн математикалык мүнөздөмөсү берилген. Энергия балансынын теңдемелерин колдонуу менен ваннадагы жумушчу суюктуктун температурасынын өзгөрүшүнүн көз карандылыктары алынат жана жумушчу суюктуктун максималдуу уруксат берилген температурасына жеткен убакыт аныкталат. Жундун узундугуна жараша иштетилген койлордун санына коз карандылык, жумушчу эмульсиянын акарицидинин массасынын*

жана концентрациясынын өзгөрүшү ваннанын келемунун ар кандай маанилери учун алынган.

Негизги сөздөр: *койлорду купкалоо үчүн ванна, жумушчу эмульсия, жүн узундугу, койдун саны, баланстык теңдеме, акарициддик зат, эктопаразиттер.*

Introduction

In the sheep-household economies of Kyrgyzstan, therapeutic and prophylactic treatment of sheep against ectoparasites is carried out by bathing them in special baths filled with an acaricidal emulsion. This method provides sufficiently high-quality treatments due to the complete penetration of the emulsion to the skin under the action of hydrodynamic pressure [1]. The use of a heliacollector to maintain the temperature regime of the acaricidal fluid in the bath in the sheep bathing meets the requirements of autonomization energy saving.

It is known that the body temperature of the treated sheep is 38 ° C, and the temperature of the working fluid in the bath should not exceed 200C ± 10C (when using the neocidol preparation). Stable preservation of the temperature of the working emulsion in the bath during the bathing of sheep within 190C ... 210C is an important factor, since at a temperature of the working emulsion above 210C grease is washed off from the wool of the sheep, where acaricidal substances are fixed providing disease prevention [1].

An increase in the temperature of the working emulsion in the bath during bathing of sheep from t0 to t occurs due to the thermal energy of the processed sheep.

Research methods and results

From the energy balance it is possible to write the equation for the temperature change of the working emulsion in the bath as follows [2]:

$$\frac{dt}{d\tau} = \frac{NKS(t_{\text{овец}} - t_{\text{ванна}})}{\rho LDhc}, \quad (1)$$

where N is the number of treated sheep; K - coefficient of heat transfer from the skin of a sheep, J / Km²; S is the total area of the skin surface of the sheep, m²; t_{овец} - sheep temperature, ° K; t_{бath} - temperature of the working emulsion in the bath, ° K; ρ is the density of the working emulsion, kg / m³; L - bath length, m; D - bath width, m; h - bath height, m; c is the heat capacity of the working emulsion, kg / J °K.

Equation (1) is valid for the condition when the process of bathing sheep occurs continuously.

Let us introduce the following notation:

$$\begin{cases} y = t_{\text{овец}} - t_{\text{ванна}}; \\ A = \frac{NKS}{\rho LDhc}. \end{cases} \quad (2)$$

Then equation (1) will take the following form:

$$\frac{dy}{d\tau} - Ay = 0. \quad (3)$$

MECHANIZATION

If at the initial moment the temperature of the working emulsion in the bath is equal to $t(0) = t_{\text{bath}}$, then the solution of equation (3) describes the change in the temperature of the working emulsion in the bath:

$$y = e^{A\tau} C . \quad (4)$$

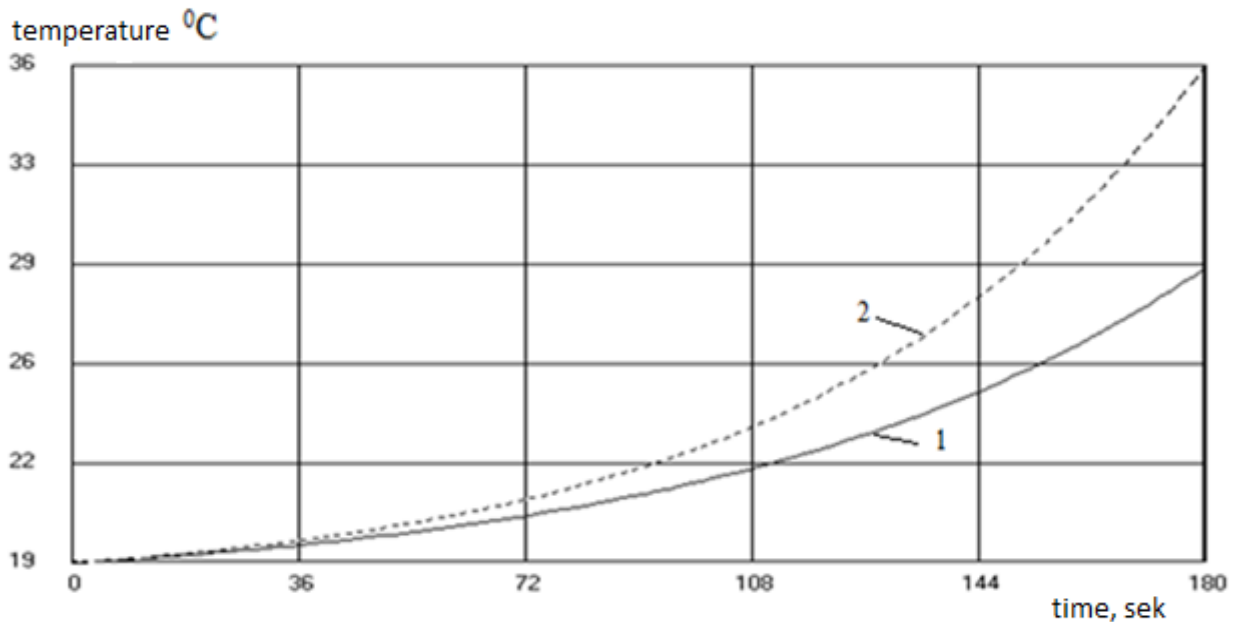
When the temperature of the working emulsion in the bath reaches the temperature t using equations (1), (3) and (4), it is possible to determine the temperature rise of the working fluid in the bath during bathing of the sheep

$$t - t_{\text{ванна}} = e^{A\tau} C \quad \text{или} \quad t = t_{\text{ванна}} + \exp\left[\frac{NKS\tau}{\rho LDhc}\right] C . \quad (5)$$

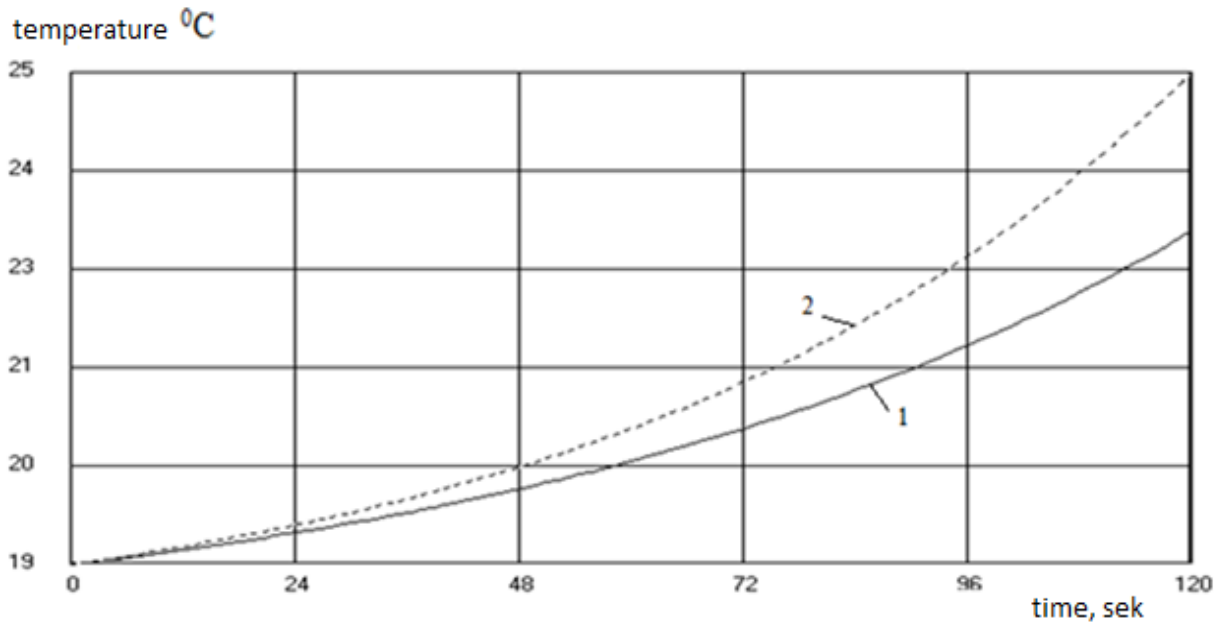
Since when bathing sheep, the maximum permissible temperature of the working emulsion should not exceed 21°C , it is possible to determine the time during which this temperature value is reached

$$\tau = \frac{\ln(t - t_{\text{ванна}}) \rho LDhc}{NKS} . \quad (6)$$

Changes in the temperature of the working emulsion in the process of bathing sheep with different mass of liquid and the number of sheep are shown in Figures 1 and 2.



Rice. 1. Change in the temperature of the working emulsion in the bath during the bathing of sheep: ($V_1 = 5000$ liters. 1- the number of sheep is 3, 2-the number of sheep is 5).



Rice. 2. Change in the temperature of the working fluid in the bath during the bathing of sheep: ($V = 6000$ l., 1- the number of sheep is 3, 2-the number of sheep is 5).

Thus, in the process of bathing the sheep, a gradual increase in temperature is observed due to heat transfer from the sheep's body to the liquid. The more sheep there are in the bath, the more intense the heat transfer takes place. With an increase in the mass of liquid in the bath, the temperature rise slows down.

The use of a solar collector in a cup installation is provided on days when the ambient temperature is + (10-150C) and below. At the same time, the heat transfer from the sheep's body to the liquid is not enough to maintain the optimal temperature of the working fluid equal to + 210C.

When bathing sheep, their wool impregnates a certain part of the liquid, which leads to the consumption of the working emulsion and a decrease in the concentration of the acaricidal substance in it. These indicators are directly proportional to the area of wool, skin of the sheep and the total number of treated sheep. If the initial mass of the working emulsion in the bath is V_0 . After bathing N sheep, this mass V_0 decreases by volume V and an additional volume V_{add} is required, that is,

$$V = V_0 - V_{\text{don}}. \tag{7}$$

In a differentiated form, the change in the flow rate of the working emulsion V has the form [3]:

$$dV = kSl dN, \tag{8}$$

where k is the coefficient of consumption of the emulsion for wool saturation; S is the area of the sheep's wool, m^2 ; l is the length of the sheep's wool, m .

Integrating equation (8) we get:

$$\int_0^{V_{\text{don}}} dV = kSl \int_0^N dN. \tag{9}$$

MECHANIZATION

If for the additional volume V_{adm} of the working fluid, $1/i$ part of the total volume of the fluid is required, then the flow rate of the additional volume can be determined:

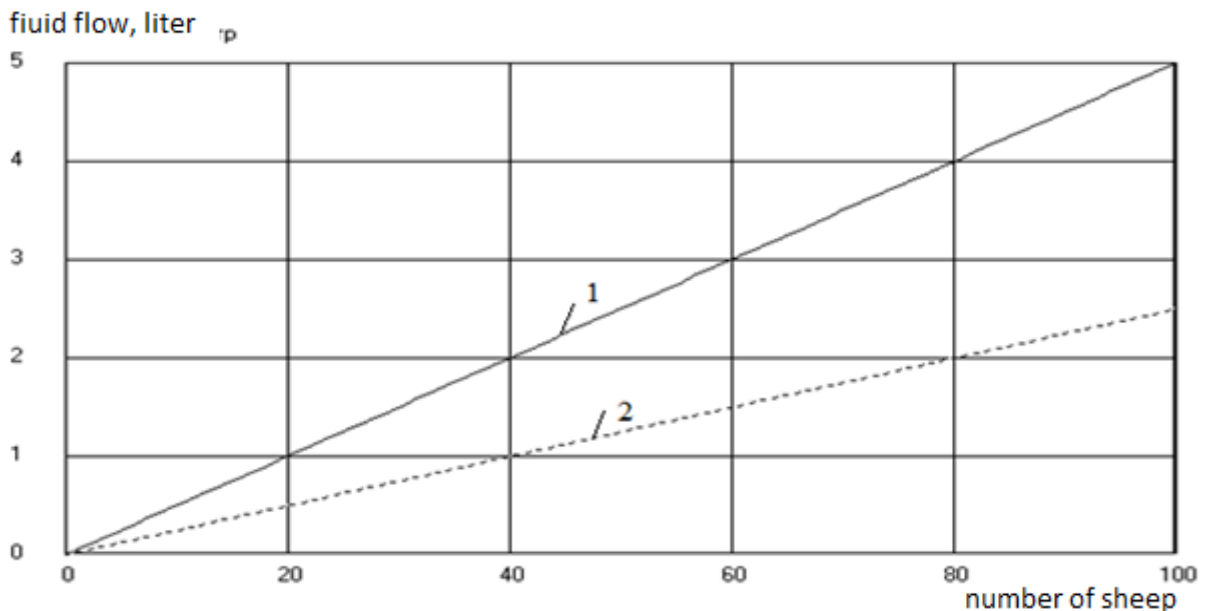
$$\int_0^{V_0/i} dV = kSl \int_0^N dN. \quad (10)$$

The value of i is determined from the ratio: $i = \frac{V_{don}}{V_0}$.

From equation (10), you can determine the number of treated sheep after which it is necessary to refuel the bath:

$$N = \frac{iV_0}{kSl} \quad (11)$$

The dependence of the change in fluid consumption on the number of sheep ($V = f(N)$) at different values of the wool length (Figure 3) show that the length of the wool of the working sheep has a significant effect on the fluid consumption in the bath.



Rice. 3. Dependence of the change in fluid consumption on the number of sheep at different values of the wool length: 1- $\ell = 8\text{mm}$; 2- $\ell = 4\text{mm}$.

The decrease in the concentration of acaricidal substance (neocidol) in baths when bathing sheep was studied experimentally. Samples of the emulsion for analysis were taken after treatment every 50 adult sheep. To refuel the bath with a refueling solution, a special device was used, the design of which is protected by copyright certificate No. 1477399 [4].

When studying the content of neocidol in the working fluid when refueling the bath using this device, it was noted that in the operating mode the concentration of acaricide remains within the values recommended by the instructions (0.05 - 0.06% for neocidol). The refueling dose of acaricidal substance depends on the length of sheep wool and is 5.27 ... 5.35 ml / head for neocidol (with a wool length of 4 mm), 12.4

... 13.3 ml / head (with a wool length of 20 mm).

Conclusions

1. It has been established that in the process of bathing sheep in a bath, the temperature of the working emulsion gradually increases due to heat transfer from the sheep's body to the liquid. The intensity of the temperature rise depends on the number of sheep and the amount of liquid in the bath.

2. A mathematical description has been made to determine the time for which the maximum permissible temperature in the working emulsion is reached, taking into account the geometric parameters of the bath, the density of the working emulsion and the number of sheep simultaneously in the liquid.

3. The use of a solar collector to maintain the optimum temperature of the working emulsion is provided at an ambient temperature of + (10-150C) and below.

4. The proposed device for refueling the bath with refueling solutions, which in the operating mode ensures the preservation of the concentration of acaricide in the working fluid within the values recommended by the instructions.

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SECTION V. ECONOMY

UDC 339.13:637.12

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**ANALYSIS OF THE FUNCTIONING OF THE MILK AND DAIRY PRODUCTS
MARKET OF THE KYRGYZ REPUBLIC**

Abstract. *The article discusses the functioning and development of the country's milk and dairy products market. Within the framework of this study, an analysis was made of the dynamics of the production of milk and its processing products, exports, and the number and productivity of cows. The contribution of various categories of farms to the receipt of raw milk has been studied. Problems in milk production have been identified. Along with this, measures were proposed to further increase the competitiveness of the dairy products produced.*

Key words: *Market of milk and dairy products, production, processing, animal husbandry, productivity, export.*

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**АНАЛИЗ ФУНКЦИОНИРОВАНИЯ РЫНКА МОЛОКА И МОЛОЧНОЙ
ПРОДУКЦИИ КЫРГЫЗСКОЙ РЕСПУБЛИКИ**

Аннотация. *В статье была рассмотрены функционирование и развитие рынка молока и молочных продуктов страны. В рамках настоящего исследования был проведен анализ динамики объемов производства молока и продуктов его переработки, экспорта и поголовья и продуктивности коров. Изучен вклад различных категорий хозяйств при получении сырого молока. Выявлены проблемы в производстве молока. Наряду с этим были предложены меры по дальнейшему повышению конкурентоспособности производимой молочной продукции.*

Ключевые слова: *Рынок молока и молочной продукции, производство, переработка, животноводство, продуктивность, экспорт*

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**КЫРГЫЗ РЕСПУБЛИКАСЫНДА СҮТ ЖАНА СҮТ ПРОДУКЦИЯЛАРЫНЫН
РЫНОГУНУН ИШИН ТАЛДОО**

Аннотация. *Макалада өлкөнүн сүт жана сүт азыктары рыногунун иштеши жана өнүгүшү талкууланат. Бул изилдөөнүн алкагында сүт жана аны кайра иштетүү продуктуларын өндүрүү динамикасына, экспортко, уйлардын санына жана продуктуулугуна талдоо жүргүзүлгөн. Чийки сутту алууга чарбалардын ар турдуу категорияларынын кошкон салымы изилденген. Сүт өндүрүүдөгү проблемалар аныкталды. Муну менен катар өндүрүлгөн сүт азыктарынын атаандаштыкка жөндөмдүүлүгүн мындан ары жогорулатуу боюнча чаралар сунушталды.*

Өзөктүү сөздөр: *Сүт жана сүт азыктарынын рыногу, өндүрүү, кайра иштетүү, мал чарбачылыгы, продуктуулук, экспорт.*

The milk and dairy products market is undoubtedly one of the most important food markets for our country. Milk and dairy products are among the most essential foods in the diet of every person. But it is also a source of income for many households in the economy. According to the National Statistical Committee of the Kyrgyz Republic (hereinafter referred to as NSC KR), 49.7% of milk is produced in personal subsidiary farms of citizens. It should be noted that milk is the main raw material for the dairy industry.

Thus, the production of milk, the consumption of unconditionally high-quality and affordable milk is one of the main tasks of socio-economic importance.

Its functioning is conditioned by both general market laws and patterns, and its specific features, conditions of product formation. The efficiency of market development primarily depends on the level of the state of dairy cattle breeding [1].

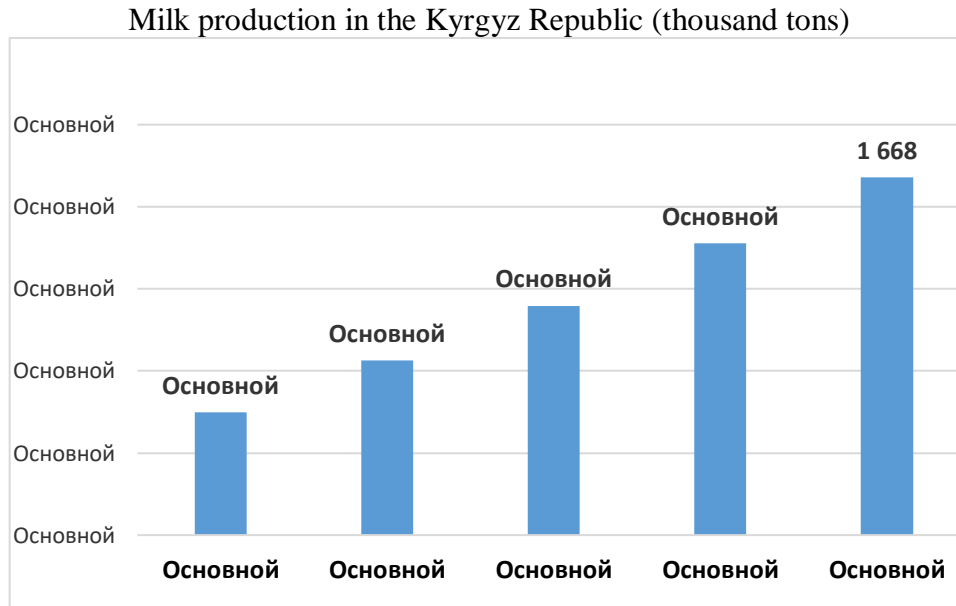
The share of livestock in the agricultural sector of Kyrgyzstan is high and amounts to

47.1%, with dairy farming following meat production and accounting for 32.5% of all agricultural production.

The annual milk production in Kyrgyzstan is approximately 1.5-1.6 million tons (Fig. 1) of each 2.5% is used for industrial processing. In 2020, 1668.0 thousand tons of milk were produced. The increase in milk production in 2020 compared to 2019 by 2.4% is due to an increase in the number of cows by 2.3% or by 19,780 heads and a slight increase in milk yield per cow. The average annual milk yield per cow in 2020 was 2006 kg, in 2019 - 2004 kg. As the analysis of statistical data has shown, there is an increase in the number of cows in Kyrgyzstan, but their productivity, despite not significant growth, leaves much to be desired. Since, in comparison with a similar indicator among the countries of the EAEU, for example, with Belarus and with Russia, the average milk yield in the republic is 2.1-2.5 times lower.

Among the EAEU countries, Belarus has the highest milk yields per cow - 4,943 kg.

Figure 1



Source: compiled according to the data of the NSC KR, coll. Kyrgyzstan in Figures 2021 page 219 [2].

Due to the natural and economic conditions and the peculiarities of population settlement in the regions of the republic, the main zones of milk production in Kyrgyzstan are not evenly located. There are significant differences between individual regions in terms of gross milk production (Table 1)

Table 1.

Milk production by regions of the Kyrgyz Republic
(in farms of all categories, thousand tons.)

	2015	2016	2017	2018	2019	2019 in % by 2015
Batken region	96,3	96,3	96,6	100,5	103,9	107,8
Jalal-Abad region	311,2	318,5	329,2	329,2	337,3	108,3
Issyk-Kul region	208,6	218,5	223,7	232,1	238,8	114,4
Naryn region	120,4	123,3	124,7	126,7	129,7	107,7
Osh region	299,6	310,5	317,7	323,4	329,3	109,9
Talas region	76,2	76,2	76,2	75,2	75,6	99,2
Chui region	373,3	388,1	398,8	402,4	413,2	110,6
Total for the republic	1 481,1	1 524,6	1 556,2	1 589,7	1 627,8	109,9

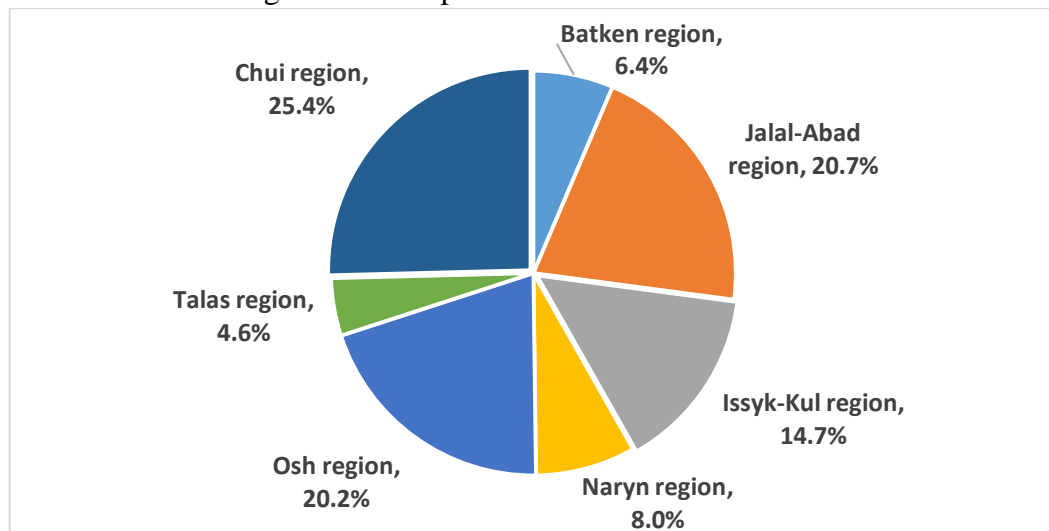
Source: compiled according to the data of the NSC KR, coll. "Agriculture of the Kyrgyz Republic" 2020 [5].

Analysis of milk production in the context of regions of the country for the period 2015-2019 shows growth in all regions, except for the Talas region where the gross milk yield decreased by 0.8%. And the largest increase in milk production is noted in such regions as Issyk-Kul, Chui by 14.4% 10.6%, as well as Osh, Jalal-Abad and Batken regions by 9.9%, 8.3% and 7.8 % respectively.

The largest producers are stay the producers of the Chui, Jalal-Abad and Osh regions. Their share in 2019 accounted for 66.3% of the gross milk production in the republic. (fig. 2). Chui oblast is characterized by the highest level of development of dairy farming in Kyrgyzstan. The region consists of 8 districts, each of which has developed milk production.

Figure 2

The share of regions in milk production to the total volume of 2019 in%



Source: compiled according to the data of the NSC KR, coll. "Agriculture of the Kyrgyz Republic" 2020 [5].

In Kyrgyzstan, the main milk producers are peasant farms and personal subsidiary plots of citizens. (tab. 2)

In gross milk production, the share of peasant (farm) households slightly increased (49.5% in 2015 to 49.8% in 2019) and subsidiary farms over the same period increased from 49.5 to 49.7%. State and collective farms do not play a significant role in milk production: their share is only 0.4% in 2019.

Table 2.

Gross milk production by categories of farms in the Kyrgyz Republic, thousand tons

	2015	2016	2017	2018	2019	2019 in % by 2015	Share of farms to total volume,%
Gross production, incl.	1 481,1	1 524,6	1 556,2	1 589,7	1 627,8	109,9	100
State farms	0,3	0,3	0,3	0,2	0,1	33,3	-
Collective farms	12,1	10,2	9,3	9,0	6,8	56,1	0,4
Peasant (farm) farms	734,4	752,6	782,6	799,5	810,7	110,3	49,8
Personal subsidiary plots of citizens	734,3	761,6	764,0	781,0	810,2	110,3	49,7

Source: compiled according to the data of the NSC KR, coll. "Agriculture of the Kyrgyz Republic" 2020 [5].

The specificity of the country's dairy market is as follows: short shelf life of primary products (milk), the universal nature of its use; the ubiquitous nature of the production, processing and sale of dairy products and the priorities of local markets [3].

The dairy industry is one of the most important and dynamically developing industries in the processing sector of the country's economy. The dairy industry accounts for over 20% of all food products. Dairy processing in the Kyrgyz Republic, according to statistical data, represents 144 milk processing enterprises and more than 300 private producers of dairy products [4]. Most of the milk processing enterprises are located in the Chui region and in the city of Bishkek, where they account for about 60-70% of the total volume. This year milk processing enterprises of the country were produced: butter of all types - 5621.1 tons, cheeses of all types, including processed - 3628.9 tons, processed liquid milk - 40471.0 tons, milk and cream in solid forms - 6265,7 tons, ice cream - 5066.6 tons. From 2015 to 2019, the production of butter of all types in the republic increased by 2.6 times, cheeses

of all types, including processed cheese - 0.3%, processed liquid milk - 28%, ice cream - 57.4%.

Dairy products are not only consumed in the domestic market, but also exported to neighboring countries. Exports of milk and dairy products of the Kyrgyz Republic are shown in Table 3.

In 2020, compared to 2016, the total volume of exports of dairy products doubled and reached almost 35 thousand tons for a total of \$ 46 million. Currently, such basic dairy products as butter (37% of the commodity volume), cheese and cottage cheese (21%), condensed and dry milk and cream (17%), as well as non-condensed milk and cream (13%) and fermented milk products (about 11%). Basically, dairy products were exported to Kazakhstan, where in 2020 products were delivered for \$ 24.1 million, which is more than 52% of the total export of these products, as well as to Russia (for \$ 21 million, or about 46%). Also, dairy products are supplied to countries such as Uzbekistan (for \$ 705 thousand) and Tajikistan (for \$ 217 thousand), [6].

Export of milk and dairy products of the Kyrgyz Republic

Years	Total	of which by main partner countries			
		Kazakhstan	Russia	Uzbekistan	Tajikistan
One thousand dollars					
2016	22 610,2	10 862,5	11 717,5	-	29,4
2017	33 971,1	20 922,6	12 965,5	0,2	78,0
2018	31 663,4	15 875,5	14 889,9	596,8	286,0
2019	45 404,1	16 057,0	28 889,7	298,5	143,6
2020	46 086,7	24 084,0	21 043,4	704,5	217,1
Percentage of the previous year					
2016	83,2	46,4	-	-	2,0
2017	150,2	192,6	110,7	-	265,3
2018	93,2	75,9	114,8	-	366,7
2019	143,4	101,1	194,0	50,0	50,2
2020	101,5	150,0	72,8	236,0	151,2

Source: data of the NSC KR [6].

Analysis of the milk and dairy products market in Kyrgyzstan over the past five years has shown that there is a positive growth trend in such indicators as milk production, an increase in the number of cows, and the export of dairy products. In the future, there are great opportunities to increase these indicators. But for this it is necessary to eliminate a number of basic problems, which are noted by many researchers of the problems of the development of the milk market in Kyrgyzstan. These problems are:

- small-scale production;
- low quality of raw materials and finished products;
- lack of feed;
- weak level of breeding;
- unstable epizootic situation;
- unwillingness of young specialists to work in production [5].

The lack of raw materials for processing is due to the fact that the main milk producers are small farms with 2-3 dairy cows. Most of the small producers started dairy farming on the plots obtained after the collapse of the USSR, and still do not have the basic technology. It is difficult to produce consistent volumes and maintain quality for these manufacturers.

The quality of milk is the great importance, since milk and dairy products are in demand by all segments of the population. Milk is supplied for processing from households whose production technology, in fact, cannot provide high quality.

It is important to observe the hygiene of raw milk from milking to processing, removing impurities, controlling the temperature and sterilization time. Most of the problems with dairy products in Kyrgyzstan are associated with milking. This is due to a lack of knowledge regarding hygiene and quality

control. The quality of raw milk is especially important for improving the quality of dairy products and ensuring food safety in the republic.

Milk collection is carried out by intermediaries who formed the raw milk procurement market in the middle of the 1990. There are no statistics because there is no network for the purchase of milk from agricultural producers to milk processors. Nobody could evaluate this market. Only according to the observation of some researchers of the milk market, intermediaries have 20-30 percent of the final price.

In order to maintain a stable sale of dairy products, Kyrgyzstan needs to increase the competitiveness of its dairy products in the market, to carry out selection and breeding work in the field of dairy cattle breeding.

Also, work to improve the image of dairy products of Kyrgyzstan in exported countries, since our dairy products are inexpensive and natural. For this, it is necessary to build a system for the production of dairy products, from milking to the production of final products that would meet strict standards. This will change the image of a natural products and make it with high quality and affordable.

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**MATHEMATICAL MODEL OF THE TASK OF OPTIMIZING
THE PRODUCTION AND PROCESSING OF LIVESTOCK PRODUCTS**

Abstract: *The article presents a developed mathematical model and algorithm for solving the problem of optimization of production and processing of livestock products, where the optimal volume of produced and processed products and the corresponding amount of investment (credit) received by the farm to create an enterprise for processing these products are determined.*

Key words: *mathematic model, optimization of production, livestock products, investment, farming.*

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**МАТЕМАТИЧЕСКАЯ МОДЕЛЬ ЗАДАЧИ ОПТИМИЗАЦИИ ПРОИЗВОДСТВА И
ПЕРЕРАБОТКИ ПРОДУКЦИИ ЖИВОТНОВОДСТВА**

Аннотация: *В статье разработана математическая модель и алгоритм решения задачи оптимизации производства и переработки продукции животноводства, где определяется оптимальный объем производимой и перерабатываемой продукции и соответствующий объем инвестиции (кредита), получаемой хозяйством для создания предприятия по переработке этой продукции.*

Ключевые слова: *математическая модель, оптимизация производства, продукция животноводства, инвестиции, хозяйство*

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**МАЛ ЧАРБА ПРОДУКЦИЯЛАРЫН ДАЯРДООНУ ЖАНА ИШТЕТҮҮНҮ
ОПТИМАЛДАШТЫРУУ МАСЕЛЕЛЕРИНИН МАТЕМАТИКАЛЫК МОДЕЛИ**

Аннотация: *Макалада мал чарба продуктыларын өндүрүүнү жана кайра иштетүүнү оптималдаштыруу маселесин чечүүнүн математикалык модели жана алгоритми иштелип чыккан, мында өндүрүлгөн жана кайра иштетилген продукциянын оптималдуу көлөмү жана чарба тарабынан бул продуктыларды кайра иштетүүчү ишканалары түзүү үчүн алынган инвестициянын (кредиттин) тиешелүү көлөмү аныкталат.*

Негизги сөздөр: *математикалык модель, өндүрүштү оптималдаштыруу, мал чарба продуктылары, инвестиция, чарба.*

Introduction This article describes the benefits of applying the mathematical model in detail and calculation method of the considered problem of choosing the optimal variant of development of the economy. On the basis of mathematical modeling of production processes the reserves and ways

to increase the quality and efficiency of agricultural production are revealed.

Problem statement and mathematical model

Let a livestock farm that has crops of different categories (irrigated, rainfed, etc.) in the amount of s_k , $k \in K$ plans to develop its

activity. There is ample opportunity for the farm to produce agricultural products, depending on the chosen development option , $r \in R$. Since livestock products (meat, milk, etc.) produced by the farm are part of perishable products, they need timely processing. In this connection the farm plans to create a small enterprise for processing of livestock products. To create a small enterprise, the farm needs to obtain investment (credit). The amount of investment (credit) received by the farm depends on the capacity of the processing enterprise being created, and also the processing capacity, in turn, is directly

related to the chosen development option of the farm and depends on the volume of livestock products being produced.

Depending on the chosen option for the development of $r \in R$ will be determined by the number of keeping animals of different directions (dairy, meat, etc.) and the allotted acreage for forage crops $s_k^r (s_k^r = s_k)$, $k \in K$, $r \in R$.

It is required to determine the best option for the development of the economy and the appropriate amount of investment (credit) so that the profit from the production, processing and sale of products will be the maximum [4].

Methods

The mathematical model of the task can be represented as follows.

$$\sum_{v \in V_0} (d_v - c_v) z_v + \sum_{r \in R} (\Delta_l^r - (c^r + \Delta_0^r)) y^r \rightarrow \max \quad (1)$$

under the conditions

$$\sum_{r \in R} (a_j^r - \bar{a}_j^r) y^r = \sum_{v \in V} x_{jv}, \quad j \in J^*, \quad (2)$$

$$\sum_{j \in J^*} \frac{1}{a_{jv}} x_{jv} = z_v, \quad v \in V, \quad (3)$$

$$\sum_{r \in R} k^r y^r \leq G, \quad (4)$$

$$\sum_{r \in R} y^r = 1, \quad (5)$$

$$y^r \in \{0,1\}, \quad r \in R, \quad (6)$$

where $\Delta_0^r = \sum_{j \in J_0} \sum_{k \in K} c_{jk}^r \bar{x}_{jk}^r$, $\Delta_l^r = \sum_{j \in J_0} c_j \bar{y}_j^r$, $r \in R$, (7)

and $\{\bar{x}_{jk}^r\}$, $\{\bar{y}_j^r\}$, $r \in R$ - optimal solutions for the task

$$L(y, r) = \sum_{j \in J_0} c_j y_j^r - \sum_{k \in K} \sum_{j \in J_0} c_{jk}^r x_{jk}^r \rightarrow \max, \quad r \in R \quad (8)$$

under the conditions

$$\sum_{j \in J_0} x_{jk}^r = s_k^r, \quad k \in K, \quad r \in R, \quad (9)$$

$$\sum_{k \in K} a_{jk}^r x_{jk}^r = v_j^r \geq b_j^r, \quad j \in J_0, \quad r \in R, \quad (10)$$

$$v_j^r - b_j^r = y_j^r, \quad j \in J_0, \quad r \in R, \quad (11)$$

$$x_{jk}^r \geq 0, \quad j \in J_0, \quad k \in K, \quad r \in R, \quad (12)$$

$$y_j^r \geq 0, \quad j \in J_0, \quad r \in R, \quad (13)$$

where j - index of the type of agricultural products which produced by the farm, $j \in J$ and J - multitude of indices of the type of agricultural products of the farm, $J = \{1, 2, \dots, n\}$.

Consider the multitude J as a union of two non-intersecting subsets $J = J^* \cup J_0$, $J^* \cap J_0 = \emptyset$.

J_0 - many types of crop products for animal feed, $j \in J_0$;

J^* - many types of livestock products intended for processing $j \in J^*$;

v - finished product type index after processing $v \in V$;

V - many types of products after processing $V = \{1, 2, \dots, v\}$.

The known parameters:

s_k^r - the size of the k - category of crop area used by the farm under the r - development option (for any development option $r \in R$ the farm prefers to use the sown area of all categories completely, i.e. $s_k^r = s_k$), $k \in K, r \in R$;

a_{jk}^r - yield of j - category crop on k - category sown area under r - variant of farm development $j \in J_0, k \in K, r \in R$;

b_j^r - annual demand of the farm for the j -type of crop production used for animal feed under the r - development option, $j \in J_0, r \in R$;

where $b_j^r = \sum_{l \in L} a_{jl}^r D_l^r$, $j \in J_0, r \in R$, a_{jl}^r – annual requirement for j - type of agricultural products per animal, according to the l - daily ration feeding according to r - variant of development of the farm, $j \in J_0, l \in L, r \in R$;

D_l^r – the number of animals kept on the l - daily feed ration by r - variant of development, $l \in L, r \in R$;

c_j – the wholesale price of j - type of crop production, $j \in J_0$,

c_{jk}^r – expenditures per unit size of k - category of sown area under j - type of crop in the farm, $j \in J_0, k \in K, r \in R$;

a_j^r – the volume of livestock production of the j - kind for the r - option of farm development, where $a_j^r = \sum_{l \in L} \theta_{jl}^r D_l^r$, $j \in J^*, r \in R$; [1]

θ_{jl}^r – annual production of the j - species obtained from one animal according to the l - daily feed ration for the r - farm development option, $j \in J_0, l \in L, r \in R$;

a_{jv} – the rate of consumption of the j - type of livestock products for the v - type of finished products, $j \in J^*, v \in V$;

k^r – the size (credit) used to create a processing plant by the farm under the r - development option, $r \in R$;

c^r – total costs of livestock production for the r - development option, $r \in R$;

d_v, c_v – price of sales and consumption per unit volume of the v - type of the farm's finished products, $v \in V$;

G – the maximum allowable amount of investment (credit) received by the farm for the development of the farm (for the establishment of a processing plant);

Δ_0^r – total expenditures of the farm for crop production according to the r - development option, $r \in R$;

Δ_1^r – income received by the farm from the sale of crop production under the r - development option, $r \in R$;

The required variables:

x_{iv} – volume of livestock products of the j - kind, directed to the production of the v - kind of finished products, $j \in J^*, v \in V$;

x_{jk}^r – the size of the k -category sown area under the j - category crop for the r - option of farm development, $j \in J_0, k \in K, r \in R$;

v_j^r – production volume of j - type of crop production under r - development option development option, $j \in J_0, r \in R$;

y_j^r – the volume of sales of the j - type of crop production for r - development option, $j \in J_0, r \in R$;

z_v – the volume of finished products of the v - kind to be sold by the farm, $v \in V$;

y^r – Boolean variable, taking value 0 or 1, defining the variant of farm development, $r \in R$;

The target function (1) determines the maximum net income of the farm from the production and processing of agricultural products;

Constraint (2) requires that the volume of livestock production of each species, excluding that used for internal farm needs, must be allocated for production to each type of finished produced product;

Constraint (3) determines the volume of sold finished products for each type;

Constraint (4) requires that the amount of investment (credit) received by a farm to create an enterprise for processing livestock products must not exceed the maximum capacity of the farm;

Equality (5) indicates that the farm must choose only one development option;

Condition (6) is a Boolean variable taking value 0 or 1, (7) requires nonnegativity of the variables sought.

The target function (8) defines the net income from the production and sale of crop production, except for the products used for the internal needs of the farm;

Constraint (9) requires that the acreage of all categories of the farm be fully utilized for crop production;

Constraint (10) requires that the amount of agricultural production on the farm must be no less than the amount the farm needs internally, i.e., for feed.

Equality (11) shows the amount of crop production sold for each species;

Conditions (12) and (13) require nonnegativity of variables.

Research results

The calculations begin by determining the value of the parameters $b_j^r, j \in J_0, r \in R, a_j^r, j \in J^*, r \in R$. Using the known data $s_k^r, k \in K, r \in R, a_{jk}^r, c_{jk}^r, j \in J_0, k \in K, r \in R, c_j, j \in J_0$ we will make a numerical model of the problem according to (8)-(13). Solving the problem for each option of the farm development $r \in R$, we will define the optimal plans of sowing of areas under each kind of crops $\{\bar{x}_{jk}^r, j \in J_0, k \in K, r \in R, \}$ and the corresponding production volumes for each type $\{\bar{v}_j^r, j \in J_0, r \in R, \}$, and as well as the volume of sold crop products $\{\bar{y}_j^r, j \in J_0, r \in R, \}$ and the total expenditure and income of the farm from the sale of crop production, respectively, i.e. $\{\Delta_0^r, \Delta_l^r, r \in R, \}$. [4]

Next, let's formulate a numerical model of the form (1)-(7), using the known data $a_{jv}, j \in J^*, v \in V, a_j^r, \bar{a}_j^r, j \in J^*, r \in R, d_v, c_v, v \in V, k^r, \Delta_0^r, \Delta_l^r, c^r, G$. [5]

From the solution of the formulated numerical model of the form (1) - (7) we define the effective variant of development and the appropriate size (credit), which provides the farm with the maximum total profit from of production, processing and sale of agricultural products, that is we define the optimal plan $\{\bar{y}^r, r \in R\}$ and the corresponding values of the required variables $\{\bar{x}_{jk}^r, y_j^r, j \in J_0, k \in K, r \in R, z_v, v \in V\}$. The algorithm of the calculation ends [4].

Conclusions

Using a mathematical model, the economic entity determines the effective option for the development of their economy and the amount of credit received, delivering maximum net income to the economy.

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INCREASING PRODUCTIVITY AND QUALITY OF AGRICULTURAL PRODUCTION IN THE CONTEXT OF DIGITALIZATION

Abstract: *The article considers digital agriculture as a new direction, which is particularly interesting because, in addition to increasing the productivity of industries, it directly contributes to the state's ability to ensure the country's food security and increase the competitiveness of its food exports. Digital agriculture creates a powerful potential for stimulating economic growth, increasing incomes and improving the quality of life of the rural population by increasing the efficiency of agricultural production.*

Key words: *Agricultural production, production resources, production quality, sustainable development, food security, digital technology.*

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ПОВЫШЕНИЕ ПРОИЗВОДИТЕЛЬНОСТИ И КАЧЕСТВА ПРОИЗВОДСТВА СЕЛЬСКОХОЗЯЙСТВЕННОЙ ПРОДУКЦИИ В УСЛОВИЯХ ЦИФРОВИЗАЦИИ

Аннотация: *В статье рассматривается цифровое сельское хозяйство, как новое направление которое, помимо повышения производительности отраслей, оно непосредственно способствует возможности государства обеспечить продовольственную безопасность страны и рост конкурентоспособности ее продовольственного экспорта. Цифровое сельское хозяйство создает мощный потенциал для стимулирования экономического роста, повышения уровня доходов и улучшения качества жизни сельского населения за счет повышения эффективности сельскохозяйственного производства.*

Ключевые слова: *Сельскохозяйственное производство, производственные ресурсы, качество производства, устойчивое развитие, продовольственная безопасность, цифровая технология.*

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САНАРИПТЕШТИРҮҮ ШАРТЫНДА АЙЫЛ ЧАРБА ПРОДУКЦИЯЛАРЫН ӨНДҮРҮҮНҮН САПАТЫН ЖАНА ӨНДҮРҮҮМДҮЛҮГҮН ЖОГОРУЛАТУУ

Аннотация: *Санариптик айыл чарбасы – бул өзгөчө актуалдуу жаңы багыт, анткени ал тармактардын өндүрүмдүүлүгүн жогорулатуудан тышкары, өлкөнүн азык-түлүк коопсуздугун камсыздоо мүмкүнчүлүгүнө жана анын азык-түлүк экспортунун атаандаштыкка жөндөмдүүлүгүнүн өсүшүнө түздөн-түз салым кошот. Санариптик айыл чарбасы эффективдүү айыл чарба өндүрүшү аркылуу экономикалык өсүштү стимулдаштыруу, киреше деңгээлин жогорулатуу жана элет элинин жашоо сапатын жакшыртуу үчүн кубаттуу потенциалды түзөт.*

Негизги сөздөр: *Айыл чарба өндүрүшү, өндүрүш ресурстары, өндүрүштүн сапаты, туруктуу өнүгүү, азык-түлүк коопсуздугу, санариптик технология.*

Introduction. This article describes the issues of orientation of the economy to the innovative way of development, the creation of a regional innovation system based on digitalization, which are becoming increasingly relevant. It is necessary to take into account that information processes are important elements of complex production, economic and social transformations. The development of digital technology will determine the country's competitiveness at the global level. The transition to a digital economy is seen as a key driver of economic growth. Agricultural specialists of the future will need systemic thinking, advanced organizational skills, and IT knowledge. Farmers have to think like innovative entrepreneurs and be able to apply the new technological solutions that increase the efficiency of their farms. The introduction of digital technologies in agriculture opens a wide way for the efficient use of the labor, the material and the financial resources. All this will further increase the production of high-quality agricultural products and better meet the growing needs of the population with the limited use of society's resources.

The process of development of digital agriculture, requires the significant structural, production and personnel transformation at all levels. The introduction of IT must take place everywhere. The government should assume the role of investor for solving this problem.

Problem statement. Today there are 7.97 billion people living on Earth, The UN predicts that by 2050 it could increase to 9 billion people [9]. As the world's population increases in the following years, the food requirement will increase. Currently, the number of people suffering from hunger in the world has reached up to 800 million. If

humanity is not to face global hunger, the agriculture industry will have to meet some major challenges.

It is known that the expansion of agricultural production can lead to soil erosion, degradation of pastures, contamination of water bodies due to the application of fertilizers or plant protection products, as well as an increase in air emissions of polluting substances.

At the same time, in order to its multidimensional applicability, digital transformation provides the basis for sustainable development in the case of a simultaneous increase in productivity in the production process. This argument is not only valid for the production process, but also for further processing: based on the acquisition and processing of data, valuable up-to-date information can be fed into the production process and used to optimize it accordingly.

Agriculture is the most important sector of Kyrgyzstan's economy, the development of which is of key importance for the entire economy. In 2020, the share of agriculture, forestry and fisheries in GDP was 13.5%. [10] Agriculture employs 20% of all employed citizens, and 66% of the country's total population live in rural areas. The poverty rate of the rural population in the Kyrgyz Republic in 2019 was 23.2%, significantly higher than the poverty rate of the urban population (14.7%) [11].

Agriculture and the agro-industrial sector are key sectors of Kyrgyzstan's economy, which employs the majority of the country's able-bodied population. However, the agro-industrial sector of Kyrgyzstan does not provide food security for all basic foodstuffs, as agricultural production develops mainly in an extensive way, there is a low productivity in livestock farming and a low yield in crop

production. Modern innovative technologies in agriculture are introduced at a relatively slow pace, since most farmers cannot afford agro-innovations due to their high cost. The process of integration of agricultural producers is also slow.

As of January 1, 2021 there are about 855.0 thousand heads of breeding stock of cattle in the republic, the specific weight of breed animals in the republic is 40-45% of the total livestock.

At the same time with a steady increase in the number of cattle the productive quality of bred animals is very low. In the last three years, the average milk yield per cow in the country was about 2000 liters, whereas in 1990 it was 3070 liters accordingly [12].

Great strides in the digital development of agriculture will be made through the use of high-tech methods to control and regulate the various stages of the production cycle and preparation for agricultural work. New high-tech methods improve the quality of farm animals and plant crops used in the food industry, crops and raw materials, and preserve soil fertility. Agricultural innovations cover all stages of the production cycle and can significantly reduce losses.

The agricultural sector offers a unique platform - "Smart Farm", contributing to the active development of the agricultural sector. The essence of this platform is fully automated production, requiring a minimum of human resources. This platform independently evaluates and analyzes production data, calculates more efficient methods of work taking into account the economic situation in the market, and increases the efficiency of all sectors of agriculture. Artificial intelligence makes administrative decisions, increases soil fertility, animal productivity, independently selects selective crops, fertilizers, selects parental pairs in animal breeding, monitors climate change, creates optimal conditions

for efficient production, taking into account all factors affecting productivity, contributes to the improvement of crop and livestock production quality.

Methods. A literature review in the field of digitalization of agriculture was conducted, the results of surveys, reports and policy briefs on the evaluation of digital transformation were studied.

Research results. The problem of stabilization of animal breeding and transition to sustainable growth of production are closely connected with new technologies of breeding and selection of farm animals. Management of genetic potential in modern conditions should be carried out with the use of breeding profile ACS, providing centralized and the most complete processing of information.

In breeding work, there is experience in the use of various software products. Farms in Europe and Russia use the software - ARMS (Automated workstation of the breeder), which includes reference books, card index, boning, queries, statistics, and reproduction. In addition to standard zootechnical tasks, such as primary accounting and appraisal, the estimation of population genetic parameters of bulls, lines, and interlinear crops is performed. In breeding control, determination of genetic superiority, selection of parental pairs taking into account blood parameters, etc. are carried out. At present, digital technologies are being widely implemented, which allow for the development of fast-acting software packages with the possibility of modification and improvement. In this period, there is an opportunity to create unified centers for the accumulation and additional processing of information.

The purpose of creating and maintaining a unified database of cattle of dairy direction on productive and genetic indicators is the organization of pedigree accounting of cows,

specifically: development and introduction of electronic pedigree card of cows and bulls, creation of database for sustainable pedigree work with dairy cows.

The use of software programs providing comprehensive evaluation and selection by exterior and productivity, calculation of breeding and genetic parameters, developed in relation to the needs of gene pool breeds ensure the solution of breeding problems, implementation of promising directions of increasing genetic potential and preservation of cattle breeds.

As known, at present, in order to improve the breed composition and increase milk productivity of highly productive animals in the Kyrgyz Republic the importation of highly productive breeding cattle of foreign selection is carried out. However, there is no unified information base where data on the breeding qualities of these animals could be included.

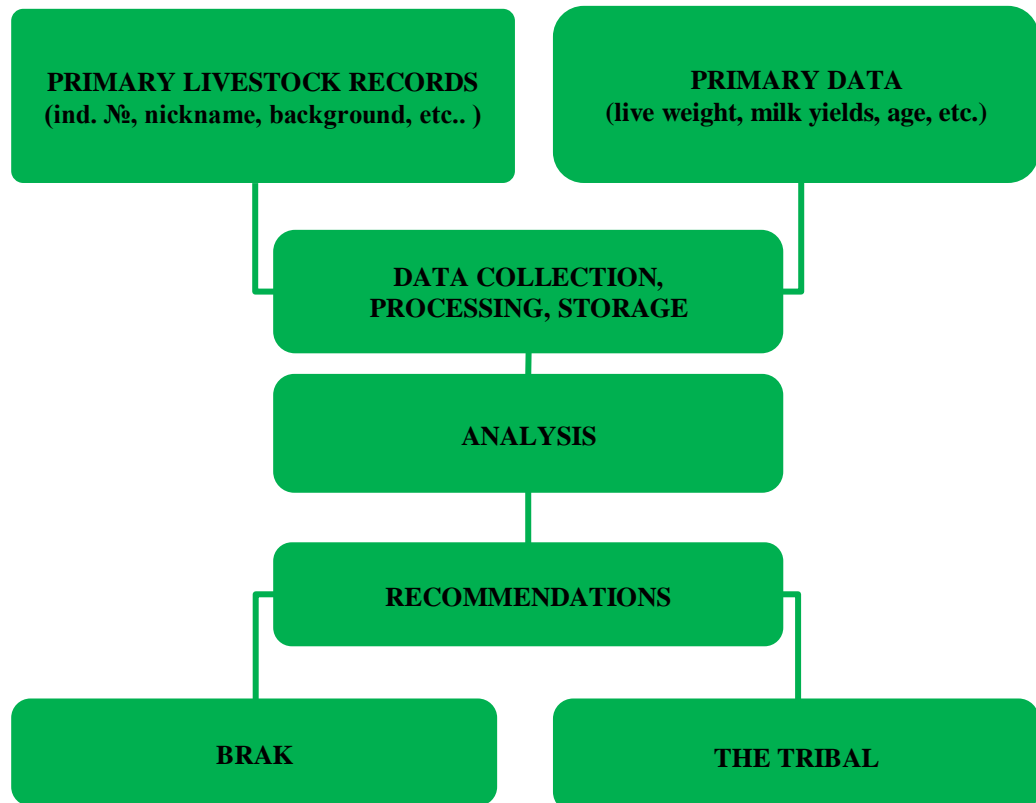
It should be noted that many CIS farms have software products for on-farm accounting.

Breeding work with dairy cattle should be the main means of increasing their productivity.

There is a module that allows importing data from SELEX system (developer - Plinor, St. Petersburg), which is used by many dairy farms. The program "SELEX" allows to create a closed cycle of processing information on cattle on a farm.

In developed countries, agricultural software development is a major industry in the information technology industry.

Domestic scientists face the task of preserving and improving the productive and breeding qualities of imported and local cattle. Along with the technology of feeding and animal housing, it is necessary to determine the evaluation of breeding value of cows, because their further improvement requires the use of advanced methods of evaluation by genotype using modern methods of breeding with digital technology. Along with the introduction of digital technology in the field of breeding, the rule of record keeping in breeding livestock should be defined (Picture 1).



Picture 1. Primary accounting algorithm, Farmer №1 (developed by the authors)

Livestock accounting is one of the main and necessary measures in carrying out work on breeding work and accounting of animal productivity. Livestock accounting is based on documents (timely entries in the documents), which is divided into primary accounting and final accounting.

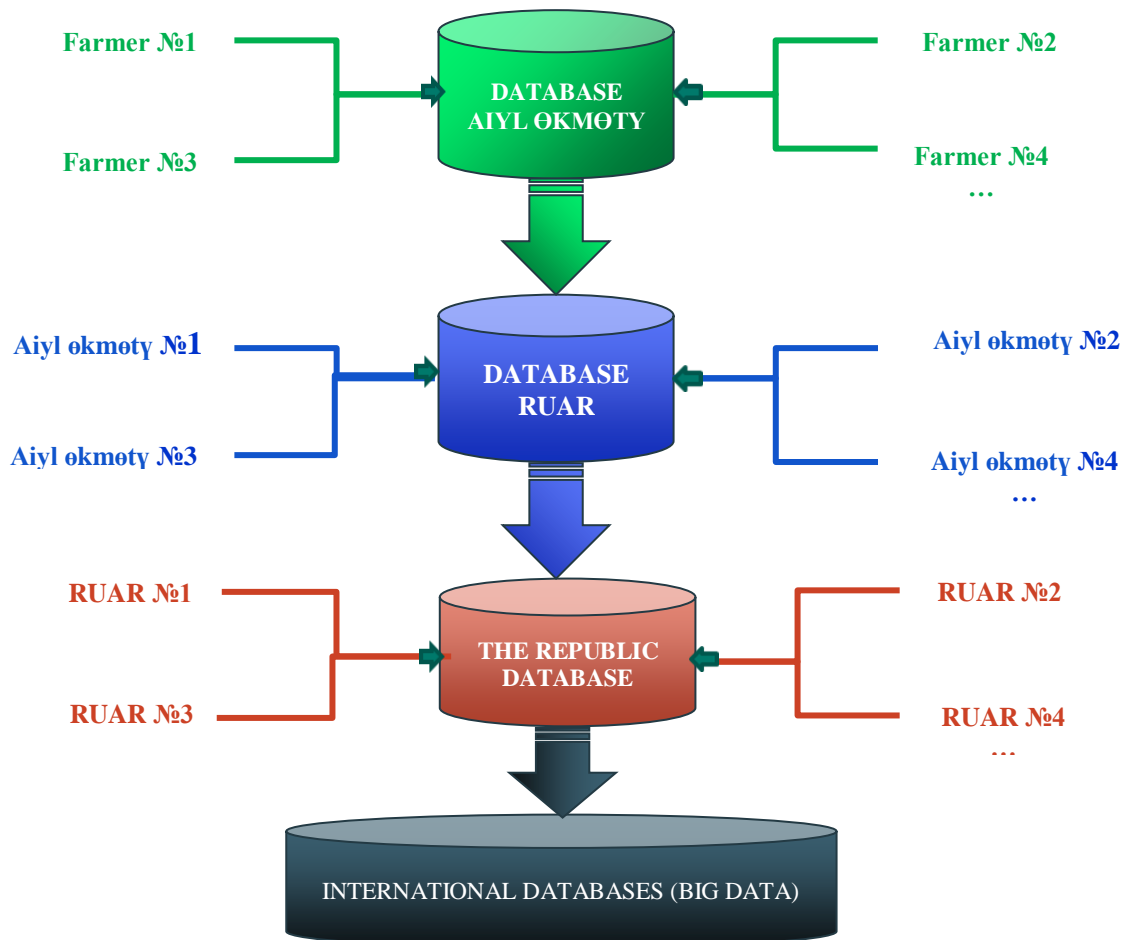
The procedure for keeping an accounting system in breeding livestock shall be established by the state executive body exercising powers in the field of breeding livestock.

Data recording shall be carried out by means of primary accounting and reporting forms;

- keeping of records in livestock breeding shall be carried out with mandatory identification of animals on the basis of a unified principle of coding and assignment of an identification number and with the use of an automated information system (software).

- software used in livestock breeding for selection and breeding work shall be registered in the prescribed manner, have a certificate confirming compliance with the requirements.

- the data generated by the software must be integrated into a unified database system (picture 2):



Picture 2. Information flow diagram (developed by the authors).

*RUAR - District Department of Agrarian Development.

The main arguments in support of digitalization of agricultural production are the need to fulfill the following problematic tasks:

- increasing the quantity and quality of crops and animal productivity;

- minimization of capital investment;

- reducing labor intensity and increasing productivity of agricultural production;
- reducing the harmful effects on the environment;
- reducing dependence on the human factor in agriculture and yield deviation.

According to experts, the introduction of digital technology in agriculture can reduce costs by about 23% when implementing a comprehensive approach.

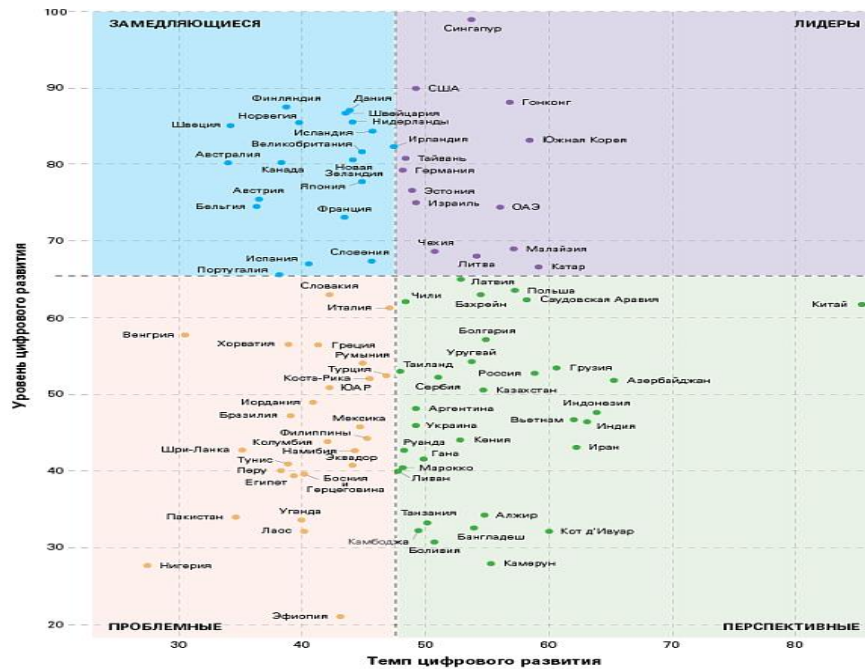
Thus, the digitalization of breeding work in livestock will allow:

- logically complete the identification of livestock, which began 2-3 years ago in Kyrgyzstan;

- create information databases on breeding animals;
- farmers and farms breeding cattle - to sell animals with a breeding card;
- unsystematic selection of parental pairs (inbreeding) will be excluded.

Also, the digital transformation is designed to solve a wide range of tasks in the field of automation of breeding accounting, centralization of accumulated data on the productivity of cattle, through the creation of a central database.

Digital Evolution - Current Status and Speed: a 12-year rating from 2008 to 2019. "Map" divides economies into four zones: leaders, slowing down, promising and problematic.



Источник: Digital Planet. Шюле Флетчера при Университете Тафтса: Mastercard

In the Eurasian area the direction of digital agriculture is still at an early stage of development, most countries do not have national strategies in this area, but according to FAO estimates, have significant potential. Digital agriculture as a global new trend is particularly interesting because, in addition to increasing the productivity of industries, it directly contributes to the state's ability to ensure the country's food security and

increase the competitiveness of its food exports. Given its impact on strategically important issues for the country, it is worth noting that for the full implementation and transition to more "smart" agriculture, government support in collaboration with agribusiness and private innovative enterprises is crucial.

Conclusions

The transition to a digital economy should be seen as a key power of economic growth. Digital transformation has a significant impact on material and human resources, increases crop productivity, and improves the quality of crop and livestock production. In addition to the introduction of modern innovative technologies, the effective development of agriculture also requires a new generation of specialists - qualified personnel with digital skills, with digital competencies and skills to work in an automated production environment.

Digitalization creates not only global opportunities, but also global challenges that require international solutions to exploit the positive and reduce the negative impacts. Successful international data management contributes to economic, social, and environmental goals, with people at the center.

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**THE ROLE OF THE FINANCIAL MEDIATOR IN THE SOCIAL PROTECTION OF
THE POPULATION**

Abstract. *This article examines the importance of such an institution of the financial market as a financial ombudsman, its role in social protection of the population. The features of his appointment are studied, the main powers are highlighted. In the course of the work, the role of the financial ombudsman in the banking and insurance services market is described. The article also substantiates the advantages of this institute and its financing. The advantages for consumers of financial services, for financial organizations, and for the country as a whole are studied separately.*

Keywords: *financial mediator service, financial ombudsman, consumers of financial services, financial organizations, institute financing, financing structure, financing models, advantages of the financial mediator institute.*

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**РОЛЬ ФИНАНСОВОГО ПРИМИРИТЕЛЯ В СОЦИАЛЬНОЙ ЗАЩИТЕ
НАСЕЛЕНИЯ**

Аннотация: *В данной статье исследуется значимость такого института финансового рынка, как финансовый омбудсмен, его роль в социальной защите населения. Изучаются особенности его назначения, освещаются основные полномочия. В ходе работы описывается роль финансового омбудсмена на рынке банковских и страховых услуг. В статье также обосновано преимущества данного института и его финансирования. Отдельно изучаются преимущества для потребителей финансовых услуг, для финансовых организаций, для страны в целом.*

Ключевые слова: *служба финансового примирителя, финансовый омбудсмен, потребители финансовых услуг, финансовые организации, финансирование института, структура финансирования, модели финансирования, преимущества института финансового примирителя.*

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**ӨЛКӨНҮН ФИНАНСЫ СЕКТОРУН ӨНҮКТҮРҮҮДӨ
ФИНАНСАЛЫК АКЫЙКАТЧЫНЫН РОЛУ**

Аннотация: *бул макалада финансылык акыйкатчы катары финансылык рынок институтунун маанилүүлүгү, анын калкты социалдык коргоодогу ролу иликтенген. Аны дайындоонун өзгөчөлүктөрү изилденип, негизги ыйгарым укуктары чагылдырылат. Иштин жүрүшүндө банктык жана камсыздандыруу кызмат көрсөтүүлөр рыногунда каржы Омбудсмендин (Акыйкатчынын) ролу баяндалат. Макалада ошондой эле аталган институттун артыкчылыктары жана аны каржылоо негизделген. Финансылык кызматтарды керектөөчүлөр үчүн, финансылык уюмдар үчүн, бүтүндөй өлкө үчүн, артыкчылыктар өзүнчө иликтенген.*

Негизги сөздөр: *финансылык элдештируу кызматы, финансылык омбудсмен, финансылык кызматтарды керектөөчүлөр, финансылык уюмдар, институтту каржылоо, каржылоо тузуму, каржылоо модели, финансылык элдештируу кызматынын артыкчылыктары.*

Currently, due to the difficult economic situation in our country and in the world, with the complication of financial relations in the course of economic globalization, the growing number of consumers of financial services, the question of how their rights can be protected, except in court, is very relevant. In this regard, the institute of the Financial Ombudsman, its place and role in the financial and banking systems of the state is of particular interest for the study.

Often banks and microfinance organizations take advantage of people's lack of financial literacy and slip them unprofitable contracts that are very difficult to fulfill. Also, clients often become victims of technical errors, low competence or conscious actions of employees of a financial institution, as a result of which money is debited from accounts or there are more percentages and commissions than stipulated in the contract.

Protecting our parents and their children from such actions by banks and MFOs is the main task of a public defender. It is also worth contacting him when it is impossible to agree on debt restructuring with a financial institution, and the borrower cannot service the debt in a timely manner.

Ensuring the maximum efficiency of the single market of goods and services of the Eurasian Economic Union by improving its functioning, by ensuring quality and safety guarantees of goods and services traded, awareness and proper protection of consumer rights is defined as one of the key directions for the development of integration processes within the Union [1] until 2025. The rapid development of high technologies and changing consumer demands, the use of new financial instruments, the growing level of cross-border financial services - all this

contributes to an increase in the number of consumers who, entering into legal relations with financial organizations, do not always adequately assess the obligations assumed. In this regard, the financial sector is perceived by the consumer as a zone of special risk associated, on the one hand, with the availability of financial services, and on the other hand, with the difficulty for his understanding and competent assessment of the conditions of such services. This circumstance may have an impact on the risks of making unreasonable decisions on the part of consumers, ultimately leading to an increase in the growth of creditworthiness of the population in the EAEU member states. Statistics show that the debt of individuals on loans in the Union has a stable upward trend and, on average, increases by 12% annually. Thus, in the 1st quarter of 2019, in comparison with the same period of 2014, the indicator of individuals' debt on loans in the Republic of Armenia increased by 1.7 times, in the Republic of Belarus by 2.1 times, in the Republic of Kazakhstan by 1.5 times, in the Kyrgyz Republic by 2.66 times, in the Russian Federation by 1.5 times. The growth of debt on loans can provoke problems related to the settlement of legal relations between financial organizations that issue such loans and consumers (individuals). Studies conducted in the member States indicate that consumers are often distrustful of the current problem-solving system and do not feel confident that they are able to resolve disputes that may arise in relations with a financial institution [2].

The introduction and maintenance of the functioning of such an institution does not require funding from the state and at the same time is effective and affordable for the

population, including low-income citizens and households with a high level of debt, especially in rural areas and remote regions.

The Financial Mediator Service (hereinafter referred to as the Service) is a legal entity established by the National Bank in the organizational and legal form of the fund, operating in accordance with the Law of the Kyrgyz Republic "On the Financial Mediator Service", having settlement and other accounts, seal and letterheads with its brand name [3].

The management bodies of the Service are the Supervisory Board and the head of the Service. The Supervisory Board is the highest management body of the Service and exercises the following powers: approves the candidacy for the position of financial mediator, as well as the head of the service; terminates the powers of the financial mediator and the head of the service ahead of schedule, approves documents defining the strategy and policies, work regulations, structure and staffing of the Service, reports of the head of the service on budget execution, financial mediator on the work done with the frequency provided by the Charter; approves the budget and monitors the execution of the budget; approves the amount and procedure for remuneration and bonuses of the head of the service, as well as the financial mediator; determines the amount and procedure for making payments by financial service providers; determines annually, on a tender basis, an independent audit organization to conduct an external audit, reviews and approves the results of the audit; resolves other issues related to the implementation of the activities of the Service provided for by the charter of the service.

On the recommendation of the working group, the composition of the Supervisory Board of 7 members is planned and is formed as follows: one representative is appointed by

the Chairman of the authorized state body in the field of supervision and regulation of the non-banking financial market; two representatives are appointed by the Board of the National Bank; three representatives from organizations representing the interests of financial service providers; one representative from organizations representing the interests of consumers of financial services.

A citizen of the Kyrgyz Republic who speaks the state and official languages, has high professional qualifications, an impeccable reputation, has a higher education in the field of law, economics or finance, as well as work experience in these areas for at least 5 years can be appointed as a financial mediator.

A financial mediator is prohibited from engaging in entrepreneurial or other commercial activities, being a member of any party, holding a position in state bodies or local self-government bodies, performing other paid work, except for scientific, pedagogical and creative activities. The financial mediator must refrain from any activity or actions that may call into question his reputation, independence, impartiality and objectivity.

Advantages of the Financial Mediator Service for Financial Service consumers:

- Access to a free, informal, fast and effective dispute resolution mechanism;
- The opportunity to file a complaint if, in the opinion of consumers, they were treated unfairly;
- Alternative to the court in case of conflict with financial organizations.

Advantages of the Service for financial organizations:

- Reduction of legal costs;
- Consistent and specialized approach to dispute resolution;
- More confident consumers who are ready to use financial services;

- A tool for improving internal quality control;
- Independent expert assessment in the case when they are right and the client is not.

Advantages of the Service for the country:

- Easing the burden on the courts;
- Availability of a specialized institute for dispute resolution;
- Notification of systematic risks and the possibility of their prevention;
- Increasing financial intermediation as a result of increasing confidence in the financial system;
- Independent assessment of what is happening between the fins. the organization and the consumer.

In order for the Financial Mediator Service to function successfully, it is necessary to finance this Service. Based on the best international experience, the generally accepted fundamentals of the Service's activities and the economic and social conditions of the Kyrgyz Republic, a proposal for the Service financing system was developed.

When developing the proposal, the responses of the working group were taken into account regarding the components of the model of the future institute of Financial Ombudsman, as well as the concept of the Service model in the Kyrgyz Republic [1]. When forming the proposal, responses to questionnaires provided by local authorities and other organizations were used. This proposal presents general recommendations regarding the financing system, estimates the expected workload of the Financial Ombudsman's Office and describes the proposed financing structure.

Initial assumptions for the forecast [4]

1. In the first year of activity, the Office will receive applications outside the competence of the Financial Ombudsman. However, the Office staff will have to devote time to these consumers, explain to them the role and

functions of the Ombudsman and redirect them to the relevant competent authorities.

2. As experience shows, with the activity of the Finombudsman, consumer appeals will become more and more targeted, provided that the Finombudsman implements an intensive program to raise public awareness.

3. It is assumed that explanatory work will be carried out with each client, and the purpose of the Office will be a quick resolution of the dispute. Therefore, only a small part of the appeals will turn into statements that will be formally considered (on average 20%).

4. It is also assumed that the first stages of dispute resolution will be negotiations and mediation, only then - the mandatory decision of the Ombudsman.

5. To save resources, in the first years, one employee can perform several functions simultaneously, and some functions can be outsourced (marketing, HR, IT).

6. In the first three years of work, a lot of time should be devoted to public awareness programs (seminars in all financial institutions, seminars with consumers in large corporations, conferences, etc.). At least 40 percent of employees' working time should be allocated to this function.

7. It is assumed that on average every day, along with other functions, a specialist in accepting complaints can serve up to 7 clients (talk on the phone, explain the situation, receive in the office, draw up documents for the client, enter the client's data into a common database, etc.). And if we take into account that a specialist in accepting complaints in the first years will have additional functions, then in one working day a specialist can serve up to 4 clients.

8. Dispute resolution specialists can simultaneously consider up to 25 cases, but at the beginning, given the lack of experience, up to 15 cases. According to the questionnaire filled out by the working group, the Finombudsman will have 30, plus

an additional 10 working days to consider applications. It turns out that a case review specialist can consider an average of 130-150 cases per year. And taking into account other responsibilities, this figure may amount to about 100-120 cases annually.

I. Justification of expenses

1. Expenses related to the coverage of office activities. In the first years of the Finombudsman's activity, continuous informing of the public is very important. To do this, it is necessary to use all possible ways to raise public awareness and concentrate considerable resources on this. In the first year, it is important to develop a Finombudsman logo that will be recognizable among the public. It is necessary to disseminate information by all means of communication, to advertise on television, on radio and on social sites. It is also important to place booklets about the Finombudsman in all financial institutions, including the phone number of the Finombudsman in the directories of the country, and so on.

2. Website design and maintenance costs. Detailed information about the Financial Ombudsman should be available to the public and all beneficiaries. The website should provide an opportunity to submit a complaint online. On the Finombudsman's website, he must publish internal rules for accepting and considering complaints, financial reports, complaint statistics, and so on.

3. Labor costs. In order to ensure the independence and impartiality of the Ombudsman and the employees of the Financial Ombudsman's office, their salaries should be competitive. The salary of employees in the field of financial intermediation and insurance in August 2019 amounted to 34,240 som. In the budget, the salary of a Finombudsman is calculated as five times the salary of financial market workers. And the salary of the

Finombudsman's Office specialists is comparable to the average salary of employees in the field of financial intermediation.

II. General recommendations regarding the financing system

1. Fair burden sharing. The financing system should be designed in such a way as to ensure that the burden of financing the Financial Ombudsman's office is distributed fairly among financial market participants.

2. Participation of all financial and credit organizations. Since all financial market participants benefit from the activities of the Financial Ombudsman (strengthening consumer confidence and, as a result, increasing financial intermediation), all financial and credit organizations should participate in its financing.

3. Availability of sufficient funds. Funding should be sufficient to ensure the effective operation of the Ombudsman institution. At the same time, the financing mechanisms should guarantee the impartiality and independence of the Financial Ombudsman.

4. Flexibility. To ensure greater flexibility, the law may define general principles of financing, and the amounts/percentages of contributions may be determined by a by-law. A by-law may be adopted by the NBKR, or by the Finombudsman's council and approved by the NBKR.

5. A simple financing scheme. It is recommended to start by setting up a simple financing scheme. The more complex the funding structure, the more expensive the process of collecting contributions and monitoring them will be. A simple scheme will be understandable for financial organizations, and it will be easy for the Financial Ombudsman's office to count and collect the amounts charged, without wasting unnecessary administrative resources. In addition, a simple financing system is quite predictable from the point of view of the

income received and avoids significant volatility of the funds collected.

6. Availability of a reserve fund. The main activity of the Finombudsman is the consideration of consumer applications, and as a rule, the workload of the Finombudsman's office is largely beyond his control. When budgeting, it is necessary to provide a reserve fund in order to cope with this uncertain workload. The reserve Fund is also needed in cases where the actual payments are less than expected (for example, some financial organizations may cease their activities, or the initial data on the number of financial organizations will be incorrect, etc.). For these and other reasons, the budget should provide reasonable reserves and be accompanied by an analysis of cash flows.

7. Fixed annual contributions only. It is not recommended at the beginning of the Finombudsman's activity (at least in the first 7-10 years, until the dynamics of applications coming to the Office becomes clear) to charge a fee for individual applications (case fee), because there may be fewer applications than planned, and besides, collecting funds for individual applications will require additional administrative resources of the Finombudsman.

8. Penalty for late payments. It is recommended that the Law on the Finombudsman provide for the right of the Finombudsman to receive interest for overdue payments of financial organizations. It is also necessary to prescribe mechanisms to ensure mandatory payments (for example, the imposition of a fine by the supervisory authority for non-payment, the publication of this information on the Ombudsman's website).

9. Transparency. A finombudsman must publish his annual financial statements, as a rule, together with the conclusion of an independent and reputable auditor.

10. Collection and monitoring of contributions. It is necessary to initially determine who will collect contributions, that is, who will be the operator of collecting and monitoring the collected funds (this is usually either the regulator or the Financial Ombudsman's Office). And if it is a Financial Ombudsman's Office, then it is necessary that regulators provide periodic data to the Financial Ombudsman about financial organizations.

III. Description of the financing model

1. Initial costs

Initial costs (startup funding) are capital investments in office furniture, equipment, software, as well as the purchase of necessary equipment for the continuous and efficient operation of a Finombudsman. Two ways of financing the initial costs are recommended:

1) The regulator or donor organizations can provide a grant to finance the initial costs.

2) Financial organizations can cover the initial costs with the help of mandatory contributions. And in order not to have problems with cash flow, the following is recommended: A Finombudsman can start his professional activity after, for example, three months from the date of entry into force of the law on Finombudsman. Thus, from the moment the law comes into force, financial organizations will pay annual contributions, but within three months the Financial Ombudsman's Office will not have current expenses, and accordingly, free accumulated funds for capital expenditures will be available.

2. Subsequent financing of the Financial Ombudsman's activities

1) It is proposed to collect fees from all regulated financial organizations operating on the territory of Kyrgyzstan (except for organizations that do not provide services to individuals, for example, payment operators, etc.).

2) Contributions can be collected annually, every year until November 1st or December 1st.

3) The collection of contributions will be carried out according to the needs of the Finombudsman's office, that is, according to the preliminary annual budget approved by the Finombudsman's council (taking into account budget calculations). In this model, the institute's budget is projected and approved, and then each financial institution is provided with an account to make the necessary contributions.

4) Funds for the reserve fund will be added to the necessary current funds/expenses (to begin with, it is proposed to consider up to an additional 20%).

5) Financing structure:

a. Banks – 50%. It is proposed to divide half of the total required amount - 50% between commercial banks either evenly or in accordance with their share in total banking assets. Since banks are the most stable, weighty and active financial intermediaries (the share of banks in the total assets of the financial sector is about 90%), it would be logical to shift half of the burden of financing the activities of the Financial Ombudsman to banks.

b. Non-bank FCO - 35%. Non-bank financial institutions (micro-credit companies, microfinance companies, micro-credit agencies) are the most active players in the financial sector after banks and are next in terms of assets (about 10% of the total assets of the financial sector), and in terms of the number of clients/borrowers of individuals (approximately equal to the number of borrowers of the banking sector). For this reason, it is proposed that non-bank FCO pay 35% of the total amount, evenly distributing the amount among all companies, or in accordance with their share of assets in the total assets of non-bank FCO.

c. Insurance companies - 15%. Soon, the law on compulsory civil liability insurance (CTP) for car owners will come into force in full. In addition, world experience shows that, as a rule, a significant number of complaints are received against insurance companies to the Office of the Financial Ombudsman. For this reason, it is proposed that insurance companies pay 15% of the total amount, evenly distributing the amount among all insurance companies, or in accordance with their share of insurance premiums in the total amount of premiums.

d. Other financial organizations - fixed contributions. Credit unions and other organizations (pawnshops, exchange offices, dealers and brokers in the securities market) will pay a fixed amount of 5,000.00 - 11,000.00 SOM annually. After the first year of activity, the contributions of these organizations can be used to replenish the reserve fund, or the collection of funds for the next year can be reduced by this amount.

6) Ideally, the Financial Ombudsman's Office should have balanced income and expenses at the end of the year. In cases of budget savings, these funds, by the decision of the Finombudsman's council, can be used to replenish the reserve fund, or the collection of funds for the next year can be reduced by an appropriate amount.

7) In case of a deficit in the current year, by the decision of the Finombudsman's council, the reserve fund will be used and/or by the decision of the Finombudsman's council and the approval of the NBKR, financial organizations will have to pay additional contributions in the same proportions.

8) The Law on the Financial Ombudsman may prescribe the following: after 5 years from the date of the Financial Ombudsman's activity, the financing structure and shares of financial organizations may be revised by the decision of the Financial Ombudsman's Council (or upon approval by the NBKR),

taking into account changes in the financial market and the dynamics of the applications considered.

In conclusion, it should be added that the increase in the number of problems of citizens with credit and insurance organizations leads to the need to create a financial mediator service in the state. This project can be considered useful not only for citizens, but also for the state, because a steady demand for financial services is a necessary condition for the prosperity of the economy. The Financial mediator service will strengthen the domestic credit system, make it more resistant to external and internal shocks. Moreover, the competent work of the Financial Ombudsman institution will increase the level of citizens' confidence in the credit system as a whole, which is very important in today's economic conditions.

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**SOCIAL PROTECTION OF THE POPULATION IN THE REPUBLIC OF
KAZAKHSTAN**

Abstract: *this article discusses the problem of social protection of the population, which is one of the most important components of the social policy carried out in Kazakhstan. Over the years of independence, we have observed a different degree of state participation in the organization of social protection of the population. The article suggests ways to solve the problems of social policy, that is, the need to direct social policy to solve priority problems, develop mechanisms for the effective use of resources, coordinate the obligations of the state with the real possibilities of their financing.*

Keywords: *social protection, social policy, social protection of the population, pension provision, social guarantees, social insurance, regulation of relations in the social sphere.*

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СОЦИАЛЬНАЯ ЗАЩИТА НАСЕЛЕНИЯ В РЕСПУБЛИКЕ КАЗАХСТАН

Аннотация. *В данной статье рассматривается проблема социальной защиты населения, которая является одной из важнейших составных частей проводимой в Казахстане социальной политики. За годы обретения независимости мы наблюдаем разную степень участия государства в организации социальной защиты населения. В статье предлагаются пути решения проблем социальной политики, то есть необходимость направления социальной политики на решение приоритетных проблем, выработку механизмов эффективного использования ресурсов, согласование обязательств государства с реальными возможностями их финансирования.*

Ключевые слова: *социальная защита, социальная политика, социальная защита населения, пенсионное обеспечение, социальные гарантии, социальное страхование, регулирование отношений в социальной сфере.*

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**КАЗАКСТАН РЕСПУБЛИКАСЫНДА КАЛКТЫ СОЦИАЛДЫК ЖАКТАН
КОРГОО**

Аннотация. *Бул макалада Казакстанда жүргүзүлүп жаткан социалдык саясаттын маанилүү курамдык бөлүктөрүнүн бири болуп саналган калкты социалдык жактан коргоо көйгөйү каралган. Көз карандысыздыкка ээ болгон жылдардын ичинде биз мамлекеттин калкты социалдык жактан коргоону уюштурууга ар кандай даражадагы катышуусун байкап турабыз. Беренде социалдык саясаттын маселелерин чечүү жолдору сунушталат, башкача айтканда социалдык саясатты артыкчылыктуу көйгөйлөрдү чечүү, ресурстарды натыйжалуу пайдалануунун механизмдерин иштеп чыгуу, аларды финансылуунун реалдуу мүмкүнчүлүгү менен мамлекеттин милдеттенмелерин макулдашуу зарылдыгы келип чыгат.*

Негизги сөздөр: *социалдык коргоо, социалдык саясат, калкты социалдык коргоо, пенсиялык камсыздоо, социалдык кепилдиктер, социалдык камсыздандыруу, социалдык чөйрөдөгү мамилелерди жөнгө салуу.*

Almost all countries of the world have a social protection system, this is typical for all countries. If a person is not able to create conditions by his work that provide him with the necessary vital needs, then the need for social protection will be required. At present, the system of social protection of the population is understood as the totality of all economic, social and legal guarantees and rights of social institutions and institutions. These guarantees should ensure the implementation and create the necessary conditions for the maintenance of livelihoods and the existence of various social strata and groups of the population, especially the socially vulnerable.

The article proposes ways to solve the problems of social policy, that is, the need to direct social policy to address priority problems, develop mechanisms for the efficient use of resources, harmonize the government's obligations with the real possibilities of financing them. It is necessary to solve these problems on the basis of state standards, the development of self-financing and insurance principles, and the strengthening of the financial base of the social sphere. And it is also necessary to focus on the main priorities of social policy, which will enable Kazakhstan to enter the 30 most developed countries of the world.

The essence of social protection of the population lies in the adoption of a system of measures to strengthen the status of economically and socially weak citizens in compliance with the principle of equality. The most important priority of the social protection system is to support, first of all, disabled citizens.

Social protection of the population includes social security, social insurance and social support (assistance). The need to improve the system of social protection of the population is caused by the transition to market relations in society. The main prerequisites for its development are:

- change in forms of ownership;
- change in the system of distribution of material goods and services and the

formation of new relations between members of society;

- the need for solving a number of social problems (unemployment, guarantees of social protection in old age, medical care, etc.), social stratification of society, as well as ensuring the legislative framework for the protection of human rights and freedoms.

An important role in the system of social protection of the population is played by trade unions, administration and various forms of self-government in labor collectives.

The form of implementation of the state employment policy at all levels of government is federal, territorial and local (city, district) programs. Federal programs, as a rule, have a regional aspect, but the regional programs for promoting employment of the population do not even mention federal and other regional programs, let alone reflect the indicators of the movement of jobs. Currently, program developers at all levels face an acute problem of linking the indicators of the movement of jobs and labor force used in programs, taking into account the parameters of the most important sectoral, intersectoral, regional and interregional programs.

Due to historical, cultural, political and other factors in states of the same level of development, there are different degrees of solidarity in the organization of social protection systems and different degrees of participation of state institutions.

At its core, social security is a system of financial relations between the state and legal entities and individuals regarding the formation of state targeted social funds and their use for social protection of citizens of the country. The existence of social security is dictated by the need to maintain disabled citizens, support them and equalize the living standards of various groups of the population. In recent years, Kazakhstan has its own model of social development. This model is based on dynamic economic growth. In each country, a social policy is being carried out, which is aimed at increasing the social protection of the population.

Targeted social assistance (hereinafter referred to as TSA) provides for the provision of comprehensive social assistance to low-income citizens:

- firstly, it is a cash payment;
- secondly, measures to promote employment, that is, the provision of referrals for training, youth practice, public works, social jobs, microcredit, permanent jobs;
- thirdly, social rehabilitation of disabled people, including measures for social adaptation, legal advice, housing and communal services, to reimburse the costs of paying for assistance, assistance in obtaining housing, queuing up for the provision of housing and kindergartens, as well as in women's accounting consultations and other activities (sections, circles, extracurricular activities and free meals for school-age children)
- Fourth, a guaranteed social package for children from low-income families (provision of food kits and a set of household chemicals; provision of free meals at the place of study, school uniforms and school supplies, reduced fare in city public transport).

TSA is classified into 2 types: unconditional and conditional cash assistance.

1. Unconditional financial assistance is provided to families with disabled citizens or families in which the only able-bodied family member for objective reasons is unable to find a job (caring for a child under the age of three, a disabled child, a disabled child of the first or second group, the elderly in need of outside care and assistance). Compulsory participation in employment promotion measures is not required to receive unconditional cash assistance. Unconditional cash assistance is assigned for the current quarter from the month of appeal and is paid monthly.

2. Conditional financial assistance is provided to families with at least one able-bodied member, subject to the conclusion and conscientious performance of a social contract. The term of the social contract is 3 months.

Conditional financial assistance is assigned from the month of application and is paid

monthly or uniformly for the period of validity of the social contract.

To appoint a TSA, low-income families (citizens) must apply to the employment center of the population at the place of residence, in the rural area - to the akim of the village, settlement, rural district with an application for identification and presentation of an identity card.

When accepting documents for assistance, an interview is conducted, during which the grounds for the provision of public services are determined:

- to receive unconditional or conditional cash assistance;
- the need for measures to promote employment;
- the need for social adaptation measures.

TSA is assigned to citizens with an average per capita income not exceeding the poverty line for each family member.

To date, the poverty line is set at 70% of the subsistence minimum, or on average for the 1st quarter of 2020, 21,302 tenge.

Thus, the size of the TSA per person (family) is calculated as the difference between the average per capita income and the established poverty line for each family member in the regions.

In this case, the total family income includes all types of income, except for the following payments: targeted social assistance and housing assistance; one-time burial allowance; state social benefits for disability for disabled children under sixteen years of age; state social benefits for disability for disabled children from sixteen to eighteen years of the first, second, third groups; special state allowances for disabled children under sixteen years of age; special state allowances for disabled children aged from sixteen to eighteen years of the first, second, third groups; monthly state allowances assigned and paid to mothers of many children who were awarded the "Altyn alka", "Kumis alka" pendants or who received the title "Mother Heroine" earlier, awarded the orders of "Mother's Glory" I and II degrees; state scholarships paid to students studying in educational institutions implementing higher programs; assistance to the family in order to

compensate for the harm caused to its health and property as a result of emergency situations; one-time state benefits in connection with the birth of a child; material assistance provided to students from low-income families in educational institutions in accordance with the legislation of the Republic of Kazakhstan in the field of education; Decree of the Government of the Republic of Kazakhstan dated May 21, 2013 "On Approval of the Model Rules for the Provision of Social Assistance, Establishing the Size and Determining the List of Certain Categories of Citizens in Need" in connection with the increase in food prices.

It seems appropriate to differentiate functionally oriented, complementary institutions of social protection, which provide:

- social guarantees based on the principles of equality of opportunities, universal accessibility of national education systems, health care and social insurance;
- social assistance to the most vulnerable and, first of all, to the disabled categories of the population.
- social insurance: compulsory - the entire active population of the country at the expense of contributions from employers and employees, voluntary - part of the employed population as a personal initiative of employees and employers.

While social guarantees and social insurance are not related to the degree of need, social assistance should be targeted, which requires:

- Strict accounting of the level of material security of each citizen;
- Transition to targeted assistance, both to an individual citizen and to a family;
- A clear differentiation of the causes of need, refusal of state aid to able-bodied citizens who have the opportunity to work, but do not want to do it.

To equalize the social situation in various regions of the country at the state level, it is advisable to determine only the minimum state standards for the main types of social services for the population, in accordance with which the policy of financial equalization is implemented.

Hence the need:

- Equalization of conditions for budget financing of socially significant expenses;
- Support for social reforms and social development of problem regions.

Thus, sustainable development of human potential, stabilization of the standard of living must be achieved by creating conditions for realizing labor potential, increasing the level of income of the population, ensuring the availability and improving the quality of education, medical care, implementing targeted poverty alleviation based on measures of social adaptation, economic rehabilitation and social support for the most vulnerable segments of the population.

Provided to low-income citizens from the state budget and other sources in accordance with Resolution No. 504; one-time cash assistance provided in accordance with the Model Rules; charitable help; payment for citizens' travel for free or preferential prosthetics; maintenance of citizens for the duration of prosthetics; the cost of free or reduced travel of citizens for treatment outside the village; in-kind assistance provided in accordance with the legislation of the Republic of Kazakhstan: medicines; Spa treatment; prosthetic and orthopedic products (manufacturing and repair); vehicles (wheelchairs) and rehabilitation facilities allocated to disabled people; material assistance provided to students and pupils of state educational institutions from families that have not received state targeted social assistance, orphans, children left without parental care living in families, children from families in need of emergency assistance as a result of emergencies, and others categories of students and pupils in accordance with the legislation of the Republic of Kazakhstan On education; assistance provided as part of a guaranteed social package to children from low-income families; one-time payments in connection with the adoption of an orphan child and (or) a child left without parental care; lump-sum payment for moving to voluntary migrants (for each family member) within the framework of the program; One-time repayment of debt on unsecured consumer loans in second-tier banks and

microfinance organizations in accordance with the Decree of the President of the Republic of Kazakhstan dated June 26, 2019 No. 34 "On measures to reduce the debt burden of citizens of the Republic of Kazakhstan"; the amount of housing certificates to cover part of the initial loan payment in accordance with the procedure established by housing legislation.

Therefore, the transition to planning the living standards of the population on the basis of a rational consumer budget, which is developed on the basis of scientifically grounded norms and standards for the consumption of material goods and services, becomes practically important. Sustainable budgeting means setting a national standard for the middle class. The development of social and economic policy can then be carried out on the basis of eliminating the gaps between accepted standards and the actual consumption of material goods and services. The importance of this approach is determined by the fact that by now the level of social aspirations of the majority of the population of the republic has decreased. Insufficient attention to this problem can lead to a further decrease in the quality of human potential or to an increase in social tension in society. In this regard, the Ministry of Labor and Social Protection, taking into account changes in the composition of consumer spending of the population, should amend the structure of the subsistence minimum, which should lead to an increase in its value. In addition, it is proposed to consider the possibility of moving to the definition of the subsistence level "on the basis of median

income, as is customary in most countries of the European Community."

All this should bring state social standards in line - the minimum wage, minimum pensions and benefits, the threshold level of social assistance and support. To determine how effective a given social policy is, of course, you can use various parameters and indicators. It is believed, however, that the effectiveness of this social policy is evidenced by social stability, the growing well-being of the population, international recognition and real opportunities to set ambitious goals for Kazakhstan to become one of the 30 most developed countries in the world.

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SECTION VI. HUMANITARIAN SCIENCES

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STATE POLICY ON THE FORMATION OF EDUCATIONAL ACTIVITIES IN THE KAZAKH ASSR IN THE 1920S

Annotation. *During the October Revolution, Soviet pedagogy formed a common goal for the development of education. Reflecting the interests of the masses and the needs of the new society, Soviet pedagogy contrasted individual ideas of bourgeois pedagogical theory with individualism, nationalism, politics and other great ideas of human thought: humanism, collectivism, internationalism, democracy, the need for all-round development of the individual. The combination of productive work with education as a prerequisite and condition ... The purpose of the study is to study and analyze the state policy of the formation of enlightenment activities in the Kazakh ASSR during the formation of the USSR.*

The tasks are to study the materials from the well-known state documents of historical significance "The Regulations on the Unified School of Labor" and "The Basic principles of the unified School of Labor". These documents confirmed and pedagogically justified the ideas of humanism and democracy in upbringing and education, school self-government and innovative educational relations between students and teachers.

The methodology of the project is based on the general principles of objectivity and historicism. The research materials can find practical application both in the writing of scientific papers, and in the preparation of training courses and the compilation of educational and reference manuals on the history of historical science.

Keywords: *People's education, Decree, elimination of illiteracy, ideology, People's Commissariat of Education, S. Sadvakasov, Latin alphabet, schools.*

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ИЗ ИСТОРИИ ФОРМИРОВАНИЯ ПРОСВЕТИТЕЛЬСКОЙ ДЕЯТЕЛЬНОСТИ В КАЗАХСТАНЕ В 20-ЫЕ ГОДЫ ПРОШЛОГО ВЕКА

Аннотация: *В годы после Октябрьской революции советской педагогики была сформулирована общая цель развития образования. Отражая интересы масс и потребности нового общества, советская педагогика противопоставляла отдельные идеи буржуазной педагогической теории индивидуализму, национализму, политике и другим великим идеям человеческой мысли: гуманизму, коллективизму, интернационализму, демократии, необходимости всестороннего развития личности. Сочетание продуктивной работы с обучением как предпосылка и условие.*

Целью исследования является изучение и анализ государственной политики формирования просветительской деятельности в Казахской АССР в период становления СССР.

Задачами является изучить материалы из известных государственных документах исторического значения «Положение о единой школе труда» и «Основные принципы единой школы труда». Эти документы подтвердили и педагогически обосновали идеи гуманизма и демократии в воспитании и образовании, школьного самоуправления и новаторских образовательных отношений между учениками и учителями.

Методология проекта базируется на общих принципах объективности и историзма. Материалы исследования могут найти практическое применение как при написании научных трудов, так и при подготовке учебных курсов и составлении учебных и справочных пособий по истории исторической науки.

Ключевые слова: Народное образование, Декреты, ликвидация безграмотности, идеология, Наркомпрос, С.Садвакасов, латиница, школы.

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КАЗАКСТАНДА ӨТКӨН КЫЛЫМДЫН 20-ЖЫЛДАРЫНДАГЫ АГАРТУУЧУЛУК ИШТИН ТАРЫХЫНАН

Аннотация: Советтик педагогиканын Октябрь революциясынан кийинки жылдары билим берүүнү өнүктүрүүнүн жалпы максаты түзүлдү. Көпчүлүктүн кызыкчылыгын жана жаңы коомдун муктаждыктарын чагылдырып, советтик педагогика буржуазиялык педагогикалык теориянын жекече идеяларын индивидуализмге, улутчулдукка, саясатка жана адамзаттын ой жүзүртүүсүнүн башка улуу идеяларына карама-каршы койду: гуманизм, коллективизм, интернационализм, демократия, баарына болгон муктаждык - инсандын тегерек өнүгүшү. Алгачкы шарт жана шарт катары үзүрлүү эмгекти окуу менен айкалыштыруу. Изилдөөнүн максаты болуп, СССР калыптануу мезгилинде Казак АССРинде агартуучулук ишмердүүлүктү түзүүнүн мамлекеттик саясатын изилдөө жана талдоо болуп саналат.

"Бирдиктүү эмгек мектеби жөнүндө жобо" жана "бирдиктүү эмгек мектебинин негизги принциптери" тарыхый маанидеги белгилүү мамлекеттик документтерден материалдарды изилдөө милдети болуп саналат. Бул документтерди тарбиялоодо жана билим берүүдө гуманизм жана демократия, мектептик өз алдынча башкаруу идеяларын жана окуучулар менен мугалимдердин ортосунда новатордук билим берүү мамилелерин педагогикалык жактан негиздеп тастыкташты.

Долбоордун методологиясы объективдүүлүктүн жана тарыхизмдин жалпы принциптерине негизделет. Илимий-изилдөө материалдары илимий эмгектерди жазууда жана окуу курстарына даярдык көрүүдө жана тарыхый илимдин тарыхы боюнча окуу жана маалымдама китептер даярдоодо практикалык колдонмо табууга болот.

Ачык сөздөр: Эл агартуу, Жарлыктар, сабатсыздыкты жоюу, идеология, Билим берүү Эл Комиссариаты, С.Садвакасов, Латын алфавити, мектептер.

Introduction: The Soviet education system is the foundation of the current education system. Reflecting the interests of the masses and the needs of the new society, Soviet education opposed individual ideas of bourgeois pedagogical theory to individualism, nationalism, politics and other great ideas of human thought: humanism, collectivism, internationalism, democracy, the need for the all-round development of the individual. Combining productive work with learning as a prerequisite and condition. These ideas are clearly reflected in the well-known state documents of historical significance "Provisions on the Unified

School of Labor", "Elimination of Illiteracy" and "Basic Principles of the Unified School of Labor". These documents confirmed and pedagogically substantiated the ideas of humanism and democracy in upbringing and education, school self-government and innovative educational relations between students and teachers.

Result: The establishment of Soviet power after the October Revolution led to numerous changes in the Union and on the Kazakh land. The new political ideology led to great changes in the field of education and enlightenment. This article reflected the adopted decrees, legislation in the new

system of knowledge, as well as the Kazakh society from 1917 to the 20s of the twentieth century, there have been significant changes in the field of education and the number of Kazakh youth studying.

As a result of decrees introduced to eradicate illiteracy, schools were opened, young people began to strive for education, and the number of students increased. In addition, it is noted that girls and boys are taught in the same class.

The formation of education has its own history, which developed in the distant past, when children were taught by «mullahs» in madrasahs. One of the conquests of the Great October Socialist Revolution was the system of school education, which was created in the USSR, unique in its scale and scientific formulation of the matter. The role and significance of the post-October transformations are that they have led to significant results in the creation of a school system in Kazakhstan as the basis of a nationwide movement towards education and science, as a basis for raising the well-being and culture of the people. Only the revolution that took place in October 1917 could eliminate the centuries-old backwardness, eliminate the illiteracy of the population of Kazakhstan. Having won political power, the working class under the leadership of the Communist Party, along with the transformation of the economy, the development of socialist social relations and the strengthening of the socialist state system, made a real revolution in the field of culture. The revolution led the peoples of Kazakhstan to the broad road of historical progress, initiated a radical restructuring of the system of public education in the republic. The socialist revolution leveled the educational level of the country's population in the matter of radical transformations in the field of education and culture, Lenin's instructions and decrees of the Soviet state on public education were of decisive importance. Education remains one of the priority areas for each state. Teachers, historical figures, public figures who have always raised the problem of education were held in high esteem. Pre-revolutionary Kazakhstan was

one of the backward regions of Russia in terms of population literacy. If in Russia there were 20% literate, then in Kazakhstan, according to the 1897 census, their number did not exceed 8.2%, and among the Kazakh population - no more than 2%. The people's craving for literacy was enormous [1, p. 197].

The restructuring of the entire system of public education begins from the first days of the revolution. In a decree of November 9, 1917, a state commission on education was organized, which was mainly engaged in analyzing the foundations of creating a new system of public education. People's Commissar of Education A. V. Lunacharsky (1875-1933) addressed the public to teachers and students. In this address, he described the main principles and tasks of the Soviet government in the field of public education: universal compulsory primary education, the possibility of obtaining general education at all levels of schools, the presence of a religion in the school, democratization of education, taking into account local and national characteristics. Let us dwell in more detail on the new decrees in the field of education, adopted in 1917-1918:

- Adopted on November 9, 1917, "Decree on the establishment of state Commission for Education", which was signed by the People's Commissar for Education A. V. Lunacharsky., Chairman of the Council of People's Commissars V. Ulyanov (Lenin) and Secretary of the Council N. Gorbunov, is the first document in the field of education:

"The matter of the general leadership of public education, since this remains with the central state power, is entrusted, until the Constituent Assembly, to the State Commission on Public Education, the representative and executor of which is the People's Commissar.

All the functions previously performed by the Minister of Public Education and his comrades are entrusted, in accordance with the decision of the Council of People's Commissars and the general procedure established by the Congress of Soviets, to the Commission on Public Education.

The Commission on Education is responsible in all its actions to the Executive Committee of the Soviets of Workers', Soldiers' and Peasants' Deputies.

The composition of the Commission is as follows:

1) Chairman - People's Commissar for Education.

2) Secretary of the Public Education Commission.

3) Delegated persons:

4) Persons appointed by the Council of People's Commissars: fifteen persons, heads of departments.

The State Commission on Public Education is by no means the central authority that governs educational institutions. On the contrary, the entire school business should be transferred to local government bodies. The independent work of class - workers, soldiers, peasants - cultural and educational organizations should have full autonomy both in relation to the state center and in relation to municipal centers.

The business of the State Commission is to serve as a liaison and assistant, to organize sources of material, ideological and moral support for municipal and private, especially labor and class educational institutions on a state nationwide scale.

A number of valuable bills have been developed since the beginning of the revolution by the State Committee for Public Education, democratic in its composition, rich in experienced specialists.

The State Commission will enter into systematic cooperation with this committee, the convocation of an emergency session of which the People's Commissar will immediately contact the committee's bureau. The subject matter of this session will be:

1) Revision of the norms of representation in the spirit of further democratization of the committee.

2) Revision of his rights in the spirit of their expansion and transformation of the committee into the State Institute for the preparation of bills.

3) Revision of the bills already created by the committee together with the new State

Commission, required by the fact that when editing them, the committee took into account the bourgeois spirit of the previous ministries.

After such a revision, the bills will be implemented without any red tape in a revolutionary manner.

Cooperation between educators and public forces is what the Commission will pursue in all its activities.

Only the Constituent Assembly will establish a detailed procedure for state and public life in our country, including the general nature of the organization of public education.

Without prejudging his will, the People's Government considers itself entitled in this respect to carry out a number of measures aimed at enriching and illuminating the spiritual life of the country as soon as possible.

Current affairs should still go on as usual through the Ministry of Public Education.

The ministry should play the role of an executive body under the State Commission for Public Education. " [2].

- Adopted on June 25, 1918, "Provisions of the All-Russian Central Executive Committee and the Council of People's Commissars on the Socialist Academy of Social Sciences":

«1. The Socialist Academy of Social Sciences is a free community of persons with the goal of studying and teaching both social knowledge from the point of view of scientific socialism and communism, and sciences that are in contact with this knowledge.

2. The Socialist Academy of Social Sciences includes, as its members, students of all departments and divisions, all competing members who constantly work in its institutions, and, finally, included in its composition, according to the election, full members, professors, lecturers and assistants.

3. The Socialist Academy of Social Sciences is divided into two main sections:

- a) scientific and academic*
- b) educational.*

The first is aimed exclusively at scientific activity, the second pursues the tasks of teaching and enlightenment.

4. The plan of teaching the educational section of the Socialist Academy of Social Sciences aims to provide students with the opportunity to complete education in the spirit of scientific socialism, both in general in the field of social knowledge, and in individual cycles of socio-political sciences. The section annually establishes the teaching plan for both basic and additional subjects.» [3].

On December 15, 1917, religious educational institutions, previously subordinate to the church, were transferred to the People's Commissariat for Education, transformed into a general education school. On January 21, 1918, the «Decree on depriving the church of the state and school by the church» was signed by V. I. Lenin. This decree forbade division and restriction or discrimination based on different faiths, and gave full freedom to what religion people believed in or did not believe in. The decree prohibited the teaching of religion in schools or the preaching of religious practices. This decree eliminated the harmful influence of the church on the younger generation, religion in general, and rid the school of religion. Estates and national restrictions on education in school, inequality of countries in education were eliminated by special decrees. In 1918, by a decree of the People's Commissariat for Education on May 31, the school introduced the joint education of boys and girls.

In 1917-1918, the principles of creating a Soviet school were revised on the basis of about 30 state decrees adopted by the Soviet government:

- All types of educational institutions were abolished before the October Revolution, the school system was changed;
- the school was separated from the church, religious schools were abolished, and the teaching of religion at school was prohibited;
- proclaimed the right of all citizens to education, regardless of their social environment, religion, nationality, etc .;

- all peoples within Russia were given the opportunity to study in their native language;
- training of boys and girls started together;
- for the first time a preschool institution was opened;

In the implementation of the above-mentioned decrees and measures of Soviet power, there were also great obstacles on the part of the counter-revolutionary elements (the bourgeoisie, landowners and part of the intelligentsia of the bourgeoisie). They tried not to carry out these decrees, they went as far as intimidating teachers. Only as a result of the stubborn struggle of the Communist Party and the Soviet government was the revolutionary restructuring of the school carried out.

Teachers had different attitudes towards the October Revolution. Some of the teachers opposed the Soviet regime. Many teachers, mostly secondary school teachers, were hostile to the revolutionary changes. They opposed the Soviet regime, supported the counter-revolutionary activities of the All-Russian Union of Teachers. But most of the teachers, especially the teachers of the public schools, greeted the revolution with special attention.

The most difficult issue was the training of new teachers. Because the number of schools grew rapidly. And there were very few pedagogical educational institutions. In this regard, teachers' seminaries in the country have been transformed into three-year pedagogical courses, and teaching institutes are higher pedagogical educational institutions.

The main direction of cultural transformations after October 1917 in Kazakhstan was the overcoming of mass illiteracy and the development of public education. With the coming to power, the «Bolsheviks» launched extensive work to combat mass illiteracy. Local bodies of Soviet power, even in the difficult conditions of the Civil War, opened schools whenever possible. The process of teaching secular literacy allowed them to actively promote the Bolshevik ideology among the local population. In this regard, in July 1918, the People's Commissariat of Education

(People's Commissariat for Education) was created in the structure of the Turkestan Autonomous Soviet Socialist Republic, and earlier in Kirrevkom - a school department. Measures of a systemic order were needed, not of an episodic and one-off nature. Therefore, on December 26, 1919, a decree of the Council of People's Commissars «On the elimination of illiteracy among the population of the RSFSR» was adopted. In 1919-1923, the following barriers were observed to eliminate illiteracy in Kazakhstan:

- Lack of specialist staff suitable for training the population;
- Lack of new textbooks and lack of written instruments and lack of written instruments;
- Weak material and technical base of education authorities in cities, especially in rural areas.

In February 1924, a branch of the All-Union Society "to eliminate illiteracy" was created in Kazakhstan. On the pages of the newspaper "Sauat ashkysh", a plan for conducting classes for individual groups was published, short-term courses for the training of teachers-liquidators of illiteracy were opened.

Beginning in 1920, the Bolsheviks began everywhere to create emergency commissions for the elimination of illiteracy, which were engaged in accounting for the illiterate population, training teachers, organizing schools and short-term courses. At these courses, they taught writing, reading, various crafts, clubs and theaters were opened. Disciplines such as environmental studies, accounting, singing, drawing, etc. were taught here. Elements of indoctrination of the population were also introduced. For this purpose, the Soviet authorities recruited experienced specialists. So, in 1919, in the Omsk district of the Akmola province, Magzhan Zhumabaev, Koshke Kemengerov, Amre Isin and others took part in these courses.

According to S. Sadvakasov, who served as inspector of public education in 1919, the rise of public education after October 1917 in Kazakhstan was "the most pressing need of the aul. Without it, no

innovations in the steppe are possible "[4, p.17]. S. Sadvakasov wrote a lot about the need to strengthen public education. In his article "The needs of the aul" he expressed deep thoughts that were far ahead of his time: "Every person working for the good of the people must firmly and forever remember that without education all his aspirations for the better are either unproductive or completely in vain. An unenlightened and ignorant people do not have strong convictions either. "

In October 1920, the People's Commissariat of Education of the Kazakh ASSR was created [5, p.122]. The Commissariat was headed by the People's Commissar of Education, who is also the chairman of the board. During the period under study, the people's commissars of education were A. Baitursynuly (1920-1921), S. Sadvakasov (1925-1927), U. Dzhandosov (1927-1929), S. Mendeshev (1930-1933), T. Zhurgenov (1933-1937)) [6, p.71].

The schools of Kazakhstan were built and developed on the basis adopted for the RSFSR, but with some peculiarities, mainly in the lower echelons. At the first stage of the formation of the new education system, the following types of schools existed:

- Schools of the first stage with a 4-year term of study;
- Seven-year schools;
- Secondary school (nine-year);
- Workers' faculties, as general secondary educational institutions, providing a complete secondary education for working and peasant youth who did not have the opportunity to receive it before [7, p.108].

Since in order to eliminate illiteracy, the main thing was to learn to write and read, then in the course of the fight against illiteracy, the problem was posed of replacing the Arabic script with Latin, which came into use at that time. The People's Commissariat of the RSFSR for Nationalities in 1923 created a commission to reform the Arabic script.

This commission worked on three issues:

- 1) Preparation of writing for peoples without writing;

- 2) translation of peoples with their own writing into the Latin alphabet;
- 3) reforming the Turkic writing [8, p.26].

On March 6, 1926, the First All-Union Congress of Turkologists was held, at which the issue of translating the writing of the Turkic-speaking peoples into the Latin script was considered. At that time, A. Baitursynuly, the Council of People's Commissars of Public Education of the Kazakh ASSR, opposed the transition to the Latin alphabet. A. Bukeikhanov and A. Baitursynuly proposed to simplify some features of the Arabic writing [9, p.108]. Supporters of the abandonment of the Arabic alphabet said that the transition to the use of the Latin script is a conspiracy on the national culture. They considered that a transition to a new alphabet, characteristic only for Europeans, was necessary in Kazakhstan, but the conditions were not yet ripe. However, adhering to the task of consolidating a single cultural space, the Soviet leadership did not share the views of the representatives of the Republic. A commission was created to create a new alphabet, which in the fall of 1929 presented a draft of the Kazakh alphabet based on the Latin alphabet. Until the full transition to the Latin alphabet, the Arabic script was used. The printing technique began to be equipped with the Latin alphabet. This facilitated the publication of newspapers, textbooks, literature. The republic began to use simultaneously two alphabets: for Kazakh - Latin, for Russian - Cyrillic. By the end of the 30s of the XX century, the USSR had become a totalitarian state. The formation of a totalitarian system began to manifest itself in culture. In 1940, a draft of a new Kazakh alphabet based on the Cyrillic alphabet was developed. At the V session of the Supreme Council on November 10, 1940, a law was adopted "on the translation of the Latinized Kazakh writing into a new alphabet based on Russian graphics" [10, p.38].

Conclusion. The adopted decrees in the field of education and enlightenment after the October Revolution changed the life of the USSR and Kazakh society: firstly, the people switched to a new form of education, secondly, the Kazakh people switched from

the Arabic alphabet to the Latin alphabet, then to the Cyrillic alphabet, and thirdly, according to In the Soviet Union and in Kazakh society, the number of children and adults studying has increased, and illiteracy has been eliminated.

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