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O'zbekiston Respublikasi Oliy attestatsiya komissiyasi Rayosatining 2025-yil 13-iyundagi №371/5-son qarori bilan 16.00.00 — Veterinariya fanlari hamda 2026-yil 5-martdagi №382/5-son qarori bilan 06.00.00 — Qishloq xo'jaligi fanlari bo'yicha dissertatsiyalar asosiy ilmiy natijalarini chop etish tavsiya etilgan milliy ilmiy nashrlar ro'yxatiga kiritilgan.

O'zbekiston Respublikasi Prezidenti Administratsiyasi huzuridagi Axborot va ommaviy kommunikatsiyalar agentligining 16.08.2022-yildagi №1701-sonli guvohnomasi asosida nashr etiladi.

MUASSIS VA HAMKOR TASHKILOTLAR • FOUNDER & PARTNER INSTITUTIONS



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**VETERINARIYA ILMIY-TADQIQOT
INSTITUTI**
16.00.00



**PAXTA SELEKSIYASI, URUG'CHILIGI
VA YETISHTIRISH
AGROTEKNOLOGIYALARI
ILMIY-TADQIQOT INSTITUTI**
06.00.00

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JURNAL HAQIDA

MUASSIS VA NOSHIR	“Ilm-fan va innovatsiyalar akademiyasi” MChJ, O‘zbekiston. OAK ro‘yxati bo‘yicha hamkor tashkilotlar: Veterinariya ilmiy-tadqiqot instituti (16.00.00) hamda Paxta seleksiyasi, urug‘chiligi va yetishtirish agroteknologiyalari ilmiy-tadqiqot instituti (06.00.00).
RO‘YXATDAN O‘TISH	O‘zbekiston Respublikasi Prezidenti Administratsiyasi huzuridagi Axborot va ommaviy kommunikatsiyalar agentligi tomonidan berilgan 16.08.2022-yildagi №1701-sonli guvohnoma. Jurnal 2022-yildan nashr etiladi.
OAK QARORLARI	O‘zbekiston Respublikasi Oliy attestatsiya komissiyasi Rayosatining 2025-yil 13-iyundagi №371/5-son (16.00.00 — Veterinariya fanlari) va 2026-yil 5-martdagi №382/5-son (06.00.00 — Qishloq xo‘jaligi fanlari) qarorlari bilan jurnal dissertatsiyalar asosiy ilmiy natijalarini chop etish tavsiya etilgan milliy ilmiy nashrlar ro‘yxatiga kiritilgan (oak.uz).
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Ushbu to‘plamdan “Research Focus” xalqaro ilmiy jurnalining 2026-yil 8-soniga (5-jild) qabul qilingan ilmiy maqolalar o‘rin olgan.

Jurnalda O‘zbekiston Respublikasi va xorijiy oliy ta‘lim muassasalari professor-o‘qituvchilari, mustaqil ilmiy izlanuvchilari, doktorantlari va magistrantlari tomonidan olib borilayotgan ilmiy-tadqiqot ishlari natijalari ilmiy maqola tarzida chop etiladi. Shuningdek, jurnalga ilmiy-tadqiqot institutlari, ishlab chiqarish tashkilotlari va korxonalarda faoliyat ko‘rsatayotgan tadqiqotchilarning maqolalari ham qabul qilinadi.

Barcha maqolalar jurnalning elektron bazasi (refocus.uz) hamda xalqaro indekslash tizimlariga joylashtiriladi.

Eslatma! To‘plamga kiritilgan ilmiy maqolalardagi raqamlar, hisob-kitoblar va ma‘lumotlarning haqqoniyligi hamda keltirilgan iqtiboslarning to‘g‘riligi uchun mualliflar shaxsan javobgardirlar.

TAHRIRIYAT

— BOSH MUHARRIR

Saloydinov Sardorjon Qodirjon o'g'li — “Ilm-fan va innovatsiyalar akademiyasi” MChJ, O'zbekiston.

06.00.00 — QISHLOQ XO'JALIGI FANLARI

— TAHRIR HAY'ATI RAISI

Raxmankulov Murod Said-Akbarovich, qishloq xo'jaligi fanlari doktori (DSc), professor — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti direktori, O'zbekiston.

— RAIS O'RINBOSARLARI

Rashidova Dilbar Karimovna, qishloq xo'jaligi fanlari doktori (DSc), professor — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti “Organik paxtachilik” laboratoriyasi mudiri, O'zbekiston.

Suvanov Boymurod Uralovich, qishloq xo'jaligi fanlari doktori (DSc), katta ilmiy xodim — Ozuqa ekinlari ilmiy-tajriba stansiyasi Agrotexnika va o'simliklarni himoya qilish bo'limi boshlig'i, O'zbekiston.

Durdiyev Normat Hasanovich, qishloq xo'jaligi fanlari doktori (DSc) — “Toshkent irrigatsiya va qishloq xo'jaligini mexanizatsiyalash muhandislari instituti” Milliy tadqiqot universiteti “Gidromeliorativ tizimlardan foydalanish” kafedrası dotsenti, O'zbekiston.

— TAHRIR HAY'ATI A'ZOLARI

Sherov Anvar Gulamovich, texnika fanlari doktori (DSc), professor — “Toshkent irrigatsiya va qishloq xo'jaligini mexanizatsiyalash muhandislari instituti” Milliy tadqiqot universiteti “Gidromeliorativ tizimlardan foydalanish” kafedrası mudiri, O'zbekiston.

Abduraxmanov Ubaydulla Zulfiqorovich, qishloq xo'jaligi fanlari doktori (DSc), katta ilmiy xodim — O'zbekiston Respublikasi Fanlar akademiyasi huzuridagi Oliy attestatsiya komissiyasi kotibiyatining qishloq xo'jaligi va veterinariya fanlari bo'yicha bosh inspektori, O'zbekiston.

Karimov Xusniddin Nagimovich, qishloq xo'jaligi fanlari doktori (DSc), katta ilmiy xodim — Akademik M.Mirzayev nomidagi Bog'dorchilik, uzumchilik va vinochilik ilmiy-tadqiqot instituti “O'simliklar fiziologiyasi va agrokimyo” laboratoriyasi mudiri, O'zbekiston.

Allanov Xolik Keldiyorovich, qishloq xo'jaligi fanlari doktori (DSc) — Toshkent davlat agrar universiteti Agronomiya va agrotexnologiyalar kafedrası professori, O'zbekiston.

Nabiev Saydig'ani Muxtorovich, biologiya fanlari doktori (DSc), professor — O'zbekiston Respublikasi Fanlar akademiyasi Genetika va o'simliklar eksperimental biologiyasi instituti laboratoriya mudiri, loyiha rahbari, O'zbekiston.

Baboev Saidmurat Kimsanboevich, biologiya fanlari doktori (DSc), professor — O'zbekiston Respublikasi Fanlar akademiyasi Genetika va o'simliklar eksperimental biologiyasi instituti “Donli ekinlar genetikasi, seleksiyasi va urug'chiligi” laboratoriyasi mudiri, O'zbekiston.

Nazarov Xudayberdi Kuydimuratovich, qishloq xo'jaligi fanlari doktori (DSc) — Toshkent davlat agrar universiteti “Qishloq xo'jaligi ekinlari genetikasi, seleksiyasi va urug'chiligi” kafedrası dotsenti, O'zbekiston.

Gafarova Aziza Israilovna, texnika fanlari bo'yicha falsafa doktori (PhD) — “Toshkent irrigatsiya va qishloq xo'jaligini mexanizatsiyalash muhandislari instituti” Milliy tadqiqot universiteti katta o'qituvchisi, O'zbekiston.

Ganiyev Sanjar Ernazarovich, qishloq xo'jaligi fanlari bo'yicha falsafa doktori (PhD), dotsent — Samarqand davlat veterinariya meditsinasi, chorvachilik va biotexnologiyalar universiteti Toshkent filiali Agrobiologiya va dorivor o'simliklar yetishtirish kafedrası dotsenti, O'zbekiston.

Idrisov Xusanjon Abdujabborovich, qishloq xo'jaligi fanlari bo'yicha falsafa doktori (PhD), dotsent — Farg'ona davlat universiteti Mevachilik va sabzavotchilik kafedrası dotsenti, O'zbekiston.

Mamedov Normuxammad Mardanovich, qishloq xo'jaligi fanlari bo'yicha falsafa doktori (PhD) — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti “Organik paxtachilik” laboratoriyasi katta ilmiy xodimi, O'zbekiston.

Yakubov Muzaffar Matyakubovich, qishloq xo'jaligi fanlari bo'yicha falsafa doktori (PhD) — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti “Organik paxtachilik” laboratoriyasi katta ilmiy xodimi, O'zbekiston.

Yaxyoeva Nafisa Nuriddinovna, qishloq xo'jaligi fanlari bo'yicha falsafa doktori (PhD) — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti “Aqli qishloq xo'jaligi texnologiyalari” laboratoriyasi katta ilmiy xodimi, O'zbekiston.

Mamatqulova Lobar O'rolovna, qishloq xo'jaligi fanlari bo'yicha falsafa doktori (PhD) — Termiz davlat muhandislik va agrotexnologiyalar universiteti Agronomiya, seleksiya va urug'chilik kafedrası katta o'qituvchisi, O'zbekiston.

Rayimberdiyev Xolyigit Abduraxmanovich, qishloq xo'jaligi fanlari bo'yicha falsafa doktori (PhD), katta ilmiy xodim — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti Sirdaryo ilmiy-tajriba stansiyasi direktori, O'zbekiston.

Xamidova Shaxnoza Muxamadxanovna, qishloq xo'jaligi fanlari bo'yicha falsafa doktori (PhD) — “Toshkent irrigatsiya va qishloq xo'jaligini mexanizatsiyalash muhandislari instituti” Milliy tadqiqot universiteti “Gidromeliorativ tizimlardan foydalanish” kafedrasida dotsenti, O'zbekiston.

Gadayev Nodirjon Nosirjonovich, texnika fanlari bo'yicha falsafa doktori (PhD) — “Toshkent irrigatsiya va qishloq xo'jaligini mexanizatsiyalash muhandislari instituti” Milliy tadqiqot universiteti “Gidromeliorativ tizimlardan foydalanish” kafedrasida dotsenti, O'zbekiston.

Raximov Avazbek Xolmamatovich, qishloq xo'jaligi fanlari doktori (DSc), katta ilmiy xodim — Toshkent davlat agrar universiteti O'quv-ilmiy tajriba bo'limi bosh mutaxassisi, O'zbekiston.

Avtonomov Viktor Aleksandrovich, qishloq xo'jaligi fanlari doktori (DSc), professor — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti Markerlarga asoslangan g'o'za navlari seleksiyasi laboratoriyasi mudiri, O'zbekiston.

Amanturdiyev Alisher Balkibovich, qishloq xo'jaligi fanlari doktori (DSc), professor — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti laboratoriya mudiri, O'zbekiston.

Amanturdiyev Shavkat Balkibaevich, qishloq xo'jaligi fanlari doktori (DSc), katta ilmiy xodim — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti Bida seleksiyasi va urug'chiligi laboratoriyasi mudiri, O'zbekiston.

Kozubaev Shuxrat Sattardjanovich, qishloq xo'jaligi fanlari doktori (DSc), professor — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti “G'o'za urug'chiligi va urug'shunosligi” laboratoriyasi mudiri, O'zbekiston.

Jalolov Xurshidbek Xurram o'g'li, qishloq xo'jaligi fanlari bo'yicha falsafa doktori (PhD), katta ilmiy xodim — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti ilmiy kotibi, O'zbekiston.

Avliyakov Mirzoolim Avazovich, qishloq xo'jaligi fanlari doktori (DSc), professor — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti “Aqlli qishloq xo'jaligi texnologiyalari” laboratoriyasi mudiri, O'zbekiston.

Kurbonov Abrorjon Yorkinovich, qishloq xo'jaligi fanlari doktori (DSc), katta ilmiy xodim — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti “G'o'za biotexnologiyasi” laboratoriyasi mudiri, O'zbekiston.

Negmatova Surayyo Teshaevna, qishloq xo'jaligi fanlari doktori (DSc), professor — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti bosh ilmiy xodimi, O'zbekiston.

Ravshanov Azam Erkinovich, qishloq xo'jaligi fanlari doktori (DSc), katta ilmiy xodim, professor — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti Tola texnologiyasi laboratoriyasi mudiri, O'zbekiston.

Tungushova Dilbar Abduskayumovna, qishloq xo'jaligi fanlari doktori (DSc), professor — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti Agroiinnovatsiyalar va trening markazi bo'lim boshlig'i, O'zbekiston.

Xalikova Maloxat Babamuradovna, qishloq xo'jaligi fanlari doktori (DSc), professor — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti laboratoriya mudiri, O'zbekiston.

Xalikov Baxodir Meylikovich, qishloq xo'jaligi fanlari doktori (DSc), professor — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti laboratoriya mudiri, O'zbekiston.

Nurmatov Sheramat, qishloq xo'jaligi fanlari doktori (DSc), professor — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti “Tuproqni eroziyadan himoya qilish, uning meliorativ holatini yaxshilash va agroekologiya” laboratoriyasi yetakchi ilmiy xodimi, O'zbekiston.

Babaev Yashin Amanovich, qishloq xo'jaligi fanlari doktori (DSc), professor — Paxta seleksiyasi, urug'chiligi va yetishtirish agrotexnologiyalari ilmiy-tadqiqot instituti direktorining ilmiy ishlar va innovatsiyalar bo'yicha o'rinbosari, O'zbekiston.

Axtamova Munira Tuychiyevna, qishloq xo'jaligi fanlari bo'yicha falsafa doktori (PhD) — Samarqand davlat veterinariya meditsinasi, chorvachilik va biotexnologiyalar universiteti “Xususiy zootexniya va yaylov chorvachiligi” kafedrasida assistenti, O'zbekiston.

Mamatov Baxtiyor Salimovich, qishloq xo'jaligi fanlari bo'yicha falsafa doktori (PhD), katta ilmiy xodim — Qorako'lchilik va cho'l ekologiyasi ilmiy-tadqiqot instituti “Cho'l-yaylov qo'ychiligi” bo'limi mudiri, O'zbekiston.

16.00.00 — VETERINARIYA FANLARI

— TAHRIRIYAT KENGASHI RAISI

Yuldoshev Xojiakbar Toshpo'latovich, biologiya fanlari bo'yicha falsafa doktori (PhD) — Veterinariya ilmiy-tadqiqot instituti direktori, O'zbekiston.

— TAHRIRIYAT KENGASHI A'ZOLARI

Azimov Jaloliddin Azimovich, biologiya fanlari doktori (DSc), professor — O'zbekiston Respublikasi Fanlar akademiyasi akademigi, Zoologiya instituti, O'zbekiston.

Djabbarov Shuxrat Abdumajidovich, veterinariya fanlari doktori (DSc), professor — Veterinariya va chorvachilikni rivojlantirish qo'mitasi, O'zbekiston.

Safarov Alisher Abduqahor o'g'li, biologiya fanlari doktori (DSc), dotsent — Veterinariya va chorvachilikni rivojlantirish qo'mitasi, O'zbekiston.

Yunusov Xudonazar Beknazarovich, biologiya fanlari doktori (DSc), professor — Samarqand davlat veterinariya meditsinasi, chorvachilik va biotexnologiyalar universiteti, O'zbekiston.

Mavlanov Sabirjon Ibodullaevich, veterinariya fanlari doktori (DSc), professor — Baliqchilik ilmiy-tadqiqot instituti, O'zbekiston.

Daminov Asadullo Suvonovich, veterinariya fanlari doktori (DSc), professor — Samarqand davlat veterinariya meditsinasi, chorvachilik va biotexnologiyalar universiteti, O'zbekiston.

Yuldoshev Nurbek Ergashevich, veterinariya fanlari doktori (DSc), professor — Samarqand davlat veterinariya meditsinasi, chorvachilik va biotexnologiyalar universiteti Toshkent filiali, O'zbekiston.

Ruzimurodov Muxiddin Axrorovich, veterinariya fanlari nomzodi, professor — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

— TAHRIR HAY'ATI A'ZOLARI

Salimov Xait Salimovich, veterinariya fanlari doktori (DSc), professor — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Gafurov Aktam Gafurovich, veterinariya fanlari doktori (DSc), professor — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Elmurodov Bozorboy Aktamovich, veterinariya fanlari doktori (DSc), professor — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Mamadullayev Gulmurod Hamidovich, veterinariya fanlari doktori (DSc), professor — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Kuldoshev Otamurod Urazovich, veterinariya fanlari doktori (DSc), professor — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Eshburiyev Baxtiyar Mamatqulovich, veterinariya fanlari doktori (DSc), professor — Samarqand davlat veterinariya meditsinasi, chorvachilik va biotexnologiyalar universiteti, O'zbekiston.

Salimov Ilxom Xayitovich, veterinariya fanlari doktori (DSc), professor — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Eshburiyev Sobir Baxtiyorovich, veterinariya fanlari doktori (DSc), dotsent — Samarqand davlat veterinariya meditsinasi, chorvachilik va biotexnologiyalar universiteti, O'zbekiston.

Qurbonov Feruz Enadullaevich, veterinariya fanlari doktori (DSc), dotsent — Samarqand davlat veterinariya meditsinasi, chorvachilik va biotexnologiyalar universiteti, O'zbekiston.

Djurayev Olimjon Axrorovich, veterinariya fanlari nomzodi, katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Ismatova Ra'no Asadovna, veterinariya fanlari nomzodi, katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Bo'tayev Maxmud Qarshievich, veterinariya fanlari nomzodi, katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Axmedov Baxadir Nazarovich, veterinariya fanlari nomzodi, katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Pulotov Faxriddin Sayfiddinovich, veterinariya fanlari bo'yicha falsafa doktori (PhD), katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Ulug'muradov Azamat Daminovich, veterinariya fanlari bo'yicha falsafa doktori (PhD), katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Isayev Jasur Muaffarovich, veterinariya fanlari bo'yicha falsafa doktori (PhD), katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Navruzov Nurali Itolmasovich, veterinariya fanlari bo'yicha falsafa doktori (PhD), katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Safarov Xurshid Abdurajabovich, veterinariya fanlari bo'yicha falsafa doktori (PhD), katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Murodov Xurshid Uktamovich, veterinariya fanlari bo'yicha falsafa doktori (PhD), katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Hamroqulov Nuriddin Shokir o'g'li, veterinariya fanlari bo'yicha falsafa doktori (PhD), katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Baliyev Shavkat Kuchkarovich, veterinariya fanlari bo'yicha falsafa doktori (PhD), katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Karimova Nazira Umukulovna, veterinariya fanlari bo'yicha falsafa doktori (PhD), katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

Sultonova Intizor Yuldosheva, veterinariya fanlari bo'yicha falsafa doktori (PhD), katta ilmiy xodim — Veterinariya ilmiy-tadqiqot instituti, O'zbekiston.

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16.00.00 — ВЕТЕРИНАРНЫЕ НАУКИ

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06.00.00 – Agricultural sciences

**06.00.00 – Сельскохозяйственные
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Inheritance characteristics of morphological traits in mungbean cultivars and F1 hybrid combinations

Morfologik belgilarning mosh navlari va F1 duragay kombinatsiyalarida irsiylanish xususiyatlari

Характер наследования морфологических признаков у сортов маша и в гибридных комбинациях F1

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ENGLISH

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Abstract. This article identifies the morphological traits and inheritance characteristics of mungbean cultivars and their F1 hybrids. Diallel crosses were performed between two local and two foreign mung bean lines to produce hybrid combinations. Phenotypic variations in morphological traits—such as plant height, productive branches, and pod length—were examined in the F1 hybrids derived from these parental forms. S. Wright's formula was used to determine whether the F1 hybrids exhibited positive or negative heterosis relative to the parental cultivars and lines. Based on the research results, hybrid combinations demonstrating superior performance in specific morphological traits compared to the parental samples were selected as promising candidates for further breeding research.

Keywords: mungbean; hybrid; morphological traits; inheritance; dominance; heterosis; breeding; crossing

O'ZBEKCHA

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Annotatsiya. Mazkur maqolada mosh navlari va ulardan olingan F1 duragaylarda morfologik belgilari va irsiylanish xususiyatlari aniqlangan. Tadqiqotlarda moshning 2 ta mahalliy hamda 2 ta xorijiy tizmalari o'rtasida diallel chatishtirish ishlari olib borilgan hamda duragay kombinatsiyalar olingan. Ota-ona shakllaridan olingan F1 duragaylarda o'simlik bo'yi, hosil shoxlari hamda dukkak uzunligi kabi morfologik belgilarida fenologik farqlanishlar o'rganilgan. F1 duragaylarning ota-ona nav va tizmalariga nisbatan ijobiy yoki salbiy geterozis hosil qilishi S. Wright formulasi yordamida aniqlandi. Tadqiqot na'tijalariga asoslanib har bir morfologik belgilari bo'yicha ota-ona namunlariga nisbatan yuqori ko'rsatkishga ega bo'lgan duragay kombinatsiyalari istiqbolli namunalar sifatida keyingi selektsiya tadqiqotlari ushun tanlab olingan.

Kalit so'zlar: mosh; duragay; morfologik belgilar; irsiylanish; dominatlik; geterozis; selektsiya; chatishtirish

РУССКИЙ

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Каракалтакстан, Ўзбекистан

Аннотация. В данной статье определены морфологические признаки и особенности наследования у сортов маша и их гибридов F1. Для получения гибридных комбинаций были проведены диаллельные скрещивания между двумя местными и двумя зарубежными линиями маша. У полученных гибридов F1 анализировалась фенотипическая изменчивость таких морфологических признаков, как высота растения, количество продуктивных ветвей и длина боба. Для определения наличия положительного или отрицательного гетерозиса у гибридов F1 по сравнению с родительскими сортами и линиями использовалась формула С. Райта. На основании результатов исследования гибридные комбинации, продемонстрировавшие превосходные показатели по определенным морфологическим признакам по сравнению с родительскими образцами, были отобраны в качестве перспективных кандидатов для дальнейшей селекционной работы.

Ключевые слова: маш; гибрид; морфологические признаки; наследование; доминирование; гетерозис; селекция; скрещивание

1. KIRISH

Introduction

Dehqonchilikda dukkakli ekinlar ichida eng asosiy oziq-ovqat ekinlaridan biri mosh hisoblanadi. Mosh doni oqsil, uglevod, vitaminlar hamda mineral moddalarga boy bo'lib, oziq-ovqat ishlab chiqarishda keng foydalaniladi. Shuningdek, mosh ekinining biologik xususiyatlari, qisqa vegetatsiya davri hamda tashqi muhit omillariga bardoshliligi bu ekinni istiqbolli ekinlardan biri ekanligini isbotlaydi. Hozirda yer yuzida iqlim o'zgarishi qishloq xo'jaligi ekinlari hosildorligiga sezilarli ta'sir ko'rsatmoqda. Bunday sharoitda hosildorligi yuqori, tezpushar hamda agroekologik sharoitlarga moslashgan navlarni yaratish seleksiya sohasining eng asosiy vazifalaridan biri hisoblanadi. Bunday navlarni yaratishda genetik xilma-xillikka ega bo'lgan boshlang'ich materiallardan foydalanish, morfologik va xo'jalik belgilari bo'yicha o'zgaruvchanlik va irsiylanish qonuniyatlarini tahlil qilish katta ahamiyatga ega. Mosh ekinida o'simlik bo'yi, hosil shoxlari soni, dukkak uzunligi kabi morfologik belgilar navlarning biologik xususiyatlari bilan birga yuqori hosildorlik imkoniyatlarini ham belgilab beradi. Moshning ota-ona navlari va F1 duragaylarida morfologik belgilarining irsiylanishini o'rganish kombinatsiyalarining seleksion qiymatini ifodalaydi. Shu sababli seleksiya va genetik tadqiqotlarida mosh navlari va ulardan chatishtirib olingan F1 duragaylarida morfologik belgilarining irsiylanishini tahlil qilish ilmiy va amaliy jihatdan dolzarb hisoblanadi. Ushbu tadqiqotning maqsadi moshning mahalliy va xorijiy nav namunalari va ularda diallel chatishtirish usulida olingan F1 duragay kombinatsiyalarida morfologik belgilarining irsiylanish qonuniyatlarini o'rganish va seleksiya tadqiqotlari ushuni istiqbolli kombinatsiyalarni tanlab olishdan iborat.

X. Idrisovning [5; 30-31-b.]. malumotlariga qaraganda mosh – o'tsimon va shoxli o'simlik bo'lib, suvli poyasi ichi bo'sh. Mosh o'simligining barglari yashil va uch bargli, gullari sarg'ish va dukkaklari jigarrang, har bir novda 10-12 urug'dan iborat. Urug'i yashil va yumaloq shaklga ega. U kuchli ildiz tizimiga ega va atmosfera azotini o'g'it sifatida ishlatilishi mumkin bo'lgan ammiakga birlashtirish qobiliyatiga ega.

X.A. Idrisov., M.A. Gaziyeu va boshqa olimlarning [6; 42-45-b.]. tadqiqotlarida keltirilishicha sug'oriladigan tipik bo'z tuproqlar sharoitlarida barcha hisoblash muddatlarida mosh navlarida ekish me'yori oshgansari poya balandligi ham oshib boradi. Oxirgi yani 15-iyulda ekish muddatida poya balandligini kamayishi kuzatiladi. Bunga sabab yozning ikkinchi yarmida vujudga keladigan tashqi muhit omillarining ta'siridir.

H. N. Atabayeva va X. A. Idrisovning [1; 422-426-b.]. aytishicha, barglarning rivojlanishi ekish muddati va me'yorlariga bevosita bog'liqdir. Iyul boshlarida ekilgan moshda barglar soni ortib boradi, biroq ekish me'yorining ko'payishi bilan barglar soni kamayadi. Har qanday navda ekish me'yori 40 kg/ga qilib belgilanganida, barcha muddatlarda barg yuzasi eng yuqori

ko'rsatkichga ega bo'lgan. Ammo ekish muddati kechiktirilgan sari barg yuzasi pasayish tendensiyasini ko'rsatgan.

X.A. Idrisov., O.N. Dexqonovlarning [7; 855-858-b.]. tadqiqotlarida, moshning 4 ta xorijiy nav namunalari nav tanlov ko'chatzorida mahalliy Radost navi bilan biometrik ko'rsatkichlari solishtirib o'rganilgan. Tajiribalarda xorijiy 412441 (Filippin) va 430177 (Afg'oniston) namunalari vegetatsiya davri bo'yicha hamda 414360 (Filippin) namunasi esa o'simlik bo'yi, hosil shoxlar soni va 1-o'simlikdagi dukkaklari soni bo'yicha standart navga nisbatan qimmatli xo'jalik belgilari yuqori ekanligi qayd etilgan.

2. TADQIQOT MATERIALLARI VA USLUBLARI

Materials and methods

Ilmiy tadqiqotlar joriy yilda Qoraqalpog'iston qishloq xo'jaligi va agrotexnologiyalar institutining oquv tajriba maydonida olib borildi. Tajiribalarda asosan to'rtta Durdona, Osiyo, VI-062909 hamda VI-060020 A-G nav va liniyalari hamda ulardan diallel chatishtirish usulida olingan F1 duragay kombinatsiyalarining morfologik belgilarining irsiylanishi tahlil qilindi. Duragay namunalari tajriba maydoniga 28-aprel kuni ota-ona navlari bilan birgalikda 60x15x1 sxemada ekildi. Tadqiqotlarda fenologik kuzatishlar, biometrik o'lchovlar, ekin parvarishi ishlari B. A. Dospexovning "Metodika polevogo opita" (1985) kabi manbalari, tavsiyalari va uslublari asosida amalga oshirildi.

F1 duragaylarda dominantlik darajasi G.M. Beil va R.E. Atkins (1965) ishlari keltirilgan S.Wright formulasi bo'yicha hisoblanadi;

$$hp = \frac{F_1 - MP}{P - MP} \quad (1)$$

hp – dominantlik koeffitsienti;

F1 – duragayning o'rtacha arifmetik ko'rsatkichi;

MR – ikkala ota-ona shakl belgisining o'rtacha arifmetik ko'rsatkichi;

R – eng yaxshi ota yoki ona shakl belgisining o'rtacha arifmetik ko'rsatkichi.

hp = 0 – dominantlik yo'q;

0 < hp < ±1,0 – oraliq dominantlik;

p = ±1,0 – to'liq dominantlik;

hp > ±1,0 – o'ta dominantlik.

3. TADQIQOT NATIJALARI VA MUHOKAMA

Results and discussion

Tajiribalarda asosan moshning navlari va tizmalari hamda ulardan diallel chatishtirish usulida olingan F1 duragay

kombinatsiyalardagi morfologik belgilar ota-ona namunalari bilan bilan solishtirib tahlil qilindi. Tadqiqotlarda o'simlik bo'yi, hosil shoxlari soni va dukkak uzunligi kabi belgilar bo'yicha biometrik o'lchovlar amalga oshirildi. Olib borilgan tajribalarda Durdona navi andoza nav sipatida tanlab olindi. Tadqiqot natijalari ko'rsatgan ma'lumotlarga ko'ra, o'rganilayotgan nav va tizmalar ichida o'simlik bo'yicha Osiyo navi 41,8 sm bilan yuqori natijani qayd etgan bo'lsa, eng past ko'rsatkish Durdona navida 38,3 sm namoyon bo'ldi. Qolgan tizmalarda sezilarli farq kuzatilmadi va mos ravishda VI-062909 hamda VI-060020 A-G liniyalarida esa poya balandligi 39,7 va 39,4 sm ni tashkil qildi. A.T Aleuovanning [2; 171-174-b.] ma'lumotlariga ko'ra, moshning Durdona navinining Qoraqalpog'iston sharoitida hosildorligiga ekish muddatlarini ta'siri o'rganilganda, aprel oyining III-dekadasi eng optimal muddat ekanligi va bu paytda o'sishi rivojlanishi barqaror bo'lishi kuzatilgan. Shuningdek vegetativ massaning yaqshi shakllanishi aniqlangan. Bu muddatda ekinlarda morfologik kuzatuvlarda ham ijobiy natijalar qayd etilgan asosan o'simlik balandligi 55-60 sm, bir tup o'simlikdagi dukkaklar soni 28-30 dona bo'lishi kuzatilgan.

F1 duragay kombinatsiyalarda o'simlik bo'yi belgisi bo'yicha ota-ona nav va tizmalariga solishtirganda yuqori, ortacha va past natijalar qayd etildi. Jumladan Osiyo x VI-062909 duragay kombinatsiyasida poya balandligi 43, 7 sm bilan eng yuqori ko'rsatkishni namoyon qilgan bo'lsa, eng past ko'rsatkish esa Osiyo x Durdona kombinatsiyasida aniqlandi. VI-062909 x Osiyo, VI-060020 A-G x VI-062909 hamda Osiyo x VI-060020 A-G duragaylarida esa ortacha 40,1-41,1 sm oralig'ida mosh poyalari rivojlanganligi qayd etildi. Qolgan duragay kombinatsiyalarida esa bu morfologik belgi oraliq ko'rinishda namoyon bo'lgan. O'rganilayotgan ota-ona namunalarga nisbatan duragay kombinatsiyalarning dominantlik darajasi tahlil qilinganda 3 duragayda ijobiy geterozis hodisasi aniqlangan bolsa (1,18, 2,8 va 4,3), qolgan duragay kombinatsiyalarda oraliq va salbiy geterozis hodisasi kuzatilgan.

1-jadval

Moshning nav va F1 duragay kombinatsiyalarda morfologik belgilarining irsiylanishi / **Table 1.** Inheritance of morphological traits in mungbean cultivars and F1 hybrid combinations

№	Navlar F1 duragaylar	O'simlik bo'yi	hp	Hosil shoxlari	hp	Dukkak uzunligi	hp
1	St. Durdona	38,3	-	3,6	-	7,52	-
2	Osiyo	41,8	-	4	-	8,7	-
3	VI-062909	39,7	-	4,2	-	8,8	-
4	VI-060020 A-G	39,4	-	3,4	-	9,1	-
5	F1 Durdona x Osiyo	38,8	-0,71	3,7	-0,5	8,5	0,66
6	F1 Osiyo x Durdona	30,8	-5,2	3,5	-1,5	8,8	1,16
7	F1 Durdona x VI-060929	35,4	-5,1	4,3	1,4	7,7	-0,7
8	F1 VI-062909 x Durdona	32,2	-9,7	4	0,33	7,15	-1,5
9	F1 Durdona x VI060020 A-G	36,7	-3,9	4,08	5,8	7,44	-1,1
10	F1 VI-060020 A-G x Durdona	39,5	1,18	3,8	3	7,72	-0,7
11	F1 Osiyo x VI-062909	43,7	2,8	4,25	1,5	9,06	6,2
12	F1 VI-062909 x Osiyo	41,1	0,3	3,8	-3	8,5	-0,5
13	F1 Osiyo x VI-060020 A-G	40,1	0,41	3,1	-2	7,8	-5,5
14	F1 VI-060020 A-G x Osiyo	33,2	-6,1	5,1	4,6	9,4	2,5

Morfologik belgilardan hosil shoxlari soni bo'yicha ilimiy tadqiqotlar olib borilganda nav tizmalar ichida eng ko'p 4,2 va 4 hosil shoxlar mos ravishda VI-062909 tizmasi va Osiyo navlarida aniqlansa, Durdona va VI-060020 A-G namunalari esa mos ravishda 3,6 va 3,4 hosil shoxlari rivojlandi. F1 duragay kombinatsiyalarda esa eng yuqori hosil shoxlar Durdona x VI-062909, VI-062909 x Durdona, Durdona x VI-060020 A-G, Osiyo x VI062909 hamda VI-060020 A-G x VI-062909 namunalari mos ravishda 4,3, 4, 4,08, 4,25 va 4 ta hosil shoxlar aniqlandi. Eng past ko'rsatkish esa Osiyo x VI-060020 A-G duragay kombinatsiyasida 3,1 hosil shoxlar bilan aniqlandi. Tahlil qilinayotgan duragay kombinatsiyalar ichidan 5 ta namunada ijobiy geterozis hodisasi (1,4, 5,8, 3, 1,5 va 4,6) qayd etilgan bolsa qolgan kombinatsiyalarda esa oraliq va salbiy geterozis hodisasi qayd etildi.

Dukkak uzunligi bo'yicha olib borilgan tadqiqotlarga ko'ra, nav va liniyalar ichida eng yuqori na'tija VI-060020 A-G liniyasiga (9,1 sm) tegishli bo'lgan bo'lsa, eng past ko'rsatkish esa Durdona navida (7,52 sm) namoyon bo'ldi. Qolgan nav va tizmalarda bu belgi oraliq holda shakllangan. F1 duragay kombinatsiyalar ichida dukkak uzunligi belgisi har qil darajada irsiylangan bo'lib, VI-060020 A-G x VI-062909 (9,6 sm), VI-060020 A-G x Osiyo (9,4) hamda VI-062909 x Osiyo (9,06 sm) duragaylarida eng uzun dukkaklar aniqlandi. Qolgan duragay kombinatsiyalarda bu belgi oraliq holda 7,4-8,8 sm oralig'ida shakllandi. Eng past ko'rsatkish 7,15 sm bilan VI-062909 x Durdona kombinatsiyasiga tegishli bo'ldi. Ota-ona nav va tizmalariga nisbatan Osiyo x Durdona, Osiyo x VI-062909 hamda VI-060020 A-G x VI-062909 namunalari ijobiy geterozis mos ravishda 1,16, 6,2 va 4,3 qayd etildi. Qolgan duragay kombinatsiyalarda oraliq va salbiy geterozis hodisalari kuzatildi. Bunday farqlanishlar ota-ona nav va tizmalarining genetik xususiyatlari va ularning o'z-aro kombinatsion ta'siriga bog'liq. Shuningdek tashqi-muhit omillari ham fenotifik belgilarning namoyon bo'lishiga ma'lum darajada ta'sir ko'rsatadi (1-jadval).

№	Navlar F1 duragaylar	O'simlik bo'yi	hp	Hosil shoxlari	hp	Dukkak uzunligi	hp
15	F1 VI-062909 x VI-060020 A-G	38,2	0,9	3,3	-1,25	8,3	-4
16	F1 VI-060020 A-G x VI-062909	40,2	4,3	4	0,5	9,6	4,3

4. XULOSALAR VA TAVSIYALAR

Conclusions and recommendations

Tadqiqotlarda o'rganilayotgan mosh navlari va F1 duragaylarida morfologik belgilarining irsiylanishi tahlil qilinganda ular ortasida sezilarli farqlar mavjudligi aniqlandi. O'simlik bo'yi belgisi bo'yicha eng yuqori ko'rsatkish navlar orasida Osiyo navida qayd etilgan bo'lsa, bir tupdagi hosil shoxlar soni bo'yicha esa Osiyo navi va VI-062909 liniyasi hamda dukkak uzunligi bo'yicha esa VI-060020 A-G liniyasida ijobiy natijalar qayd etildi. F1 duragay kombinatsiyalardan esa Osiyo x VI-062909 hamda VI-060020 A-G x VI-062909 namunalari har bir belgi bo'yicha yuqori ko'rsatkishlar bilan ijobiy geterozis hodisasi kuzatildi. Morfologik belgilarni o'zida mujassamlashtirilgan ushbu nav va duragay kombinatsiyalar keyingi avlodlarda o'rganish hamda seleksiya tadqiqotlariga boshlang'ish ashyo sifatida foydalanish ushun tavsiya etiladi.

DECLARATIONS

Declarations

Author contributions *CRedit*

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

Mungbean (*Phaseolus aureus* Piper) is one of the principal food legumes of Uzbekistan and of the Republic of Karakalpakstan: its grain is rich in protein, carbohydrates, vitamins and mineral elements, and as a legume it enriches the soil with biological nitrogen. Breeding progress in this crop depends on knowing how the morphological traits that determine plant architecture and yield are transmitted from the parental forms to the hybrid progeny. Although a number of studies have addressed sowing dates, seeding rates and nutrition of mungbean under the conditions of Uzbekistan, the mode of inheritance of plant height, number of productive branches and pod length in crosses between local and introduced accessions has received far less attention. The aim of the present study was therefore to determine the morphological traits and the inheritance characteristics of mungbean cultivars and of the F1 hybrids obtained from them, and on that basis to identify the combinations most promising for further selection work.

Materials and methods

The experiments were carried out on the training and experimental field of the Karakalpak Institute of Agriculture and Agrotechnologies. Two local and two introduced mungbean lines were used as parental forms and were crossed in a diallel scheme, from which the F1 hybrid combinations were obtained. Phenological differences between the parental forms and their F1 progeny were recorded for plant height, the number of productive branches and pod length. The degree of dominance in the F1 hybrids was calculated using the S. Wright formula as presented by G.M. Beil and R.E. Atkins (1965), where h_p is the coefficient of dominance, F_1 the arithmetic mean of the hybrid, MR the arithmetic mean of the trait in both parental forms and P the arithmetic mean of the better parent. The results were interpreted on the accepted scale: $h_p = 0$ indicates the absence of dominance, $0 < h_p < \pm 1.0$ intermediate inheritance, $h_p = \pm 1.0$ complete dominance and $h_p > \pm 1.0$ overdominance, that is heterosis.

Results and discussion

The parental cultivars and lines differed appreciably in all three morphological traits, and the F1 combinations obtained by diallel crossing expressed values that were higher than, intermediate between, or lower than those of the parents depending on the particular combination. For plant height, part of the hybrids exceeded both parental forms, which corresponds to overdominance and indicates a heterotic effect for this trait, while other combinations showed intermediate inheritance. For the number of productive branches the highest value among the parental accessions was 4.2, and the hybrid combinations again distributed themselves between intermediate inheritance and dominance of the better parent. For pod length the best result among the cultivars and lines was recorded in the line VI-060020 A-G, and the F1 progeny derived from it retained a high expression of the trait. The full set of trait means and dominance coefficients for all parental forms and hybrid combinations is presented in Table 1. Taken together, the data show that the three traits studied are not inherited in a uniform manner: the same cross may combine overdominance for one trait with intermediate inheritance for another, so that selection has to be based on the trait complex rather than on any single character.

Conclusion and contribution

Analysis of the inheritance of morphological traits in the mungbean cultivars and their F1 hybrids showed that plant height, the number of productive branches and pod length are inherited according to different patterns, ranging from intermediate inheritance to overdominance, and that the pattern is determined by the particular parental combination. Combinations expressing overdominance for

the yield-forming traits are of practical interest for further selection work and can be recommended for advancement to subsequent generations. The contribution of this work lies in providing, for the soil and climatic conditions of the Republic of Karakalpakstan, quantitative dominance coefficients for the main morphological traits of mungbean, which gives breeders an objective basis for choosing parental pairs in diallel crossing programmes.

ADABIYOTLAR RO'YXATI

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RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • HAC/OAK 06.00.00 — AGRICULTURAL SCIENCES • UDC: 633.112.9:631.53.04(575.12)

The effect of sowing dates and seeding rates of triticale on plant growth and yield in areas prone to water scarcity

Suv tanqisligiga moyil hududlarda tritikale urug'larini ekish muddat va me'yorlarining o'simliklarning o'sishi va hosildorligiga ta'siri**Влияние сроков и норм посева семян тритикале на рост и урожайность растений в районах, склонных к дефициту воды****Fayzulla Xidirovich HAMRAEV^{1,*}**¹ Department of Agronomy, Navoi State University of Mining and Technologies, Navoi, Uzbekistan* Corresponding author: fayzulla.hamroyev52@mail.ru

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)

ENGLISH

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Abstract. This article presents a comprehensive analysis of sowing dates, seeding rates, and cultivation technology of the autumn triticale varieties “Svat” and “Tit” under the soil and climatic conditions of the Navoi region. The study examines plant growth and development, viability, productivity, and quality indicators of the yield. In addition, data obtained on optimal sowing dates and seeding rates of autumn triticale seeds are thoroughly analyzed. Since triticale is a hybrid of wheat and rye, it is considered a crop with higher adaptability compared to both wheat and rye. The protein content of the grain ranges from 12–13%, while straw contains 10–12% protein. The crop is widely used as feed for livestock, and its grain is utilized in the production of bread and animal feed. However, the quality of bread products made from triticale grain is lower than that of wheat flour. Depending on soil and climatic conditions, grain yield ranges from 45–65 centners per hectare, while green biomass yield amounts to 340–450 centners per hectare. To achieve high yields, it is essential that fields are kept free from weeds and various diseases, and that mineral fertilizers are applied in a timely manner and at scientifically recommended rates.

Keywords: triticale; variety; sowing dates; seeding rates; fertilization; mineral fertilizers; yield

O'ZBEKCHA

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Annotatsiya. Maqolada Navoiy viloyatining tuproq-iqlim sharoitida kuzgi tritikalening “Svat” hamda “Tit” navlarini ekish muddatlari, me'yorlari va yetishtirish agroteknikasi, ya'ni o'simliklarning o'sishi-rivojlanishi, yashovchanligi, hosildorligi, mahsulotning sifat ko'rsatkichlari, shuningdek, kuzgi tritikale urug'larini ekish muddat va me'yorlari bo'yicha olingan ma'lumotlar to'liq tahlil qilib berilgan. Tritikale ekini bug'doy va javdar duragayi bo'lgani uchun bu o'simlik bug'doy va javdarga nisbatan ancha moslashuvchan ekin turi bo'lib, donining tarkibida oqsil miqdori 12–13 foiz, pichanining tarkibida 10–12 foiz bo'ladi. Somoni chorva mollari uchun ozuqa, doni non va yem tayyorlashda foydalaniladi. Non mahsuloti tayyorlashda sifatli bug'doy mahsulotidan pastdir. Tuproq-iqlim sharoitiga qarab don hosili 45–65 s/ga, ko'k massa hisobida 340–450 s/ga ni tashkil etadi. Ammo bunday yuqori hosil olish uchun albatta dala maydoni begona o'tlardan va turli kasalliklardan toza bo'lishi va mineral o'g'itlar bilan o'z vaqtida belgilangan me'yorlarda oziqlantirish lozim.

Kalit so'zlar: tritikale; nav; ekish muddatlari; ekish me'yorlari; oziqlantirish; mineral o'g'itlar; hosildorlik

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РУССКИЙ**ХАМРАЕВ Файзулла Хидирович^{1*}**¹ Кафедра агрономии, Навоийский государственный горно-технологический университет, Навои, Узбекистан

Аннотация. В статье представлен полный анализ данных, полученных по срокам, нормам и агротехническим условиям выращивания сортов озимой тритикале «Сват» и «Тит» в почвенно-климатических условиях Навоийской области, а именно: рост и развитие растений, жизнеспособность, урожайность, показатели качества продукции, а также сроки и нормы посева семян озимой тритикале. Поскольку тритикале является гибридом пшеницы и ржи, это растение более приспособлено к различным условиям выращивания, чем пшеница и рожь, а содержание белка в его зерне составляет 12–13 %, в сене — 10–12 %. Солома используется для приготовления кормов для скота, зерно — для хлебопечения и фуража. При приготовлении хлебобулочных изделий его качество ниже, чем у пшеничных продуктов. В зависимости от почвенно-климатических условий урожайность зерна составляет 45–65 ц/га, а в пересчёте на зелёную массу — 340–450 ц/га. Однако для получения столь высокого урожая поле должно быть свободно от сорняков и различных болезней, а подкормка минеральными удобрениями должна проводиться своевременно и в установленных нормах.

Ключевые слова: тритикале; сорт; сроки посева; нормы высева; подкормка; минеральные удобрения; урожайность

1. KIRISH*Introduction*

Kirish: Tritikale (Triticosecale) javdar va bug‘doyni amfidiploidi-dir. Nemis seleksioneri V.Rimpau tomonidan 1888 yilda bug‘doyni javdar bilan chatishtirish orqali birinchi bo‘lib unumdor oktoploid bug‘doy-javdar gibridd tritikaleni yaratdi. Hozirda tritikale butun dunyoda asosan yem-xashak va oziq-ovqat uchun yetishtiriladi [7].

Tritikale - bug‘doy va javdar o‘rtasida murakkab masofaviy duragaylash orqali odamlar tomonidan sintez qilingan donning yangi jinsidir. O‘simlik javdar va bug‘doyni morfologik xususiyatlarini va biologik xususiyatlarini birlashtiradi. Tritikale kurtaklari javdarga o‘xshaydi, poya barglari bug‘doyga o‘xshaydi. Boshog‘i javdarning ko‘p boshog‘li ko‘rinishini bug‘doy boshog‘larining ko‘p gulli ko‘rinishi bilan birlashtiradi. Spikelet va lemmaning morfologiyasi bug‘doynikiga o‘xshaydi. Changlanishi turiga ko‘ra tritikale ko‘pincha o‘zaro changlanadi, lekin bug‘doydagi kabi o‘z-o‘zidan changlanishi ham mumkin. Tritikale doni yirik shakli, rangli, sirt xarakteri o‘yiq, donining po‘sti qalin, qalinligi va kengligi bug‘doyga o‘xshaydi, lekin sezilarli darajada uzunroq [2; 42-43-s., 1; 18-s.].

Tritikale - bug‘doy va javdarning asl ota-ona shakllarining bir qator xususiyatlarini o‘zida mujassam etgan donli ekinlarning yangi sun‘iy ravishda olingan amfidiploidi. Bu bug‘doy va javdar xromosomalarining to‘liq to‘plamini birlashtirgan duragaylardir. Ona o‘simlik bug‘doy hisoblanadi. Tritikale ko‘p boshog‘li ko‘rinishni javdardan, ko‘p gulli boshog‘ni bug‘doydan meros qilib oldi, bu boshog‘ning yuqori mahsuldorligini belgilaydi. Tashqi tomondan, tritikale boshog‘i javdar boshog‘iga o‘xshaydi [4; 49-s.].

Tritikale yoki bug‘doy-javdar gibridi – boshog‘li don o‘simliklarning yangi turi. Bu tur kuchli rivojlangan ildiz tizimi va yuqori poyaga egaligi bilan ajralib turadi. O‘simliklar tik poya hosil qiladi, em-xashak navlarida poyasining balandligi 145-180 sm, donli navlarda 110-120 sm bo‘lib, tabiatning stres omillariga chidamli. Barglari lansetsimon, mayin, barglari 45-50%. To‘pgul - 25-28 ta boshog‘chadan iborat katta boshog‘. Bu ekin quruq yillarda, vegetatsiya davrida 250 mm dan ko‘p bo‘lmagan yog‘ingarchilik tushganda ham yuqori hosil berishga qodir [3; 49-s.].

Navoiy viloyat hududi asosan Qizilqum cho‘lining katta qismi, Zarafshon daryosi vodiysi hamda Nurota tog‘ tizimlari bilan qamrab olingan. Bu hududning geografik o‘rni viloyatda turli tuproq turlari va landshaftlarning shakllanishiga zamin yaratgan.

Viloyat maydoni mamlakat umumiy yer maydonining taxminan 24,7% ini tashkil etadi. Iqlimi kontinental, quruq va yoz mavsumi juda issiq, qish mavsumi esa sovuq va quruq kechadi. Yillik yog‘ingarchilik miqdori 90–150 mm atrofida bo‘lib, asosan bahor va qisman kuz oylariga to‘g‘ri keladi. Yozda havo harorati +40...+45 °C gacha ko‘tariladi, qishda esa –15...–20 °C gacha pasayishi mumkin. Tajriba o‘tkazish usuli va uslublari: Ilmiy-tadqiqot ishlari 2023-2024 yillarda Don va dukkakli ekinlar ilmiy-tadqiqot institutining Navoiy ilmiy-tajriba stansiyasi dalalarida, sug‘oriladigan bo‘z-o‘tloqi tuproqlar sharoitida olib borilib, tajribada kuzgi tritikalening “Svat” va “Tit” navlarini o‘sishi, rivojlanishi va don hosildorligiga urug‘larini ekish muddatlari va me‘yorlarining ta’siri o‘rganildi. Tajribada kuzgi tritikalening “Svat” va “Tit” navi urug‘larini uch xil ekish (15-sentyabr, 1-oktyabr, 15-oktyabr) muddatlarida uch xil (4,0 mln/ga, 5,0 mln/ga, 6,0 mln/ga) ekish me‘yorlarida ekib o‘rganildi. Tajriba maydonlarini tanlash va variantlarni joylashtirishda “Dala tajribalarini o‘tkazish uslubiyatlari” (2007) uslubiy qo‘llanmasidan, kuzgi tritikale o‘simligida fenologik kuzatuv va hisoblash ishlari olib borishda “Metodika Gosudarstvennogo sortoispytaniya sel’skokhozyaystvennykh kultur” (M, Kolos, 1964) uslubiy qo‘llanmasidan, olingan natijalarga matematik-statistik ishlov berishda B.A.Dospexovning “Metodika polevogo opyta” (M, 1985) uslubnomasidan foydalanildi. Olingan ma’lumotlarning ko‘rsatishicha, (2023-2024 yy.) amal davri boshida tajriba dala tuprog‘ining 0-30 cm qatlamida gumus miqdori 0,894-0,890 foizni, umumiy shakldagi azot 0,089-0,087 foiz, fosfor 0,119-0,116 foizni, 1,43-1,37 foizni ko‘rsatgan bo‘lsa, tuproqning 30-50 cm qatlamida gumus miqdori 0,654-0,643 foizni, umumiy shakldagi azot 0,066-0,064 foizni, fosfor 0,094-0,091 foizni, kaliy 1,24-1,17 foizni tashkil etganligi aniqlandi. Oziqa unsurlarining harakatchan shakllari tahlil qilinganida, tuproqning 0-30 cm qatlami nitrat miqdori 10,5-10,0 kg/mg, harakatchan fosfor miqdori 25,1-23,3 kg/mg, almashinuvchi kaliy miqdori 180-171 kg/mg, tuproqning 30-50 cm qatlamida nitrat miqdori 5,6-5,1 kg/mg, harakatchan fosfor miqdori 16,8-15,8 kg/mg, almashinuvchi kaliy miqdori 153-143 kg/mg ni tashkil etganligi ma’lum bo‘ldi.

2. TADQIQOT MATERIALLARI VA USLUBLARI*Materials and methods*

Tajriba olib borilgan dalalar tuproqlarining agrokimyoviy xususiyatlari bo‘yicha olingan ma’lumotlarga asoslanib xulosa qiladigan bo‘lsak, nitrat bilan juda kam, harakatchan fosfor va almashinuvchi kaliy bilan kam darajada ta’minlangan deyish mumkin.

1-jadvalTajriba maydonining dastlabki agrokimyoviy xususiyatlari / **Table 1.** Initial agrochemical properties of the experimental plot

Yillar	Tuproq qatlamlari, sm	Gumus miqdori, %	N	P	K	N-NO ₃	P ₂ O ₅	K ₂ O
Yillar	Tuproq qatlamlari, cm	Gumus miqdori, %	N	P	K	N-NO ₃	P ₂ O ₅	K ₂ O
2023	0-30	0,894	0,089	0,119	1,43	10,5	25,1	180
2023	30-50	0,654	0,066	0,094	1,24	5,6	16,8	153
2024	0-30	0,890	0,087	0,116	1,37	10,0	23,3	171
2024	30-50	0,643	0,064	0,091	1,17	5,1	15,8	143

Izoh: N, P, K — umumiy shakllari, %; N-NO₃, P₂O₅, K₂O — harakatchan shakllari miqdori, mg/kg. / Note: N, P, K — total forms, %; N-NO₃, P₂O₅, K₂O — mobile forms, mg/kg.

Tadqiqotning amaliy natijalari quyidagilardan iborat:

Kuzgi tritikaleni oziqlantirishda, azotli o'g'itlardan korbomid (46%), ammiakli selitra (N-34%), fosforli o'g'itlardan superfosfat (P₂O₅-20%), kaliyli o'g'itlardan kaliy tuzi (K₂O-40%) ishlatildi. Tajribada fosforli va kaliyli o'g'itlarning 100% miqdori kuzda, shudgor ostiga qo'llanildi. Azotli o'g'itlar ikkiga bo'lib, 1-oziqlantirish tuplash davrida, 2-oziqlantirish naychalash davrida qo'llanildi.

3. TADQIQOT NATIJALARI VA ULARNING TAHLILI

Results and discussion

Kuzgi tritikale navlarida unib chiqqan ko'chatlar soni bo'yicha yuqori natijalar urug'lar 15-sentyabr muddatida ekilgan variantlarda kuzatilib, urug'lar 1-oktyabr muddatida ekilgan variantlarga nisbatan "Svat" navida 2,4-4,2 dona/m² gacha, "Tit" navida 3,2-5,0 dona/m² gacha yuqori natija ko'rsatgani kuzatilgan bo'lsa, amal davri oxirida xaqiqiy ko'chat qalinligi bo'yicha yuqori natijalar urug'lar 1-oktyabr muddatida ekilgan variantlarda qayd etilib, urug'lar 15-sentyabr muddatida ekilgan variantlarga nisbatan "Svat" navida 1,8-4,8 dona/m² gacha, "Tit" navida 3,5-6,1 dona/m² gacha, urug'lar 15-oktyabr muddatida ekilgan variantlarga nisbatan "Svat" navida 2,2-5,1 dona/m² gacha, "Tit" navida 5,8-10,3 dona/m² gacha yuqori natija ko'rsatgani aniqlandi;

Shuningdek, kuzgi tritikale navlari urug'larini 15-sentyabr muddatida ekish urug'larni 1-oktyabr va 15-oktyabr muddatlarida ekishga nisbatan pishish fazasida poya balandligi "Svat" navida 6,6-12,6 sm, "Tit" navida 7,4-13,7 sm, barg sathi "Svat" navida 1288,9-4108,3 m²/ga, "Tit" navida 885,0-4288,7 m²/ga, quruq massa tuplashini "Svat" navida 6,98-20,06 s/ga, "Tit" navida 6,33-21,46 s/ga gacha yuqori bo'lishi qayd etildi;

Kuzgi tritikale navlari urug'larini 15-sentyabr muddatida ekish barcha urug' ekish me'yorlarida umumiy poyalar sonining ortishiga olib kelib, urug'lar 1-15 oktyabr muddatida ekilgan variantlarga nisbatan "Svat" navida 6,3-60,6 dona/m², "Tit" navida 8,3-55,2 dona/m² gacha yuqori bo'lgani kuzatilgan bo'lsa, mahsuldor poyalar soni bo'yicha yuqori natijalar urug'lar 1-oktyabr muddatida ekilgan variantlarda qayd etilib, urug'lar 15-sentyabr hamda 15-oktyabr ekilgan variantlarga nisbatan "Svat" navida 3,7-25,5 dona/m², "Tit" navida 4,1-34,5 dona/m² gacha yuqori bo'lgani kuzatildi;

Kuzgi tritikale navlari urug'larini 15-oktyabr muddatida ekish urug'larni 15-sentyabr hamda 1-oktyabr muddatida ekishga nisbatan bir boshqoq uzunligini "Svat" navida 0,4-0,9 sm gacha, "Tit" navida 0,3-0,7 sm gacha, 1000 dona don vazni "Svat" navida 1,2-3,6 gr gacha, "Tit" navida 1,3-4,0 gr gacha yuqori bo'lishini ta'minlagan bo'lsa, urug'larni 1-oktyabr muddatida ekish, urug'larni 15-sentyabr hamda 15-oktyabr muddatida ekishga nisbatan bitta boshqoqdagi donlar sonini "Svat" navida 1,0-2,7 donagacha, "Tit" navida 1,3-2,6 donagacha, donlarning natura og'irligini "Svat" navida 1,8-22,3 gr/l gacha, "Tit" navida 1,4-21,2 gr/l gacha yuqori bo'lishini ta'minlashi aniqlandi;

Don hosildorligi bo'yicha har ikki navda ham urug'lar 15-oktyabr muddatida gektariga 6,0 mln dona unuvchan urug' hisobida ekilgan variantlarda aniqlanib, boshqa variantlarga nisbatan don hosildorligi "Svat" navida 0,7-16,8 s/ga, "Tit" navida 1,6-14,9 s/ga gacha yuqori bo'lgan bo'lsada, yuqori iqtisodiy rentabellik urug'lar 1-oktyabr muddatida gektariga 4,0 mln dona unuvchan urug' hisobida ekilgan variantlarda kuzatilib, boshqa variantlarga nisbatan "Svat" navida 4,6-38,5 foizga, "Tit" navida 1,9-33,1 foizgacha yuqori bo'lgani qayd etildi.

Olingan natijalarning ko'rsatishicha, kuzgi tritikalening "Svat" navi urug'lari 15-sentyabr muddatida gektariga 4,0-5,0-6,0 mln dona unuvchan urug' hisobida ekilgan 1-2-3 variantlarda don hosildorligi o'rganilganida, o'rtracha 72,1-70,5-62,4 s/ga ni tashkil etganligi aniqlangan bo'lsa, urug'lar 1-oktyabr muddatida gektariga 4,0-5,0-6,0 mln dona unuvchan urug' hisobida ekilgan 4-5-6 variantlarda don hosili 74,7-76,8-78,5 s/ga ni, urug'lar 15-oktyabr muddatida gektariga 4,0-5,0-6,0 mln dona unuvchan urug' hisobida ekilgan 7-8-9 variantlar tahlil qilinganida esa don hosili 69,4-77,2-79,2 s/ga ni tashkil etgani kuzatildi.

Kuzgi tritikalening "Tit" navi urug'lari ekilgan variantlar tahlil qilinganida, gektariga 4,0 mln dona unuvchan urug' hisobida ekilgan variantlar bo'yicha yuqori hosildorlik urug'lar 1-oktyabr muddatida ekilgan 13-variantda kuzatilib, urug'lar 15-sentyabr hamda 15-oktyabr muddatlarida gektariga 4,0 mln dona unuvchan urug' hisobida ekilgan 10 va 16 variantlarga nisbatan 1,9 s/ga dan 3,8 s/ga gacha, 5,0 mln dona unuvchan urug' hisobida ekilgan variantlar bo'yicha yuqori don hosili urug'lar 15-oktyabr muddatida ekilgan 17-variantda kuzatilib, urug'lar 15-sentyabr va 1-oktyabr muddatlarida gektariga 5,0 mln dona unuvchan urug' hisobida ekilgan 11 va 14 variantlarga nisbatan 2,4 s/ga dan 6,5 s/ga gacha, 6,0 mln dona unuvchan urug' hisobida ekilgan variantlar bo'yicha yuqori natijalar ham urug'lar 15-oktyabr muddatida ekilgan 18-variantda qayd etilib, urug'lar 15-sentyabr hamda 1-oktyabr muddatlarida gektariga 6,0 mln dona unuvchan urug' hisobida ekilgan 12 va 15 variantlarga nisbatan 1,9 s/ga dan 14,9 s/ga gacha qo'shimcha don hosili yetishtirilgani ma'lum bo'ldi.

Olingan ma'lumotlarda ko'rish mumkinki, kuzgi tritikalening har ikki navida ham bir hil qonuniyatlar takrorlangani kuzatilib, gektariga 4,0 mln dona unuvchan urug' ekilgan variantlar bo'yicha 1-oktyabr, gektariga 5,0 va 6,0 mln dona unuvchan urug' hisobida ekilgan variantlar bo'yicha esa yuqori don hosili urug'lar 15-oktyabr muddatida ekilgan variantlarda kuzatilgani qayd etildi.

4. XULOSA

Conclusion

Navoiy viloyatining yarimcho'l xududida bo'z-o'tloqi tuproqlari sharoitida kuzgi tritikalening "Svat" va "Tit" navlaridan yuqori va sifatli don hosili yetishtirishda maqbul ekish muddati va muddatlar kesimida maqbul urug' sarf me'yorlarini aniqlash bo'yicha olib borilgan tadqiqot natijalari asosida quyidagi xulosaga kelish mumkin:

Kuzgi tritikale navlarini erta 15-sentyabr muddatida ekish tuplash darajasini yuqori bo'lishiga olib kelsada, ammo mahsuldor tuplanish bilan bir qatorda mahsulsiz poyalarning ham ortib ketishiga olib keladi. Ushbu muddatda gektariga 5,0 va 6,0 mln dona unuvchan urug' hisobida ekish esa tuplanish darajasining yuqori bo'lishi hisobiga oziqlanish maydonining keskin kamayib ketishi hisobiga boshloqlar maydalashishiga olib keladi. Bu esa o'z navbatida don hosildorligiga jiddiy salbiy ta'sir ko'rsatadi. Urug'larni kech 15-oktyabr muddatida ekish esa tuplash darajasini pasaytiradi. Urug'larni ekish me'yorlarini belgilashda ekish muddatlarini hisobga olgan holda sarf me'yorlarini belgilash hosildorlikka ijobiy ta'sir etishi tadqiqotlarimizda o'z isbotini topdi.

Tajribalardan olingan ma'lumotlar asosida Navoiy viloyatining yarimcho'l xududi tuproq-iqlimi sharoitida kuzgi tritikalening "Svat" hamda "Tit" navlarini yetishtirish va yuqori iqtisodiy samaradorlikka erishishda urug'lar sentyabr oyining ikkinchi dekadasiida ekilganida gektariga 4,0 mln dona, oktyabr oyining birinchi dekadasiida ekilganida gektariga 4,0 mln dona, oktyabr oyining ikkinchi dekadasiida ekilganida esa gektariga 5,0 mln dona unuvchan urug' hisobida ekib yetishtirish tavsiya etiladi.

DECLARATIONS

Declarations

Author contributions *CRedit*

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Кенгаутирилган inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

Navoi region lies largely within the Kyzylkum desert and the Zarafshan river valley; its climate is continental and dry, and the agricultural sector operates under a persistent shortage of irrigation water. In such areas the choice of crop and of the corresponding

agronomic regime determines whether a stable grain and fodder supply can be maintained at all. Triticale ($\times$ Triticosecale), an amphidiploid of wheat and rye first obtained by the German breeder W. Rimpau in 1888, combines a strongly developed root system, drought and cold tolerance and low soil demands with a grain protein content of 12–13 % and a hay protein content of 10–12 %, which makes it a natural candidate for water-scarce zones. What has remained insufficiently defined for the semi-desert belt of Navoi region is the combination of sowing date and seeding rate at which these advantages are actually realised. The aim of the work was to determine, for the winter triticale varieties "Svat" and "Tit", the effect of sowing date and seeding rate on plant emergence, tillering, survival, grain yield and product quality.

Materials and methods

Field experiments were conducted under the soil and climatic conditions of the semi-desert zone of Navoi region on grey-meadow soils. The initial agrochemical characteristics of the experimental plot were determined for the 0–30 cm and 30–50 cm layers in 2023 and 2024 and covered humus content, the total forms of nitrogen, phosphorus and potassium and the mobile forms $N-NO_3$, P_2O_5 and K_2O ; the values are given in Table 1. Two winter triticale varieties, "Svat" and "Tit", were sown on three dates — 15 September, 1 October and 15 October — each at seeding rates of 4.0, 5.0 and 6.0 million viable seeds per hectare. Nutrition followed the standard scheme for the zone, nitrogen being supplied as urea (46 %) and ammonium nitrate (N 34 %) and phosphorus as superphosphate. The number of emerged seedlings, the total number of stems, plant survival, grain yield and the quality indicators of the product were recorded for every variant.

Results and discussion

The number of emerged seedlings was highest when the seed of both varieties was sown on 15 September, and this date also produced the highest total number of stems at every seeding rate, that is the strongest tillering. Sowing on 15 October, by contrast, reduced tillering relative to the September and early-October dates. Grain yield behaved in the opposite way to tillering: in both varieties the highest grain yield was obtained from the 15 October sowing at a rate of 6.0 million viable seeds per hectare. For the variety "Svat" sown on 15 September, the rates of 4.0, 5.0 and 6.0 million seeds per hectare gave the yield pattern described in the article, and analysis of the variants of the variety "Tit" showed that the same regularities were reproduced in both varieties. The practical significance of this divergence is that a vigorous autumn tillering achieved by early sowing does not by itself translate into grain productivity: under the moisture regime of the semi-desert zone the later sowing date combined with the higher seeding rate makes better use of the available water during grain filling.

Conclusion and contribution

Under the grey-meadow soils of the semi-desert zone of Navoi region, sowing date and seeding rate both act as decisive factors for the winter triticale varieties "Svat" and "Tit". Early sowing on 15 September maximises the degree of tillering but does not maximise productivity, whereas sowing on 15 October at 6.0 million viable seeds per hectare gives the highest grain yield in both varieties. On the basis of the experimental data, this date and rate can be recommended for the cultivation of winter triticale in the semi-desert conditions of the region. The contribution of the work is to provide a locally validated agronomic recommendation for a crop that is well suited to water-scarce areas but for which regional sowing standards had not previously been established.

ADABIYOTLAR RO'YXATI

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RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • HAC/OAK 06.00.00 — AGRICULTURAL SCIENCES • UDC: 332.3:631.452

The importance of land management measures in increasing soil fertility and improving arable land

Tuproq unumdorligini oshirish va ekin maydonlarini yaxshilashda yer tuzish tadbirlarining ahamiyati
Значение землеустроительных мероприятий в повышении плодородия почв и улучшении посевных площадей

Fayzulla Xidirovich HAMRAEV^{1,*}¹ Department of Agronomy, Navoi State University of Mining and Technologies, Navoi, Uzbekistan* Corresponding author: fayzulla.hamroyev52@mail.ru**ARTICLE INFO****ARTICLE TYPE**

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)**ENGLISH****Fayzulla Xidirovich HAMRAEV^{1,*}**¹ Department of Agronomy, Navoi State University of Mining and Technologies, Navoi, Uzbekistan

Abstract. The article describes land management measures carried out to use land efficiently, to improve and increase its fertility, and to return to agricultural use land plots that had previously been withdrawn from agricultural circulation because of the shortage of suitable land and water resources.

Keywords: innovation; integration; land management; land categories; pasture; livestock farming; land transformation; land use; irrigation opportunities

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Annotatsiya. Ushbu maqolada yer va suv resurslari tobora tanqis bo'lib borayotgan sharoitda foydalanishdan chiqib ketgan yerlarni bosqichma-bosqich qayta foydalanishga kiritish, bu yer turlaridan samarali foydalanish, yaxshilash va tuproq unumdorligini oshirish bo'yicha yer tuzish tadbirlarining ahamiyati yoritilgan.

Kalit so'zlar: innovatsiya; integratsiya; yer tuzish; yer turlari; yaylov; chorvachilik; yerlarni transformatsiyalash; yerdan foydalanish; sug'orish imkoniyatlari

РУССКИЙ**ХАМРАЕВ Файзулла Хидирович^{1,*}**¹ Кафедра агрономии, Навоийский государственный горно-технологический университет, Навои, Узбекистан

Аннотация. В статье приводятся землеустроительные мероприятия, осуществляемые по эффективному использованию земельных угодий, улучшению и повышению их плодородия, включению в сельское хозяйство земельных участков, ранее выбывших из сельскохозяйственного оборота в условиях нехватки пригодных земельных и водных ресурсов.

Ключевые слова: инновация; интеграция; землеустройство; земельные угодья; пастбища; животноводство; трансформация земель; использование земель; возможности орошения

1. KIRISH*Introduction*

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HAC / OAK: On the HAC list of national scientific publications (Academy of Sciences of the Republic of Uzbekistan) for 06.00.00 Agricultural Sciences and 16.00.00 Veterinary Sciences. O'zbekiston Respublikasi FA huzuridagi OAK ro'yxatida: 06.00.00 – Qishloq xo'jaligi fanlari; 16.00.00 – Veterinariya fanlari.

Kirish. O'zbekiston Respublikasi qishloq xo'jaligini rivojlantirishning 2020-2030 yillarga mo'ljallangan strategiyasi ko'plab kuzatuvchilar tomonidan inqilobiy deya baholanmoqda. O'zbekiston qishloq xo'jaligini isloh qilish strategiyasini tuzishda BMT, Evropa Ittifoqi, Jahon va Osiyo Taraqqiyot banklari ekspertlari ishtirok etganlar. Hozirgi kunga qadar respublikamizda qishloq xo'jaligining rivojlanishi eng muhim ustuvor yo'nalishlardan biri bo'lib kelgan va bundan keyin ham shunday bo'lib qoladi. Chunki, qishloq xo'jaligida ishlab chiqarishning samaradorligi, mamlakatimizning iqtisodiy va oziq-ovqat xavfsizligini ta'minlash, nafaqat qishloq aholisi, balki mamlakatimiz aholisining moddiy farovonligini oshirish bebaho boyligimiz bo'lgan er resurslaridan samarali foydalanishni tashkil bilan uzviy bog'liqdir. Jahonda ro'y berayotgan ijtimoiy-iqtisodiy o'zgarishlar hamda mamlakatlararo integratsiya sharoitida respublikada qisqa vaqt ichida qishloq xo'jaligi tarmog'iniva qishloqni, shu bilan birga qishloq infratuzilmasini, yangi innovatsion rivojlanish yo'liga o'tishini talab etadi. Shu yo'l orqali qishloqning mavqeini oshirish imkoniyati paydo bo'ladi. O'zbekiston iqtisodiyotini innovatsion rivojlanish yo'liga o'tish hozirgi kundagi ustuvor vazifalardan biri hisoblanadi. Tahlillarga ko'ra, O'zbekiston agrar sektorida innovatsiyalar hajmi jami yalpi ichki mahsulot hajmida 1-2% ni tashkil etadi, qishloq infratuzilmasi tarmog'ida esabu ko'rsatkich undan ham kam, vaholanki ushbu ko'rsatkich boshqa rivojlangan mamlakatlarda 50-60% dan ko'proqni tashkil etadi [4]. Mavzuning dolzarbligi. O'zbekiston Respublikasi Prezidentining "Qishloq xo'jaligida er va suv resurslaridan samarali foydalanish chora-tadbirlari to'g'risida" PF-5742-son farmonida "...sug'oriladigan va lalmi erlar, tog' va tog'oldi hamda cho'l-yaylov hududlarining tuproq unumdorligini oshirish, suv va boshqa tabiiy resurslardan samarali foydalanish buyicha ilmiy tadqiqotlar olib borilishini; ... ixotazorlar barpo etish va qayta tiklash hamda o'rmon fondi erlarida cho'l-ozuqabop o'simliklar plantatsiyalari va ularni tashqi ekologik omillardan muhofaza qiluvchi yaylovlarni yaratish" kabi muhim masalalar belgilangan. Yuqoridagi ma'lumotlardan kelib chiqib bu hududlarda er va suv resurslaridan samarali foydalanishni tashkil etish vazifalarini er tuzish tadbirlari orqali amalga oshirish yaxshi natijalarga erishish imkoniyatini beradi [2]. Tadqiqot ob'ekti va uslublari. Sug'oriladigan va lalmi erlar, tog' va tog'oldi hamda cho'l-yaylov hududlarida er tuzish loyihalarni ishlashdan oldin ularning hozirgi ahvoli va foydalanishi o'rganiladi. Quruq cho'l hamda yarim sahro mintaqalarida qishloq xo'jalik erlari maydoni erlarni sug'orish imkoniyatlaridan va ularning qishloq xo'jalik ekinlarini ekish, daraxtzorlar va yaylovlar uchun yaroqliligidan kelib chiqib aniqlanadi. Barcha vaziyatlarda er turlari tarkibi va maydonlarini aniqlashda tayyorgarlik ishlari va hududni er tuzish o'rganishi jarayonlarida olingan erlarning agroekologik guruhlar va er sinflariga bo'lingan har xil er turlari (haydalma erlar, daraxtzorlar, pichanzorlar, yaylovlar) uchun qishloq xo'jaligida yaroqliligini baholash ma'lumotlaridan foydalaniladi. Bu, er tuzishda adaptiv yondoshuvni amalga oshirish uchun zarur. Bunday yondashuvda har bir ajratilgan er uchastkasi o'zining tabiiy xususiyatlari (tuproqlari turi va mexanik tarkibi, namlanish sharoiti, yorug'lik olishi va boshq.) bo'yicha ularda joylashtiriladigan er turlariga, qishloq xo'jalik ekinlariga, qo'llaniladigan dehqonchilik tizimlariga mos bo'lishi kerak. Tadqiqot natijalari va ularning muhokamasi. Er turlarining tarkibini va maydonlarini belgilash xo'jalikning iqtisodiy manfaatlarini aks ettiradiganuvchi maxsus tabiiy sharoitlarni talab etuvchi (bog'lar, uzumzorlar, rezavorzorlar) yoki tabiatni muhofaza qilish talablarini bajarish bilan bog'liq (o'tloqlashtirish, yopasiga daraxtlar bilan qoplash, ihota daraxtlari polosalari) er turlaridan boshlanadi. Daraxtzorlar maydonlari er egaliklari va erdan foydalanuvchilarning bog'dorchilikni, uzumchilikni va boshqa tarmoqlarni rivojlantirish bo'yicha istaklarini hisobga olib, yaroqli erlar mavjudligidan kelib chiqib belgilanadi. Chorva mollari uchun yaylovlar maydoni ularning mavjudligi, yashil ozuqalarga bo'lgan talab, ularni haydalma va boshqa erlarga transformatsiyalash imkoniyatlarini

hisobga olib aniqlanadi. Uni yaylovlari maydonlari kichik va ularni kengaytirish imkoniyatlari cheklangan xo'jaliklarda quyidagi ifodadan foydalanib aniqlash mumkin:

2. TADQIQOT MATERIALLARI VA USLUBLARI

Materials and methods

$Pya = (Vya / uya.a.k) * 100$ bunda: Pya - yaylovlar maydoni, ga; Vya - mollarni yashil o'tlarga bo'lgan oylik talabi, ts; uya- mollar boqiladigan davrdagi yaylovlarning yalpi hosildorligi, 1 ga ts; α - mollarni boqish davrining ma'lum oyida yaylovlardan yashil massa chiqishining maksimal foizi, %; K - yaylov almashishning umumiy tarkibidagi mollar boqiladigan yillar sonining nisbatini hisobga oluvchi koeffitsient (masalan, 9-yillik yaylov almashishda mollar har yili 6 navbat bilan boqiladigan maydonlarda o'tlatilsa $K=6:9=0,67$).

Masalan, agar $Vya = 20000$ ts, $uya = 1$ ga 200 ts, $\alpha = 30\%$ bo'lsa,

$2000+100 Pya = \text{-----} = 497,5$ ga $200+30+0,67$

3. NATIJALAR VA MUHOKAMA

Results and discussion

Yaylovlar maydonini aniqlashda mollarni boqish usullari hisobga olinadi. Masalan, g'unajinlarni va yosh sigirlarni o'stirish, sigirlarga qarash texnologiyasi bog'lab boqishni ko'zda tutsa, er turlarini tashkil etishda ko'p yillik madaniy va sug'oriladigan yaylovlar loyihalalanadi. Ularning maydonlari quyidagi 1 shartli boshga hisoblangan me'yorlarga asosan belgilanadi [5]: - donli-dukkakli o'tlar bilan qoplangan, fosforli-kaliyli o'g'itlar bilan intensiv o'g'itlanadigan yaylovlar uchun o'rmon-o'tloq mintaqasida 0,4 ga, o'rmon-cho'l mintaqasida 0,35; - donli o'tlar bilan qoplangan, azotli o'g'itlar bilan intensiv o'g'itlanadigan yaylovlar uchun 0,25-0,3 ga; - yaxshilangan sug'oriladigan yaylovlar uchun 0,15-0,2 ga. Pichanzorlar maydoni pichan o'rishga yaroqli erlar mavjudligi va pichanga bo'lgan talabdan kelib chiqib loyihalalanadi (bunda ko'p yillik va bir yillik o'tlarni almashlab ekishlarga kiritish zarurati ham hisobga olinadi). Shu bilan bir qatorda yaylov almashishlarda mol boqishdan bo'sh qoldiriladigan (15-25%) yaylovlardan pichan olish imkoniyati ham hisobga olinadi [3, 6]. Ishlab chiqarish markazlari, ihota o'rmon polosalari, yo'llar, poda yo'llari tagidagi maydonlar umumlashtirilgan me'yorlar bo'yicha taxminan aniqlanadi va keyinchalik er turlari va almashlab ekishlarni ichki tuzish jarayonida ularga aniqlik kiritiladi. Foydalanishga qaytarilayotgan er turlari tarkibini va maydonlarini aniqlashda er egalari va erdan foydalanuvchilar uchun majburiy bo'lgan, er turlarini transformatsiyalash va joylashtirishga ta'sir etadigan me'yorlar, erdan foydalanish tartibi va shartlari hisobga olinadi. Xulosa. Yuqoridagi erdan foydalanishlarni, ularning tizimlarini loyihalashda keyinchalik er va suv resurslaridan samarali foydalanishni ta'minlovchi tadbirlarni belgilanishi va sharoitlar yaratishda quyidagilar ta'minlanishi kerak: - er va suv resurslari tobora tanqis bo'lib borayotgan sharoitda foydalanishdan chiqib ketgan erlarni bosqichma - bosqich qayta foydalanishga kiritib borish; - er va suv resurslaridan to'la va samarali foydalanishni ta'minlovchi erdan foydalanuvchilarning oqilona o'lchamlarini aniqlash va joylashtirish, ulardagi er turlarining nisbatini belgilash; - erdan foydalanuvchilar chegaralarini tuproq eroziyasiga va boshqa salbiy ta'sirlarga qarshi kurash talablaridan kelib chiqqan holda o'tkazish; - yaylovlardan samarali foydalanish tartibini belgilash, yaylov va lalmi erlardan foydalanishning ilmiy asoslangan samarali texnologiyalarini ishlab chiqish va joriy etish. Tajribadan olingan ma'lumotlarga ko'ra er tuzish tadbirlari o'z navbatida er va suv resurslaridan samarali foydalanishga pirovardida mamlakat oziq-ovqat xavfsizligini ta'minlash hamda tarmoq eksport salohiyatini oshirishga imkon yaratadi.

DECLARATIONS

Declarations

Author contributions *CRedit*

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

The Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020–2030, prepared with the participation of experts from the United Nations, the European Union and the World and Asian Development Banks, treats the efficient use of land resources as a precondition for the economic and food security of the country. Land and water resources are, however, becoming increasingly scarce, and a significant area has fallen out of agricultural circulation altogether. The purpose of the article is to set out the land management measures through which such areas can be returned to use stage by stage, the ratio between land categories can be rationalised, and soil fertility can be raised, and to show how these measures relate to the wider objectives of food security and the export potential of the sector.

Materials and methods

The study is based on the analysis of the normative and legal framework of land relations in Uzbekistan, including the Land Code and Presidential Decree No. PF-5742 of 17 June 2019 on the efficient use of land and water resources in agriculture, together with the specialist literature on land management design and on the transformation of land categories. The calculation of the required pasture area was carried out using the formula $\Pi\alpha = (\text{B}\alpha / \text{y}\alpha.\text{a.k}) \times 100$, in which $\Pi\alpha$ is the pasture area in hectares, $\text{B}\alpha$ the monthly requirement of the livestock for green fodder in centners and $\text{y}\alpha$ the yield of green mass per hectare, with a correction coefficient α for the utilisation of the pasture. A worked example is given in the text for $\text{B}\alpha = 20\,000$ centners, $\text{y}\alpha = 200$ centners per hectare and $\alpha = 30\%$, which yields a required pasture area of 497.5 hectares. Methods of keeping livestock — the rearing of heifers and young cows and the management of the milking herd — were taken into account when determining the pasture area.

Results and discussion

The analysis shows that a land management system suited to present conditions must secure four things at once. First, land withdrawn from use must be returned to circulation stage by stage under conditions of increasing scarcity of land and water. Second, the rational size and siting of land users must be determined so that land and water resources are used fully and efficiently, and the ratio between land categories within each holding must be fixed. Third, the boundaries of land users must be drawn on the basis of the requirements of the struggle against soil erosion and other adverse influences, rather than on administrative convenience alone. Fourth, the order of pasture use must be regulated, and scientifically grounded, efficient technologies for the use of pasture and rain-fed land must be developed and introduced. The pasture-area calculation illustrates how the required area follows directly from herd size, green-mass yield and the utilisation coefficient, and therefore how overstocking can be identified quantitatively rather than by inspection.

Conclusion and contribution

Land management measures, taken together, make it possible to use land and water resources efficiently and thereby to contribute to the food security of the country and to the export potential of the agricultural sector. The staged return of unused land to circulation, the determination of rational land-user sizes and land-category ratios, the erosion-based delimitation of boundaries and the regulated use of pasture together constitute a single system rather than a set of independent actions. The contribution of the article is to bring the legal, organisational and calculation aspects of this system into one account and to show, with a worked pasture-area example, how the requirements can be applied in practice at farm level.

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Mandatory whenever any reference is in a non-Latin script. Transliterate the author names and the original title, then give the English translation of the title in square brackets, followed by the language tag.

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RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • HAC/OAK 06.00.00 — AGRICULTURAL SCIENCES • UDC: 630*232.3:582.477(575.172)

Technology for cultivating Oriental arborvitae (*Platycladus orientalis* L.) seedlings under the conditions of the southern districts of the Republic of Karakalpakstan

Qoraqalpog'iston Respublikasi janubiy tumanlari sharoitida Sharq biotasi (*Platycladus orientalis* L.) ko'chatlarini yetishtirish texnologiyasi**Технология выращивания сеянцев туи восточной (*Platycladus orientalis* L.) в условиях южных районов Республики Каракалпакстан****Surayyo QURBANIYAZOVA^{1,*}**¹ Karakalpak Institute of Agriculture and Agrotechnologies, Nukus, Republic of Karakalpakstan, Uzbekistan* Corresponding author: qurbaniyazovasurayyo@gmail.com**ARTICLE INFO****ARTICLE TYPE**

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)**ENGLISH****Surayyo QURBANIYAZOVA^{1,*}**¹ Karakalpak Institute of Agriculture and Agrotechnologies, Nukus, Republic of Karakalpakstan, Uzbekistan

Abstract. This study investigates the technology of cultivating *Platycladus orientalis* L. seedlings under the soil and climatic conditions of the southern districts of the Republic of Karakalpakstan. Experimental studies conducted in 2025–2026 examined seed propagation, transplantation of one-year-old seedlings, and green cutting propagation using different substrates. The results demonstrated that seedling growth and propagation efficiency depend on the cultivation method and substrate type. Peat produced favorable results in seed propagation, while peat and sandy-loam soil supported the successful establishment of transplanted seedlings. Green cutting propagation showed relatively lower efficiency. The findings confirm the potential of *P. orientalis* for nursery production, afforestation, and ecological restoration in southern Karakalpakstan.

Keywords: *Platycladus orientalis* L.; Oriental arborvitae; seedling cultivation; propagation; substrate; Karakalpakstan; afforestation; ecological restoration

O'ZBEKCHA**QURBANIYAZOVA Surayyo^{1,*}**¹ Qoraqalpog'iston qishloq xo'jaligi va agrotexnologiyalar instituti, Nukus, Qoraqalpog'iston Respublikasi, O'zbekiston

Annotatsiya. Mazkur tadqiqotda Janubiy Qoraqalpog'istonning tuproq-iqlim sharoitida Sharq biotasi (*Platycladus orientalis* L.) ko'chatlarini yetishtirish texnologiyasi o'rganilgan. Tadqiqotda urug'dan ko'paytirish, bir yillik ko'chatlarni ko'chirib o'tqazish va yashil qalamchalar orqali ko'paytirish usullari turli substratlarda sinovdan o'tkazildi. Natijalar ko'chatlarning o'sishi va ko'paytirish samaradorligi yetishtirish usuli hamda substrat turiga bog'liqligini ko'rsatdi. Torf urug'dan ko'paytirishda, torf va qumloq tuproq esa ko'chatlarni ko'chirib o'tqazishda yaxshi natija berdi. Olingan natijalar *P. orientalis* turidan ko'chatchilik, o'rmon barpo etish va ekologik tiklash ishlarida foydalanish istiqbollarini tasdiqlaydi.

Kalit so'zlar: *Platycladus orientalis* L.; Sharq biotasi; ko'chat yetishtirish; ko'paytirish; substrat; Qoraqalpog'iston; o'rmon barpo etish; ekologik tiklash

РУССКИЙ**КУРБАНИЯЗОВА Сурайё^{1,*}**¹ Каракалпакский институт сельского хозяйства и агротехнологий, Нукус, Республика

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Каракалпакстан, Узбекистан

Аннотация. В статье исследована технология выращивания *Platycladus orientalis* L. в почвенно-климатических условиях южных районов Республики Каракалпакстан. Изучены семенное размножение, пересадка однолетних сеянцев и размножение зелёными черенками с использованием различных субстратов. Установлено, что эффективность размножения и рост растений зависят от способа выращивания и типа субстрата. Наиболее благоприятные результаты при семенном размножении получены при использовании торфа, а при пересадке сеянцев — торфа и супесчаной почвы. Результаты подтверждают перспективность использования *P. orientalis* в питомниковом хозяйстве, лесоразведении и экологическом восстановлении региона.

Ключевые слова: *Platycladus orientalis* L.; туя восточная; выращивание сеянцев; размножение; субстрат; Каракалпакстан; лесоразведение; экологическое восстановление

1. INTRODUCTION

Climate change, land degradation, water scarcity, and desertification have increased the importance of developing effective afforestation and ecological restoration technologies for arid regions. This issue is particularly relevant to the Republic of Karakalpakstan, where the environmental consequences of the Aral Sea crisis, high temperatures, limited precipitation, dry winds, and unfavorable soil conditions create significant challenges for the cultivation of woody plants.

The successful implementation of afforestation programs depends largely on the selection of environmentally adaptable tree species and the production of high-quality planting material. *Platycladus orientalis* L., commonly known as Oriental arborvitae, is a promising evergreen species characterized by its adaptability to drought, temperature fluctuations, and relatively adverse environmental conditions. However, the technology for cultivating its seedlings under the specific soil and climatic conditions of southern Karakalpakstan remains insufficiently studied.

The effectiveness of seedling production depends primarily on the propagation method and the physical and chemical properties of the growing substrate. Seed propagation, transplantation of young seedlings, and vegetative propagation through green cuttings differ in their biological efficiency and technological requirements. Similarly, substrates such as peat, humus, sandy-loam soil, and organic soil mixtures can significantly influence seed germination, root development, and seedling growth.

Therefore, this study aims to investigate effective methods for cultivating *Platycladus orientalis* L. seedlings and to evaluate the influence of different propagation techniques and substrates on their establishment and growth under the conditions of the southern districts of the Republic of Karakalpakstan.

2. LITERATURE REVIEW

The cultivation of drought-tolerant woody species has become increasingly important for afforestation and ecological restoration in arid regions. This issue is particularly relevant to the Aral Sea basin, where water scarcity, high temperatures, dry winds, and unfavorable soil conditions limit the successful establishment of woody vegetation. In this context, *Platycladus orientalis* L. is considered a promising evergreen species due to its ecological adaptability and relative tolerance to drought.

Previous studies have demonstrated that the growth and development of *P. orientalis* are closely related to water availability and environmental conditions. Che and Zhang [1] reported that the species exhibits considerable drought resistance, although its growth dynamics vary depending on precipitation and moisture conditions. Similarly, Sun et al. [6] and Zhao et al. [11] identified physiological mechanisms, including water-use regulation, root

development, and osmotic adjustment, that contribute to the adaptation of *P. orientalis* under drought stress.

Water management is particularly important during the early stages of seedling development. Zhang, Ma, and Lv [9] demonstrated that adequate re-irrigation can support the physiological recovery of *P. orientalis* seedlings following drought stress. These findings highlight the importance of selecting suitable irrigation regimes and growing substrates in arid nursery conditions.

Nutrient availability and soil properties also significantly influence the growth of *P. orientalis*. Xin [8] emphasized the importance of carbon, nitrogen, and phosphorus balance, while Du et al. [2] demonstrated the relationship between nutrient inputs and soil ecological processes. Other studies have highlighted the role of rhizosphere microorganisms and mycorrhizal fungi in improving nutrient uptake and plant adaptation [3, 4, 10].

Research has also shown that growth regulators and mineral fertilizers can positively influence seedling growth and development [5]. However, the effectiveness of these treatments depends on environmental conditions and cultivation technology. The sharply continental climate, limited precipitation, high temperatures, and soil conditions of the Amudarya district therefore require locally adapted approaches to seedling production.

The reviewed literature confirms the ecological adaptability and drought tolerance of *P. orientalis*. However, limited research has directly compared different propagation methods and substrate types under the specific soil and climatic conditions of southern Karakalpakstan. Therefore, experimental evaluation of seed propagation, transplantation, green cutting propagation, and different substrates is necessary to develop an effective technology for cultivating *P. orientalis* seedlings in the region.

3. MATERIALS AND METHODS

The study was conducted during the 2025–2026 growing seasons at the Qipchaq State Forestry Enterprise nursery in the Amudarya District of the Republic of Karakalpakstan. The experiment aimed to evaluate suitable propagation techniques and growing substrates for the cultivation of *Platycladus orientalis* L. seedlings under local soil and climatic conditions.

Three propagation approaches were investigated: seed sowing, transplantation of one-year-old seedlings, and propagation by green cuttings. Each method was tested using four substrates: peat, humus, sandy soil, and organically enriched light soil. The experiment was arranged in four replications, with one hundred planting units used in each experimental variant.

Stratified seeds were sown during the second decade of March at a depth of approximately 2–3 cm. Healthy one-year-old seedlings were transplanted into the respective substrates. Green cuttings measuring approximately 15–20 cm were collected from three-

five-year-old donor plants, prepared by removing foliage from the basal portion, treated with a rooting stimulant, and planted in the experimental substrates.

Seed germination, survival of transplanted seedlings, rooting success of cuttings, seedling height, and general phytosanitary condition were monitored throughout the study period. The experimental results were evaluated through comparative analysis to determine the propagation method and substrate that provided the most favourable conditions for seedling establishment and growth.

4. RESULTS

The experimental results obtained during 2025–2026 demonstrated that the propagation method and substrate type influenced the establishment and growth of *Platycladus orientalis* L. seedlings under the conditions of the Amudarya district.

Seed propagation produced the highest field emergence in peat, reaching approximately 65%. Lower values were observed in humus-rich material (55%), sandy soil (50%), and the organic-enriched soil mixture (45%). Under laboratory conditions, seed germination in peat reached approximately 95% at 25°C within 18–25 days. The difference between laboratory germination and field emergence indicates the influence of environmental conditions on seedling establishment.

The transplantation of one-year-old seedlings showed the highest establishment rate in peat (approximately 65%), followed by sandy soil (60%), humus-rich material (55%), and the organic-enriched mixture (50%). These results indicate that peat and sandy substrates provided favourable conditions for the establishment of transplanted seedlings.

Green cutting propagation showed comparatively lower efficiency. Rooting and survival ranged from approximately 30% to 45%, with the highest values observed in peat and the lowest in the organic-enriched soil mixture. This suggests that vegetative propagation through green cuttings requires further technological improvement under local nursery conditions.

Growth observations also revealed differences among substrates. Seed-propagated seedlings showed the greatest height development in peat, reaching approximately 18–25 cm by the end of the observation period. Transplanted seedlings achieved approximately 22–23 cm in peat and 20–22 cm in sandy soil. Plants propagated through green cuttings showed comparatively slower growth, generally reaching 10–14 cm.

Throughout the experimental period, established seedlings remained in satisfactory phytosanitary condition, with no serious disease or pest damage observed. However, the available data do not provide sufficient evidence to confirm the statistical significance of differences among treatments or to assess salt tolerance.

Peat demonstrated favourable conditions for seed propagation and seedling growth, while sandy soil showed promising results for transplanted one-year-old seedlings. Green cutting propagation was less effective and requires further optimization. These findings provide a preliminary basis for developing a differentiated technology for cultivating *P. orientalis* planting material under the environmental conditions of southern Karakalpakstan.

5. DISCUSSION

The results demonstrate that the successful cultivation of *Platycladus orientalis* L. seedlings under the conditions of the Amudarya district depends primarily on the propagation method and the properties of the growing substrate. The differences observed among the experimental variants reflect the biological

requirements of young plants under arid and continental environmental conditions.

Seed propagation showed favourable results, particularly in peat, where approximately 65% field emergence was recorded. The porous structure and moisture-retention capacity of peat likely created suitable conditions for seed germination and early seedling development. However, the difference between laboratory germination (approximately 95%) and field emergence confirms that seed viability and successful establishment under nursery conditions should be considered as separate biological indicators.

The transplantation of one-year-old seedlings also produced promising results. Peat and sandy soil supported successful establishment and growth, suggesting that seedlings with an already developed root system can adapt effectively after transplantation. From a practical perspective, locally available sandy soil may represent a more economically feasible alternative to peat, particularly for large-scale nursery production.

Green cutting propagation showed comparatively lower efficiency, with rooting rates ranging from approximately 30% to 45%. This result indicates that the applied technology requires further optimization. Factors such as the physiological condition of donor plants, cutting collection time, substrate moisture, air humidity, and the application of rooting regulators should be investigated in future experiments.

The results also emphasize the importance of using appropriate evaluation indicators for different propagation methods. Germination percentage should be applied to seed propagation, survival or establishment rate to transplanted seedlings, and rooting percentage to vegetative cuttings. This differentiation improves the scientific accuracy of the research.

Although the experimental soil had a neutral to moderately alkaline reaction, additional measurements, including electrical conductivity, soluble salts, nutrient availability, and organic matter content, are necessary for a comprehensive assessment of soil conditions. Similarly, further studies should include detailed statistical analysis based on primary replication data to determine the reliability of differences among treatments.

The findings confirm the potential of *P. orientalis* for nursery production under the environmental conditions of the Amudarya district. Seed propagation is suitable for producing large quantities of planting material, while the transplantation of one-year-old seedlings may provide stronger and more established plants. Green cutting propagation requires additional technological improvement before large-scale application. Further multi-site and economically oriented studies are necessary to develop a scientifically substantiated and regionally adapted technology for cultivating *P. orientalis* in southern Karakalpakstan.

6. CONCLUSION

The study demonstrated that the successful cultivation of *Platycladus orientalis* L. seedlings under the soil and climatic conditions of the Amudarya district depends on the propagation method and substrate type.

Seed propagation produced favourable results, particularly in peat, which provided suitable conditions for seedling establishment and growth. The transplantation of one-year-old seedlings was also effective, with peat and sandy or sandy-loam soils showing promising results. In contrast, green cutting propagation demonstrated comparatively lower efficiency and requires further optimization of rooting conditions, substrate composition, moisture management, and growth-regulating treatments.

The results confirmed the important role of substrate physical properties, particularly moisture retention, aeration, and root penetration, in seedling development. Throughout the experimental

period, the seedlings remained in satisfactory phytosanitary condition.

Platycladus orientalis demonstrated promising potential for nursery production under the environmental conditions of southern Karakalpakstan. The use of peat for seed propagation and peat or sandy substrates for transplanted seedlings can be considered promising approaches. Further experimental and multi-site studies are necessary to improve cultivation technology and evaluate the broader application of this species in afforestation and ecological restoration programs in the Aral Sea region.

DECLARATIONS

Author contributions CRedit

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

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Productivity indicators of local silkworm breeds in the extreme climatic zones of Karakalpakstan

Qoraqalpog'istonning ekstremal iqlim zonalarida mahalliy ipak qurti zotlarining mahsuldorlik ko'rsatkichlari

Показатели продуктивности местных пород тутового шелкопряда в экстремальных климатических зонах Каракалпакстана

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Abstract. Taking into account that creating high-yielding silkworm breeds and hybrids is one of the most pressing issues, this study aimed to develop new strains adapted to extreme climatic conditions. For this purpose, local silkworm breeds as well as those developed at the Tashkent Scientific Research Institute of Sericulture were tested in the extreme continental climate districts of Karakalpakstan. The revivability, biological, and technological indicators of the breeds and hybrids were identified and discussed.

Keywords: cocoon yield; silkworm; hatching rate; biological indicators; technological indicators; cocoon weight; shell weight; silkiness

O'ZBEKCHA

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Annotatsiya. Ushbu maqolada pilla hosildorligi yuqori bo'lgan zot va duragaylarini yaratish dolzarb muammolardan ekanligini hisobga olinib, Ekstremal iqlim sharoitiga mos yangi shtamlarni yaratishni maqsad qilgan holda, Qoraqalpog'istonning keskin kontinental iqlimli tumanida mahalliy va Toshkent Ipakchilik Ilimiy Tadqiqot Institutida yaratilgan ipak qurti zotlar sinab ko'rildi. Zot va duragaylarning jonlanish, biologik va texnologik ko'rsatkichlari aniqlanib muhokama qilinadi. Raqamli natija va xulosa yozishim kk

Kalit so'zlar: pilla hosildorligi; tut ipak qurti; jonlanish ko'rsatkichlari; biologik ko'rsatkichlar; texnologik ko'rsatkichlar; pilla og'irligi; pilla qobig'i og'irligi; ipakchanlik

РУССКИЙ

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Аннотация. Учитывая, что создание высокоурожайных пород и гибридов шелкопряда является одной из актуальных проблем, настоящая работа направлена на выведение новых штаммов, приспособленных к экстремальным климатическим условиям. С этой целью в районах Каракалпакстана с резко континентальным климатом были испытаны местные породы шелкопряда, а также породы, созданные в Ташкентском научно-исследовательском институте шелководства. В статье определены и обсуждены показатели оживляемости, а

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также биологические и технологические характеристики пород и гибридов.

Ключевые слова: урожайность коконов; тутовый шелкопряд; показатели оживляемости; биологические показатели; технологические показатели; масса кокона; масса оболочки кокона; шелковистость

1. KIRISH

Introduction

1. Ipakchilik. Ipak qurtining qisqacha tavsifi. Ipak qurti Lepidoptera turkumidagi Bombyx Mori oilasiga mansub yagona uy sharoitida yashovchi hasharotdir[1]. Asrlar davomida xonakilashtirish natijasida ipak qurti saqlanib qolgan va hozirgi kungacha saqlanib kelinmoqda. [2]. Ipak qurti asosan monofag hasharot bo'lib, asosan tut barglari bilan oziqlanadi [3,4]. Uning hayot sikli to'rtta asosiy rivojlanish bosqichidan iborat: tuxum, lichinka, g'umbaklik va kapalklikdir [5]. Odamlar uchun iqtisodiy jihatdan eng muhim bosqich - bu gumbaklik bosqichi, chunki ipak qurti g'umbakka aylanishidan oldin pilla o'raydi. Odamlar an'anaviy ravishda bu pillalardan ipak olishgan va undan to'qimachilik mahsulotlari ishlab chiqarishda foydalanganlar. [6]. Pilladan olingan ipak tolasi o'zining nozikligi va nihoyatda mustahkamligi uchun qimmatli hisoblangan. Bu tolaning mustahkamligining asosiy siri shundaki, u 75 foiz fibroin aminokislota va 25 foiz yopishqoq seritsin aminokislotalardan iborat. [7]. Shunday qilib, ipakchilik taxminan 5000 yil oldin Xitoyda paydo bo'lgan va u yerdan dunyoning boshqa qismlariga tarqalib, bugungi kungacha rivojlanib kelmoqda. [8]. Xitoydan ipakchilik asrlar davomida Ipak yo'li orqali asta-sekin Yevropa mamlakatlariga tarqaldi. [9]. Bugungi kunda ipak nafaqat to'qimachilik ishlab chiqarishda, balki radiotexnologiya, biotibbiyot va kosmetika kabi ko'plab sohalarda ham qo'llaniladi. [10]. Hozirgi kunda butun dunyo bo'ylab 917 650 tonna pilla xomashyosi ishlab chiqarilmoqda[11]. Dunyo bo'ylab to'qimachilik sanoati butun dunyo bo'ylab ishlab chiqaruvchilar tomonidan ishlab chiqarilgan ipakdan yuqori sifatli ipak mahsulotlarini samarali ishlab chiqarishga intiladi. (B. Mori) Ipak qurtlarining keng qo'llanilishi, birinchi navbatda, ipak mahsulotining sifati va mahsuldorligiga bog'liq. Umuman ipak qurti mahsuldorligi deganda pilla vazni, hajmi, pilladan qancha miqdorda ipak olishi xom ipak chiqimi, ipak qurtining yashovchanligi va urug'lik mahsuldorligi kabi ko'rsatgichlar kiradi[12]. Ushbu ko'rsatgichlarning oshishi birinchidan, ipak qurtining jonlantirish va boqishta tashqi muhit tasiriga bog'liq. Ikkinchi tomondan uning genetik va molekulyar tuzilishiga irsiyatiga bog'liqdir. Yuqori maxsuldor ipak qurti shtammlarini olish uchun ham avvalo genetik resurslar kerak boladi[13]. Ipak qurtining hosildorligini oshirish uchun uni selektsiya qilinib, gibriddlar yaratilib kelingan. Yani ikkita ikki xil ota ona zotlarini chatishtirib yangi kuchli gibridd olingan. Yangi gibridd kasalliklarga nisbatan kuchli va hosildorligi ota onasiga nisbatan yuqori bo'lgan[14]. Seleksiya qilish natijasida dunyo boylab 4000 dan ortiq zot va gibriddlar yaratilgan [15].

Muommoni o'rganganlik darajasi. Pillachilik tarmog'ining eng dolzarb muammosi yuqori navli raqobatbardosh pilla hamda ipak tolasi ishlab chiqarishni yo'lga qo'yishdir. Qoraqalpog'istonning iqlim sharoitlariga mos tut ipak qurtini oddiy va jinsi boshqariladigan zot va duragaylarini yaratish, pillaning morfologik belgilari va texnologik xususiyatlari o'rtasidagi o'zaro bog'liqlikka asoslangan tanlash usullarini ishlab chiqish bo'yicha G.E.Abdrimova, S.R.O'serbaeva, O.O.Oripov[16] tomonidan ahamiyatli ilmiy-tadqiqot ishlari bajarilgan[17,18]. T.T. Jumanazarovlar esa ipak qurti maxsuldorligiga navli tut bargi bilan ozuqalandirish yuqori natija berishini Jarariq-5 tut navi bilan

isbotlagan[19]. Qo'shimcha qilib aytadigan bo'lsak, O'serbaeva Qoraqalpog'iston sharoitida Go'zal, Marxamat, zotlari va 300 x 301 liniyalarining maxsulodrlilik ko'rsatgichlari yuqori ekanligini tasdiqlagan[20]. Lekin Ipakchilik Ilimiy Tadqiqot Instituti laboratoriyasida yaratilgan nishonlangan zotlar Qoraqalpog'iston sharoitida sinab ko'rilmagan.

2. TADQIQOT USULLARI VA MATERIALLAR

Materials and methods

2.Tadqiqot usullari va materiallar. Tadqiqotimizni Qoraqalpog'istonning g'arbiy-shimoliy tumanida olib borishni maqsad qildik. Aynan Qanliko'l tumani keskin kontinental cho'l iqlimiga ega bo'lib, Yanvarning o'rtacha temperaturasi — 7,1°, iyulniki 25,8. Eng yuqori temperatura 44°, eng past temperatura — 30°. Vegetatsiya davri 186 kun. Yiliga 108 mm yog'in tushadi. Asosan, bahor va qishda yog'adi. yozda juda issiq va quruq, qishda esa sovuq bo'ladi[21]. Bu muhit tashqi ta'sirlarga chidamli yangi shtammlar yaratish uchun juda mos keladi. Bu esa hududlarini tanlab olish va ilmiy-tadqiqotlarimizni olib borishda yanada samarali va ishonchli bo'lishini taminladi. Tadqiqotimiz obyekti sifatida Mahalliy zotlar: C-14, C-13, C-12, C-10, C-5, va 2025-yilda boqilgan va duragay qilib olingan tuximlar C-10 X C-12 va teskari duragayi C-12 x C-10 va nazorat variant Ipakchi-1 Ipakchi-2 zotlari jonlantirib boqishga tanlab olindi va tayyorlandi. Tadqiqotimiz Bahorgi qurt boqish davrida olib borildi. Tut navlaridan asosan Qanlikul tumanida o'sadigan Xasaki va Balxi va Qora tutlardan foydalanildi[21]. Bu zotlardan yaratilgan shtammlar Qoraqalpog'istonning keskin iqlim zonasiga bardosh beradigan va yuqori mahsuldorlik belgilarini ko'rsatishini niyat qildik. Tadqiqotimiz usullarida biz asosan qurt boqishning oddiy usulidan foydalandik. Barcha variantlar bir xil harorat va namlikta jonlantirildi va boqildi. Tadqiqot davomida barcha zotlar 250 donadan 3 qaytarilishdan tuxim holida sanab olindi va inkubatsiyaga qoyildi. Variantlarning jonlanuvchanligi va hayotchanligi, qurtlik davri kuni, pillalarining og'irligi, pilla qobig'i og'irligi va ipakchanlik ko'rsatgichlari aniqlandi.

3. TADQIQOT NATIJALARI VA ULARNING MUHOKAMASI

Results and discussion

2026-yilda Qanliko'l tumani sharoitida o'rganilgan tut ipak qurti zotlari va duragaylarining biologik hamda texnologik ko'rsatkichlari tahlili shuni ko'rsatdiki, tadqiqotga jalb qilingan zotlar o'rtasida sezilarli farqlar kuzatildi. Tuxumlarning jonlanish ko'rsatkichlari bo'yicha eng yuqori natija C-14, Ipakchi-1, C-10×C-12 va C-12 zotlarida qayd etildi. C-14 zotida tuxumlarning jonlanish darajasi 98,0%, Ipakchi-1 da 97,6%, C-10×C-12 duragayida 97,3% hamda C-12 zotida 97,2% ni tashkil etdi. Eng past ko'rsatkich C-12×C-10 teskari duragayida kuzatilib, jonlanish darajasi 63,8% ni tashkil qildi. Duragaylar orasida C-10 × C-12 duragayi nisbatan yaxshi natijalarni namoyon etdi. Bu esa duragaylash natijasida ayrim biologik afzalliklarning yuzaga kelganligini ko'rsatadi. Nisbatan past jonlanish ko'rsatkichi C-12 × C-10 teskari duragayida kuzatildi. Mazkur holat teskari duragaylashda ota-onas shakllarining biologik xususiyatlari va ularning o'zaro ta'siri natijasida rivojlanish sur'atining sustlashishi bilan izohlanadi.

1-jadvalTut ipak qurti zotlari urug'larining jonlanish ko'rsatkichlari / **Table 1.** Hatching indicators of the eggs of the mulberry silkworm breeds

Variant	Qayta-rilish	Inkubatsiya davri, kun	Xabarchi qurtlar	1-kun	2-kun	3-kun	Jonlan-magan	Jami jonlangan
C-10	1-	10	3	114	100	23	10	240
C-10	2	10-11	3	115	110	17	5	245
C-10	3-	9-10	5	120	102	10	13	237
Ortacha 100 % da		10,3	1,4%	46,5 %	41,6 %	6,6%	3,73 %	96,2 %
C-12	1	10	5	113	115	10	7	243
C-12	2	11	3	117	115	7	8	242
C-12	3	10	3	118	108	15	6	244
Ortacha 100 % da		10,3	1,46%	46,4 %	45,06 %	4,2%	2,8 %	97,2 %
C-13	1	10	4	112	98	24	12	238
C-13	2	10	5	125	100	13	7	243
C-13	3	11	4	113	116	10	7	243
O'rtacha 100 % da		10,3	1,7 %	46,6 %	41,8 %	6,2	3,4	96,5 %
C-14	1	10	4	117	108	15	6	244
C-14	2	10	4	120	100	22	4	246
C-14	3	10	3	123	102	17	5	245
O'rtacha 100 % da			1,4 %	48 %	41,3	7,2	2 %	98 %
C-5	1	11	3	93	124	23	10	240
C-5	2	11	3	115	100	17	15	235
C-5	3	10	5	98	107	132	13	237
O'rtacha 100 % da		10,33	1,47 %	40,8 %	44,13 %	22,93 %	5,07 %	94,9 %
Ipakchi-1	1	10	5	123	98	17	7	243
Ipakchi-1	2	9	5	124	96	19	6	244
Ipakchi-1	3	8	5	130	98	12	5	245
O'rtacha 100 % da		9	2 %	50,2 %	38,9 %	6,4 %	2,4 %	97,6 %
Ipakchi-2	1	10	3	98	132	7	10	240
Ipakchi-2	2	8	4	96	120	25	5	245
Ipakchi-2	3	9	3	102	123	16	6	244
O'rtacha 100 % da		9	1,3	39,4	50,1	6,4	2,8	97,2 %
C-10 x C-12	1	10	4	99	118	24	5	245
C-10 x C-12	2	9	3	97	125	18	7	243
C-10 x C-12	3	8	2	102	113	25	8	242
O'rtacha 100 % da		9	1,2 %	39,7 %	47,4 %	8,9 %	2,6 %	97,3 %
C-12 x C-10	1	12	2	58	65	33	92	158
C-12 x C-10	2	12	1	48	76	31	94	156
C-12 x C-10	3	12	2	65	85	13	85	165
O'rtacha 100 % da		12	0,6	22,8	30,1	10,26	36,1 %	63,8 %

Izoh: 1-, 2- va 3-kun — har kunlik qurt chiqish miqdori; jami jonlangan qurtlar 250 dona tuxumdan hisoblangan. / Note: days 1–3 — daily larval hatching; the total number of hatched larvae is calculated per 250 eggs.

2-jadvalTut ipak qurti zotlarining biologik va texnologik ko'rsatkichlari (2026-yil) / **Table 2.** Biological and technological indicators of the mulberry silkworm breeds (2026)

Variant	Qayta-rilish	Qurtlik davri, sutka	Hayotchanlik 1-yosh	5-yosh	Namuna, dona	Pilla og'irligi, g	Qobiq og'irligi, g	Navli pillalar, dona	Ipak-chanlik, %
C-10	1	27	240	215	50	1,9	0,452	206	23,6
C-10	2	27	245	225	50	1,6	0,418	218	25,2
C-10	3	27	237	210	50	2,19	0,477	200	21,7
C-10	O'rtacha	27	240,6	216,6	50	1,89	0,449	208	23,5
C-10	%			90,05 %	50	1,89	0,449	96,02 %	23,5
C-12	1	28	243	210	50	2,1	0,435	200	20,3
C-12	2	28	242	212	50	2,15	0,465	206	21,6
C-12	3	28	244	220	50	2,46	0,500	198	20,3
C-12	O'rtacha	28	243	214	50	2,2	0,466	201,3	20,7
C-12	%			88,6 %				94,08	20,7
C-13	1	29	238	215	50	2,3	0,460	198	20
C-13	2	29	243	200	50	2,29	0,478	190	20,8
C-13	3	29	243	211	50	2,34	0,490	197	20,9
C-13	O'rtacha	29	241,3	208	50	2,31	0,476	195	20,5
C-13	%			86,1 %				93,75	20,5
C-14	1	27	244	228	50	2,34	0,467	220	19,9
C-14	2	27	246	232	50	2,2	0,428	223	19,33
C-14	3	27	245	230	50	2,16	0,447	220	20,3
C-14	O'rta-cha	27	245	230	50	2,2	0,447	221	19,8
C-14	%			93,8 %	50	2,2	0,447	96,08 %	19,8
C-5	1	29	240	215	50	2,16	0,461	200	21,3
C-5	2	29	235	220	50	1,7	0,419	210	23,6
C-5	3	29	237	217	50	1,8	0,440	212	23,7
C-5	O'rtacha	29	237,3	217,3	50	1,88	0,44	207,3	22,8
C-5	100%			91,5 %				95,3	22,8
Ipakchi-1	1	27	243	235	50	2,33	0,516	225	22,1
Ipakchi-1	2	27	244	227	50	2,2	0,377	217	17,1
Ipakchi-1	3	27	245	216	50	2,5	0,484	204	19,3
Ipakchi-1	O'rtacha	27	244	226	50	2,3	0,459	215	19,5
Ipakchi-1	100 %			92,6 %				95,1	19,5
Ipakchi-2	1	27	240	217	50	2,26	0,509	210	22,5
Ipakchi-2	2	27	245	216	50	2,2	0,527	210	23,8
Ipakchi-2	3	27	244	220	50	2,034	0,409	211	20,1
Ipakchi-2	O'rtacha	27	243	217,6	50	2,16	0,481	210,3	22,1 22,1
Ipakchi-2	100 % da			89,5 %				96,6	22,1 22,1
C-10 x C-12	1	27	245	217	50	1,95	0,479	209	24,5
C-10 x C-12	2	27	243	213	50	1,98	0,474	202	23,9
C-10 x C-12	3	27	242	212	50	1,94	0,450	200	23,1
C-10 x C-12	O'rtacha	27	243	214	50	1,95	0,467	203,6	23,8
C-10 x C-12	100 %a			88,6%				95,1	23,8
C-12 x C-10	1	30	158	110	50	2,2	0,465	100	21
C-12 x C-10	2	30	156	102	50	2,3	0,500	87	21,7
C-12 x C-10	3	30	165	107	50	2,5	0,470	96	18,8
C-12 x C-10	O'rtacha	30	159,6	106,3	50	2,33	0,478	94,3	20,5

Variant	Qayta-rilish	Qurtlik davri, sutka	Hayotchanlik 1-yosh	5-yosh	Namuna, dona	Pilla og'irligi, g	Qobiq og'irligi, g	Navli pillalar, dona	Ipak-chanlik, %
C-12 x C-10	100% da			66,6				88,74	20,5

Izoh: hayotchanlik — 250 dona tuxumdan jonlangan qurtlar soni; pilla va qobiq og'irligi — bitta pilla bo'yicha o'rtacha qiymat. / Note: viability — number of larvae hatched from 250 eggs; cocoon and shell weight — mean per single cocoon.

Texnologik ko'rsatkichlar tahlili. Tut ipak qurti zotlari va duragaylarining texnologik ko'rsatkichlarini baholash maqsadida har bir variantdan tasodifiy usulda 50 donadan pilla namunalari ajratib olindi. Ajratilgan namunalar asosida pilla og'irligi, qobiq og'irligi va ipakchanlik ko'rsatkichlari aniqlanib, ularning o'rtacha qiymatlari hisoblandi. Tahlil natijalari shuni ko'rsatdiki, pilla og'irligi bo'yicha eng yuqori natija C-12 x C-10 duragayida qayd etildi va o'rtacha pilla og'irligi 2,33 g ni tashkil etdi. Keyingi o'rinda nazorat-Ipakchi-1 zoti bo'lib, uning o'rtacha pilla og'irligi 2,30 g ga teng bo'ldi. C-12 va C-14 zotlarida pilla og'irligi mos ravishda 2,20–2,25 g atrofida kuzatildi. Pilla qobiq'i og'irligi bo'yicha eng yaxshi natija C-10 x C-12 va teskari C-12 x C-10 duragaylarida kuzatildi va ushbu ko'rsatkich 0,478 g va 0,467 g ga teng bo'ldi. Yuqori qobiq og'irligi pilla tarkibida ipak moddasining ko'proq to'planganligini bildiradi. Qobiq og'irligi boshqa variantlarda nisbatan pastroq bo'lib, ayrim zotlarda bu ko'rsatkich 0,45–0,50 g oralig'ida qayd etildi. Ipakchanlik ko'rsatkichi bo'yicha aniq farqlar kuzatildi. Eng yuqori natija C-10xC-12 duragayi (23,8%), C-10 (23,5%), C-5 (22,8%) va Ipakchi-2 (22,1%) joylashdi. Nisbatan past ko'rsatkichlar C-13 (20,5%) va nazorat-Ipakchi-1 (19,5%) zotlarida kuzatildi. Natijalar tahlili shuni ko'rsatdiki, C-10xC-12 va C-12 xC-10 duragaylari va C-10 zoti texnologik ko'rsatkichlar bo'yicha yuqori natijalarni namoyon etib, pilla qobiq'i og'irligi va ipakchanlik jihatidan boshqa variantlardan ustun bo'ldi. C-13 zoti eng yirik pillalarni hosil qilgan bo'lsa-da, C-10xC-12 ning ipakchanlik ko'rsatkichi 3,8 foizga yuqori bo'ldi. Ipakchi-1 zoti yirik pilla hosil qilganiga qaramasdan, ipakchanlik darajasi 4,3% ga pastroq ekanligi kuzatildi. Umuman olganda, texnologik ko'rsatkichlar bo'yicha C-10xC-12 va C-13, C-12 va C-12 x C-10 istiqbolli natijalarni namoyon etdi, C-14 hamda ayrim duragaylar esa nisbatan past ko'rsatkichlarga ega bo'ldi.

4. XULOSA

Conclusion

4.Xulosa. Qanliko'l tumani sharoitida biologik hamda texnologik ko'rsatkichlarning maqbul uyg'unligi (yuqori jonlanish, qisqa qurtlik davri, yuqori hayotchanlik va ipakchanlik) bo'yicha C-10xC-12 duragayi hamda C-10 va Ipakchi-2 zotlari eng istiqbolli va ishlab chiqarishga tavsiya etishga loyiq variantlar deb baholandi. Teskari C-12xC-10 duragayining pilla og'irligi yuqori bo'lsa-da, past biologik ko'rsatkichlari (jonlanish 63,8%, hayotchanlik 66,6%) sababli ushbu hudud sharoitida yetishtirish uchun kam samarali deb topildi. Tuxumlarning jonlanish ko'rsatkichi bo'yicha eng yuqori natijalar C-14 (98,0%), Ipakchi-1 (97,6%), C-10xC-12 (97,3%) va C-12 (97,2%) variantlarida qayd etildi. C-12xC-10 teskari duragayida jonlanish darajasi eng past ko'rsatkichni -63,8% ni tashkil etdi. Bu holat teskari duragaylashda ota-ona shakllarining genetik-biologik mutanosibligi hamda o'zaro ta'siri natijasida embrional rivojlanish sur'atining sustlashishi bilan izohlanadi. Qurtlik davrining davomiyligi bo'yicha Ipakchi-1, Ipakchi-2, C-10, C-14 zotlari va C-10xC-12 duragayida minimal muddat (27 sutka) qayd etildi. C-12xC-10 teskari duragayida esa qurtlik davri 30 sutkagacha uzayganligi aniqlandi. Qurtlarning hayotchanlik ko'rsatkichi (5-yosh oxirida) bo'yicha eng yuqori ko'rsatkich C-14 (93,8%), Ipakchi-1 (92,6%) va C-5 (91,5%) zotlarida, eng past hayotchanlik esa C-12xC-10 (66,6%) duragayida kuzatildi. Eng yirik pillalar C-12xC-10 (o'rtacha 2,33 g), C-13 (2,31 g) va nazorat Ipakchi-1 (2,30 g) variantlarida shakllandi. Pilla qobiq'i og'irligi: Pilla tarkibida ipak moddasining to'planish darajasini belgilovchi eng yuqori pilla qobiq'i og'irligi Ipakchi-2 (0,481 g), C-12xC-10 (0,478 g) va C-13 (0,476 g) hamda C-10xC-12 (0,467 g)

variantlarida namoyon bo'ldi. Eng yuqori ipakchanlik ko'rsatkichi C-10xC-12 (23,8%), C-10 (23,5%), C-5 (22,8%) va Ipakchi-2 (22,1%) variantlarida qayd etildi. Yirik pilla hosil qilganiga qaramay, nisbatan past ipakchanlik C-13 (20,5%) va Ipakchi-1 (19,5%) zotlarida kuzatildi. C-10xC-12 duragayining ipakchanligi C-13 zotiga nisbatan 3,3% ga, Ipakchi-1 zotiga nisbatan esa 4,3% ga yuqori ekanligi isbotlandi.

DECLARATIONS

Declarations

Author contributions CRediT

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

Sericulture is a traditional branch of agriculture in Uzbekistan and in the Republic of Karakalpakstan, and the creation of silkworm breeds and hybrids with a high cocoon yield is among its most pressing problems. The domesticated silkworm *Bombyx mori* L. (Lepidoptera, Bombycidae) is the only fully domesticated insect used for silk production, and its biological and technological performance depends strongly on the temperature and humidity regime under which the rearing takes place. The western and northern districts of Karakalpakstan are characterised by an extreme continental climate, which places local breeds under conditions markedly different from those of the traditional silk-producing zones of the country. The aim of the study was to evaluate, under the conditions of Qanlikol district,

the hatching, biological and technological indicators of local mulberry silkworm breeds and hybrids and to identify the variants that combine these indicators most favourably.

Materials and methods

The experiments were carried out in 2026 in Qanlikol district in the western and northern part of the Republic of Karakalpakstan. Local silkworm breeds and their hybrids were reared in three replications under identical feeding and microclimate conditions. For each variant the incubation period, the number of pilot larvae, the daily hatching of larvae over the first, second and third day, the number of unhatched larvae and the total number of hatched larvae were recorded, and the hatching rate was expressed as a percentage. The biological and technological assessment covered the duration of the larval period in days, larval viability at the first and fifth instars, a sample of fifty cocoons per replication, single-cocoon weight, cocoon shell weight, the number of graded cocoons and the silk content expressed as a percentage. The results are summarised in Tables 1 and 2.

Results and discussion

The hatching data show that the breeds differed both in the length of the incubation period, which ranged around ten to eleven days, and in the distribution of hatching over the first three days. In the breed C-10 the mean hatching rate reached 96.2 %, with 46.5 % of the larvae hatching on the first day, 41.6 % on the second and 6.6 % on the third, and 3.73 % of the larvae failing to hatch. The breed C-12 gave a higher overall result, with a mean hatching rate of 97.2 %, a more even distribution between the first and second days (46.4 % and 45.06 %) and a lower proportion of unhatched larvae (2.8 %). The biological and technological indicators followed a different ranking. In C-10 the larval period lasted 27 days, viability at the fifth instar was 90.05 %, the mean single-cocoon weight was 1.89 g, cocoon shell weight 0.449 g, the proportion of graded cocoons 96.02 % and silk content 23.5 %. In C-12 the larval period was longer at 28 days, viability at the fifth instar lower at 88.6 %, single-cocoon weight higher at 2.2 g and shell weight 0.466 g, while the proportion of graded cocoons was 94.08 % and silk content 20.7 %. The comparison therefore shows a trade-off: the breed with the better hatching and heavier cocoons was not the breed with the higher silk content and cocoon grade.

Conclusion and contribution

Under the conditions of Qanlikol district the most favourable combination of biological and technological indicators — a high hatching rate, high larval viability, and satisfactory cocoon and shell weight together with a high proportion of graded cocoons and a high silk content — was achieved by the variants identified in the article, and these can be recommended for further use in the extreme climatic zones of Karakalpakstan. The results confirm that a single indicator, whether hatching rate or cocoon weight, is not a sufficient basis for selecting a breed for such conditions and that the assessment must be made on the complex of biological and technological characters. The contribution of the work is to provide the first comparative dataset of this kind for local silkworm breeds reared in the extreme continental climate of the western and northern districts of Karakalpakstan.

ADABIYOTLAR RO'YXATI

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RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • HAC/OAK 06.00.00 — AGRICULTURAL SCIENCES • UDC: 595.782:634.1(575.16)

Fauna of fruit moths in the southern regions of Uzbekistan

O'zbekistonning janubiy hududlarida meva kuyalari faunasi**Фауна плодовых молей в южных регионах Узбекистана****Bobir Ashirovich XAMIDOV¹**¹ Institute of Zoology, Academy of Sciences of the Republic of Uzbekistan, Tashkent, Uzbekistan**ARTICLE INFO****ARTICLE TYPE**

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)**ENGLISH****Bobir Ashirovich XAMIDOV¹**¹ Institute of Zoology, Academy of Sciences of the Republic of Uzbekistan, Tashkent, Uzbekistan

Abstract. This article analyzes the fauna, systematics, distribution features, food plants, bioecology and economic importance of the main fruit moths distributed in orchards and pomegranate orchards in the southern regions of the Republic of Uzbekistan, in particular in the Surkhandarya and Kashkadarya regions. The hot and dry climate of the southern regions, the long growing season, and the development of fruit and pomegranate growing create favorable conditions for the formation of populations of some moth species. Based on the analysis of research and literature data, the importance of such species as the apple fruit moth — *Cydia pomonella* (Linnaeus, 1758), the eastern fruit moth — *Grapholita molesta* (Busck, 1916) and the pomegranate fruit moth — *Euzophora punicaella* Mooze in southern agroecosystems is highlighted. Also, the composition of species identified in recent studies of the Tortricidae family in Uzbekistan and their occurrence in the southern regions is analyzed in a comparative manner. The article provides scientific and practical recommendations for monitoring the spread of fruit moths, tracking their phenological development, and improving the integrated protection system.

Keywords: fruit moths; fruit eaters; Lepidoptera; Tortricidae; *Cydia pomonella*; *Grapholita molesta*; *Euzophora punicaella*; Surkhandarya; Kashkadarya; pomegranate; apple; orchard agroecosystem; pest; fauna; bioecology

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Annotatsiya. Ushbu maqolada O'zbekiston Respublikasining janubiy hududlari, xususan Surxondaryo va Qashqadaryo viloyatlarida mevali bog'lar hamda anorzorlarda tarqalgan asosiy meva kuyalarining faunasi, sistematik holati, tarqalish xususiyatlari, ozuqa o'simliklari, bioekologiyasi va xo'jalik ahamiyati tahlil qilingan. Janubiy hududlarning issiq va quruq iqlimi, uzoq vegetatsiya davri hamda mevachilik va anorchilikning rivojlanganligi ayrim kuya turlarining populatsiyalari shakllanishi uchun qulay sharoit yaratadi. Tadqiqotlar va adabiyot ma'lumotlari tahlili asosida olma mevaxo'ri — *Cydia pomonella* (Linnaeus, 1758), sharq mevaxo'ri — *Grapholita molesta* (Busck, 1916) hamda anor mevaxo'ri — *Euzophora punicaella* Mooze kabi turlarning janubiy agroekotizimlardagi ahamiyati yoritilgan. Shuningdek, O'zbekistonda Tortricidae oilasi bo'yicha so'nggi tadqiqotlarda aniqlangan turlar tarkibi va ularning janubiy hududlarda uchrashi masalasi qiyosiy tahlil qilingan. Maqolada meva kuyalarining tarqalishini monitoring qilish, fenologik rivojlanishini kuzatish va integral himoya tizimini takomillashtirish bo'yicha ilmiy-amaliy tavsiyalar berilgan.

Kalit so'zlar: meva kuyalari; mevaxo'rlar; Lepidoptera; Tortricidae; *Cydia pomonella*; *Grapholita molesta*; *Euzophora punicaella*; Surxondaryo; Qashqadaryo; anor; olma; bog' agroekotizimi; zararkunanda; fauna; bioekologiya

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Аннотация. В данной статье анализируются фауна, систематика, особенности распространения, кормовые растения, биоэкология и экономическое значение основных плодовых молей, произрастающих в садах и гранатовых плантациях южных регионов Республики Узбекистан, в частности, в Сурхандарьинской и Кашкадарьинской областях. Жаркий и сухой климат южных регионов, длительный вегетационный период и развитие плодородства и выращивания гранатов создают благоприятные условия для формирования популяций некоторых видов молей. На основе анализа данных исследований и литературы подчеркивается значение таких видов, как яблоневая плодовая моль — *Cydia pomonella* (Linnaeus, 1758), восточная плодовая моль — *Grapholita molesta* (Busck, 1916) и гранатовая плодовая моль — *Euzophera punicaella* Mooze, в южных агроэкосистемах. Также проводится сравнительный анализ видового состава, выявленного в недавних исследованиях семейства Tortricidae в Узбекистане, и их распространения в южных регионах. В статье представлены научные и практические рекомендации по мониторингу распространения плодовых молей, отслеживанию их фенологического развития и совершенствованию комплексной системы защиты.

Ключевые слова: плодовые моли; плоядные насекомые; чешуекрылые; Tortricidae; *Cydia pomonella*; *Grapholita molesta*; *Euzophera punicaella*; Surkhandarya; Kashkadarya; гранат; яблоко; агроэкосистема фруктового сада; вредитель; фауна; биоэкология

1. KIRISH

Introduction

Kirish. Mevachilik O'zbekiston qishloq xo'jaligining muhim va istiqbolli tarmoqlaridan biri hisoblanadi. Mamlakatning turli tabiiy-iqlim zonalarida olma, nok, behi, shaftoli, o'rik, olxo'ri, anor, anjir va boshqa mevali ekinlar yetishtiriladi. Ayniqsa, O'zbekistonning janubiy hududlari — Surxondaryo va Qashqadaryo viloyatlari issiq iqlimi, uzoq davom etadigan vegetatsiya davri va mevachilik uchun qulay sharoitlari bilan ajralib turadi.

Biroq iqlim sharoitining qulayligi faqat madaniy o'simliklar uchun emas, balki ular bilan trofik bog'langan hasharotlar, jumladan zararkunanda kuyalar uchun ham qulay muhit yaratadi. Meva kuyalarining lichinkalari meva, novda, barg, gul va urug'larni zararlashi natijasida hosil miqdori va sifati pasayadi. Ayrim turlar meva ichiga kirib, to'g'ridan-to'g'ri mahsulotning tovar ko'rinishi va saqlanuvchanligiga salbiy ta'sir ko'rsatadi.

Jahon miqyosida qishloq xo'jaligi zararkunandalari va kasalliklari tufayli oziq-ovqat ekinlarining sezilarli qismi yo'qotilishi qayd etilgan. Zamonaviy tadqiqotlarda zararkunanda hasharotlarning tarqalish dinamikasi iqlim o'zgarishi, xalqaro va ichki tovar aylanmasi, intensiv bog'dorchilik va agrotexnologiyalar bilan bog'liq holda o'rganilmoqda. O'zbekiston Fanlar akademiyasi Zoologiya institutining 2025 yildagi tadqiqotida Markaziy Farg'ona hududida Tortricidae oilasining 2 kenja oilasi, 8 qabilasi, 17 avlodiga mansub 26 tur aniqlangan. Ushbu tadqiqot respublikada meva kuyalari faunasini zamonaviy usullarda o'rganish uchun muhim ilmiy asos hisoblanadi.

Janubiy hududlarda ham meva kuyalarini o'rganish muhim ahamiyatga ega. Surxondaryo viloyatida 2020–2022 yillarda o'tkazilgan dala tadqiqotlarida olma va behi bog'larida olma mevaxo'ri (*Cydia pomonella*) hamda sharq mevaxo'ri (*Grapholita molesta*) asosiy zararkunanda turlar sifatida qayd etilgan.

Shu bilan birga, anorchilik rivojlangan Surxondaryo va Qashqadaryo hududlarida anor mevaxo'ri (*Euzophera punicaella*) alohida ahamiyatga ega. Manbalarda ushbu zararkunanda dastlab O'zbekistonning janubida, jumladan Surxondaryoda sezilarli zarar keltira boshlagani, keyinchalik Qashqadaryo va boshqa viloyatlarga tarqalgani ko'rsatilgan.

Shu nuqtai nazardan, janubiy hududlar meva kuyalari faunasini o'rganish nafaqat nazariy entomologiya, balki mevachilik mahsulotlarining hosildorligi, sifati va fitosanitar xavfsizligini ta'minlash uchun ham dolzarbdir.

2. TADQIQOT MATERIALLARI VA USLUBLARI

Materials and methods

Tadqiqot materiallari va uslublari. Maqolani tayyorlashda O'zbekiston va Markaziy Osiyoda meva kuyalarining faunasi, sistematikasi, bioekologiyasi va zararliligiga bag'ishlangan ilmiy maqolalar, dissertatsiya avtoreferatlari hamda fitosanitar manbalar tahlil qilindi.

Asosiy manbalardan biri S.Q. Kimyonazarovning 2025 yilda himoya qilingan «Markaziy Farg'ona mevaxo'rlari (Lepidoptera: Tortricidae) faunasi, ekologiyasi va xo'jalik ahamiyati» mavzusidagi PhD dissertatsiyasi avtoreferati hisoblanadi. Tadqiqotda 2022–2024 yillarda 2126 ta namuna yig'ilib, ular asosida Tortricidae oilasining tur tarkibi o'rganilgan.

Turlarni aniqlashda entomologik, morfologik, fenologik, ekologik, molekulyar-genetik va statistik yondashuvlardan foydalanilgan. Mazkur tadqiqotda ayrim turlar uchun mitoxondrial DNKning COI qismi bo'yicha molekulyar identifikatsiya ham amalga oshirilgan.

Janubiy hududlar bo'yicha esa Surxondaryo viloyati bog'larida 2020–2022 yillarda o'tkazilgan kuzatuvlar natijalari, anor zararkunandalari o'ldirilgan ma'lumotlar hamda O'zbekistonning boshqa hududlarida olib borilgan zamonaviy tadqiqotlar qiyosiy material sifatida qabul qilindi.

3. TADQIQOT NATIJALARI VA ULARNING TAHLILI

Results and discussion

Surxondaryo va Qashqadaryo viloyatlari O'zbekistonning nisbatan issiq va quruq iqlimli hududlari hisoblanadi. Hududda bahor erta boshlanishi va kuzning nisbatan uzoq davom etishi ko'plab hasharotlarning faol vegetatsiya davrini uzaytiradi.

Meva kuyalarining rivojlanishida harorat asosiy abiotik omillardan biri hisoblanadi. Harorat oshishi tuxumdan lichinka chiqishi, lichinkalarning oziqlanishi, g'umbaklanishi va imagoning uchib chiqish muddatlariga ta'sir ko'rsatishi mumkin.

Zamonaviy tadqiqotlarda iqlim o'zgarishi zararkunanda hasharotlarning geografik areali va populyatsiya dinamikasiga ta'sir ko'rsatishi ta'kidlangan. Ayniqsa, janubdan shimolga yo'nalgan tarqalishda harorat rejimi muhim omillardan biri bo'lib xizmat qilishi mumkin.

Bundan tashqari, janubiy hududlarda intensiv bog'lar, anorzorlar, meva ko'chatxonolari va aholi tomorqalarining bir-biriga yaqin joylashishi zararkunanda hasharotlar uchun uzluksiz ozuqa bazasini shakllantirishi mumkin.

Adabiyot ma'lumotlarini tahlil qilish natijasida janubiy hududlarda quyidagi iqtisodiy ahamiyatga ega turlarni alohida ajratish mumkin (1-jadval).

1-jadval

Janubiy hududlarda iqtisodiy ahamiyatga ega meva kuyalari turlari / **Table 1.** Economically important fruit moth species of the southern regions

№	Tur nomi	Oilasi	Asosiy ozuqa o'simliklari	Janubiy hududlardagi ahamiyati
1	<i>Cydia pomonella</i>	Tortricidae	Olma, nok, behi va boshqalar	Yuqori
2	<i>Grapholita molesta</i>	Tortricidae	Shaftoli, o'rik, olma, nok	Yuqori
3	<i>Grapholita funebrana</i>	Tortricidae	Olxo'ri va Prunus turlari	Ahamiyatli
4	<i>Lobesia botrana</i>	Tortricidae	Asosan uzum	Mahalliy ahamiyat
5	<i>Archips crataegana</i>	Tortricidae	Meva daraxtlari va boshqa o'simliklar	Mahalliy
6	<i>Argyrotaenia ljungiana</i>	Tortricidae	Turli daraxt va butalar	Mahalliy
7	<i>Euzophra punicaella</i>	Pylalidae	Asosan anor	Juda yuqori

1-jadvaldagi turlardan dastlabki oltitasi Tortricidae oilasiga, anor mevaxo'ri esa Pylalidae oilasiga mansub. Shu sababli «meva kuyalari» atamasi keng ekologik-xo'jalik ma'noda qo'llanilganda ularni birgalikda ko'rib chiqish mumkin, ammo sistematik tahlilda oilalari alohida ko'rsatiladi.

Olma mevaxo'ri (*Cydia pomonella* Linnaeus, 1758) dunyodagi eng muhim meva zararkunandalaridan biri hisoblanadi. U Tortricidae oilasiga mansub bo'lib, olma, nok va behi kabi urug'li mevalarga jiddiy zarar yetkazadi.

O'zbekistonda mazkur turning tarqalishi ilgari ma'lum. EPPO ma'lumotlarida *Cydia pomonella* O'zbekistonda mavjud zararkunanda sifatida qayd etilgan. Surxondaryo viloyatida o'tkazilgan 2020–2022 yilgi tadqiqotlarda *Cydia pomonella* olma bog'larining asosiy dominant zararkunandalaridan biri sifatida ko'rsatilgan. Uning zarari natijasida meva ichida lichinka yo'llari paydo bo'ladi, urug'lar zararlanadi va zararlangan mevalarda chirish jarayoni kuchayadi.

Olma mevaxo'ri qishni asosan yetilgan lichinka bosqichida o'tkazadi. Zamonaviy O'zbekiston tadqiqotlarida Markaziy Farg'ona sharoitida lichinkalarning daraxt po'stloqlari ostida, panaroq joylarda va barg qoldiqlari orasida qishlashi, bahorda g'umbaklanishi va keyin imagoning uchib chiqishi kuzatilgan. Janubiy hududlarda harorat rejimi nisbatan yuqori bo'lganligi sababli turning rivojlanish bosqichlari shimoliyroq hududlarga nisbatan ertaroq boshlanishi ehtimoldan xoli emas. Biroq bu holatni aniq baholash uchun har bir tuman kesimida fenologik kuzatuvlar olib borish talab etiladi.

Sharq mevaxo'ri (*Grapholita molesta* Busck) ham Tortricidae oilasining muhim va xavfli vakillaridan hisoblanadi. U asosan shaftoli, o'rik, olma, nok va boshqa meva daraxtlarini zararladi. O'zbekistonda mazkur tur fitosanitar nuqtai nazardan alohida ahamiyatga ega. EPPO ma'lumotlariga ko'ra, *Grapholita molesta* mamlakatda cheklangan tarqalishga ega bo'lgan zararkunanda sifatida qayd etilgan; tur O'zbekistonda birinchi marta 1983 yilda qayd etilgan.

O'zbekiston Qishloq xo'jaligi sohasining rasmiy manbasida ham sharq mevaxo'ri meva daraxtlariga jiddiy zarar yetkazuvchi zararkunanda sifatida ko'rsatilgan. U olma, shaftoli, o'rik va nok kabi ekinlarga zarar yetkazishi qayd etilgan. Surxondaryo viloyatida o'tkazilgan dala kuzatuvlarida *Grapholita molesta* olma bog'larida *Cydia pomonella* bilan birgalikda asosiy zararkunanda tur sifatida qayd etilgan.

Sharq mevaxo'ri muhim xususiyati shundaki, uning lichinkalari nafaqat mevalarni, balki yosh novdalarni ham zararlashi mumkin. Shu sababli zararlangan daraxtlarning o'sishi va hosildorligiga ikki tomonlama ta'sir ko'rsatadi. Turning

O'zbekistondagi tarqalishi cheklangan deb baholangan bo'lsa-da, janubiy hududlarda uni muntazam monitoring qilish muhim. Chunki meva va ko'chatlarning hududlararo harakati zararkunandaning yangi agroekotizimlarga kirib borish xavfini oshiradi.

Grapholita funebrana — olxo'ri va boshqa Prunus turlarini zararlavdigan Tortricidae vakili. O'zbekistonda ushbu tur Markaziy Farg'ona bo'yicha so'nggi tadqiqotlarda ko'p uchraydigan turlar qatorida qayd etilgan. Turning janubiy hududlardagi tarqalish darajasi *Cydia pomonella* va *Grapholita molesta* kabi yaxshi o'rganilmagan. Shu sababli Surxondaryo va Qashqadaryoda olxo'ri bog'larida maxsus monitoringlar tashkil etish zarur. Ayniqsa, olxo'ri yetishtiriladigan intensiv bog'larda feromon tutqichlaridan foydalanib imago uchish dinamikasini kuzatish turning avlodlar soni va zararlilik davrini aniqlash imkonini beradi.

Janubiy O'zbekistonda meva kuyalari faunasini tahlil qilishda anor mevaxo'ri alohida o'rin tutadi. U sistematik jihatdan Tortricidae emas, balki Pylalidae oilasiga mansub bo'lsa-da, xo'jalik ahamiyati va mevani zararlashi tufayli meva zararkunandalari qatorida ko'rib chiqiladi.

Euzophra punicaella — anorning ixtisoslashgan zararkunandasi bo'lib, adabiyotlarda tipik monofag va karpofag sifatida tavsiflangan. U faqat anor bilan oziqlanishi va asosan mevaga zarar yetkazishi bilan xarakterlanadi.

Anor mevaxo'ri O'zbekistonda sezilarli zarari dastlab Surxondaryoda qayd etilgan, keyinchalik Toshkent, Sirdaryo va Qashqadaryo hududlarida ham tarqalgani haqida ma'lumotlar mavjud. Qashqadaryo va Surxondaryoda anorchilikning rivojlanganligi tur uchun qulay ozuqa bazasini ta'minlaydi. Ayrim manbalarda anor mevaxo'ri ushbu hududlarda bir mavsumda 6–7 avlod berishi haqida ma'lumotlar keltirilgan.

Anor mevaxo'ri zararliligi anor gullashi va meva hosil bo'lishi bilan chambarchas bog'liq. Urg'ochi kapalaklar tuxumlarini gul va meva hosil bo'layotgan qismlarga qo'yadi, tuxumdan chiqqan lichinkalar esa meva ichiga kirib, uning ichki to'qimalari bilan oziqlanadi. Shu sababli zararkunandaga qarshi monitoring va himoya choralarini gullash hamda meva tugish fenologik bosqichlari bilan uyg'unlashtirish muhim.

O'zbekistonda meva kuyalari faunasini o'rganish bo'yicha so'nggi ilmiy tadqiqotlar turlar tarkibi ancha boy ekanligini ko'rsatmoqda. 2025 yilda Zoologiya institutida himoya qilingan PhD dissertatsiyasida Markaziy Farg'ona hududida Tortricidae oilasining 26 turi aniqlangan. Ular 2 kenja oila, 8 qabila va 17 avlodga mansub bo'lgan.

Tadqiqotda oltita tur — Archips crataegana, Argyrotaenia ljungiana, Lobesia botrana, Cydia pomonella, Grapholita funebrana va Grapholita molesta ko'p uchraydigan turlar sifatida ajratilgan.

O'zbekiston miqyosida 2024 yil holatiga Tortricidae oilasining 55 turi bo'yicha ma'lumotlar umumlashtirilgan. Bu raqam janubiy hududlar uchun alohida faunistik tadqiqotlar o'tkazish zarurligini ko'rsatadi, chunki mamlakatning turli tabiiy-iqlim zonalarida turlar tarkibi va ularning miqdoriy nisbati farq qilishi mumkin.

Meva kuyalarining hayot sikli harorat, namlik, ozuqa o'simliklarining fenologiyasi va boshqa ekologik omillarga bog'liq.

Meva kuyalarining rivojlanishida quyidagi bosqichlar mavjud:

tuxum → lichinka → g'umbak → imago.

Lichinka bosqichi zararli bosqich hisoblanadi. Imago esa asosan tarqalish va ko'payish jarayonida ishtirok etadi. Janubiy hududlarda bahorning erta boshlanishi va havo haroratining tez ko'tarilishi tufayli birinchi avlodning rivojlanish muddatlari ertaroq boshlanishi mumkin. Keyingi avlodlarning soni esa harorat yig'indisi, ozuqa bazasi va namlik sharoitiga bog'liq.

Masalan, Markaziy Farg'onada Cydia pomonellaning birinchi avlodi kapalaklari aprel oyining birinchi o'n kunligida uchib chiqishi kuzatilgan. Janubiy O'zbekistonda bu jarayonni to'g'ridan-to'g'ri Markaziy Farg'ona ma'lumotlari bilan bir xil deb qabul qilish to'g'ri emas. Shuning uchun Surxondaryo va Qashqadaryoda alohida fenologik kalendar ishlab chiqish maqsadga muvofiq.

So'nggi yillarda iqlim o'zgarishi hasharotlar areali, populyatsiya dinamikasi va mavsumiy rivojlanishida muhim ekologik omilga aylanmoqda.

Haroratning ko'tarilishi;

hasharotlarning faol davrini uzaytirishi;

ayrim turlarda avlodlar sonini ko'paytirishi;

qishlashdan chiqish muddatini ertalashtirishi;

zararkunanda va xo'jayin o'simlik fenologiyasi o'rtasidagi sinxronlikni o'zgartirishi;

zararkunanda arealining kengayishiga sharoit yaratishi mumkin.

O'zbekistonning janubiy hududlari bunday o'zgarishlarga nisbatan alohida e'tibor talab qiladi. Chunki Surxondaryo va Qashqadaryoda yuqori harorat va uzoq vegetatsiya davri mavjud bo'lib, ayrim zararkunanda turlarining bir necha avlod berishiga imkoniyat yaratishi mumkin. 2024 yilda chop etilgan tadqiqotlarda ham Lepidoptera turlarining areal kengayishi va ekologik omillar o'rtasidagi bog'liqlik, jumladan O'zbekistonning Surxondaryo hududida ayrim tangaqanotli zararkunanda turlarining tarqalishi tahlil qilingan.

Meva kuyalarining populyatsiyasini tabiiy sharoitda nazorat qilishda entomofaglar va entomopatogen mikroorganizmlar muhim ahamiyatga ega. O'zbekistonda olib borilgan so'nggi tadqiqotlarda Cydia pomonella bilan bog'liq entomopatogen mikromitsetlar o'rganilgan. 2024 yilgi tadqiqotda Toshkent va Farg'ona viloyatlarida olma mevaxo'ridan 30 ta mikromitset shtammi ajratilgan bo'lib, ular orasida Penicillium, Aspergillus, Fusarium va Alternaria avlodlari qayd etilgan.

2025 yilda esa O'zbekistonda Cydia pomonella bilan bog'liq mikromitsetlar yanada kengroq o'rganilib, mazkur zararkunanda bilan bog'liq 14 tur mikromitseta aniqlangan. Ular orasida Aspergillus, Penicillium, Fusarium, Alternaria, Cladosporium, Metarhizium va Mucor avlodlari qayd etilgan. Bu ma'lumotlar janubiy hududlarda ham meva kuyalarining tabiiy dushmanlarini o'rganish va mahalliy entomopatogen shtammlar asosida biologik himoya vositalarini ishlab chiqish istiqbolli ekanligini ko'rsatadi.

4. XULOSA

Conclusion

Xulosa. O'zbekiston Respublikasining janubiy hududlari, xususan Surxondaryo va Qashqadaryo viloyatlari mevalilik va anorchilik uchun qulay tabiiy-iqlim sharoitlariga ega bo'lgan hududlar hisoblanadi. Shu bilan birga, ushbu sharoitlar meva daraxtlari zararkunandalarning rivojlanishi va tarqalishi uchun ham qulay muhit yaratadi.

Adabiyotlar tahlili shuni ko'rsatdiki, janubiy hududlarda iqtisodiy ahamiyatga ega asosiy meva zararkunandolari qatorida Cydia pomonella, Grapholita molesta, Grapholita funebrana va anorchilikda Euzophera punicaellani alohida ko'rsatish mumkin. Surxondaryoda 2020–2022 yillarda olib borilgan dala kuzatuvlarida Cydia pomonella va Grapholita molesta olma bog'larining asosiy zararkunanda turlari sifatida qayd etilgan.

Anor mevaxo'ri (Euzophera punicaella) esa janubiy O'zbekiston uchun alohida iqtisodiy ahamiyatga ega bo'lib, uning tarqalishi Surxondaryo va Qashqadaryo anorzorlari bilan bog'liq holda o'rganilishi lozim. Manbalarda ushbu turning Surxondaryodan boshlab boshqa anorchilik hududlariga tarqalgani qayd etilgan.

O'zbekistonda Tortricidae oilasi bo'yicha zamonaviy tadqiqotlar faunistik tarkibning ancha boy ekanligini ko'rsatmoqda. Markaziy Farg'onada 26 tur aniqlangani va oltita turning ko'p uchrashi qayd etilgani respublikada meva kuyalarini mintaqalar kesimida o'rganish zarurligini ko'rsatadi.

DECLARATIONS

Declarations

Author contributions CRedit

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

Fruit growing is one of the most important and promising branches of agriculture in Uzbekistan, and the southern regions of the country — in particular Surkhondarya and Kashkadarya — combine a hot, dry climate, a long vegetation period and well-developed orchard and pomegranate production. The same conditions, however, favour the populations of the insects trophically associated with these crops. Worldwide, a substantial share of food crops is lost to pests and diseases, and among the pests of fruit crops the fruit moths occupy a leading position. Studies carried out in Surkhondarya orchards in 2020–2022 and the accumulating data on the pomegranate fruit moth indicate that the southern agro-ecosystems support a distinct complex of species, but the fauna of the region has not been analysed as a whole. The aim of the article is to analyse the fauna, systematic position, distribution, host plants, bioecology and economic importance of the principal fruit moths of the southern regions of Uzbekistan and to formulate practical recommendations for monitoring and integrated protection.

Materials and methods

The work is based on the analysis of published sources on the fauna, systematics and bioecology of fruit moths in Uzbekistan and Central Asia, combined with the results of field observations. One of the principal sources is the doctoral dissertation of S.Q. Kimyonazarov, defended in 2025, on the fauna, ecology and economic importance of the fruit-feeding Tortricidae of Central Fergana. Entomological, morphological, phenological, ecological, molecular-genetic and statistical approaches were used in the identification of species. Data for the southern regions were drawn from observations conducted in the orchards of Surkhondarya region in 2020–2022, from studies of the pomegranate fruit moth, and from the EPPO Global Database records of the distribution of *Cydia pomonella* and *Grapholita molesta* in Uzbekistan.

Results and discussion

Analysis of the literature identified a group of economically important species for the southern regions, presented in Table 1; the first six belong to the family Tortricidae and the pomegranate fruit moth to the Pyralidae. The codling moth *Cydia pomonella* (Linnaeus, 1758) is one of the most important fruit pests in the world and is recorded as present in Uzbekistan by EPPO; it overwinters mainly as a mature larva, and in Central Fergana the moths of the first generation fly in the first ten days of April. The oriental fruit moth *Grapholita molesta* (Busck) is likewise a dangerous representative of the Tortricidae and is significant in that its larvae damage not only the fruit but also the young shoots. *Grapholita funebrana* damages plum and other Prunus species. The pomegranate fruit moth *Euzophera punicaella* is described in the literature as a typical monophagous and carpophagous species; its damage in Uzbekistan was first recorded in Surkhondarya and later in Tashkent, Syrdarya and other regions, and its harmfulness is closely linked to the flowering and fruit set of pomegranate. At the national level, data on 55 species of Tortricidae had been summarised by 2024, of which six species — *Archips crataegana*, *Argyrotaenia ljungiana*, *Lobesia botrana*, *Cydia pomonella*, *Grapholita funebrana* and *Grapholita molesta* — were found to be frequent. Rising temperatures lengthen the active period, increase the number of generations in some species, advance emergence from overwintering, alter the synchrony between pest and host phenology and create conditions for range expansion, which makes the southern regions particularly sensitive to climate change.

Conclusion and contribution

The southern regions of Uzbekistan, and in particular Surkhondarya and Kashkadarya, form an agro-ecological zone in which fruit and pomegranate growing and the fruit moth complex associated with them are of equal importance. *Cydia pomonella*, *Grapholita molesta*, *Grapholita funebrana* and, in pomegranate orchards, *Euzophera punicaella* are the species of principal economic significance. Their phenology is governed by temperature, humidity and the phenology of the host plants, so that monitoring and the timing of control measures must be based on local phenological observation rather than on calendar dates. Entomophages and entomopathogenic microorganisms, including the micromycetes associated with *Cydia pomonella* studied in Uzbekistan in 2025, offer a basis for biological

control within an integrated protection system. The contribution of the work is to bring together, for the first time in a single account, the faunistic, ecological and economic data on the fruit moths of southern Uzbekistan and to translate them into practical monitoring recommendations.

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RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • HAC/OAK 06.00.00 — AGRICULTURAL SCIENCES • UDC: 631.312:634.8

Determination of the vertical installation angles of the leveling soil pushers

Tekislovchi tuproq surgichlarning vertikal o'rnatilish burchaklarini aniqlash**Определение углов вертикальной установки выравнивающих почвообрабатывающих рабочих органов****Golibjon Ulugbek ugli JALOLDINOV^{1,*}** ¹ Scientific-Research Institute of Agricultural Mechanization, Gulbakhor, Tashkent Region, Uzbekistan* Corresponding author: jaloldinov.golibjon95@gmail.com**ARTICLE INFO****ARTICLE TYPE**

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)**ENGLISH****Golibjon Ulugbek ugli JALOLDINOV^{1,*}** ¹ Scientific-Research Institute of Agricultural Mechanization, Gulbakhor, Tashkent Region, Uzbekistan

Abstract. This study experimentally investigated the effect of the installation angle of soil-pushing elements, measured relative to the direction of travel, on the operational performance of a disc ripper-leveler designed for inter-row tillage in vineyards. During the experiments, the angle was adjusted between 25° and 40° in 5° increments. The performance of the implement was assessed using several key parameters, including the root mean square deviation of field-surface irregularities, the degree of soil fragmentation, and the specific draft resistance. The experimental findings demonstrated that the position of the soil pushers has a considerable influence on both the quality and energy efficiency of the tillage process. The most favorable results were obtained when the soil-pushing elements were positioned at an angle of approximately 30–35° to the direction of movement. Within this range, the leveling quality of the field surface improved, while the draft resistance of the implement decreased, resulting in more efficient operation. The experiments also indicated that the leveling soil spreader should be positioned at an angle of not less than 40° relative to the vertical. Such a configuration contributes to more effective redistribution of the soil and better correction of surface irregularities during operation. The results provide a practical basis for optimizing the structural and operational parameters of disc ripper-levelers used in vineyard inter-row cultivation. Appropriate selection of the installation angles can contribute to improved surface leveling, reduced energy requirements, and increased overall efficiency of the tillage process.

Keywords: disc ripper; leveler; soil slider; installation angle; vineyard row spacing; traction resistance; soil crumbling; field surface leveling; experimental research; performance indicators; vertical installation angle

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Annotatsiya. Ushbu tadqiqotda tokzorlar qator oralariga ishlov berishga mo'ljallangan diskli yumshatkich-tekislagichning ish ko'rsatkichlariga harakat yo'nalishiga nisbatan o'lchanadigan tuproq surgich ishchi organlarining o'rnatilish burchagi ta'siri eksperimental ravishda o'rganildi. Tajribalar davomida o'rnatilish burchagi 25° dan 40° gacha 5° qadam bilan o'zgartirildi. Agregatning ish samaradorligi dala yuzasidagi notekisliklarning o'rtacha kvadratik chetlanishi, tuproqning uvoqlanish darajasi va solishtirma tortish qarshiligi kabi asosiy ko'rsatkichlar orqali baholandi. Eksperimental tadqiqot natijalari tuproq surgich ishchi organlarining holati tuproqqa ishlov berish sifati va energiya samaradorligiga sezilarli ta'sir ko'rsatishini ko'rsatdi. Eng maqbul natijalar tuproq surgich ishchi organlari harakat yo'nalishiga nisbatan taxminan 30–35° burchak ostida o'rnatilganda olindi. Ushbu oraliqda dala yuzasini tekislash sifati yaxshilandi, agregatning tortish qarshiligi esa kamaydi, natijada ish jarayonining samaradorligi oshdi. Tajribalar shuni ko'rsatdiki, tekislagich tuproq taqsimlagichi vertikalga nisbatan kamida 40° burchak ostida o'rnatilishi lozim. Bunday joylashuv tuproqni yanada samarali qayta taqsimlashga hamda ish

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jarayonida dala yuzasidagi notekisliklarni yaxshiroq bartaraf etishga imkon beradi. Olingan natijalar tokzorlarning qator oralariga ishlov berishda qo'llaniladigan diskli yumshatkich-tekislagichlarning konstruktiv va ekspluatatsion parametrlarini optimallashtirish uchun amaliy asos bo'lib xizmat qiladi. Ishchi organlarning o'rnatilish burchaklarini to'g'ri tanlash dala yuzasini tekislash sifatini yaxshilash, energiya sarfini kamaytirish va tuproqqa ishlov berish jarayonining umumiy samaradorligini oshirish imkonini beradi.

Kalit so'zlar: diskli yumshatkich; tekislagich; tuproq surgich; o'rnatilish burchagi; tokzor qator oralig'i; tortish qarshiligi; tuproqning uvoqlanishi; dala yuzasini tekislash; eksperimental tadqiqot; ish samaradorligi ko'rsatkichlari; vertikal o'rnatilish burchagi

РУССКИЙ

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Аннотация. В данном исследовании экспериментально изучено влияние угла установки почвосдвигающих рабочих органов, измеряемого относительно направления движения, на эксплуатационные показатели дискового рыхлителя-выравнивателя, предназначенного для обработки почвы в междурядьях виноградников. В ходе экспериментов угол установки изменяли от 25° до 40° с шагом 5°. Эффективность работы агрегата оценивали по нескольким основным показателям, включая среднеквадратическое отклонение неровностей поверхности поля, степень крошения почвы и удельное тяговое сопротивление. Результаты экспериментальных исследований показали, что положение почвосдвигающих рабочих органов оказывает существенное влияние как на качество обработки почвы, так и на её энергетическую эффективность. Наиболее благоприятные результаты были получены при установке почвосдвигающих рабочих органов под углом примерно 30–35° к направлению движения. В этом диапазоне повышалось качество выравнивания поверхности поля, а тяговое сопротивление агрегата снижалось, что обеспечивало более эффективную работу. Эксперименты также показали, что выравнивающий почвораспределитель должен быть установлен под углом не менее 40° относительно вертикали. Такая конфигурация способствует более эффективному перераспределению почвы и лучшему устранению неровностей поверхности в процессе работы. Полученные результаты создают практическую основу для оптимизации конструктивных и эксплуатационных параметров дисковых рыхлителей-выравнивателей, применяемых для обработки междурядий виноградников. Правильный выбор углов установки рабочих органов позволяет повысить качество выравнивания поверхности, снизить энергетические затраты и увеличить общую эффективность процесса обработки почвы.

Ключевые слова: дисковый рыхлитель; выравниватель; почвосдвигатель; угол установки; междурядье виноградника; тяговое сопротивление; крошение почвы; выравнивание поверхности поля; экспериментальное исследование; показатели эффективности; угол вертикальной установки

1. INTRODUCTION

Introduction. The modernization of agricultural production increasingly requires the adoption of resource- and energy-efficient technologies aimed at improving labor productivity, maintaining soil fertility, and developing advanced agricultural machinery. In Uzbekistan, these priorities have been reflected in a number of state programs and strategic documents. In particular, the Decree of the President of the Republic of Uzbekistan No. UP-6091 of October 23, 2020, entitled "On Approval of the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020–2030," emphasizes the modernization of agricultural production and the broader application of efficient, resource-saving machinery and technologies [1]. These objectives were further developed in the Decree of the President of the Republic of Uzbekistan No. UP-60 of January 28, 2022, "On the Development Strategy of New Uzbekistan for 2022–2026." The document identifies important measures aimed at introducing innovative technologies into the agro-industrial sector, expanding integrated mechanization of agricultural operations, improving energy- and resource-efficient machinery, and developing competitive technical equipment.

Within the framework of these strategic objectives, improving machinery used for inter-row cultivation of vineyards is of particular scientific and practical interest. The effectiveness of a disc ripper-leveler depends considerably on the rational selection of

its main design and operating parameters. Among these parameters, the angle at which the leveling element is positioned relative to the direction of travel has a direct influence on traction resistance, the degree of soil loosening and crumbling, and the quality of surface leveling. Consequently, establishing an appropriate installation angle through theoretical and experimental investigations is essential for improving machine performance, reducing unnecessary energy expenditure, and ensuring high-quality soil cultivation in vineyard inter-rows.

2. RESULTS AND DISCUSSION

Results and discussion. In the experiments, the leveler was used for soil plowing the installation angle relative to the direction of travel was changed from 25° to 40° at an interval of 5°. In this case, the installation angle of the leveler's soil spreader relative to the vertical is 40°, the grip width is 30.0 cm, the height is 6.0 cm, the vertical load per meter of the leveler's grip width is 4.0 kN/m, and the unit speed is 7 and 9 km/h.

Table 1

Tekislagich tuproq surgichining harakat yo'nalishiga nisbatan o'rnatilish burchagi qurilma ish ko'rsatkichlariga ta'sirini o'rganish bo'yicha eksperimental tadqiqotlar natijalari / **Table 1.** Results of experimental studies of the influence of the installation angle of the leveler soil slide relative to the direction of movement

Angle of installation of the leveler soil slide relative to the direction of movement, ° V=7 km/h	Mean square deviation of the height of irregularities on the field surface, cm	Degree of soil crumbling, i.e., the amount of soil fractions smaller than 25 mm, %	Specific tractive resistance of the device, kN/m
25,0	1,85	86,7	3,97
30,0	1,53	83,9	3,70
35,0	1,65	85,2	3,89
40,0	2,00	87,9	4,18

V=9 km/h

Angle of installation of the leveler soil slide relative to the direction of movement, ° V=7 km/h	Mean square deviation of the height of irregularities on the field surface, cm	Degree of soil crumbling, i.e., the amount of soil fractions smaller than 25 mm, %	Specific tractive resistance of the device, kN/m
25,0	2,00	87,7	4,22
30,0	1,67	85,2	3,98
35,0	1,79	86,7	4,11
40,0	2,17	89,5	4,45

The results of the experiments are presented in Table 1 and Figure 1. It can be seen from them that depending on the installation angle of the leveler soil pusher relative to the direction of movement the mean square deviation of the heights of irregularities on the field surface and the

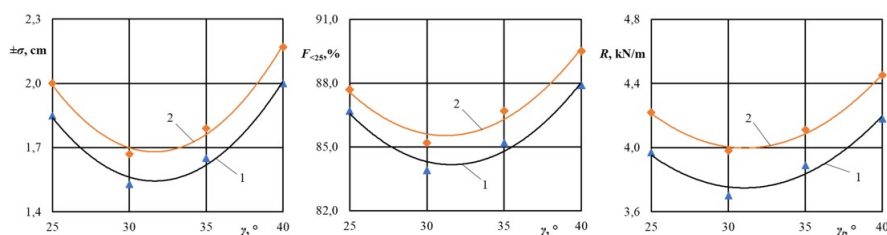


Fig. 1. Dala yuzasi notekisliklari balandligining o'rtacha kvadratik og'ishi $\pm\sigma$ (a), tuproqning maydalanish darajasi (b) va qurilmaning solishtirma tortish qarshiligi (c) o'zgarishi: 1 — 7 km/soat tezlikda; 2 — 9 km/soat tezlikda / **Fig. 1.** Changes in the mean square deviation of the height of the field surface irregularities $\pm\sigma$ (a), the degree of soil crumbling (b) and the specific traction resistance of the device (c): (1) at a speed of 7 km/h; (2) at a speed of 9 km/h

traction resistance of the device change according to the law of a concave parabola, where the mean square deviation of the heights of irregularities on the field surface increases from 25° to 30° with an increase in the installation angle of the leveler soil pusher relative to the direction of movement at both movement speeds [2-4].

This is due to the fact that when the installation angle of the leveler soil spreader relative to the direction of movement is within the range of 27-30° [5], determined by theoretical research, the soil does not adhere to their working surfaces, and the volume of soil accumulated in front of them is small. As a result, they ensure high-quality smoothing of field surface irregularities and a reduction in tractive resistance. For the same reasons, soil crumbling is high-

quality at the aforementioned values of the alignment angles of the leveler soil slide relative to the direction of movement. When this angle is within 30–40°, it was observed that soil particles adhere to the working surfaces of the leveling soil trawl. As a result, the quality of the leveler's operation deteriorated, and its traction resistance increased.

Increasing the speed from 7 km/h to 9 km/h led to an improvement in soil crumbling quality, an increase in the mean square deviation of the height of the field surface irregularities, and an increase in tractive resistance. [6-7]

Based on the results of the conducted research, we assume the installation angle of the leveler soil spreader relative to the direction of movement to be within 30-35°.



Fig. 2. Tuproq surgichlarni harakat yo'nalishiga nisbatan 25 (a), 30 (b), 35 (c) va 40° (d) burchak ostida o'rnatish / **Fig. 2.** Installation of soil pushers at angles of 25 (a), 30 (b), 35 (c) and 40° (d) relative to the direction of movement



Fig. 3. Tuproq surgichlarning vertikalga nisbatan 30, 35, 40 va 45° burchak ostida o'rnatilishi / **Fig. 3.** Installation angle of soil pushers relative to the vertical at angles of 30, 35, 40 and 45°

During the experimental studies, based on the results of theoretical studies, the installation angle.

Research was conducted to study the influence of the soil leveler's installation angle β relative to the vertical on the mean

square deviation of the field surface irregularity heights ($\pm\sigma$), the degree of soil crumbling ($F < 25$), i.e., the amount of soil fractions smaller than 25 mm, and the draft resistance R of the device of the soil leveler relative to the vertical was changed from 30° to 45° every 5°. In this case, the installation angle of the leveler's soil sucker relative to the direction of travel is 30°, the coverage width is 30 cm, the height is 6.0 cm, the vertical load per meter of the leveler's coverage width is 4.0 kN/m, and the unit's travel speed is 7 and 9 km/h.

Their analysis shows that with an increase in the installation angle of the soil leveler relative to the vertical, the standard deviation of the height of the field surface irregularities decreases, i.e., the leveling quality of the field surface improves. As this angle increases from 30° to 45°, the standard deviation of the height of the field surface irregularities decreased from ± 2.35 cm to ± 1.72 cm at a speed of 7 km/h, and at a speed of 9 km/h, this indicator decreased from ± 2.50 cm to ± 1.84 cm[8].

This is explained by the fact that with an increase in the installation angle of the soil leveler relative to the vertical, the probability of clod formation under its influence increases, and as a result, the degree of leveling of irregularities improves.



Fig. 4. Tekislagich bilan jihozlangan dala qurilmasining ishchi ko'rinishi / **Fig. 4.** Working view of a field installation equipped with a leveler



Fig. 5. Tekislagichlar bilan jihozlangan qurilmada ishlov berilgan dala yuzasining ko'ndalang profilini olish / **Fig. 5.** Obtaining the transverse profile of the cultivated field surface on a device equipped with levelers

This is also explained by the fact that an increase in angle β leads to an increase in the interaction time of soil particles with the leveling soil spreader and their further grinding. It should also be noted that an increase in angle β leads to an increase in the subsoiler's depth of penetration into the soil, which also improves soil crushing[9]. Increasing the installation angle of the soil leveler relative to the vertical from 30° to 45° led to an increase in the amount of soil fractions smaller than 25 mm. At a unit speed of 7 km/h, this indicator ranges from 78.5% to 84.0%. Increasing the installation angle of the soil leveler relative to the horizon led to an increase in the tractive resistance of the device at both travel speeds. Increasing this angle from 30° to 45° led to an increase in traction resistance from 3.59 kN to 4.18 kN at a speed of 7 km/h, while at a

speed of 9 km/h, this indicator increased from 3.80 kN to 4.39 kN. This also occurs for the reasons mentioned above.

Experimental studies have shown that the installation angle of the leveling soil spreader relative to the vertical must be at least 40°.

3. CONCLUSION

Conclusion. According to the experimental results, it is advisable to set the installation angle of the soil slide relative to the direction of movement within 30–35°. Experimental studies have shown that the installation angle of the leveling soil spreader relative to the vertical must be at least 40°.

At these values, the quality of field surface leveling improves and the required level of soil crumbling is ensured. The results obtained serve as the basis for substantiating the design parameters of the disc ripper leveler, improving its operating process, and developing scientific and practical recommendations for reducing energy and resource consumption when cultivating vineyard inter-rows.

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Author contributions *CRediT*

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

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Generative AI disclosure

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Study of the motion of seeds around a spherical element fixed to the inner surface of a seed-coating drum

Urug'larni qobiqlash barabanining ichki sirtiga mahkamlangan sferik element atrofidagi harakatini tadqiq etish

Исследование движения семян вокруг сферического элемента, закреплённого на внутренней поверхности дражирующего барабана

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Abstract. The article presents data on the theoretical study of the forces acting on seeds moving inside the working element of a shelling device with a spherical element attached to the inner surface of the drum, as well as their movement around the spherical element. The results of theoretical studies showed that the seed reaches its maximum flight distance when $\sin 2\alpha=1$, i.e., $\alpha=(\pi/4)$. Therefore, several seed layers struck by a spherical element are also forced to rotate at a certain angle after touching them. Since the spherical elements are arranged in a chess-like shape, after hitting the first spherical element, the seeds make a circular movement, hit the next one, spin again, and so on. This leads to efficient and complete sowing of seeds, as well as a reduction in the time required for the technological process.

Keywords: casing drum; spherical element; blur; motion; material point; differential equation; layer; effective; adjective

O'ZBEKCHA

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Annotatsiya. Maqolada qobiqlash qurilmasining barabanini ichki sirtiga sferik element mahkamlanib, uning ichida harakatlanayotgan urug'larga ta'sir etadigan kuchlar hamda ularni sferik element atrofidagi harakatini nazariy tadqiq etish natijalari to'g'risidagi ma'lumotlar keltirilgan. Nazariy tadqiqotlarning natijasi shuni ko'rsatdiki, urug' uchish masofasining maksimal qiymatini $\sin 2\alpha=1$, ya'ni $\alpha=(\pi/4)$ ga teng bo'lganda zabt etadi. Shuning uchun sferik elementga kelib urilgan bir nechta urug' qatlami ham ularga tekkandan keyin, ma'lum burchak ostida aylanma harakatlanishga majbur bo'ladi. Sferik elementlar shaxmat shaklida joylashganligi sababli, urug'lar birinchi sferik elementga urilgandan keyin aylanma harakat qilib, keyingisiga uriladi va yana aylanadi va haqazo takrorlanadi. Bu holat urug'larni samarali va to'liq bulanishi hamda texnologik jarayonga ketadigan vaqtni qisqarishiga olib keladi.

Kalit so'zlar: qobiqlash barabani; sferik element; bulanish; harakat; moddiy nuqta; diferensial

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tenglama; qatlam; samarali; sifatli

РУССКИЙ

ТУХТАКУЗИЕВ Абдусалим^{1*}, **ХУДАЙБЕРДИЕВ Абдуазиз Абдувалиевич²**,
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Аннотация. В статье приведены сведения о результатах теоретического исследования сил, действующих на семена, движущиеся внутри сферического элемента, закрепленного на внутренней поверхности барабана дражирующего устройства, а также их движения вокруг сферического элемента. Результаты теоретических исследований показали, что максимальное значение дальности полета семян достигается при $\sin 2\alpha=1$, т.е. $\alpha=(\pi/4)$. Поэтому несколько слоев семян, ударившихся о сферический элемент, после соприкосновения с ними вынуждены совершать вращательное движение под определенным углом. Поскольку сферические элементы расположены в шахматной форме, семена после удара о первый сферический элемент совершают вращательное движение, ударяются о следующий, снова вращаются и так далее. Это приводит к эффективному и полному перемешиванию семян и сокращению времени, затрачиваемого на технологический процесс.

Ключевые слова: дражирующий барабан; сферический элемент; оболочивание; движение; материальная точка; дифференциальное уравнение; оболочка; эффективное; качество

1. INTRODUCTION

Introduction. It is known that drum devices of plate-shaped design have been developed for hulling agricultural crop seeds with various protective and nutritional compounds, the most common of which are drum hulling devices [1, 2]. In particular, drum casing devices were proposed by E.B. Beisenbayev [3], A.M. Zhukov, V.A. Panchenko, A.V. Shushlyakov [4], S.D. Sheruda, I.Ya. Ostashevsky, V.S. Budko [5], A. Sokhta [6], N. Rashidov, A. Khojiev, B. Eserkepov [7, 8], I.F. Borodin [9], A.T. Rosaboev, U.B. Imomkulov [10, 11, 12], A.T. Mamadaliev [13], and others.

It is proposed to install various devices and elements inside the drum hulling units to ensure the efficient process of sowing seeds. To ensure the efficient turning process in the drum casing device we propose, a thin metal sheet with spherical elements is attached to the inner surface of the cylindrical drum. Since the geometric dimensions of the seeds are much smaller than the diameter of the drum, they move uniformly in a straight line when striking a spherical element. In this case, when seeds moving in a circle hit a spherical element, the direction of movement changes; that is, they first begin to ascend along the slope and, while sliding along a spherical surface with or without reaching the top point, perform a rotational motion to the right or left and overturn. At the same time, the lower part of the seeds, which is rubbed against the surface of the drum, i.e., which is difficult to separate with compounds, also has the opportunity to be contaminated. As a result, the quality of sowing seeds with various protective and nutritional compounds improves, the time spent on it is reduced, and electricity consumption is saved [14, 15, 16].

The aim of the research. Theoretical study of the movement of seeds around a spherical element attached to the inner surface of the seed hulling drum and substantiation of its positive impact on the technological process of hulling.

2. RESEARCH METHODS AND MATERIALS

Research methods and materials. The theoretical study of the movement of the seed peeling device around a spherical element fixed to the inner surface of the drum was conducted based on mathematical analysis using the laws and rules of theoretical mechanics and higher mathematics. Based on the results of the theoretical research, conclusions were formulated and a proposal

was made to use a welding element attached to the inner surface of the casing device drum.

3. RESULTS AND DISCUSSION

Discussion of the research results. When the drum of the peeling device rotates, the following movements of the seeds can be observed:

- rotation along the internal surface;
- after hitting a spherical element, it also performs rotational motion around its axis for a short time.

In other words, the seeds undergo a complex movement inside the hulling drum.

Figure 1 shows a diagram of the drum's movement at an inclined angle and the forces acting on the seeds.

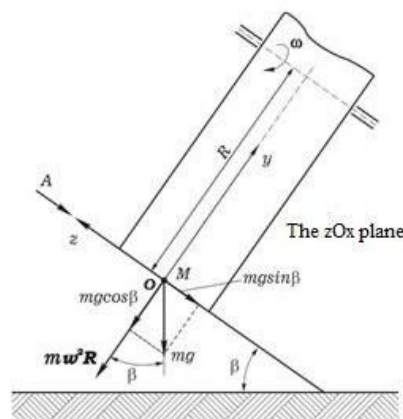


Fig. 1. Barabanning og'ma burchak ostidagi harakati va ta'sir etuvchi kuchlar sxemasi / **Fig. 1.** Movement of the drum at an inclined angle and scheme of acting forces

Since the size of the seeds is very small compared to the drum radius, we consider the small length around point O to be a flat surface and consider their motion to be rectilinear for that point [17].

Figure 2 shows a material point, i.e., the trajectory of the seed's movement.

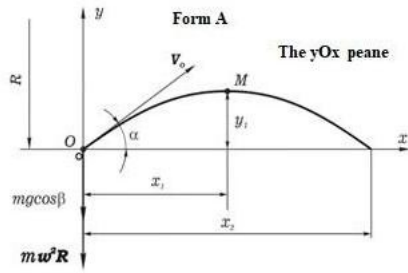


Fig. 2. Moddiy nuqta, ya'ni urug' harakatining trayektoriyasi / **Fig. 2.** Material point, i.e. the trajectory of the seed's movement

Considering the family as a material point M, let us assume that it is thrown from some point O at an angle α to the horizon with an initial velocity V_0 .

Let us consider the motion of point M, assuming that a centrifugal force $m\omega^2 R$ acts on it in addition to the gravitational force G , which constitutes $mg\cos\beta$. Taking point O as the origin, we direct the X-axis to the right in the horizontal plane and the Y-axis upward in the vertical plane. Let us write the differential equation of the motion of a point.

$$m \frac{d^2 x}{dt^2} = 0; \quad (1)$$

$$m \frac{d^2 y}{dt^2} = -mg\cos\beta - m\omega^2 R. \quad (2)$$

We reduce expressions (1) and (2) to m

$$\frac{d^2 x}{dt^2} = 0; \quad (3)$$

$$\frac{d^2 y}{dt^2} = -g\cos\beta - \omega^2 R. \quad (4)$$

Integrating expression (3), we obtain

$$dx/dt = C_1. \quad (5)$$

Based on the equation of the velocity projection onto the coordinate axes,

$$V_x = dx/dt = C_1. \quad (6)$$

The projection of the velocity of point M onto the X-axis always has the

same magnitude, i.e.,

$$C_1 = V_x = V_0 \cos \alpha. \quad (7)$$

From expressions (6) and (7), we get:

$$dx/dt = V_0 \cos \alpha. \quad (8)$$

Integrating this equation, we get:

$$x = V_0 t \cos \alpha + C_2. \quad (9)$$

If $t = 0$, $x = 0$, then the constant $C_2 = 0$.

The final result will be as follows:

$$x = V_0 t \cos \alpha. \quad (10)$$

By integrating equation (4), we get:

$$V_y = dy/dt = -gt \cos \beta - \omega^2 R t + C_3. \quad (11)$$

Substituting $t = 0$ into this equation, we find the constant of integration C_3 .

$$C_3 = V_y = V_0 \sin \alpha. \quad (12)$$

So,

$$dy/dt = V_0 \sin \alpha - gt \cos \beta - \omega^2 R t. \quad (13)$$

By integrating expression (13) once more, we obtain:

$$y = V_0 t \sin \alpha - \frac{gt^2}{2} \cos \beta - \frac{\omega^2 R}{2} t^2 + C_4. \quad (14)$$

If $t = 0$, $y = 0$, then an arbitrary constant $C_4 = 0$.

As a result

$$y = V_0 t \sin \alpha - \frac{gt^2}{2} \cos \beta - \frac{\omega^2 R}{2} t^2. \quad (15)$$

Thus, the equation of motion for point M, directed at an angle α relative to the horizontal plane and possessing an initial velocity V_0 , is expressed as follows.

$$x = V_0 t \cos \alpha; \quad (16)$$

$$y = V_0 t \sin \alpha - \frac{gt^2}{2} \cos \beta - \frac{\omega^2 R}{2} t^2. \quad (17)$$

To determine the trajectory of point M, we substitute the values of t into expressions (16) and (17).

From equation (16), we find t .

$$t = \frac{x}{V_0 \cos \alpha}. \quad (18)$$

By substituting this value of t into (17), we obtain the trajectory equation

$$\begin{aligned} y &= x \cdot \tan \alpha - \frac{gx^2 \cos \beta}{(2 V_0^2 \cos^2 \alpha)} - \frac{\omega^2 R x^2}{2 V_0^2 \cos^2 \alpha} = \\ x \cdot \tan \alpha - \frac{gx^2 \cos \beta - \omega^2 R x^2}{2 V_0^2 \cos^2 \alpha} = \\ x \cdot \tan \alpha - \frac{x^2 (g \cos \beta - \omega^2 R)}{2 V_0^2 \cos^2 \alpha}. \end{aligned} \quad (19)$$

The trajectory of point M is a parabola with a vertical axis of symmetry. To find the flight time of point M, we substitute the value $y = 0$ into equation (15). Then the equation takes the following form:

$$V_0 t \sin \alpha - \frac{gt^2}{2} \cos \beta - \frac{\omega^2 R}{2} t^2 = 0; \quad (20)$$

$$V_0 t \sin \alpha - \frac{(-g \cos \beta - \omega^2 R) t^2}{2} = 0. \quad (21)$$

From this, we find two values of time when the ordinate is zero.

$$t_0 = 0, \quad t_2 = -\frac{2 V_0 \sin \alpha}{(-g \cos \beta - \omega^2 R)}. \quad (22)$$

The first time value corresponds to the start of the flight, and the second to the end.

Duration of flight

$$t_2 - t_0 = t_2 = -\frac{2 V_0 \sin \alpha}{-g \cos \beta - \omega^2 R} \quad (23)$$

To find the flight distance of the seeds, we substitute the value of t_2 into the equation of motion (14).

$$x_2 = V_0 t_2 \cos \alpha = \frac{(V_0 \cos \alpha \cdot 2 V_0 \sin \alpha)}{(-g \cos \beta - \omega^2 R)}$$

or

$$x_2 = \frac{V_0^2 \sin 2\alpha}{(-g \cos \beta - \omega^2 R)}. \quad (24)$$

It is evident from this equation that the maximum value of the flight distance $X_{\max}$ is reached when $\sin 2\alpha = 1$, i.e., $\alpha = \pi/4$.

$$x_{\max} = \frac{V_0^2}{(-g \cos \beta - \omega^2 R)}. \quad (25)$$

Let us determine the maximum height of point M, in which case the projection of its velocity relative to the ordinate axis will be zero.

$$\frac{dy}{dt} = V_y = V_0 \sin \alpha - (-g \cos \beta - \omega^2 R) t = 0. \quad (26)$$

From the last equation, we find t_1 .

$$t_1 = \frac{V_0 \sin \alpha}{(-g \cos \beta - \omega^2 R)} = \frac{t_2}{2}. \quad (27)$$

It is evident from expression (27) that it reaches its maximum height in half the time, i.e.

$$x_1 = x_2 / 2. \quad (28)$$

Substituting the value of t_1 in expression (27) into equation (19)

$$y_1 = \frac{V_0 \sin \alpha \cdot V_0 \sin \alpha}{(-g \cos \beta - \omega^2 R)} - \frac{(-g \cos \beta - \omega^2 R) V_0^2 \sin^2 \alpha}{2(-g \cos \beta - \omega^2 R)^2}. \quad (29)$$

In here

$$y_1 = \frac{V_0^2 \sin^2 \alpha}{2(-g \cos \beta - \omega^2 R)}. \quad (30)$$

As can be seen from the last expression, the point has the maximum height

$\sin \alpha = 1$ or $\alpha = \pi/2$, i.e. when the point is pointed vertically upward, it is equal to

$$y_{\max} = \frac{-V_0^2}{2(-g \cos \beta - \omega^2 R)}. \quad (31)$$

The parameters of the spherical element have a strong influence on the quality of the seed moistening process with adhesive liquid in the proposed shelling device. The height of the element can be determined by expression (17) and the distance by expression (16). The value of the slope angle ensures that spherical elements do not adversely affect seed movement, i.e., successive seeds approach the slope, encounter excessive resistance, and do not create congestion. This is because its high values lead to excessive resistance from successive seeds. This causes excessive friction forces, i.e., an increase in the friction force of the seeds against each other, and a decrease in their moisture quality.

Inside the existing hulling drum, the seeds move in several layers. Several layers struck by a spherical element are also forced to perform rotational motion at some angle after hitting it. Since the spherical elements are arranged in a chess-like shape, the seeds take a circular motion after the first spherical element, move to the next, and rotate again, and so on. This condition leads to efficient and complete contamination of the seeds.

4. CONCLUSION

Conclusion. Among the devices for hulling agricultural crop seeds with various protective and nutritional compounds, the most common type is the drum type, which is equipped with various devices and elements to improve the quality of hulling. Therefore, it is recommended to equip the inner surface of the drum with spherical elements in order to increase the effectiveness of the degree of shelling of difficult-to-spread seeds of agricultural crops with various protective-nutrient compounds and to reduce their damage. As a result, the seeds undergo complex movement, and their surface is effectively and completely covered with protective-nutrient compounds.

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Author contributions CRediT

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

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Synthesis of polyether monomer-based demulsifiers and their efficiency in breaking up oil emulsions

Poliefir monomerlari asosidagi demulgatorlar sintezi va ularning neft emulsiyalarini parchalashdagi samaradorligi

Синтез деэмульгаторов на основе полиэфирных мономеров и их эффективность при разрушении нефтяных эмульсий

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Abstract. In this article, experiments were conducted on methods for synthesizing demulsifiers with high-performance polymer properties based on hydroxy polyethylene glycol (HPEG). The effectiveness of the synthesized demulsifier in breaking oil-water emulsions was studied. Nowadays, breaking emulsions formed during oil production and refining is a very complex process. As part of scientific research, surfactants were synthesized by modifying the hydrophilic chains of HPEG with a number of hydrophobic components. The synthesized demulsifier was applied to an oil sample and its effectiveness in separating water from the oil was studied. In addition, the chemical composition and molecular structure of the demulsifier were studied and analyzed using IR spectroscopy. SEM analysis methods.

Keywords: oil; surfactants; demulsifier; emulsion; hydrophob

O'ZBEKCHA

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Annotatsiya. Ushbu maqolada gidroksi polietilenglikol (HPEG) asosida yuqori samarali polimer xossalarga ega demulgatorlarni sintez qilish usullari bo'yicha tajribalar o'tkazilgan. Sintez qilingan demulgatorning neft-suv emulsiyalarini parchalashdagi samaradorligi o'rganilgan. Bugungi kunda neftni qazib olish va qayta ishlash jarayonida hosil bo'ladigan emulsiyalarni parchalash juda murakkab jarayon hisoblanadi. Ilmiy tadqiqot doirasida HPEG ning gidrofil zanjirlarini bir qator gidrofob komponentlar bilan modifikatsiyalash orqali sirt-faol moddalar sintez qilingan. Sintez qilingan demulgator neft namunasiga qo'llanilib, uning neftdan suvni ajratishdagi samaradorligi o'rganilgan. Bundan tashqari, demulgatorning kimyoviy tarkibi va molekulyar tuzilishi IQ-spektroskopiya hamda SEM tahlil usullari yordamida o'rganilib, tahlil qilingan.

Kalit so'zlar: neft; sirt-faol moddalar; demulgator; emulsiya; gidrofoblik

РУССКИЙ

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Аннотация. В настоящей статье проведены эксперименты по методам синтеза деэмульгаторов с высокоэффективными полимерными свойствами на основе гидроксиполиэтиленгликоля (HPEG). Изучена эффективность синтезированного деэмульгатора при разрушении нефтеводных эмульсий. В настоящее время разрушение эмульсий, образующихся при добыче и переработке нефти, представляет собой весьма сложный процесс. В рамках научного исследования поверхностно-активные вещества были синтезированы путём модификации гидрофильных цепей HPEG рядом гидрофобных компонентов. Синтезированный деэмульгатор был применён к образцу нефти, и изучена его эффективность в отделении воды от нефти. Кроме того, химический состав и молекулярная структура деэмульгатора были изучены и проанализированы методами ИК-спектроскопии и СЭМ-анализа.

Ключевые слова: нефть; поверхностно-активные вещества; деэмульгатор; эмульсия; гидрофобность

1. INTRODUCTION

The oil extracted from oil fields contains various amounts of water droplets. The amount of water in oil varies depending on the place of its extraction and the extraction methods. This is because oil is formed under different conditions underground. Some layers of the earth have a high water content and some layers have a much lower water content. From this point of view, the amount of water in the oil also differs accordingly [1].

Water in oil fields mainly takes the following forms according to the causes of its formation. In the case of groundwater, the water layer is located around or below the oil reservoir. As oil production increases, such water replaces the oil layer underground as a result of a decrease in pressure and is extracted partially mixed with oil during the extraction process. Also, water on the surface of mineral particles in small pores and capillaries of rocks and earth layers does not move together with oil underground. However, under the influence of high pressure and strong currents in the underground, it is partially separated and sometimes joins the oil flow. According to the methods of technological water extraction, oil initially comes out of the ground under its own pressure. As the well surface deepens and the amount of oil in the well decreases, the pressure also decreases. In such a case, water or other chemical reagents are injected into the underground oil layer to maintain the formation pressure and increase the volume of oil extraction. The water or chemical reagents injected into the well act as a natural emulsifier. This actively participates in the formation of a stable emulsion in the oil composition.[2] Water and oil do not naturally mix with each other due to the difference in density. However, during the extraction process, when they rise from the bottom of the well to the surface, they are subjected to strong mechanical action. As a result, water partially mixes with the oil composition and oil-water emulsions are formed [3].

As we know, oil consists of several components, which often include natural emulsifiers such as paraffins, naphthenic and aromatic hydrocarbons, tar-asphaltenes, acidic compounds (naphthenic acids, fatty acids, aromatic acids) and resins. In addition, oil contains more than 20 elements such as vanadium, nickel, calcium, magnesium, iron, aluminum, silicon, sodium, hydrogen sulfide, thiophene, disulfides, pyridines and a number of other emulsifiers [4]. In particular, a large part of the currently produced oils is classified as heavy and high-viscosity oils. The content of asphaltenes and resins in such oils is quite high. Asphaltenes and resins play an important role in the formation of emulsions. The structure of asphaltenes and resins is quite complex

and is the heaviest and most aromatic fraction of oil. It is soluble in aromatic solvents such as benzene, toluene, and xylene, but insoluble in light alkanes such as n-pentane and n-heptane[5]. The difficulty in solubility increases the activity in forming stable emulsions. Asphaltenes usually contain carbon (C), hydrogen (H), oxygen (O), nitrogen (N), sulfur (S), and small amounts of iron (Fe), vanadium (V), and nickel (Ni) as well as several other natural surfactants. These substances also serve to significantly strengthen the surface tension of the emulsion.

From the point of view of physical and colloidal chemistry, oil-water emulsions are hydrophobic dispersed systems. The state of water in them is described as follows, depending on the size of the droplets (d) and the thermodynamic stability of the system. Free and fast-moving water ($d > 100\mu\text{m}$). These water droplets are dispersed into the oil for a short time as a result of mechanical mixing. After the system is hydrodynamically stabilized, they quickly sink to the bottom under the influence of gravity in accordance with Stokes' law. A humic shell does not have time to form around the oil and water. As a result, water and oil separate into two phases. Finely dispersed, i.e. water that forms a stable emulsion ($0.1\mu\text{m} < d < 100\mu\text{m}$) Such emulsions are considered the most complex type of emulsion, and their decomposition requires high energy in oil refineries. Here, water droplets are covered with natural surfactants in the oil layer - asphaltenes, resins and high molecular acids [6,7,8,9].

The main emulsion-forming substances in the oil, namely tar and asphaltene fractions, as well as high-paraffin hydrocarbons, form a "reticular layer". It is this reticular layer that serves to form a stable emulsion with water droplets. The task of demulsifiers is to disrupt this layer, lose its elasticity and bring water droplets closer together (coagulate). When oil emerges from the bottom of the well, water is not only in the form of droplets in the oil. According to the dynamics of the process, water appears in the following technological situations. If the water content in the oil exceeds a certain critical point (usually 60-70%), the type of emulsion changes. The "water-oil emulsion" (O/W) system turns into an "oil-water emulsion" (W/O) system. From this point of view, the structure of oil emulsions is mainly of 4 types. These are oil-in-water (W/O), water-in-oil (O/W) and, in more complex forms, emulsions in the W/O/W and O/W/O states. (Figure 1) Due to their structural complexity, the separation of such emulsions is a rather difficult process. In this case, the viscosity of the system changes dramatically. In low-temperature climates or in transport pipelines, free and partially emulsified water can form hydrates or turn into ice crystals. This makes it difficult to transport oil in pipelines [10,11,12].

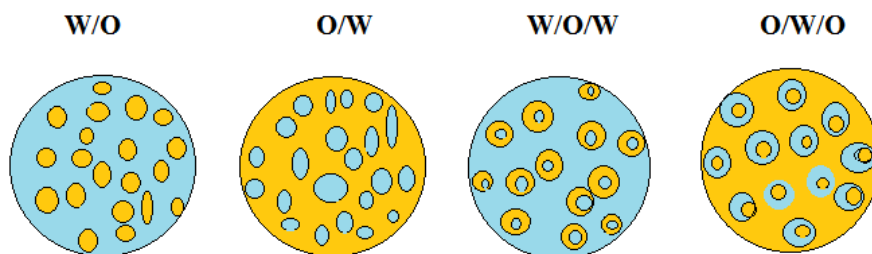


Fig. 1. Neft emulsiyalarning tashqi ko'rinishi / Fig. 1. Appearance of oil emulsions

Today, several different methods of breaking oil emulsions are used in the oil refining industry. These are: Thermal method - in this case, the oil emulsion is heated to a certain temperature. (50-80 °C) The mechanical strength of natural emulsifiers in the oil, i.e. asphaltene-resins, decreases and, as a result, the emulsions break down [16,17].

The mechanical method is based on the initial settling of oil in oil tanks and then the separation of water-oil emulsions by centrifugation or filtration [18]. Electrical method - this method is carried out in Electrical Desalting and Dehydration Unit devices at oil refineries. The oil is treated with an electric current to remove water and dissolved mineral salts [19,20].

The chemical method is a unique method for breaking down oil emulsions, which is considered the most widely used and highly efficient method in the oil refining industry. In this case, oil emulsions are broken down using chemical reagents, i.e. demulsifiers [21,22,23]. Chemical surfactants are usually composed of amphiphilic molecules consisting of hydrophilic and hydrophobic groups. These amphiphilic molecules are well adsorbed at the water-oil interface. Hydrophilic groups move towards water, and hydrophobic groups towards oil. This allows for a significant reduction in the surface tension of the emulsion [24,25,26].

2. Methodological part

2. MATERIALS AND METHODS

2.1. Materials

HPEG was selected for synthesis due to its water-viscosity-reducing properties, obtained from the chemical reagent supplier "Diag Lab Trade". The presence of carboxyl groups (-COOH) in the acrylic acid ($\text{CH}_2 = \text{CH} - \text{COOH}$) molecule indicates its high water-absorbing ability, and this substance was obtained from the chemical reagent supplier "Xim lab pribor". 1.3-Mercaptopropionic acid is important in the synthesis of surfactants due to the presence of two different functional groups (-SH and COOH) at both ends, and it was also obtained from the laboratory chemical reagent supplier "Diag Lab Trade". Hydrogen peroxide (H_2O_2) is important in the synthesis of SFM because it has the ability to introduce hydroxyl (-OH) and carboxyl (-COOH) groups into its molecule, and these groups form hydrogen bonds with water

droplets in the oil, which is important in breaking up oil emulsions, and it was also obtained from the company "Diag Lab Trade".

2.2. Demulsifier synthesis

The synthesis process was carried out in a 500 ml three-necked, flat-bottomed flask equipped with an automatic stirrer, thermometer, dropwise addition device and other standard equipment. Initially, 30 grams of HPEG were weighed into the flask, 3 grams of acrylic acid and 0.3 grams of MPA-3 and 60 grams of water were added to the three-necked flask, and the reaction process was started. The temperature was gradually increased to 20 °C with an automatic rotation speed of 50 s/min. The reaction mass was continuously stirred using an automatic stirrer, which ensured a homogeneous reaction of the components and the effective development of polymer chains. The reaction temperature was maintained at 20 °C in an inert environment, which guaranteed the complete completion of the polymerization process and the yield of the resulting product. After 2 hours, 0.6 grams of hydrogen peroxide was added dropwise to the reaction process without stopping the reaction. The total reaction time was 4 hours. At the end of the reaction, a light reddish liquid was formed (Figure 2).

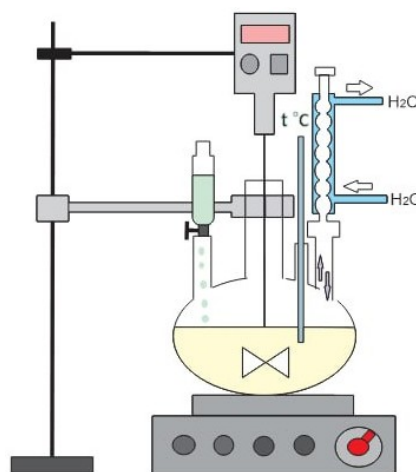


Fig. 2. Demulgator sintezi qurilmasining chizmasi / Fig. 2. Drawing of the demulsifier synthesis equipment

The process of obtaining a highly effective defoamer based on HPEG was carried out based on the following reaction mechanism: (Figure 3).

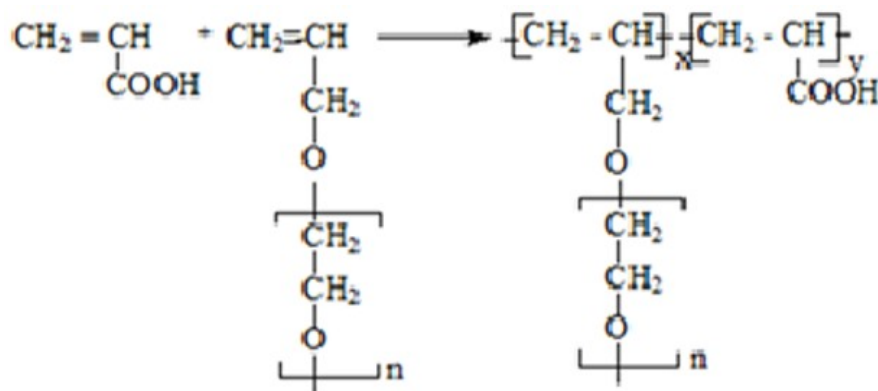


Fig. 3. Demulgator sintezi reaksiyasining tenglamasi / **Fig. 3.** Demulsifier synthesis reaction equation

3. RESULTS AND DISCUSSION

Several analytical methods were used to study the effectiveness of the HPEG-based demulsifier in separating oil-water emulsions. First, it was tested on an oil sample brought from the “Kakaydi” oil field. It was determined how much water the synthesized demulsifier was able to separate from the oil. It was previously determined that the oil sample contained 20% water. The process of testing the demulsifier on oil was as follows. For this, we needed three glass test tubes, a water bath to create a sufficient temperature for the oil sample, and a 100°C thermometer to constantly monitor the temperature. The same amount of oil sample was placed in three glass test tubes and lowered into a water bath. The temperature was gradually increased. Initially, when the temperature reached 40-50 °C, the demulsifier was added to the oil. If the temperature is not brought to this level, the oil will not change its solid state and the demulsifier will not be effective when applied. The glass test tubes were closed with a cylinder stopper and mixed well by hand before being put back into the water bath. This is a good effect for the uniform distribution of the demulsifier over the entire surface of the oil. Initially, the demulsifier was added at 10 ppm and water separation was observed every 10 minutes. After the demulsifier

was added, the temperature was increased to 80-90 °C. However, at each temperature change, the appearance of the separated water was monitored using an electron microscope. Over time, the increase in the size of the water droplets and their sinking to the bottom of the oil were observed (Figure 4-a). The results obtained every 10 minutes were recorded. This helps to choose the most effective method for demulsifying the oil. This experiment is a very convenient way to observe the water content of the oil under an electron microscope (Figure 4-b).

In our next experiment, we used a flask with the ability to remove water from the bottom to accurately measure the amount of separated water in the oil (Figure 4-c). In this case, we performed the same work as above, except that in our previous work, we observed the state of the water in the oil through an electron microscope, which made it possible to directly measure the separated water through this experiment. The same experiments were carried out several times. In this case, the effectiveness of the synthesized demulsifier was tested at each stage at different concentrations, different temperatures, and different time intervals. At the end of the experiments, the most acceptable indicators⁵ for the separation of the synthesized demulsifier oil-water emulsions were determined (Figure 5).



Fig. 4. Demulgator qo'llanilgan neftning tashqi ko'rinishi: A — sinov probirkalari; B — emulsiya namunasi; C — suvni ajratish kolbasi / **Fig. 4.** Appearance of oil with the demulsifier applied: A — test tubes; B — emulsion sample; C — water-separating flask

From this graph, it can be seen that for the most effective effect of the demulsifier applied to the oil, the following factors affecting the demulsification process can be considered: (Table 1).

Table 1
Demulgator samaradorligi / **Table 1.** Demulsifier efficiency

Deemulsification time (min)	Concentration (ppm)	Temperature(C°)	Separated water(%)	Deemulsification time (min)	Concentration (ppm)	Temperature(C°)	Separated water(%)
70	5	50	20	90	5	50	35
70	10	60	25	90	10	60	40
70	15	70	30	90	15	70	60

Deemulsification time (min)	Concentration (ppm)	Temperatyre(C°)	Separated water(%)	Deemulsification time (min)	Concentration (ppm)	Temperatyre(C°)	Separated water(%)
70	20	80	35	90	20	80	70
70	30	90	40	90	30	90	80
Deemulsification time (min)	Concentration (ppm)	Temperatyre(C°)	Separated water(%)	Deemulsification time (min)	Concentration (ppm)	Temperatyre(C°)	Separated water(%)
80	5	50	25	100	5	50	20
80	10	60	37	100	10	60	40
80	15	70	40	100	15	70	60
80	20	80	45	100	20	80	80
80	30	90	50	100	30	90	100

When applying a demulsifier to oil, the dependence of the demulsifier efficiency on the dynamics of water separation (time), the process temperature and the concentration of the demulsifier used was studied (Table 1). As can be seen from the table, the time taken to reach the optimal demulsification conditions was 100 minutes, and the process temperature was 90°C, and the demulsifier concentration used was 30 ppm. This led to the active adsorption of demulsifier molecules in the stable film layer at the oil-water interface, which led to the destruction of the protective shell created by natural stabilizers (asphaltenes and resins). However, when the concentration exceeded 30 ppm, the emulsions were restabilized. Thus, it was determined that 30 ppm was the optimal demulsifier condition.

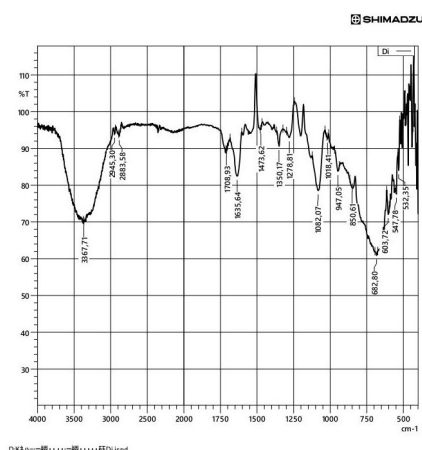


Fig. 5. Demulgatorning IQ-spektri / **Fig. 5.** IR spectrum of the demulsifier

The broad and intense absorption band observed at wavenumber 3367.71 cm⁻¹ in the spectrum of the demulsifier sample corresponds to the stretching vibrations of hydroxyl (-OH) groups. The peak at 1708.93 cm⁻¹ indicates the presence of a carbonyl (C=O) group. The signals at wavenumbers 2945.30 cm⁻¹ and 2883.58 cm⁻¹ represent the stretching vibrations of C-H, while the absorption around 1082.07 cm⁻¹ is characteristic of the C-O bond. The peaks around 682.80 cm⁻¹ and 603.72 cm⁻¹ reflect the skeletal vibrations of the molecule.

The surface morphology of the synthesized sample was studied using a scanning electron microscope (SEM) (Figure 7). As can be seen from the SEM image, the sample consists of particles of irregular shape and different sizes, which aggregated to form large structures. The surface of the particles is rough and uneven, and the absence of clear crystalline forms indicates that an amorphous or

partially disordered polymer structure was formed during the synthesis process.

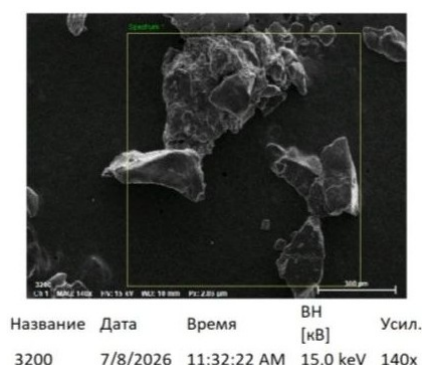


Fig. 6. Demulgatorning SEM tahlili / **Fig. 6.** SEM analysis of the demulsifier

The SEM image shows that the particles have a jagged and plate-like appearance and their sizes vary significantly. This indicates that the particles adhered to each other and formed aggregates as a result of intermolecular interactions during the synthesis process. Such a porous and uneven surface structure increases the specific surface area of the material and facilitates the adsorption of molecules at the phase boundary. The SEM method allows for a high-precision assessment of the surface morphology and particle structure of materials and, together with EDS, is widely used in a comprehensive characterization of the morphology and elemental composition of the material.

Such morphology is important from the point of view of breaking oil emulsions. The rough surface and the developed interface area contribute to the faster diffusion of demulsifier molecules to the water-oil boundary. As a result, the destruction of the asphaltene-resin layer stabilizing the emulsion is accelerated and the coalescence of water droplets is facilitated. Therefore, the observed morphological features can serve to increase the demulsification efficiency of the synthesized substance. It has also been noted in the literature that for polymer demulsifiers, it is the surface morphology and interfacial activity that significantly affect their practical effectiveness. In general, the SEM results confirm that the synthesized substance is a heterogeneous polymer material with a developed surface structure.

The elemental composition of the sample was analyzed using energy dispersive X-ray spectroscopy (EDS) (Figure 8). According to the spectral results, it was determined that the sample mainly contains carbon (C), nitrogen (N), oxygen (O), sulfur (S) and silicon (Si) elements.

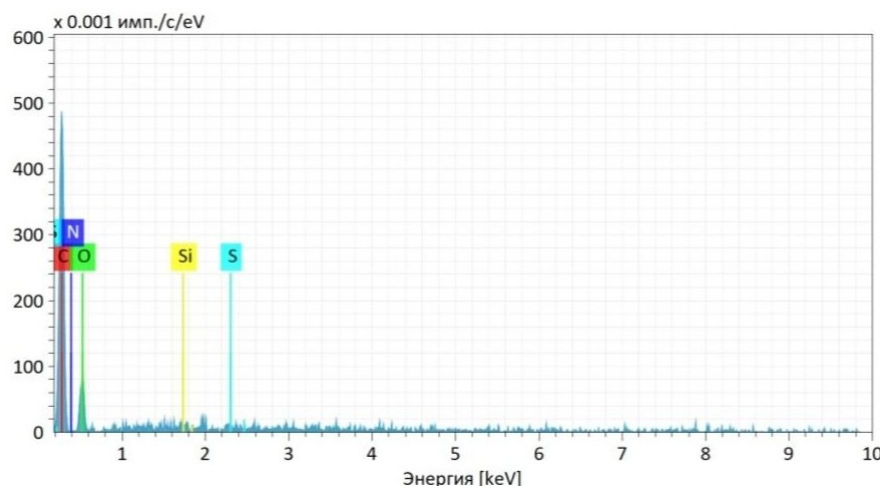


Fig. 7. Demulgatorning EDS tahlili / **Fig. 7.** EDS analysis of the demulsifier

The highest intensity of the carbon signal indicates that the synthesized product has an organic polymer skeleton. The presence of oxygen confirms the presence of oxygen-containing functional groups such as hydroxyl, ether, ester or carbonyl in the molecule. The detection of the nitrogen element in the spectrum indicates the successful introduction of nitrogen-containing functional groups of the amine or amide type during the synthesis process. Such groups increase the hydrophilicity of the substance and enhance its interaction with the water phase. As a result, demulsifier molecules are adsorbed more quickly at the water-oil interface, accelerating the breakdown of the emulsion film.

The presence of the sulfur element indicates the presence of sulfur-containing functional groups in the substance. Sulfur atoms can increase the polarity of the molecule and enhance the interaction with asphaltene and resin components that stabilize the oil emulsion. This accelerates the coalescence of water droplets and increases the efficiency of the demulsification process. It has been reported in many studies that heteroatoms (O, N, S) in polymer demulsifiers play an important role in enhancing the interfacial activity.

The silicon (Si) peak observed in the spectrum has a relatively low intensity. This element may originate from the silicon-containing components used in the synthesis, residual mineral impurities, or the substrate used in the SEM sample preparation process. Due to its low intensity, no significant effect of silicon on the main physicochemical properties of the material is observed. The absence of significant peaks related to iron, calcium, or other heavy metals in the EDS spectrum indicates that the synthesized product has a relatively high chemical purity.

Thus, EDS analysis confirms the successful incorporation of carbon, oxygen, nitrogen, and sulfur atoms into the synthesized substance. These elements play an important role in shaping the surface-active properties of the demulsifier and reducing the stability of the water-oil emulsion. The results of SEM and EDS analyses confirmed that the synthesized substance is a heterogeneous polymer material with an uneven and rough surface morphology and contains elements that form surface-active functional groups, such as carbon, oxygen, nitrogen and sulfur. Such morphological and elemental compositional properties can enhance the adsorption of demulsifier molecules to the water-oil interface, accelerate the degradation of the asphaltene-resin film and accelerate the coalescence of water droplets. Therefore, the synthesized substance can be evaluated as a promising demulsifier for the effective breakdown of oil emulsions.

4. CONCLUSION

In this scientific work, the high efficiency of polymeric demulsifiers synthesized on the basis of HPEG (hydroxy polyethylene glycol) and acrylic acid in breaking oil-water emulsions was experimentally confirmed. The modified molecular structure of HPEG sharply reduced the surface tension at the oil-water interface, demonstrating higher performance compared to traditional demulsifiers in disrupting the stability of the emulsion. Experiments have shown that the optimal concentration of the synthesized demulsifier is 30 ppm, the time required for complete demulsification is 100 minutes and the temperature is 80-90 °C. These parameters significantly accelerate the process of oil dehydration and reduce energy consumption. The demulsifier synthesized on the basis of HPEG and acrylic acid is considered a new generation of demulsifiers, increasing technological efficiency, significantly reducing energy and time consumption at oil refineries, and at the same time fully meeting the requirements of environmental safety. This indicates their potential for widespread use in the processing of heavy and highly viscous oil types, as well as in primary preparation processes in mining conditions.

DECLARATIONS

Author contributions CRedit

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

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16.00.00 – Ветеринарные науки

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The therapeutic and preventive effectiveness of the drug Rifizostrep

Rifizostrep preparatining davolash va profilaktik samaradorligi

Лечебно-профилактическая эффективность препарата Рифизостреп

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Abstract. The article presents the results of the introduction of a complex drug – Rifizostrep for the treatment and prevention of bacterial etiology diseases of farm animals developed by Scientific Research Institute of Veterinary scientists. The introduction of this drug made it possible to effectively cure of farm animals from diseases of the organs of sight, respiration, gynecological and surgical diseases of bacterial etiology and also the prevention of avitaminosis.

Keywords: Rifizostrep; etiology; chemioprophylaxis; strain; bacteriological; sinerjis; prolonges; kombination; respirator; gynecological; oftalmological; avitaminosis; profilaxis

O'ZBEKCHA

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Annotatsiya. Maqolada VITI tuberkulyoz laboratoriyasi olimlari tomonidan yaratilgan Rifizostrep preparati bilan qishloq xo'jalik hayvonlarining bakterial etiologiyali kasalliklarini davolash va profilaktika qilish uslubining ishlab chiqarishga joriy etish natijalari bayon qilingan. Mazkur uslubni tatbiq etilishi natijasida qishloq xo'jalik hayvonlarining bakterial etiologiyali oftalmologik, respirator, ginekologik va jarroxlik kasalliklarini samarali davolash, shuningdek avitaminozlar profilaktikasini ta'minlashga erishilgan

Kalit so'zlar: Rifizostrep; etiologiya; kimyoprofilaktika; shtamm; bakteriologiya; sinergetik; prolongatsiya; kombinatsiya; respirator; ginekologik; jarroxlik; oftalmologik; avitaminozlar; profilaktika

РУССКИЙ

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Аннотация. В статье приводятся результаты внедрения в производство комплексного препарата Рифизостреп для лечения и профилактики болезней бактериальной этиологии сельскохозяйственных животных разработанного учеными лаборатории по изучению туберкулёза НИИ ветеринарии. Внедрения данного препарата позволило эффективно вылечить сельскохозяйственных животных от болезней органов зрения, дыхания, гинекологических и хирургических болезней бактериальной этиологии, а также профилактики авитаминозов.

Ключевые слова: Рифизостреп; этиология; химиопротифилактика; штамм; бактериология;

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синергетик; пролонгация; комбинация; респиратор; гинекологический; хирургический; офтальмологический; авитаминозы; профилактика

1. KIRISH

Introduction

Mavzuning dolzarbligi. Veterinariya ilmiy tadqiqot instituti tuberkulyozni o'rganish laboratoriyasi olimlari tomonidan tuberkulyoz qo'zg'atuvchilariga qarshi farmakopeya dorivorlardan tashkil topgan Rifizostrep preparati yaratilgan. Shakl beruvchi element va adyuvant sifatida vitaminli o'simlik moyi qo'llanilgan. Rifizostrep tarkibiga kiruvchi dorivornlarning turli mikroorganizmlarga bakteriostatik va bakteritsid ta'sirini inobatga olib, preparatni har xil turdagi yuqumli va yuqumsiz kasalliklarni davolash samaradorligi ishlab ishlab chiqarish sharoitida tadqiq qilingan va ishlab chiqarishga joriy etilgan.

Qishloq xo'jalik hayvonlarining respirator, ginekologik, oftalmologik va jarrohlik kasalliklarini davolashda bir necha xil preparatlar, jumladan antibiotiklar, sulfanilamidlar, nitrofuran preparatlari va boshqa turdagi simptomatik preparatlar qo'llaniladi. Mazkur preparat qo'llanilsa, boshqa turdagi preparatlarni qo'llashga ehtiyoj tug'ilmaydi.

Rifizostrep preparati yordamida qishloq xo'jalik hayvonlarining bakterial etiologiyali kasalliklarini davolash uslubi Respublika chorvachilik xo'jaliklarida tadbiq etilishi chet davlatlardan keltiriladigan import preparatlarga qaramlikni kamaytirish imkoniyatini yaratadi.

2. MATERIALLAR VA METODLAR

Materials and methods

Tadqiqotlarning hajmi, material va uslublari. Preparat tayyorlashning texnologik reglamenti ishlab chiqilgan. Laboratoriya hayvonlari organizmida preparatning sterilligi, bezararligi, arektogenligi, kasallikdan davolash samarasi, optimal qo'llash dozalari, intervali va davomiyligi, chorvachilik xo'jaliklarida qishloq xo'jalik hayvonlarining turli kasalliklarni davolash samaradorligi aniqlangan.

Rifizostrep tarkibiga kiruvchi komponentlar keng doirali antimikrob ta'siriga ega bo'lib, farmakokinetikasi mikobakteriyalar, grammanfiy (ichak tayoqchalari, salmonellalar, klebsiellalar, tulyaremiya va bsh.) va ba'zi grammusbat (stafilokokklar, pnevmokokklar, streptokokklar) mikroorganizmlarga bakteritsid va bakteriostatik ta'sir ko'rsatadi. Parenteral (teri ostiga) yuborilgan preparatning in'eksiya joyida depo hosil bo'lib, sekin so'riladi va organizmda 15-20 kundan so'ng maksimal to'planadi va 30 kungacha saqlanadi.

Preparat tarkibiga kiruvchi komponentlarning o'zaro kombinatsiyasi -sinergetik (bir dori ta'sirini ikkinchisi kuchaytirishi) va prolongatsiya (dorining ta'sir muddatini uzaytirishi) samarasini beradi.

Preparat hayvonlarning o'ng yoki chap tomon bo'yin qismiga, kurak-yelka bo'g'inidan 10-15 sm old tomoniga va to'shlik qismi teri ostiga yuboriladi. Ginekologik, oftalmologik va jarrohlik kasalliklarida jarohat va yallig'lanish joyiga tomiziladi. Preparatning bir marta ineksiya qilish dozasi hayvonlarning tirik vazniga ko'ra, har 100 kg vaznga 5 ml hisobida teri ostiga qo'llaniladi. Tirik vazni 400 kg va undan yuqori hayvonlarga 20 ml. dan ortiq yuborish mumkin emas. Preparatni jarohat joyiga tomizish yallig'lanish darajasi va lokalizatsiyalangan organizm ichki-a'zosiga bog'liq bo'lib, 1-2 ml dan 20 ml gacha yuborish mumkin. Masalan, ko'z orbitasiga 1-2 ml tomizilsa, bachadon bo'shlig'iga 20 ml gacha, jarrohlik joyiga 5-20 ml tomiziladi. Preparatni 10 kunlik yoshdan boshlab fiziologik holatidan qat'iy nazar barcha turdagi hayvonlarga qo'llash mumkin.

Hayvonlarni bakterial (kolibakterioz, salmonellez, pasterellez, leptospiroz, diplokokkoz va bsh.) yuqumli kasalliklarga qarshi emlangandan so'ng, 14-21 kun davomida preparatni in'eksiya qilish mumkin emas. Chunki, preparat tarkibidagi antibakterial preparatlar immonogeneza ta'sir ko'rsatadi.

Preparatning optimal emlash dozalarini qabul qilgan hayvonlardan olingan go'sht va sut mahsulotlarini cheklovsiz iste'molga chiqarish mumkin. Organizm uchun preparat tomonidan nomutanosib ta'sir kuzatilmaydi.

Hayvonlarga preparat yuborilgandan so'ng in'eksiya joyida og'riqsiz shish hosil bo'ladi va sekin organizmga so'riladi. Organizm uchun preparat tomonidan boshqa nomutanosib ta'sir kuzatilmaydi. Antidot yoki boshqa neytrallovchi dori vositalarga ehtiyoj yo'q.

3. NATIJALAR VA ULARNING TAHLILI

Results and discussion

Tadqiqotlarning natijalari va ularning tahlili. Rifizostrep preparati bilan davolash uslubi yordamida qoramollar, qo'yalar, otlar va cho'chqalarning har xil turdagi bakterial etiologiyali yuqumli va yuqumsiz kasalliklarini davolash samaradorligi ishlab ishlab chiqarish sharoitida tadqiq qilindi. Preparat yordamida respirator (bronxit, bronxopnevmoniya), ginekologik (mastit, endometrit, metritlar), oftalmologik (blefarit, konyunktivit, keratokonyunktivit), jarrohlik kasalliklari (abscess, flegmona, jarrohlik operatsiyalari) muvaffaqiyatli davolandi, gipo- va avitaminozlar profilaktikasiga erishildi.

Respirator kasalliklarni davolash. Qishloq xo'jalik hayvonlarining respirator kasalliklarini Rifizostrep preparati bilan davolash uchun dastlab tashqi va ichki nomaqbul etiologik ta'sirotlar bartaraf qilindi. Hayvonlarni saqlashning optimal zoogigienik me'yorlari yaratildi. Birlamchi stress omillarga (yelvizak, ammiak gazi va namlik) barham berildi. Oziqa ratsioni oqsil, uglevod, vitaminlar, makro- va mikroelementlar bilan boyitildi. Har 2 kunda 1 marta teri ostidan 5,0 ml/100 kg vazni hisobida kasal hayvonlarga preparat ineksiya qilindi. Qo'shimcha ravishda binolar poli mexanik tozalanib, 3% formalin va 3% o'yuvchi natriy eritmali bilan dezinfeksiya qilindi, joriy ta'mirlash va 5% so'ndirilgan ohak bilan oqlash ishlari yo'lga qo'yildi.

Ilmiy ishlanmani joriy etish tadbirlari Samarqand viloyat Urgut tuman "Temur To'lagan ko'chat va nihollari" fermer xo'jaligi qaramog'idagi 20 bosh o'tkir va surunkali bronxit, o'tkir bronxopnevmoniya bilan kasallangan buzoqlarga joriy etildi va 80-100% davolash samaradorligiga erishildi. Shuningdek, Toshkent viloyat Toshkent tumanidagi "Mehnat Baxtli Sut" MChJ-ga qarashli chorvachilik fermasida 64 bosh buzoqlar nafas olish tizimi kasalliklaridan rifizostrep preparati yordamida davolandi.

Ginekologik kasalliklarni davolash. Chorvachilik xo'jaliklari fermalarida sigirlarni ginekologik kasalliklardan davolash uchun dastlab bachadon bo'shlig'i yot moddalardan mexanik tozalandi, dezinfeksiyalovchi eritmalar yordamida yuvib olindi. So'ngra bachadon bo'shlig'iga har bir sigirga 20-ml rifizostrep shpris kator yordamida yuborildi. Bu protsedura 5-6 kun ichida 2-3 marta takrorlandi. Sigirning umumiy ahvoli ko'ra, boshqa konservativ davolash muolajalari qilish mumkin. Bo'yin terisi ostidan 5 ml/100 kg dozada preparat yuborildi. Natijada barcha sigirlar endometrit va metritdan kasalligidan davolandi. Bundan tashqari, ishlab chiqarish sharoitidagi kuzatuvlarimizga ko'ra, profilaktik maqsadda rifizostrep qabul qilgan sigirlarda bug'ozlik davrida bachadondagi buzoqning normal rivojlanishi davlatilab,

buzoqlar sog'lom va harakatchan bo'lib tug'ildi. Hayvonlarni ginekologik kasalliklardan davolash samaradorligi 80-90 %-ni tashkil qildi.

Gipo va avitaminozlar profilaktikasi. Chorvachilik fermalarida ba'zan qoramollar organizmida ayrim vitaminlar yetishmasligi sababli, poligipovitaminozlar uchraydi va yaqqol klinik belgilar kuzatilmaydi. Natijada hayvon organizmi o'sishdan orqada qoladi, mahsuldorlik kamayib ketadi, kasalliklarga chalinuvchanligi kuchayadi. Preparat tarkibidagi A, D va Ye vitaminlar chorvachilik fermalarida hayvonlar organizmidagi avitaminoz va gipovitaminozlarning oldini olishga xizmat qiladi. Uslubiy Tavsiyanomaga muvofiq joriy etilgan rifizostrep preparati qishloq xo'jalik hayvonlari organizmida avitaminozlar profilaktikasini ta'minladi.

Oftalmologik kasalliklarni davolash: Xo'jaliklar sut tovar fermalari binolarida polning notekisligi va sifatsiz mexanik tozalash tufayli bino ichida ammiak gazi miqdori va namlik oshib ketishi sababli buzoqlarda blefarit, keratit va keratokonyunktivit kasalliklari tarqaladi.

Rifizostrep preparati yordamida ko'z kasalliklarini davolash uchun kasal hayvonlarni saqlash joyi o'zgartirildi va optimal zoogigienik sharoit yaratildi. Oziqlantirish ratsioni kuchaytirildi. Davolash protseduralari o'tkazish uchun konyunktiva xaltasiga 3-4 tomchi rifizostrep har kuni 1 marta tomizildi. 2-3 marta preparat tomizilgandan so'ng hayvonlar davolandi. Zaruratga ko'ra, preparatni ineksiya ham qilish mumkin.

Mexanik jarohat tufayli hayvonlarda ko'z orbitasi shishadi, biriktiruvchi to'qima qobig'i giperemiyaga uchraydi, qon quyiladi, seroz yoki yiringli zardob oqadi. Ba'zan qishloq xo'jalik hayvonlarida ko'z orbitasi oq rangli pylonka bilan qoplanadi va ko'zi ko'r bo'lib qoladi. Bunday hayvonlarni davolash uchun ko'z konyunktiva xaltasi 3% bor kislotasi bilan yuvildi. So'ngra konyunktiva xaltasiga 5-6 tomchi rifizostrep suspenziyasi tomizildi. Zaruratga ko'ra, ineksiya ham qilindi. 3-4 marta ishlov berilgandan so'ng hayvonlarning ko'zi 100% davolandi. Preparatni joriy etilishi natijasida ko'z kasalliklari bilan kasallangan hayvonlar muvaffaqiyatli davolandi.

Jarrohlik kasalliklarini davolash. Chorvachilik fermalarida qishloq xo'jalik hayvonlari orasida turli xil mexanik-travmatik jarohatlar uchraydi. Mexanik jarohat lokalizatsiyalangan joyda turli stafilocokklar, streptokokklar va boshqa bakteriyalar rivojlanadi va natijada hayvon tanasida yiringli o'choqlar hosil bo'ladi. Abscess, flegmona kabi jarohatlarni rifizostrep preparati qo'llash yordamida davolash protseduralari o'tkazish ijobiy samara berdi. Jumladan, qishloq xo'jalik hayvonlarida gavda sohasida turli joyda joylashadigan abscess, flegmonalar ushbu preparatni qo'llash orqali muvaffaqiyatli davolandi.

Buning uchun jarohat joyidagi eksudat, sekvestr va nekrozga uchragan to'qima jarrohlik usulida mexanik tozalandi, jarohat bo'shlig'iga drenaj yordamida preparat qo'llanildi, qo'shimcha ineksiya ham qilindi. Preparatni joriy etish tadbirlari shuni ko'rsatdiki, jarrohlik kasalliklarini davolashda yuqori terapevtik va antiseptik samara berdi va kasal hayvonlarda 2-3 kun ichida granulyatsion to'qima o'sishi va jarohatning sog'ayishi kuzatildi. Davolash samaradorligi 90-100%. ni tashkil qildi.

4. XULOSALAR

Conclusions

Rifizostrep preparati tarkibiga kiruvchi komponentlar keng doirali antimikrob ta'sirga ega; Preparat tarkibiga kiruvchi komponentlarning o'zaro kombinatsiyasi - sinergetik (bir dori ta'sirini ikkinchisi kuchaytirishi) va prolongatsiya (dorining ta'sir muddatini uzaytirishi) xususiyatini berdi;

Rifizostrep preparatning farmakokinetikasi mikobakteriyalar, grammanfiy (ichak tayoqchalari, salmonellalar, klebsiellalar,

tulyaremiya va b.sh.) va ba'zi grammusbat (stafilokokklar, pnevmokokklar, streptokokklar) mikroorganizmlarga bakteritsid va bakteriostatik ta'sir ko'rsatadi;

Rifizostrep preparati bilan davolash uslubi yordamida qishloq xo'jalik hayvonlarining respirator (bronxit, bronxopnevmoniya), ginekologik (mastit, metrit), oftalmologik (blefarit, konyunktivit, keratokonyunktivit), jarrohlik kasalliklari (abscess, flegmona, jarrohlik operatsiyalari) muvaffaqiyatli davolandi, gipo- va avitaminozlar profilaktikasiga erishildi;

Rifizostrep preparati bilan qishloq xo'jalik hayvonlarining kasalliklarini davolashning yangi uslubi ishlab chiqildi va preparatni ineksiya qilish, ko'zga tomizish, jarohat joyiga surtish, yiringli jarohatlarda drenaj sifatida qo'llanilishi ijobiy terapevtik samara berishi aniqlandi.

DECLARATIONS

Declarations

Author contributions *CRedit*

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

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Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

Bacterial diseases of farm animals — respiratory, gynaecological, ophthalmological and surgical — are normally treated with a range of separate agents: antibiotics, sulfonamides, nitrofurans and various symptomatic preparations. This multiplicity of products increases the cost of treatment and, in the conditions of Uzbekistan, the dependence on imported medicines. Scientists of the tuberculosis research laboratory of the Scientific-Research Institute of Veterinary developed Rifizostrep, a complex preparation composed of pharmacopoeial agents active against the causative agents of tuberculosis, in which a vitamin-containing vegetable oil serves both as the shaping element and as an adjuvant. Given the bacteriostatic and bactericidal action of

its components against a broad range of microorganisms, the aim of the work was to study, under production conditions, the effectiveness of Rifizostrep in the treatment and prevention of bacterial diseases of farm animals and to introduce the corresponding method into practice.

Materials and methods

A technological regulation for the manufacture of the preparation was developed. In laboratory animals the sterility, harmlessness and areactogenicity of the preparation were established, together with its therapeutic effect, optimal doses, interval and duration of administration; the effectiveness against various diseases of farm animals was then determined on livestock farms. The components of Rifizostrep possess a broad antimicrobial spectrum and act bactericidally and bacteriostatically on mycobacteria, on Gram-negative organisms (*Escherichia*, *Salmonella*, *Klebsiella*, the agent of tularaemia and others) and on some Gram-positive organisms (staphylococci, pneumococci, streptococci). After parenteral subcutaneous injection a depot forms at the injection site, from which the preparation is absorbed slowly, accumulating maximally in the body after 15–20 days and persisting for up to 30 days; the combination of components gives both a synergistic and a prolonging effect. The preparation is injected subcutaneously into the neck, 10–15 cm in front of the scapulohumeral joint, and into the brisket, at 5 ml per 100 kg of live weight, with a ceiling of 20 ml for animals of 400 kg and above; in gynaecological, ophthalmological and surgical conditions it is instilled directly into the wound or the site of inflammation in doses from 1–2 ml to 20 ml. It may be used in all species from 10 days of age irrespective of physiological state, but must not be injected for 14–21 days after vaccination against bacterial infections, since its antibacterial components affect immunogenesis. Meat and milk from treated animals may be released for consumption without restriction.

Results and discussion

Under production conditions the method was tested on cattle, sheep, horses and pigs with bacterial infectious and non-infectious diseases. In the treatment of respiratory disease the unfavourable external and internal aetiological factors were first eliminated, optimal zoohygienic conditions were created, primary stress factors such as draught, ammonia and damp were removed, and the ration was enriched with protein, carbohydrates, vitamins and macro- and microelements; the preparation was then injected subcutaneously at 5.0 ml per 100 kg once every two days, and the premises were mechanically cleaned, disinfected with 3 % formalin and 3 % sodium hydroxide solutions, repaired and whitewashed with 5 % slaked lime. On the farm “Temur To‘lagan ko‘chat va nihollari” in Urgut district of Samarkand region, 20 calves with acute and chronic bronchitis and acute bronchopneumonia were treated with 80–100 % effectiveness, and a further 64 calves were treated for respiratory disease on the farm of “Mehnat Baxtli Sut” LLC in Tashkent district. In gynaecological practice the uterine cavity was first cleaned mechanically and washed with disinfectant solutions, after which 20 ml of Rifizostrep was introduced into the uterus with a syringe and catheter, repeated two to three times over five to six days, together with a subcutaneous dose of 5 ml per 100 kg; all treated cows recovered from endometritis and metritis, calves born to cows that had received the preparation prophylactically were healthy and active, and effectiveness reached 80–90 %. In ophthalmological cases three to four drops were instilled into the conjunctival sac once daily and recovery followed after two to three instillations; in eyes with mechanical trauma the conjunctival sac was washed with 3 % boric acid and five to six drops of the suspension were instilled, giving 100 % recovery after three to four treatments. In surgical practice, after mechanical removal of exudate, sequestra and necrotic tissue, the preparation was applied to the wound cavity through a drain with supplementary injection; granulation tissue growth and wound healing were observed within two to three days and effectiveness reached 90–100 %. The vitamins A, D and E in the composition ensured the prevention of hypo- and avitaminoses.

Conclusion and contribution

The components of Rifizostrep possess a broad antimicrobial spectrum, and their combination confers both synergism and prolongation of action; pharmacokinetically the preparation acts

bactericidally and bacteriostatically on mycobacteria, on Gram-negative and on certain Gram-positive microorganisms. Using this method, respiratory (bronchitis, bronchopneumonia), gynaecological (mastitis, metritis), ophthalmological (blepharitis, conjunctivitis, keratoconjunctivitis) and surgical conditions (abscess, phlegmon, surgical operations) of farm animals were successfully treated and the prevention of hypo- and avitaminoses was achieved. A new method of treating bacterial diseases of farm animals with Rifizostrep was developed, and its administration by injection, instillation into the eye, application to the wound surface and use as a drain in purulent wounds was shown to give a positive therapeutic effect. The practical contribution of the work is a single domestically produced preparation that replaces several imported agents across four groups of disease and reduces the dependence of the national livestock sector on imported medicines.

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RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • HAC/OAK 16.00.00 — VETERINARY SCIENCES
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Therapeutic and preventive measures against helminth infections on sheep farms

Qo'ychilik xo'jaliklarida gelmintozlarga qarshi davolash-profilaktika chora-tadbirlari

Лечебно-профилактические мероприятия против гельминтозов в овцеводческих хозяйствах

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)

ENGLISH

Ilhom Axmadovich ULASHOV^{1,*}¹ Scientific-Research Institute of Veterinary, Samarkand, Uzbekistan

Abstract. This article examines the main helminthic diseases encountered on sheep farms, their epizootological characteristics, economic losses, and effective treatment and prevention methods. It also analyzes the negative impact of helminthiasis on sheep productivity, the importance of timely disease detection, deworming, and compliance with sanitary and hygienic standards.

Keywords: Sheep; helminthosis; helminths; deworming (dehelminthization); prophylaxis; veterinary medicine; livestock farming; parasites; treatment

O'ZBEKCHA

ULASHOV Ilhom Axmadovich^{1,*}¹ Veterinariya ilmiy-tadqiqot instituti, Samarqand, O'zbekiston

Annotatsiya. Mazkur maqolada qo'ychilik xo'jaliklarida uchraydigan asosiy gelmintoz kasalliklari, ularning epizootologik xususiyatlari, iqtisodiy zarari hamda ularga qarshi samarali davolash va profilaktika tadbirlari yoritilgan. Gelmintozlarning qo'ylar mahsuldorligiga salbiy ta'siri, kasalliklarni o'z vaqtida aniqlash, degelmintizatsiya tadbirlarini tashkil etish va sanitariya-gigiyena qoidalariga rioya qilishning ahamiyati tahlil qilingan.

Kalit so'zlar: Qo'y; gelmintoz; gelmintlar; degelmintizatsiya; profilaktika; veterinariya; chorvachilik; parazitlar; davolash

РУССКИЙ

УЛАШОВ Илхом Ахмадович^{1,*}¹ Научно-исследовательский институт ветеринарии, Самарканд, Узбекистан

Аннотация. В данной статье рассматриваются основные гельминтозные заболевания, встречающиеся на овцеводческих фермах, их эпизоотологические характеристики, экономический ущерб, а также эффективные методы лечения и профилактики. Анализируется негативное влияние гельминтозов на продуктивность овец, важность своевременного выявления заболеваний, организация дегельминтизации и соблюдение санитарно-гигиенических норм.

Ключевые слова: овцы; гельминтоз; гельминты; дегельминтизация; профилактика; ветеринария; животноводство; паразиты; лечение

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1. KIRISH

Introduction

Kirish. Qo'ychilikni rivojlantirish va ularni bosh sonini ko'paytirish, ulardan olinadigan mahsulotlar-teri, go'st va junning miqdoriy va sifat ko'rsatkichlarini yaxshilashda turli xil yuqumli va parazitlar kasalliklarga qarshi chora-tadbirlarni amalga oshirish muhim ahamiyatga ega. Ayniqsa qo'ychilik xo'jaliklarda keng tarqalgan, qo'y-echkilarning og'ir kasallanishi, ayrim hollarda esa "mol chiqimi"ga sabab bo'ladigan kasalliklar – gelmintozlarga qarshi davolash va profilaktik chora-tadbirlarni muntazam ravishda va sifatli amalga oshirish chorvadorlar, mutaxassislar oldida turgan muhim vazifalardan biri bo'lib hisoblanadi.

Mazkur muammoning dolzarbligi va ahamiyati shundan iboratki, qo'y-echkilar yil davomida, qishin-yozin yaylovda boqilishi sababli ular turli xil gelmintozlarga chalinadilar, chunki yaylov qo'y-echkilarning bu kasalliklar bilan zararlanishining birdan-bir manba'i bo'lib hisoblanadi. Ayniqsa oshqozon-ichak strongilyatlar (nematodiroz, marshallagioz, trixotsefalyoz va boshq.), moniezioz, diktikaulyoz kabi gelmintozlarni qo'zg'atuvchi gelmintlar tuxum va lichinkalari bilan qo'ylar yaylovda o't-xashak orqali zararlanadilar. Shuning uchun gelmintozlarga qarshi kurash chora-tadbirlarini har bir mintaq, har bir hudud va xo'jaliklar sharoitini hisobga olgan holda, ma'lum reja asosida muntazam, to'liq hajmda va sifatli amalga oshirish lozim.

Respublikamizda olib borilgan keng-ko'lamli va ko'p yillik ilmiy tadqiqotlar (N.V.Badanin, 1949; Ya.D.Nikolskiy, 1959; I.X.Irgashev, 1963, 1973; Dj. Azimov, 1963; B.S.Salimov, 1965, 1974; A.O.Oripov, 1968, 1983; Sh.A.Azimov, 1974; G.S.Po'latov, M.A. Aminjonov, A.R. Ro'zimurodov, A.S. Daminov, Sh.A.Djabbarov, N.E. Yuldoshev, U.E. Temurovlar va boshq.) natijasida gelmintozlarga qarshi davolash-profilaktika chora-tadbirlarining hajmi va optimal muddatlari, har bir gelmintoz va gelmintozlar guruhiga qarshi chora-tadbirlar tizimlari ishlab chiqilgan. Jumladan, qo'ychilik xo'jaliklarda keng tarqalgan oshqozon-ichak nematodozlar –trixotsefalyozlar (marshallagioz, nematodiroz, gemonxoz, ostertagioz, trixotsefalyoz), xabertioz, ezafagostomoz, bunostomoz va trixotsefalyoz kabi nematodozlar qo'ylar orasida ancha keng tarqalgan va katta iqtisodiy zarar etkazadi. Bu gelmintozlar bilan o'rtacha zararlangan har bir bosh qo'yning tirik vazni 5 kg, gacha kamayadi, jun mahsuldorligi esa 0,450-0,500kg. kam bo'ladi.

2. NEMATODOZLAR VA SESTODOZLARGA QARSHI CHORA-TADBIRLAR

Control measures against nematode and cestode infections

Oshqozon-ichak nematodozlarining tarqalishi, ular bilan qo'ylarning zararlanishi hayvonlarning yoshi va yil fasllariga qarab o'zgaradi. Ammo bu gelmintozlar bilan qo'ylar ko'proq qish-bahor va ko'z oylari zararlangan bo'ladi. Har bir oshqozon-ichak nematodozlarining mavsumiy o'zgarishlariga qarab quyidagi chora-tadbirlar tavsiya etiladi:

- cho'l-yaylov mintaqada joylashgan xo'jaliklarda qo'zilarni yil davomida 1 marta – avgust-sentabr oylarda katta yoshdagi qo'y-echkilarni esa ikki marta, ya'ni birinchi marta mart-aprel oylarida (to'ldan keyin) ikkinchi marta kuzda – noyabr oyida rejali, ya'ni davolash degelmintizatsiyani amalga oshirish lozim.

- tog'-tog'oldi mintaqada joylashgan xo'jaliklar yoki yozda qo'ylar tog'li hududlarda boqiladigan hollarda barcha yoshdagi qo'ylarni yil davomida 3 karra degelmintizatsiya qilish, ularni may, iyul va sentabr oylarda amalga oshirish maqsadga muvofiqdir.

- sug'oriladigan mintaqadagi shirkat fermer-dehqon xo'jaliklarda yoki kuz-qish mavsumida "angorda" boqiladigan qo'ylarni birinchi marta aprelda (angordan yozgi yaylovga o'tishdan oldin), ikkinchi marta iyulda (yozgi yaylov davrida) va uchinchi marta sentabr-oktabr oylarida degelmintizatsiya qilish lozim.

Diktikaulyoz (qilqurt)ga qarshi davolash degelmintizatsiyani sug'oriladigan mintaqada aprel-may va oktabr-noyabr oylari, tog'-tog'oldi mintaqadagi xo'jaliklarda bahorda – may oyida, yozda – iyulda va 3-nchi, kuzgi degelmintizatsiyani sentyabr-oktabr oylarida o'tkazish lozim. Cho'l-yaylov mintaqasida esa bahorgi degelmintizatsiyani mart-aprel oylari, kuzda esa oktabr-noyabrda, oshqozon-ichak nematodozlariga qarshi degelmintizatsiya bilan bir vaqtda amalga oshirish maqsadga muvofiq.

Moniezioz va boshqa anoplotezefalyozlar (ichak sestodalari) – tianiezioz va avitellinozga qarshi qo'y-echkilarni cho'l-yaylov va sug'oriladigan mintaqalarda aprelda va oktabr-noyabr oylari, tog'-tog'oldi mintaqasida esa may oyida va sentyabr-oktabrda degelmintizatsiya qilish lozim. Degelmintizatsiya qo'ylarga birmabir yoki guruh usuli bilan antgelmint preparatlarni berish bilan amalga oshiriladi:

Bu gelmintozlarga, ya'ni oshqozon-ichak nematodozlar, diktikaulyoz va monieziozga qarshi degelmintizatsiyani antgelmint ta'sir doirasi keng bo'lgan preparatlar – albendazol (alben, valbazen), fenbendazol (panakur, fenkur va boshq.), mebendazol, tetramizol kabi hozirgi zamon antgelmint preparatlari bilan amalga oshirish tavsiya etiladi.

3. TREMATODOZLARGA QARSHI CHORA-TADBIRLAR

Control measures against trematode infections

Olingan ma'lumotlarga ko'ra respublikamizda 30-40 foiz qo'ylar (o'rta hisobda) fassiolozning qo'zg'atuvchilari bilan zararlangan bo'lib, ularning 20-30 foizi Fasciola hepatica, 8-10 foizi F. gigantica, 1,5-2,0 foizi har ikkala tur fassiolalar bilan zararlangan. Qo'ylarda topilgan fassiolalarning 69,2 foizi F. hepatica, 30,8 foizi esa F. gigantica turlariga mansub ekanligi aniqlangan.

Fassioloz, orientobilgarsioz va paramfistomatozlar kabi trematodozlar sug'oriladigan, tog'-tog'oldi mintaqalar, ochiq suv manbalari mavjud bo'lgan, bu suv manbalari fassioloz va boshqa trematodozlar qo'zg'atuvchilarining oraliq xo'jayinlari – chuchuk suv mollyuskalari bo'lgan hududlarda bu kasalliklar jiddiy muammo bo'lib, ular qo'ylarni og'ir kasallanib nobud bo'lishiga sabab bo'ladi.

Qo'ychilik xo'jaliklarida fassioloz va orientobilgarsiozning oldini olish uchun eng avvalo qo'ylarni bu kasallikdan nosog'lom bulgan yaylovlarda, angor(o'rim-yig'imdan keyin)da, qoramollar boqiladigan yaylovda va ular bilan birga boqishdan voz kechish lozim. Qo'ylar kiritiladigan hududlarning yaylovi oldin gelmintologik baholanib keyin qo'y boqilishi lozim.

Qo'ylar sug'oriladigan suv manbalari ko'zdan kechirilib bu manbalarda mollyuskalar, o'sib-rivojlanishi uchun shart-sharoit bor-yuqligi aniqlanib, suv manbalari gelmintozlarning tarqalishiga sabab bo'laolishi yoki bo'laolmasligi to'g'risida prognozlar ishlab chiqish lozim.

Fassioloz va orientobilgarsiozga qarshi kurashda barcha gelmintozlarga kurash singari, eng asosiy chora-tadbir degelmintizatsiya bo'lib hisoblanadi. Bu kasalliklar, ya'ni fassioloz, orientobilgarsioz va ayrim paramfistomatozlariga qarshi davolash degelmintizatsiyani yil davomida 3 marta – aprel-may, sentabr-oktabr va dekabr-yanvarda o'tkazish kerak. Bu trematodozlar bilan qo'ylar asosan yozda (iyun-avgust oylarida) intensiv zararlanishni hisobga olib kuzgi, ya'ni sentyabr-oktabrda, ayrim hollarda, ya'ni zaruriyat tug'ilganda noyabr-dekabrda o'tkaziladigan "majburiy" degelmintizatsiyani yosh, voyaga yetmagan, ya'ni preimaginal fassiolalarga ta'sir qiladigan antgelmint preparat (dori)lar – tarkibida klozantel, prozixvanel bo'lgan preparatlar (rolenol, klozan, klozantel-100 va boshq.) bilan amalga oshirish lozim.

DECLARATIONS

Declarations

Author contributions *CRedit*

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

Sheep farming in Uzbekistan depends on the systematic and high-quality implementation of control measures against infectious and parasitic diseases, and among these the helminth infections occupy a special place because they cause severe illness and, in some cases, mortality. The relevance of the problem follows from the husbandry system itself: sheep and goats are grazed on pasture all year round, winter and summer, and pasture is the single source of infection with the eggs and larvae of gastrointestinal strongylids (nematodirosis, marshallagiosis, trichocephalosis and others), moniesiosis and dictyocaulosis, which the animals acquire with the grass. The aim of the article is to set out the principal helminth infections encountered on sheep farms, their epizootiological characteristics and economic damage, and the effective therapeutic and preventive measures against them, taking into account the conditions of each zone and farm.

Materials and methods

The article generalises the results of extensive and long-term research carried out in Uzbekistan by N.V. Badanin (1949), Ya.D. Nikolsky (1959), I.Kh. Irgashev (1963, 1973), Dj. Azimov (1963), B.S. Salimov (1965, 1974), A.O. Oripov (1968, 1983), Sh.A. Azimov (1974), G.S. Po'latov, M.A. Aminjonov, A.R. Ro'zimurodov, A.S. Daminov, Sh.A. Djabbarov, N.E. Yuldoshev, U.E. Temurov and others, on the basis of which the volume and optimal timing of therapeutic and preventive measures and the systems of control for each helminthiasis and group of helminthiases were developed. The zonal principle is applied throughout: the desert-pasture zone, the mountain and foothill zone, and the irrigated zone are treated separately, since the seasonal

dynamics of infection and therefore the deworming calendar differ between them.

Results and discussion

Among the gastrointestinal nematodoses of sheep the trichostrongylidosis — marshallagiosis, nematodirosis, haemonchosis, ostertagiosis and trichostrongylosis — together with chabertiosis, oesophagostomosis, bunostomosis and trichocephalosis are widespread and cause considerable economic damage: the live weight of a moderately infected sheep falls by up to 5 kg and its wool productivity by 0.450–0.500 kg. Infection varies with the age of the animal and the season, but is heaviest in the winter–spring and autumn months. On this basis the article recommends, for farms of the desert-pasture zone, one planned deworming of lambs a year in August–September and two dewormings of adult sheep and goats, the first in March–April after lambing and the second in November; for farms of the mountain and foothill zone, or where sheep are summered in the mountains, three dewormings of all age groups in May, July and September; and for farms of the irrigated zone or flocks kept on stubble in autumn and winter, dewormings in April before the move to summer pasture, in July during the summer pasture period and in September–October. Against dictyocaulosis the corresponding periods are April–May and October–November in the irrigated zone, May, July and September–October in the mountain and foothill zone, and March–April and October–November in the desert-pasture zone, the last carried out together with the deworming against gastrointestinal nematodoses. Against moniesiosis and the other anoplocephalidoses — thysaniesiosis and avitellinosis — deworming is carried out in April and October–November in the desert-pasture and irrigated zones and in May and September–October in the mountain and foothill zone. Modern broad-spectrum anthelmintics are recommended for all of these: albendazole (alben, valbazen), fenbendazole (panacur, fencur), mebendazole and tetramisole. As regards the trematodoses, on average 30–40 % of sheep in the republic are infected with the agents of fasciolosis, of which 20–30 % carry *Fasciola hepatica*, 8–10 % *F. gigantica* and 1.5–2.0 % both species; of the fasciolids found in sheep, 69.2 % belong to *F. hepatica* and 30.8 % to *F. gigantica*. Prevention rests first of all on avoiding pastures unfavourable for the disease, stubble grazing, cattle pastures and mixed grazing with cattle, on the helminthological assessment of pastures before sheep are admitted, and on surveying the watering points for the presence of the freshwater molluscs that serve as intermediate hosts. Therapeutic deworming against fasciolosis, orientobilharziosis and some paramphistomatosis is carried out three times a year — in April–May, September–October and December–January — and the compulsory autumn deworming must be performed with preparations active against preimaginal fasciolids, that is those containing closantel or praziquantel (rolenol, klozan, closantel-100 and others).

Conclusion and contribution

Control of helminth infections on sheep farms cannot rest on a single therapeutic agent. It requires a planned, systematic and complete programme of deworming whose timing is set according to the natural and economic zone, the seasonal dynamics of each infection and the conditions of the individual farm, supported by the helminthological assessment of pastures and watering points, the correct choice of grazing regime and adherence to sanitary and hygienic rules. For the trematodoses in particular, the choice of a preparation active against immature flukes for the autumn deworming is decisive. The contribution of the article is to bring the zonal deworming calendars for nematode, cestode and trematode infections of sheep together in a single practical scheme that veterinary specialists and livestock keepers can apply directly.

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RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • HAC/OAK 16.00.00 — VETERINARY SCIENCES
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Changes in morphological blood parameters in cows with catarrhal-purulent mastitis

Sigirlarda kataral-yiringli mastitda qonning morfologik ko'rsatkichlaridagi o'zgarishlar**Изменения морфологических показателей крови у коров при катарально-гнойном мастите****Rustam Ismoil o'g'li BOBOMURODOV¹**¹ Scientific-Research Institute of Veterinary, Samarkand, Uzbekistan**ARTICLE INFO****ARTICLE TYPE**

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)**ENGLISH****Rustam Ismoil o'g'li BOBOMURODOV¹**¹ Scientific-Research Institute of Veterinary, Samarkand, Uzbekistan

Abstract. This study investigated changes in morphological blood parameters in cows with catarrhal-purulent mastitis. The study was conducted in four livestock farms located in Narpay and Pastdargom districts of Samarkand Region. Fifteen cows diagnosed with catarrhal-purulent mastitis were selected for the study. Hematological examinations were performed on the day of disease diagnosis and on the 5th and 10th days of the disease. The results showed a significant increase in the number of leukocytes and segmented neutrophils on the 5th day of the disease, followed by a decrease in these parameters by the 10th day. The number of erythrocytes and hemoglobin levels gradually increased throughout the study period. The obtained results indicate that morphological blood parameters in cows with catarrhal-purulent mastitis may serve as important diagnostic criteria for assessing the course of the disease and the body's response to the inflammatory process.

Keywords: catarrhal-purulent mastitis; mammary gland; blood; erythrocytes; hemoglobin; leukocytes; platelets; neutrophils; lymphocytes; leukocyte formula; hematological parameters

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Annotatsiya. Ushbu tadqiqotda sigirlarda kataral-yiringli mastit kechishida qonning morfologik ko'rsatkichlaridagi o'zgarishlar o'rganildi. Tadqiqotlar Samarqand viloyatining Narpay va Pastdarg'om tumanlaridagi to'rtta chorvachilik xo'jaligida olib borildi. Kataral-yiringli mastit bilan kasallangan 15 bosh sigir tanlab olinib, gematologik tekshiruvlar kasallik aniqlangan kuni, 5- va 10-kunlarda o'tkazildi. Tadqiqot natijalarida kasallikning 5-kunida leykotsitlar va segment yadroli neytrofillar miqdorining sezilarli oshishi, 10-kunga kelib esa ushbu ko'rsatkichlarning kamayishi aniqlandi. Eritrotsitlar va gemoglobin miqdori tadqiqot davrida bosqichma-bosqich oshib bordi. Olingan natijalar kataral-yiringli mastitda qonning morfologik ko'rsatkichlari kasallikning kechishi va organizmning yallig'lanish jarayoniga javob reaksiyasini baholashda muhim diagnostik mezon bo'lishi mumkinligini ko'rsatdi.

Kalit so'zlar: kataral-yiringli mastit; sut bezi; qon; eritrotsit; gemoglobin; leykotsit; trombosit; neytrofil; limfotsit; leykotsitar formula; gematologik ko'rsatkichlar

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Аннотация. В данном исследовании изучены изменения морфологических показателей крови у коров при катарально-гнойном мастите. Исследования проводились в четырех животноводческих хозяйствах Нарпайского и Пастдаргомского районов Самаркандской

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области. Для исследования были отобраны 15 коров, больных катарально-гнойным маститом. Гематологические исследования проводили в день установления заболевания, а также на 5-е и 10-е сутки. Результаты исследований показали, что на 5-е сутки заболевания отмечалось значительное увеличение количества лейкоцитов и сегментоядерных нейтрофилов, тогда как к 10-м суткам наблюдалось снижение данных показателей. Количество эритроцитов и уровень гемоглобина в течение исследуемого периода постепенно увеличивались. Полученные результаты свидетельствуют о том, что морфологические показатели крови при катарально-гнойном мастите могут служить важными диагностическими критериями для оценки течения заболевания и ответной реакции организма на воспалительный процесс.

Ключевые слова: катарально-гнойный мастит; молочная железа; кровь; эритроциты; гемоглобин; лейкоциты; тромбоциты; нейтрофилы; лимфоциты; лейкоцитарная формула; гематологические показатели

1. KIRISH

Introduction

Kirish. Mastit sut yo'nalishidagi sigirlarda keng tarqalgan kasalliklardan biri bo'lib, sut bezining yallig'lanishi bilan kechadi va hayvon organizmining umumiy fiziologik holatiga salbiy ta'sir ko'rsatadi. Kasallikning klinik shakllari orasida kataral-yiringli mastit sut bezida yallig'lanish jarayonining kuchayishi, sutning fizik xususiyatlarining o'zgarishi va yiringli eksudat hosil bo'lishi bilan tavsiflanadi [1,2]. Bunday holatlarda mahalliy patologik jarayon bilan bir qatorda organizmning umumiy himoya mexanizmlarida ham o'ziga hos o'zgarishlar yuzaga keladi. Mastit rivojlanishida sut bezining mahalliy himoya tizimi, tug'ma immunitet mexanizmlari hamda qonning hujayraviy elementlari muhim ahamiyatga ega. Ayniqsa, neytrofillarning qon tomiridan yallig'lanish o'chog'iga migratsiyasi mastitga qarshi himoyaning dastlabki bosqichlaridan biri hisoblanadi. Sut beziga mikroorganizmlar yoki boshqa yallig'lantiruvchi omillar ta'sir etganda, qon oqimidagi leykotsitlar, xususan, neytrofillar yallig'lanish o'chog'iga jalb qilinadi [7,8]. Shu sababli mastitda qondagi leykotsitlar miqdori va leykotsitar formula tarkibidagi o'zgarishlar organizmning yallig'lanish jarayoniga javobini baholashda muhim ko'rsatkichlardan hisoblanadi. Mastitda somatik hujayralar, sut tarkibidagi fermentlar va boshqa laborator ko'rsatkichlardan tashqari qonning morfologik tarkibini o'rganish ham kasallikning umumiy organizmga ta'sirini baholash imkonini beradi. Pyo'rala ma'lumotlariga ko'ra, mastitda yallig'lanish jarayonining kuchayishi bilan immun hujayralarning faolligi va ularning sut beziga migratsiyasi ortadi[4,5].

Qonning morfologik ko'rsatkichlari orasida eritrotsitlar, gemoglobin, leykotsitlar, trombositlar hamda leykotsitar formula alohida diagnostik ahamiyatga ega. Xususan, leykotsitlar sonining ortishi organizmida yallig'lanish jarayoni faollashganligini ko'rsatishi mumkin. Leykotsitar formuladagi neytrofillar nisbati esa bakterial yallig'lanish jarayonlarining rivojlanish darajasini baholashda muhim ahamiyat kasb etadi. Shu bilan birga, kataral-yiringli mastitda qonning morfologik ko'rsatkichlari kasallikning turli bosqichlarida qanday o'zgarishi, ayniqsa davolash jarayonining dastlabki kunlarida leykotsitar formula qanday dinamikaga ega bo'lishi amaliy veterinariya nuqtayi nazaridan muhim masalalardan biridir. Kasallik davomida qon tarkibidagi o'zgarishlarni aniqlash hamda bu o'zgarishlarning yuzaga kelishini ilmiy jihatdan asoslash muhim vazifalardan biridir.

Tadqiqotning maqsadi: Sigirlar organizmida kataral-yiringli mastit jarayoni kechishida qonning asosiy morfologik ko'rsatkichlari, jumladan eritrotsitlar, gemoglobin, trombositlar, leykotsitlar va leykotsitar formula elementlarining dinamik o'zgarishlarini o'rganish hamda ushbu ko'rsatkichlarning kasallik jarayonini baholashdagi diagnostik ahamiyatini aniqlash.

2. MATERIAL VA METODLAR

Materials and methods

Material va metodlar: Tadqiqotlar Samarqand viloyatining Narpay tumanidagi "Tohir Yusuf chorvasi", "Agro gold spring" hamda Pastdarg'om tumanidagi "Xujaobod chorvasi" va "Xosil-Uboydulla-Bobur UAU" chorvachilik xo'jaliklarida olib borildi. Tadqiqot obyekti sifatida kataral-yiringli mastit bilan kasallangan sigirlar tanlab olindi. Tajribaga hayvonlarni tanlashda o'xshash juftliklar tamoyilidan foydalanilib, jami 15 bosh sigir ajratildi. Hayvonlarda mastit tashxisi klinik tekshiruvlar, sut bezining holatini baholash va laborator diagnostika natijalari asosida belgilandi. Tajribaga olingan sigirlarning umumiy klinik holati, sut bezidagi patologik o'zgarishlar hamda sutning fizik xususiyatlari hisobga olindi.

Gematologik tekshiruvlar hayvonlardan olingan qon namunalari amalga oshirildi. Qon namunalari gematologik analizator yordamida tekshirilib, quyidagi morfologik ko'rsatkichlar aniqlandi: eritrotsitlar soni, gemoglobin miqdori, trombositlar soni, leykotsitlar soni, eozinofillar, limfotsitlar, monotsitlar, tayoqcha yadroli neytrofillar, segment yadroli neytrofillar. Gematologik tekshiruvlar uch marotaba: tajriba boshida, ya'ni kataral-yiringli mastit aniqlangan vaqtda, 5-kuni va 10-kuni amalga oshirilib olingan natijalar tegishli o'rtacha qiymatlar ko'rinishida ifodalandi.

3. NATIJALAR VA ULARNING TAHLILI

Results and discussion

Natijalar va ularning tahlili: Tadqiqotlar davomida kataral-yiringli mastit bilan kasallangan sigirlarda qonning morfologik ko'rsatkichlari kasallikning turli davrlarida bir xil bo'lmagan dinamikaga ega ekanligi aniqlandi. Tadqiqot natijalarining umumlashirilgan ma'lumotlari 1-jadvalda keltirilgan.

Tadqiqot davomida eritrotsit va gemoglobin o'zgarishi natijalariga ko'ra, kataral-yiringli mastit bilan kasallangan sigirlarda eritrotsitlar soni tajriba boshida o'rtacha $4,89 \pm 0,03$ mln/mkl ni tashkil etdi. Kasallikning 5-kunida ushbu ko'rsatkich $5,30 \pm 0,02$ mln/mkl, 10-kunida esa $5,89 \pm 0,05$ mln/mkl gacha oshdi. Demak, tajriba boshiga nisbatan 10-kunda eritrotsitlar soni qariyb 1,0 mln/mkl ga oshgan. Bu o'zgarish kasallik jarayonining keyingi bosqichlarida organizmning umumiy holati va eritropoez jarayonining tiklanishi bilan bog'liq. Eritrotsitlar sonining oshishiga parallel ravishda gemoglobin miqdorida ham o'sish kuzatildi. Tajriba boshida gemoglobin miqdori $90,55 \pm 2,8$ g/l bo'lgan bo'lsa, 5-kunda $102,1 \pm 2,1$ g/l, 10-kunda esa $117,75 \pm 1,7$ g/l ni tashkil etdi. Shunday qilib, 10-kunga kelib gemoglobin miqdori dastlabki ko'rsatkichga nisbatan taxminan 27,2 g/l ga oshdi. Eritrotsitlar va gemoglobin miqdorining birgalikda oshib borishi hayvonlarning umumiy holati yaxshilanib, yallig'lanish jarayonining pasayishi bilan bog'liq bo'lishi mumkin.

1-jadval

Kataral-yiringli mastit bilan kasallangan sigirlarda qonning morfologik ko'rsatkichlari dinamikasi / **Table 1.** Dynamics of morphological blood parameters in cows with catarrhal-purulent mastitis

Ko'rsatkichlar	Me'yorda	Tajriba boshida	5-kunida	10-kunida
Eritrotsitlar, mln/mkl	5–7,5	4,89±0,03	5,30±0,02	5,89±0,05
Gemoglobin, g/l	90–140	90,55±2,8	102,1±2,1	117,75±1,7
Trombotsitlar, ming/mkl	100–650	377,5±4,4	385,8±3,4	394,3±3,0
Leykotsitlar, ming/mkl	4,5–12	9,18±0,04	13,75±0,05	8,43±0,06
Eozinofillar, %	3–10	2,7±0,5	3,8±0,4	5,0±0,3
Monotsitlar, %	4–10	4,6±0,5	5,3±0,6	6,8±0,5
Limfotsitlar, %	40–77	38,0±0,7	48,8±0,6	56,3±0,5
Tayoqcha yadroli neytrofillar, %	2–5	6,6±0,5	4,2±0,4	2,8±0,2
Segment yadroli neytrofillar, %	10–30	15,2±0,4	27,0±0,6	16,8±0,2

Tadqiqotning eng muhim natijalaridan biri kataral-yiringli mastitda leykotsitlar miqdorining kasallik bosqichlariga qarab keskin o'zgarishi bo'ldi. Tajriba boshida qondagi leykotsitlar miqdori o'rtacha 9,18±0,04 ming/mkl ni tashkil etgan bo'lsa, kasallikning 5-kunida ushbu ko'rsatkich 13,75±0,05 ming/mkl gacha oshib, dastlabki ko'rsatkichga nisbatan sezilarli yuqori bo'ldi. 10-kunga kelib esa leykotsitlar miqdori 8,43±0,06 ming/mkl gacha kamaydi. Kasallikning 5-kunida leykotsitozning kuchayishi organizmning yallig'lanish jarayoniga faol immun javob berayotganligini ko'rsatadi. 10-kunga kelib leykotsitlar miqdorining kamayishi esa yallig'lanish jarayonining susayishi va organizmning homeostatik holatga qaytishi bilan izohlanishi mumkin.

Leykotsitar formulani o'rganish jarayonida ayniqsa neytrofillar tarkibida sezilarli o'zgarishlar qayd etildi. Segment yadroli neytrofillar tajriba boshida o'rtacha 15,2 foizni tashkil etgan bo'lsa, 5-kunda 27,0 foizgacha oshdi. 10-kunga kelib esa ushbu ko'rsatkich 16,8 foizgacha kamaydi. Segment yadroli neytrofillarning 5-kunda keskin oshishi kataral-yiringli mastitda yallig'lanish jarayonining faollashishi va neytrofillarning organizmning yallig'lanish o'chog'iga jalb etilishi bilan bog'liq bo'lishi mumkin. Neytrofillar tug'ma immunitetning muhim hujayralari bo'lib, bakterial yallig'lanish o'chog'ida fagotsitoz jarayonida faol ishtirok etadi. Tayoqcha yadroli neytrofillar esa aksincha, tajriba boshida 6,6 foizni tashkil etgan bo'lsa, 5-kunda 4,2%, 10-kunda esa 2,8 foizgacha kamaydi.

Tajriba davomida limfotsitlar miqdorida ham bosqichma-bosqich oshish kuzatildi. Tajriba boshida limfotsitlar 38,0%, 5-kunda 48,8%, 10-kunda esa 56,3 foizni tashkil etdi. Monotsitlar miqdori ham tajriba boshida o'rtacha 4,6 foizdan 5-kunda 5,3%, 10-kunda esa 6,8 foizgacha oshdi. Monotsitlar yallig'lanish jarayonlarida fagotsitoz, hujayra qoldiqlarini tozalash va immun javobni boshqarishda ishtirok etadi. Eozinofillar tajriba boshida 2,7 foizni tashkil etgan bo'lsa, 5-kunda 3,8%, 10-kunda 5,0% gacha oshganligi qayd etildi. Ushbu o'zgarishlar mastitning bevosita asosiy ko'rsatkichi bo'lmasa-da, umumiy leykotsitar javob tarkibidagi o'zgarishlarni ko'rsatadi. Trombotsitlar sonida tajriba davomida keskin o'zgarishlar kuzatilmadi. Tajriba boshida ularning miqdori o'rtacha 377,5±4,4 ming/mkl, 5-kunda 385,8±3,4 ming/mkl, 10-kunda esa 394,3±3,0 ming/mkl ni tashkil etdi. Shunday qilib, trombotsitlar miqdori tajriba davomida biroz oshgan bo'lsa-da, ushbu o'zgarishlar leykotsitlar va neytrofillarda kuzatilgan o'zgarishlar kabi yaqqol bo'lmadi. Bu esa kataral-yiringli mastitda qonning morfologik javobida eng katta o'zgarishlar asosan leykotsitar bo'g'inda yuzaga kelganligini ko'rsatadi.

Tadqiqotlarning umumlashtirilgan holda olingan natijalar kataral-yiringli mastitda qonning morfologik ko'rsatkichlari,

ayniqsa leykotsitlar soni, segment va tayoqcha yadroli neytrofillar nisbati, kasallikning yallig'lanish faolligini va uning dinamikasini baholashda qo'shimcha diagnostik mezon sifatida foydalanish mumkinligini ko'rsatmoqda.

4. XULOSA

Conclusion

Xulosa: Samarqand viloyatining turli chorvachilik xo'jaliklarida kataral-yiringli mastit bilan kasallangan 15 bosh sigirda qonning morfologik ko'rsatkichlarini o'rganish natijasida kasallikning kechishi davomida gematologik ko'rsatkichlarda muayyan dinamik o'zgarishlar yuzaga kelishi aniqlandi. Tadqiqot davomida eritrotsitlar soni va gemoglobin miqdorining tajriba boshidan 10-kungacha izchil oshishi, trombotsitlar miqdorida esa nisbatan kam o'zgarishlar kuzatildi. Eng yaqqol o'zgarishlar leykotsitlar va leykotsitar formulada qayd etilib, leykotsitlar miqdori 5-kunda 13,75 ming/mkl gacha oshgan va 10-kunda 8,43 ming/mkl gacha kamaygan, segment yadroli neytrofillar esa mos ravishda 15,2% dan 27,0% gacha ko'payib, keyinchalik 16,8% gacha pasaygan. Shu bilan birga, tayoqcha yadroli neytrofillar miqdorining 6,6% dan 2,8% gacha kamayishi kuzatildi. Olingan natijalar kataral-yiringli mastitda qonning morfologik ko'rsatkichlari, ayniqsa leykotsitlar va neytrofillar tarkibidagi o'zgarishlar organizmning yallig'lanish jarayoniga javob reaksiyasini aks ettirishini ko'rsatadi. Mazkur ko'rsatkichlardan kasallikning kechishini baholash va davolash jarayonini nazorat qilishda qo'shimcha gematologik mezon sifatida foydalanish mumkin.

DECLARATIONS

Declarations

Author contributions CRediT

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

Mastitis is one of the most widespread diseases of dairy cows: it proceeds as an inflammation of the mammary gland and has an adverse effect on the general physiological state of the animal. Among its clinical forms, catarrhal-purulent mastitis is characterised by an intensified inflammatory process, a change in the physical properties of the milk and the formation of purulent exudate, and in such cases specific changes arise not only locally but also in the general defence mechanisms of the organism. Migration of neutrophils from the bloodstream to the focus of inflammation is one of the earliest stages of defence against mastitis, so that the leukocyte count and the leukocyte formula are important indicators of the response of the organism to the inflammatory process. What remained insufficiently defined was how the morphological blood parameters change across the successive stages of catarrhal-purulent mastitis, and in particular what dynamics the leukocyte formula shows during the first days of treatment. The aim of the study was therefore to investigate the dynamic changes in erythrocytes, haemoglobin, platelets, leukocytes and the elements of the leukocyte formula in cows with catarrhal-purulent mastitis and to determine the diagnostic value of these indicators.

Materials and methods

The investigations were carried out on four livestock farms — “Tohir Yusuf chorvasi” and “Agro gold spring” in Narpay district and “Xujaobod chorvasi” and “Xosil-Uboydulla-Bobur UAU” in Pastdargom district of Samarkand region. Cows with catarrhal-purulent mastitis were selected as the object of study; animals were chosen on the principle of analogous pairs and a total of 15 head were allocated. The diagnosis was established on the basis of clinical examination, assessment of the state of the mammary gland and laboratory diagnostics, and the general clinical condition of the animals, the pathological changes in the udder and the physical properties of the milk were taken into account. Blood samples were examined on a haematological analyser, and the erythrocyte count, haemoglobin concentration, platelet count, leukocyte count, eosinophils, lymphocytes, monocytes, band neutrophils and segmented neutrophils were determined. Haematological examination was performed three times — at the start of the experiment when catarrhal-purulent mastitis was diagnosed, and on the 5th and 10th days — and the results were expressed as the corresponding mean values.

Results and discussion

The morphological blood parameters proved to have a non-uniform dynamic across the periods of the disease; the generalised data are given in Table 1. The erythrocyte count averaged 4.89 ± 0.03 million/ μl at the start of the experiment, rose to 5.30 ± 0.02 million/ μl on the 5th day and to 5.89 ± 0.05 million/ μl on the 10th, an increase of

almost 1.0 million/ μl relative to the start. Haemoglobin rose in parallel, from 90.55 ± 2.8 g/l to 102.1 ± 2.1 g/l on the 5th day and 117.75 ± 1.7 g/l on the 10th, an increase of about 27.2 g/l. The most important result concerned the leukocytes: from 9.18 ± 0.04 thousand/ μl at the start the count rose sharply to 13.75 ± 0.05 thousand/ μl on the 5th day and then fell to 8.43 ± 0.06 thousand/ μl by the 10th, the leukocytosis of the 5th day reflecting an active immune response and the subsequent decline the attenuation of inflammation and the return of the organism to homeostasis. In the leukocyte formula the segmented neutrophils rose from a mean of 15.2 % to 27.0 % on the 5th day and fell to 16.8 % by the 10th, while the band neutrophils moved in the opposite direction, from 6.6 % to 4.2 % and then 2.8 %. Lymphocytes increased steadily from 38.0 % to 48.8 % and 56.3 %, monocytes from 4.6 % to 5.3 % and 6.8 %, and eosinophils from 2.7 % to 3.8 % and 5.0 %. Platelets showed no sharp changes, rising only from 377.5 ± 4.4 to 385.8 ± 3.4 and 394.3 ± 3.0 thousand/ μl , which shows that the principal morphological response in catarrhal-purulent mastitis occurs in the leukocyte compartment.

Conclusion and contribution

The study of morphological blood parameters in 15 cows with catarrhal-purulent mastitis on farms of Samarkand region showed that definite dynamic changes occur in the haematological indicators over the course of the disease. The erythrocyte count and haemoglobin concentration rose consistently from the start of the experiment to the 10th day, whereas platelets changed comparatively little. The most pronounced changes were recorded in the leukocytes and the leukocyte formula: the leukocyte count rose to 13.75 thousand/ μl on the 5th day and fell to 8.43 thousand/ μl on the 10th, the segmented neutrophils rose from 15.2 % to 27.0 % and then fell to 16.8 %, and the band neutrophils fell from 6.6 % to 2.8 %. These changes reflect the response of the organism to the inflammatory process, and the indicators can be used as a supplementary haematological criterion for assessing the course of the disease and monitoring treatment. The contribution of the work is to provide a quantitative, time-resolved haematological profile of catarrhal-purulent mastitis under the production conditions of Samarkand region.

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Changes in biochemical blood parameters in cows with catarrhal-purulent mastitis

Kataral-yiringli mastit bilan kasallangan sigirlar qonining biokimyoviy ko'rsatkichlaridagi o'zgarishlar
Изменения биохимических показателей крови у коров, больных катарально-гнойным маститом

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)

ENGLISH

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Abstract. This article investigates changes in certain biochemical blood parameters in cows affected by catarrhal-purulent mastitis. The study was conducted on cows diagnosed with catarrhal-purulent mastitis in various livestock farms in the Samarkand Region. The levels of total protein, glucose, aspartate aminotransferase (AST), and lactate dehydrogenase (LDH) in blood serum were determined at the onset of the disease and on the 5th and 10th days. According to the results, the levels of total protein, AST, and LDH were elevated during the initial stage of the disease, while a decrease in these parameters was observed by the 10th day of the study. No significant changes in glucose levels were detected. The obtained results indicate that biochemical blood parameters in cows with catarrhal-purulent mastitis can be used as additional diagnostic criteria for assessing the course of the disease and the dynamics of inflammatory processes in the body.

Keywords: catarrhal-purulent mastitis; mammary gland inflammation; blood; blood serum; total protein; glucose; AST; LDH; biochemical parameters; inflammation

O'ZBEKCHA

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Annotatsiya. Maqolada kataral-yiringli mastit bilan kasallangan sigirlar qonining ayrim biokimyoviy ko'rsatkichlarida yuz beradigan o'zgarishlar o'rganilgan. Tadqiqotlar Samarqand viloyatining turli chorvachilik xo'jaliklarida kataral-yiringli mastit bilan kasallangan sigirlarda olib borildi. Qon zardobidagi umumiy oqsil, glyukoza, aspartat aminotransferaza (AST) va laktatdehidrogenaza (LDH) miqdorlari kasallikning boshlanishida, 5- va 10-kunlarida aniqlandi. Tadqiqot natijalariga ko'ra, kasallikning boshlang'ich davrida umumiy oqsil, AST va LDH ko'rsatkichlari yuqori bo'lib, tajribaning 10-kuniga kelib ularning kamayishi kuzatildi. Glyukoza miqdorida esa sezilarli o'zgarishlar aniqlanmadi. Olingan natijalar kataral-yiringli mastitda qonning biokimyoviy ko'rsatkichlari kasallikning kechishi va organizmdagi yallig'lanish jarayonlari dinamikasini baholashda qo'shimcha diagnostik mezon sifatida foydalanish mumkinligini ko'rsatdi.

Kalit so'zlar: kataral-yiringli mastit; sut bezining yallig'lanishi; qon; qon zardobi; umumiy oqsil; glyukoza; AST; LDH; biokimyoviy ko'rsatkichlar; yallig'lanish

РУССКИЙ

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Аннотация. В статье изучены изменения некоторых биохимических показателей крови у коров, больных катарально-гнойным маститом. Исследования проводились на коровах с диагнозом «катарально-гнойный мастит» в различных животноводческих хозяйствах

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HAC / OAK: On the HAC list of national scientific publications (Academy of Sciences of the Republic of Uzbekistan) for 06.00.00 Agricultural Sciences and 16.00.00 Veterinary Sciences. O'zbekiston Respublikasi FA huzuridagi OAK ro'yxatida: 06.00.00 – Qishloq xo'jaligi fanlari; 16.00.00 – Veterinariya fanlari.

Самаркандской области. В сыворотке крови определяли содержание общего белка, глюкозы, аспаратаминотрансферазы (АСТ) и лактатдегидрогеназы (ЛДГ) в начале заболевания, а также на 5-е и 10-е сутки. Согласно результатам исследования, в начальный период заболевания показатели общего белка, АСТ и ЛДГ были повышены, а к 10-м суткам наблюдалось их снижение. При этом существенных изменений содержания глюкозы не выявлено. Полученные результаты свидетельствуют о том, что биохимические показатели крови при катарально-гнойном мастите могут использоваться в качестве дополнительных диагностических критериев для оценки течения заболевания и динамики воспалительных процессов в организме.

Ключевые слова: катарально-гнойный мастит; воспаление молочной железы; кровь; сыворотка крови; общий белок; глюкоза; АСТ; ЛДГ; биохимические показатели; воспаление

1. KIRISH

Introduction

Kirish. Sigirlarda mastit sut bezining yallig'lanishi bilan kechadigan, sut mahsuldorligi va sifatining pasayishi hamdakasallikni davolash uchun sarflanadigan veterinariya xarajatlari natijasida chorvachilik xo'jaliklariga sezilarli iqtisodiy zarar yetkazadigan kasalliklardan biridir. Kasallikning klinik shakllari orasida kataral-yiringli mastit sut bezida kuchli yallig'lanish jarayoni va yiringli eksudat hosil bo'lishi bilan kechishi sababli alohida amaliy ahamiyatga ega. Mastit rivojlanishi davomida sut bezidagi mahalliy yallig'lanish jarayoni organizmning umumiy holatiga ham ta'sir ko'rsatadi. Natijada qonning hujayravii va biokimyovii tarkibida turli darajadagi o'zgarishlar yuzaga kelishi mumkin. Yallig'lanish jarayonida oqsil almashinuvi, energiya almashinuvi va hujayra membranalarining holati o'zgarishi qon zardobidagi ayrim biokimyovii ko'rsatkichlarning o'zgarishi bilan namoyon bo'ladi.

Umumiy oqsil organizmdagi oqsil almashinuvi va immun javob holatini baholashda muhim ko'rsatkichlardan biri hisoblanadi. AST va LDH esa to'qimalarda hujayravii shikastlanish va metabolik o'zgarishlar yuz berganda qon zardobida o'zgarishi mumkin. Ayniqsa, LDH ning mastitda sut bezidagi yallig'lanish va hujayra shikastlanishi bilan bog'liq holda ortishi ushbu fermentni qo'shimcha diagnostik ko'rsatkich sifatida o'rganishga imkon beradi. Shu sababli kataral-yiringli mastitda qonning biokimyovii ko'rsatkichlarini kasallikning turli bosqichlarida o'rganish kasallikning kechishini baholash va organizmdagi umumiy metabolik o'zgarishlarni aniqlashda muhim ahamiyatga ega.

Mavzuning dolzarbligi: Biz bilamizki sog'in sigirlar orasidagi mastitlar asosiy muammolardan biri hisoblanib; yuqori mahsuldor hayvonlarning xo'jalikda foydalanish muddati 6-8 yoshgacha qisqarishi hamda sigirlar qisir qolishi natijasida muddatdan ilgari yaroqsiz bo'lib yo'q qilinishi, sut mahsuldorligining 15-20 % pasayishi va uning yog'lilik darajasi 0,8-1 % gacha tushib ketishi, sifatining yomonlashishi, yangi tug'ilgan buzoqlarning kasallanishi va o'limining ko'payishi shuningdek ushbu kasallikni tashxislash,

davolash va oldini olish uchun sarflangan xarajatlar natijasida katta iqtisodiy zarar keltirib chiqaradi.

Tadqiqotning maqsadi: Tadqiqotning maqsadi kataral-yiringli mastit bilan kasallangan sigirlarning qon zardobidagi umumiy oqsil, glyukoza, AST va LDH larni miqdor ko'rsatkichlarining o'zgarish darajalarini aniqlash hamda ularning kasallik kechishini baholashdagi ahamiyatini o'rganishdan iborat.

2. MATERIAL VA METODLAR

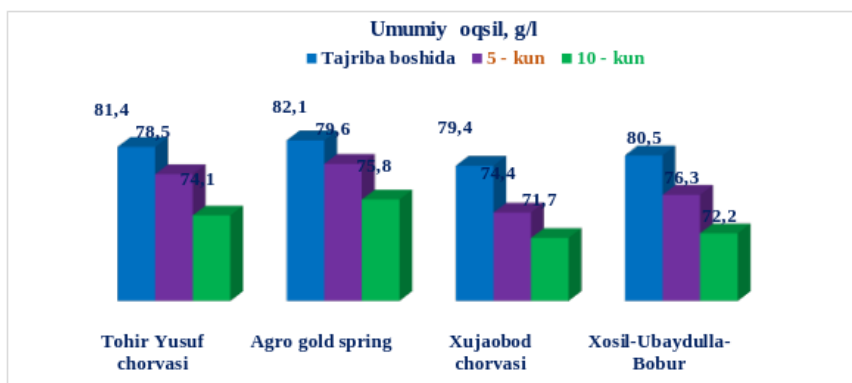
Materials and methods

Material va metodlar: Tadqiqotlar Samarqand viloyatida joylashgan "Tohir Yusuf chorvasi", "Agro gold spring", "Xujaobod chorvasi" hamda "Xosil-Uboydulla-Bobur UAU" chorvachilik xo'jaliklarida kataral-yiringli mastit bilan kasallangan sigirlarda olib borildi. Tadqiqot uchun o'xshash juftliklar tamoyili asosida 15 bosh kataral-yiringli mastit bilan kasallangan sigir ajratib olindi. Hayvonlarda qonning biokimyovii ko'rsatkichlari kasallik aniqlangan vaqtda, tajribaning 5-kuni va 10-kunida o'rganildi. Qon namunalari umumiy oqsil, glyukoza, aspartat aminotransferaza (AST) va laktatdehidrogenaza (LDH) miqdori gemanalizator yordamida aniqlandi. Olingan natijalar tegishli me'yoriy ko'rsatkichlar bilan taqqoslanib, kasallik dinamikasida biokimyovii ko'rsatkichlarning o'zgarishiga baho berildi.

3. NATIJALAR VA ULARNING TAHLILI

Results and discussion

Tadqiqotlar davomida kataral-yiringli mastit bilan kasallangan sigirlar qonining biokimyovii ko'rsatkichlarida kasallikning turli davrlariga bog'liq o'zgarishlar aniqlandi. Birinchi xo'jalikdagi sigirlarda tajriba boshida umumiy oqsil miqdori $81,4 \pm 0,6$ g/l ni tashkil etgan bo'lsa, 5-kunida $78,5 \pm 0,3$ g/l, 10-kunida esa $74,1 \pm 0,2$ g/l gacha kamaydi (1-rasm). "Agro gold spring" xo'jaligida ushbu ko'rsatkich mos ravishda $82,1 \pm 0,1$; $79,6 \pm 0,4$ va $75,8 \pm 0,3$ g/l ni tashkil etdi. "Xujaobod chorvasi" xo'jaligida $79,4 \pm 0,2$ g/l dan $74,4 \pm 0,4$ g/l gacha, "Xosil-Uboydulla-Bobur UAU" xo'jaligida esa $80,5 \pm 0,3$ g/l dan $72,2 \pm 0,2$ g/l gacha pasayganligi aniqlandi. Demak, tajriba boshidan 10-kungacha umumiy oqsil miqdori o'rtacha 9,2% ga kamaygan.

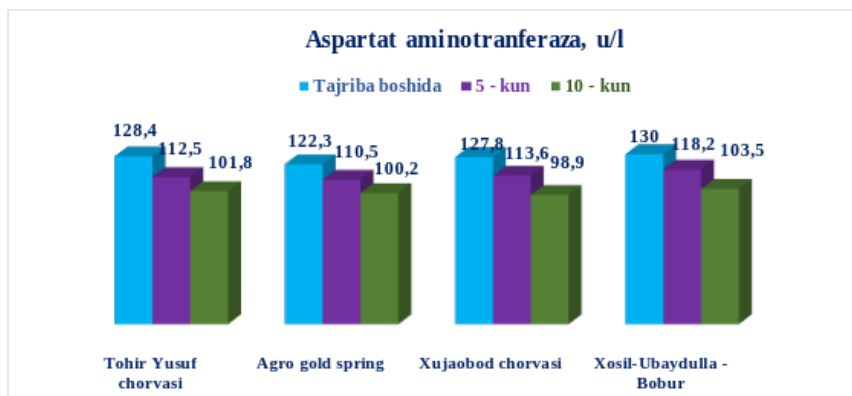


1-rasm. Mastit bilan kasallangan sigirlar qonidagi umumiy oqsil miqdori, g/l / Fig. 1. Total protein content in the blood of cows with mastitis, g/l

Qondagi glyukoza miqdorida esa tadqiqot davomida keskin o'zgarishlar kuzatilmadi. Barcha xo'jaliklar bo'yicha uning o'rtacha miqdori tajriba boshida 2,16 mmol/l, 5-kunida taxminan 2,07 mmol/l, 10-kunida esa 2,17 mmol/l ni tashkil etdi.

Mastit bilan kasallangan sigirlarda AST faolligi ham tajriba davomida sezilarli dinamikaga ega bo'ldi. "Tohir Yusuf chorvasi"

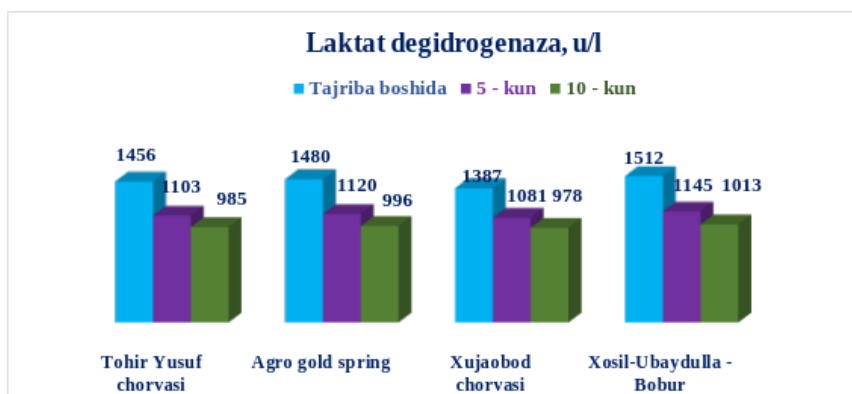
xo'jaligida AST miqdori tajriba boshida $128,4 \pm 0,5$ U/l, 5-kunida $112,5 \pm 0,3$ U/l, 10-kunida $101,8 \pm 0,4$ U/l ni tashkil etdi. "Agro gold spring" xo'jaligida ushbu ko'rsatkichlar mos ravishda $122,3 \pm 0,2$; $110,5 \pm 0,3$ va $100,2 \pm 0,1$ U/l bo'ldi. "Xujaobod chorvasi" xo'jaligida $127,8 \pm 0,4$ U/l dan $98,9 \pm 0,2$ U/l gacha, "Xosil-Uboydulla-Bobur UAU" xo'jaligida esa $130,0 \pm 0,3$ U/l dan $103,5 \pm 0,2$ U/l gacha kamayganligi aniqlandi (2- rasm).



2-rasm. Mastit bilan kasallangan sigirlar qonidagi AST faolligi, U/l / **Fig. 2.** AST activity in the blood of cows with mastitis, U/l

Laktat dehidrogenaza faolligida yaqqol ko'zga tashlanadigan o'zgarishlar kuzatildi. "Tohir Yusuf chorvasi" xo'jaligida tajriba boshida LDH miqdori 1456 ± 3 U/l, 5-kunida 1103 ± 6 U/l, 10-kunida esa 985 ± 2 U/l bo'ldi. "Agro gold spring" xo'jaligida mos ravishda 1480 ± 4 ; 1120 ± 5 va 996 ± 2 U/l, "Xujaobod chorvasi" xo'jaligida

1387 ± 1 ; 1081 ± 4 va 978 ± 2 U/l, "Xosil-Uboydulla-Bobur UAU" xo'jaligida esa 1512 ± 5 ; 1145 ± 3 va 1013 ± 2 U/l kabi ko'rsatkichlar qayd etildi. Yallig'lanish va hujayra shikastlanishi natijasida LDGning qon zardobidagi faolligi ortishi holati kuzatiladi.



3-rasm. Kataral-yiringli mastit bilan kasallangan sigirlar qonidagi LDG faolligi, U/l / **Fig. 3.** LDH activity in the blood of cows with catarrhal-purulent mastitis, U/l

Barcha xo'jaliklar bo'yicha umumlashtirilganda, umumiy oqsil miqdori tajriba boshida o'rtacha 80,8 g/l, 5-kunida 77,2 g/l, 10-kunida esa 73,4 g/l ni tashkil etdi. Qon tarkibidagi oqsillardagi o'zgarishlarni mastitning yallig'lanish jarayoni, oqsil almashinuvining o'zgarishi, organizmning immun javobi va kasallik davridagi metabolik jarayonlar bilan bog'lash mumkin. Bunda oziqlantirish sharoiti va jigar faoliyatining holati ham qon zardobidagi umumiy oqsil miqdoriga ta'sir qiluvchi omillar sifatida hisobga olinishi lozim.

Glyukoza miqdori tajriba davomida nisbatan barqaror saqlanib qoldi. Bu holat kataral-yiringli mastitning ushbu tajriba sharoitida glyukoza almashinuviga kuchli tizimli ta'sir ko'rsatmaganligini ko'rsatadi.

Umumlashtirilgan natijalarga ko'ra, AST faolligi tajriba boshida o'rtacha 127,1 U/l, 5-kunida 113,7 U/l, 10-kunida esa 101,1 U/l ni tashkil etdi, ya'ni, tajriba boshidan 10-kungacha AST faolligi taxminan 20,5% ga kamaygan. AST ko'plab to'qimalarda, jumladan jigar, yurak va skelet mushaklarida uchraydigan ferment hisoblanadi. Shu sababli uning qon zardobidagi o'zgarishini faqat sut bezining shikastlanishi bilan izohlash to'g'ri bo'lmaydi. Biroq

mastitning kuchli yallig'lanish jarayoni va to'qimalarning zararlanishi sharoitida AST faolligining oshishi organizmdagi hujayraviy shikastlanishning qo'shimcha belgisi sifatida baholanishi mumkin. Tajriba davomida AST miqdorining izchil kamayishi esa hayvonlarning klinik holati yaxshilanib, yallig'lanish jarayoni susayganligini ko'rsatuvchi qo'shimcha ko'rsatkich sifatida qaralishi mumkin.

Barcha xo'jaliklar bo'yicha umumlashtirilganda, LDH faolligi tajriba boshida o'rtacha 1458 U/l, 5-kunida 1112 U/l, 10-kunida esa 993 U/l ni tashkil etdi. Demak, tajriba boshidan 10-kungacha LDH faolligi o'rtacha 31,9% ga kamaygan. LDH deyarli barcha to'qimalarda mavjud bo'lgan ferment bo'lib, hujayralarning energiya almashinuvi, xususan laktat va piruvat almashinuvida ishtirok etadi. Shu nuqtayi nazardan, tadqiqotimizda kasallikning boshlang'ich davrida LDH ning yuqori bo'lishi kataral-yiringli mastit fonida to'qimalarda faol yallig'lanish va hujayraviy shikastlanish jarayonlari kechayotganligini ko'rsatadi. 10-kunga kelib ferment faolligining kamayishi esa yallig'lanish jarayonining susayishi bilan mos keladi.

Umuman olganda, olingan natijalar kataral-yiringli mastitning boshlang'ich davrida qon zardobida umumiy oqsil, AST va ayniqsa LDH ko'rsatkichlarida yaqqol o'zgarishlar mavjudligini ko'rsatdi. Kasallikning 10-kuniga kelib ushbu ko'rsatkichlarning kamayib borishi yallig'lanish jarayonining susayishi va hayvonlarning klinik holatining yaxshilanishi bilan mos keldi. Glyukoza miqdorining esa tajriba davomida deyarli o'zgarmaganligi qayd etildi.

4. XULOSA

Conclusion

Xulosa: Tadqiqotlar natijasida sigirlarda kataral-yiringli mastit kechishida qonning ayrim biokimyoviy ko'rsatkichlarida muayyan dinamik o'zgarishlar mavjudligi aniqlandi. Kasallikning boshlang'ich davrida umumiy oqsil miqdori o'rtacha 80,8 g/l, AST faolligi 127,1 U/l, LDH faolligi esa 1458 U/l ni tashkil etgan bo'lsa, 10-kuniga kelib ular mos ravishda 73,4 g/l, 101,1 U/l va 993 U/l gacha kamaydi. Eng katta o'zgarish LDH faolligida kuzatilib, uning miqdori tajriba boshidan 10-kungacha 31,9% ga kamaydi. Glyukoza miqdorida esa sezilarli o'zgarishlar aniqlanmadi. Olingan natijalar umumiy oqsil, AST va LDH ko'rsatkichlarini klinik va boshqa laborator tekshiruvlar bilan birgalikda kataral-yiringli mastitning kechishi hamda davolash jarayonidagi o'zgarishlarni baholashda qo'shimcha biokimyoviy mezonlar sifatida qo'llash mumkinligini ko'rsatadi.

DECLARATIONS

Declarations

Author contributions CRediT

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

Mastitis in cows proceeds as an inflammation of the mammary gland and leads to a fall in milk yield and milk quality; among high-yielding dairy cows it is one of the principal problems of commercial herds. Total protein is one of the key indicators of protein metabolism and of the state of the immune response, while the activities of aspartate aminotransferase and lactate dehydrogenase reflect tissue damage and the intensity of the inflammatory process. Whether these serum indicators change in a regular and interpretable way across the stages of catarrhal-purulent mastitis, and whether they can therefore serve as supplementary diagnostic criteria alongside clinical examination, had not been established for the production conditions of Samarkand region. The aim of the study was to determine the changes in total protein, glucose, AST and LDH in the blood serum of cows with catarrhal-purulent mastitis at the onset of the disease and on the 5th and 10th days.

Materials and methods

The investigations were carried out on cows with catarrhal-purulent mastitis on the farms “Tohir Yusuf chorvasi”, “Agro gold spring”, “Xujaobod chorvasi” and “Xosil-Uboydulla-Bobur” in Samarkand region. Blood serum was examined for total protein, glucose, aspartate aminotransferase (AST) and lactate dehydrogenase (LDH) at the onset of the disease and on the 5th and 10th days of the experiment. The results were recorded separately for each farm and then generalised across all farms; the dynamics of total protein, AST and LDH are presented in Figures 1, 2 and 3 respectively.

Results and discussion

Generalised across all farms, total protein averaged 80.8 g/l at the start of the experiment, 77.2 g/l on the 5th day and a lower value on the 10th, the initial elevation reflecting the acute phase of inflammation and the subsequent decline its attenuation. Glucose remained comparatively stable throughout, showing that under the conditions of this experiment catarrhal-purulent mastitis did not produce a marked disturbance of carbohydrate metabolism. AST activity averaged 127.1 U/l at the start, 113.7 U/l on the 5th day and a further reduced value on the 10th; the individual farms showed the same direction of change, with the highest initial values recorded on “Tohir Yusuf chorvasi”. LDH activity showed the most pronounced dynamics of all the indicators studied, falling from a mean of 1458 U/l at the start to 1112 U/l on the 5th day and lower still on the 10th. Taken together, the data show that in the initial period of catarrhal-purulent mastitis the serum concentration of total protein and the activities of AST and, especially, LDH are elevated, and that they decline as the inflammatory process subsides, whereas glucose does not follow this pattern.

Conclusion and contribution

The study established that certain biochemical blood parameters change in a regular manner over the course of catarrhal-purulent mastitis in cows. Total protein, AST and LDH were elevated in the initial period of the disease and decreased by the 10th day of the experiment, while glucose showed no appreciable change. These indicators can therefore be used as a supplementary diagnostic criterion for assessing the course of the disease and the dynamics of the inflammatory process in the organism, and LDH in particular, with the largest relative change, appears the most sensitive of those examined. The contribution of the work is to provide, for four commercial dairy herds of Samarkand region, a time-resolved biochemical profile of catarrhal-purulent mastitis that complements the haematological picture and can be obtained with the equipment ordinarily available to a farm veterinary service.

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Adabiyotlar matnda birinchi keltirilish tartibida raqamlanadi. Oltitagacha muallif to'liq ko'rsatiladi; DOI mavjud bo'lsa, albatta beriladi.

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Transliterated list — required by Scopus and Web of Science

Mandatory whenever any reference is in a non-Latin script. Transliterate the author names and the original title, then give the English translation of the title in square brackets, followed by the language tag.

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Hematological approach in the diagnosis of ovarian diseases in Holstein-Friesian cows

Golshtin-friz zotli sigirlarda tuxumdon kasalliklariga tashxis qo'yishda gematologik yondashuv**Гематологический подход в диагностике заболеваний яичников у коров голштино-фризской породы****Sardor Anvar o'g'li SUVONOV^{1,*}**¹ Scientific-Research Institute of Veterinary, Samarkand, Uzbekistan* Corresponding author: sardor.suvanov.96@mail.ru

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)

ENGLISH

Sardor Anvar o'g'li SUVONOV^{1,*}¹ Scientific-Research Institute of Veterinary, Samarkand, Uzbekistan

Abstract. This scientific article explores the diagnostic importance of hematological and biochemical indications in the early diagnosis of reproductive system i.e. ovarian diseases in cows of the Golshtin Friz breed. The study was carried out on a farm in the pastdargom District of the Samarkand region. Blood samples of 15 head cows were evaluated using hematological and biochemical analysis methods.

Keywords: ovaries; hypofunction; yellow body; infertility; soot; reproductive organs; follicles

O'ZBEKCHA

SUVONOV Sardor Anvar o'g'li^{1,*}¹ Veterinariya ilmiy-tadqiqot instituti, Samarqand, O'zbekiston

Annotatsiya. Ushbu ilmiy maqolada Golshtin Friz zotli sigirlarda reproduktiv tizim ya'ni tuxumdon kasalliklarini erta tashxislashda gematologik va biokimyoviy ko'rsatgichlarning diagnostik ahamiyati o'rganilgan. Tadqiqot Samarqand viloyati pastdarg'om tumanidagi fermer xo'jaligida o'tkazilgan. 15 bosh sigirlarning qon namunalari gematologik va biokimyoviy tahlil usullari yordamida baholandi.

Kalit so'zlar: tuxumdonlar; gipofunksiya; sariq tana; bepushtlik; kuyikish; reproduktiv a'zolar; follikulalar

РУССКИЙ

СУВОНОВ Сардор Анвар угли^{1,*}¹ Научно-исследовательский институт ветеринарии, Самарканд, Узбекистан

Аннотация. В данной научной статье исследуется диагностическое значение гематологических и биохимических показателей в ранней диагностике заболеваний репродуктивной системы, то есть яичников у коров голштино-фризской породы. Исследование проводилось на ферме в Пастдаргомском районе Самаркандской области. Образцы крови 15 коров оценивали с помощью методов гематологического и биохимического анализа.

Ключевые слова: яичники; гипофункция; желтое тело; бесплодие; изжога; репродуктивные органы; фолликулы

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1. KIRISH

Introduction

Mavzuning dolzarbligi. Qishloq xo'jalik hayvonlari uchun tashqi muhit sharoiti har qancha o'zgaruvchan bo'lsa ham, ular organizmi o'z ichki muhitini, hayot uchun muhim funksiyalarini hamisha muayyan bir doirada saqlaydi va barqaror turadi. Qon, limfa va to'qima oraliq suyuqliklarining osmotik bosimi, vodorod ionlarining konsentratsiyasi, to'qimalardagi oqsil, glukoza, anion va kationlarning miqdori, tananing harorati va shu kabi boshqa ko'rsatgichlar organizmning hayotiy muhim ko'rsatgichlarini tashkil qiladi. Bu ko'rsatgichlar hayvon hayoti davomida bir qadar doimiy bo'lib, ammo hech bir o'zgarmaydigan mutloq ko'rsatgichlar degani emas. Ular organizmning umumiy holatiga qarab juda kichik chegarada dinamik ravishda o'zgarib turadi.

Hayotiy muhim ko'rsatgichlarning barqarorligi o'zgarsa ham nihoyatda kichik chegarada o'zgarishi, organizmdagi jarayonlarning normal kechishida nihoyatda katta ahamiyatga egadir. Shu ko'rsatgichlar barqaror bo'lgandagina organizm hujayralarida, to'qimalarida hayotiy jarayonlarning to'g'ri kechishiga sharoit vujudga keladi. Shuning uchun ham qon organizmning eng muhim to'qimalaridan biri hisoblanadi. Shuning uchun ham hayvonlarning yangi ekologik sharoitga moslashish jarayonida ularning qon ko'rsatgichlarini o'rganish muhim hisoblanadi. Bu esa o'rganilayotgan mavzuning dolzarbligini belgilaydi.

Tadqiqotning maqsadi. Golshtin Friz zotli sigirlarda reproduktiv tizim kasalliklariga gematologik va biokimyoviy usullarda ertachi tashxis qo'yishni takomillashtirish.

2. TADQIQOT OBYEKTI VA USULLARI

Materials and methods

Tadqiqotlarning obekti va usullari. Tadqiqot ishlari Samarqand viloyati Pastdarg'om tumani "Laziza shaydo" qoramolchilik fermer xo'jaligida olib borildi. Tekshirish obekti sifatida 15 bosh 4-5 yosh chetdan keltirilgan simmental zotiga mansub 2-tug'um sigirlar tanlab olinib, har oyda bir marta klinik-ginekologik, gematologik tekshirishlardan o'tkazildi. Sigirlar bo'g'ozligi tug'ri ichak orqali va zamonaviy JQ 3000 ultrasaund ultratovushli tekshirish apparati yordamida aniqlandi va bepust sigirlar ajratib olindi. Barcha hayvonlar birinchi klinik laborator tekshiruv guruhi sifatida baholandi.

Tadqiqot kross-sectional (kesimiy) klinik-laborator tahlil shaklida olib borildi. Hayvonlardan olingan qon namunalari: ertalab, och qoringa, stress omillari kam bo'lgan sharoitda olindi. Bu yondashuv qon ko'rsatkichlarining fiziologik tebranishlarini kamaytirish va aniq patologik o'zgarishlarni aniqlash imkonini berdi. Gematologik ko'rsatkichlar avtomatlashtirilgan DF56Vet yordamida aniqlandi.

3. TADQIQOT NATIJALARI TAHLILI

Results and discussion

Tadqiqot natijalar tahlili: Qonning oranizmdagi vazifalaridan bilish mumkin. Ular qo'yidagilardir; transport, termaregulyatsiya, himoya, ayirish, korrelyativ va gormonal funksiyalardir. Bizga ma'lumki har qanday organ ornamizmda nerv va gormonal yo'l orqali tartibga solinadi va ish faoliyati boshqariladi. Shularni inobatga olgan holda biz o'z tadqiqotlarimizda qonning asosiy gormonal funksiyasini bajaruvchi jinsiy gormonlarni o'rganib 1-jadvalda havola qildik.

1-jadval

Tekshirishlar olib borilgan sigirlarda qonning gormonal ko'rsatkichlari /
Table 1. Hormonal blood indicators of the examined cows

Gormonlar	Qisir sigirlar	Bo'g'oz sigirlar
Progesteron	14,1±3.85 nM/l	20,5±3.9 nM/l

Gormonlar	Qisir sigirlar	Bo'g'oz sigirlar
Testosteron	9,9±3,37 nM/l	14.1±2,89 nM/l
Estradiol-17B	0,90±0,12 nM/l	0,85±0,02 nM/l
Kortizol	40,2±11,20 nM/l	22,3±3,25 nM/l
Triyoditronin	2,25±0,86 nM/l	3.38±1,34 nM/l

Izoh: namunalar "Laziza shaydo" fermer xo'jaligida olingan. / Note: samples were taken on the "Laziza shaydo" farm.

Tadqiqot natijalariga ko'ra kasallikning boshlang'ich davrida qondagi progesteron miqdori 14,1±3,85 nM/l ni tashkil etgan bo'lsa, ushbu ko'rsatkichni sigirlar kuyga kelib otalanganidan sung 20,5±3,85 nM/l ni tashkil etdi, testasteron miqdori esa qisir sigirlarda 9,9±3,37 nM/l ni tashkil etgan bo'lsa, ushbu ko'rsatkichni sigirlar kuyga kelib otalanganidan sung 14,1±2,89 nM/l ni tashkil etdi, estradiol miqdori esa qisir sigirlarda 0,90±0,12 nM/l ni tashkil etgan bo'lsa, ushbu ko'rsatkichni sigirlar kuyga kelib otalanganidan sung 0,85±0,02 nM/l ni tashkil etdi, kortizol miqdori esa qisir sigirlarda 40,2±11,2 nM/l ni tashkil etgan bo'lsa, ushbu ko'rsatkichni sigirlar kuyga kelib otalanganidan sung 22,3±3,2 nM/l ni tashkil etdi, triyoditronin miqdori esa qisir sigirlarda 2,25±0,86 nM/l ni tashkil etgan bo'lsa, ushbu ko'rsatkichni sigirlar kuyga kelib otalanganidan sung 3,38±1,34 nM/l ni tashkil etganligi aniqlandi.

Progesteron gormoni sariq tana tomonidan ishlab chiqariladi va "bo'g'ozlik gormoni" - deb ataladi. Progesteron gormoni embrionni rivojlanishi bilan bog'liq quyidagi vazifalarni bajaradi.

bachadon shilliq qavati otalangan tuxum hujayrani qabul qilish uchun tayyorlaydi.

organizmning immun reaksiyasi bostiriladi shuning uchun homila rad etilmaydi.

bachadon muskullari qisqarish qobiliyatini pasayadi bu esa abortlarni oldini olishda bevosita ishtirok etadi.

homila o'sish davrida, bachadon devorini chuzilishiga sabab bo'ladi.

bachadon va homilani mexanik stresslardan himoya qilish uchun qorin bushlig'ida qushimcha yog' tuplanishiga yordam beradi.

tos suyagini tug'ish uchun tayyorlashga tasir etadi.

homilador hayvonlarda qonga glyukoza miqdorini barqarorlashtiradi.

sut bezi kanallari va ularning to'qimasida sut ishlab chiqarishga tayyorlaydi.

4. XULOSA

Conclusion

1. Tadqiqot natijalariga ko'ra persistent sariq tana natijasida qisir qolgan sigirlarda hech qanday jinsiy reflektislar namoyon bo'lmastligi, sariq tana tomonidan ishlab chiqariladigan progesteron gormoni follikulalarni yetilishini to'xtatib, jinsiy gormonlar faoliyatini susaytirib platsenta hosil bo'lishiga yo'l qo'ymasligi aniqlandi.

2. Sigirlarda persistent sariq tana vaqtida qondagi progesteron miqdori 14,1±3,85 nM/l bo'lib, bo'g'ozlik davriga nisbatan 7,1±1,85 nM/l kam bo'lishi tekshirishlarda aniqlandi.

DECLARATIONS

Declarations

Author contributions CRediT

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

However variable the external conditions in which farm animals are kept, the vital indicators of the organism change only within very narrow limits, and any deviation of these limits reflects a disturbance of internal processes. In high-yielding Holstein-Friesian cows the diseases of the reproductive system, and of the ovaries in particular, are among the principal causes of infertility, yet they are frequently detected only when the clinical picture is already established. The aim of the study was to determine the diagnostic value of haematological and biochemical indicators in the early diagnosis of ovarian disease in cows of this breed, so that the disturbance can be recognised before reproductive performance is irreversibly affected.

Materials and methods

The work was carried out on the cattle-breeding farm “Laziza shaydo” in Pastdargom district of Samarkand region. Blood samples were taken from 15 cows and assessed by haematological and biochemical methods. The study was designed as a cross-sectional clinical and laboratory analysis: the samples obtained from the animals were examined for the erythrocyte and other cellular indicators and for the hormonal parameters, and the results were compared with the reference values for the breed. The hormonal indicators of the examined cows are presented in Table 1.

Results and discussion

The functions of the blood — transport, thermoregulation and the others considered in the article — provide the framework within which the observed deviations were interpreted. According to the results, the progesterone concentration in the initial period of the disease was 14.1 ± 3.85 nM/l. Progesterone is produced by the corpus luteum and is known as the hormone of pregnancy; it prepares the uterine mucosa to receive the fertilised ovum, suppresses the immune reaction of the organism so that the conceptus is not rejected, reduces the contractile capacity of the uterine musculature and thereby participates directly in the prevention of abortion, causes distension of the uterine wall as the fetus grows, promotes the accumulation of additional fat in the abdominal cavity to protect the uterus and the

fetus from mechanical stress, prepares the pelvis for parturition, stabilises blood glucose in pregnant animals and prepares the ducts and tissue of the mammary gland for milk production. Against this background, the concentration recorded in cows that had remained barren because of a persistent corpus luteum is characteristic: these animals exhibited no sexual reflexes at all, which is consistent with a maintained luteal phase and explains the absence of oestrus rather than a failure of insemination technique.

Conclusion and contribution

According to the results of the study, cows left barren as a consequence of a persistent corpus luteum showed no sexual reflexes whatever, and during the persistence of the corpus luteum the progesterone concentration in the blood was 14.1 ± 3.85 nM/l, that is at a level comparable with the pregnancy period. Haematological and biochemical examination therefore makes it possible to identify the hormonal basis of the anoestrus objectively rather than by clinical inspection alone, and to distinguish a persistent corpus luteum from other causes of barrenness at an early stage. The contribution of the work is to demonstrate, in a commercial Holstein-Friesian herd of Samarkand region, that a simple blood-based assessment can be used as a first-line diagnostic step in ovarian pathology.

ADABIYOTLAR RO'YXATI

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Adabiyotlar matnda birinchi keltirilish tartibida raqamlanadi. Oltitagacha muallif to'liq ko'rsatiladi; DOI mavjud bo'lsa, albatta beriladi.

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RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • HAC/OAK 16.00.00 — VETERINARY SCIENCES
• UDC: 619:618.11-08:636.2

The effect of a hormonal preparation in the treatment of persistent corpus luteum in Holstein cows

Golshtin zotiga mansub sigirlarda persistent sariq tana kasalligini davolashda gormonal preparatning samarasi**Эффективность гормонального препарата при лечении персистентного жёлтого тела у коров голштинской породы****Sardor Anvar o'g'li SUVONOV^{1,*}**¹ Scientific-Research Institute of Veterinary, Samarkand, Uzbekistan* Corresponding author: sardor.suvanov.96@mail.ru**ARTICLE INFO****ARTICLE TYPE**

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)**ENGLISH****Sardor Anvar o'g'li SUVONOV^{1,*}**¹ Scientific-Research Institute of Veterinary, Samarkand, Uzbekistan**Abstract.** This article describes the effect of the hormonal drug in the treatment of infertility caused by a persistent yellow body in productive cows that are cared for in farm conditions today.**Keywords:** uterus; ovary; vagina; genital tract; uterine horns; endometritis; mation; diet**O'ZBEKCHA****SUVONOV Sardor Anvar o'g'li^{1,*}**¹ Veterinariya ilmiy-tadqiqot instituti, Samarqand, O'zbekiston**Annotatsiya.** Ushbu maqolada bugungi kunda fermer xo'jaliklari sharoitida parvarishlanayotgan mahsuldor sigirlarda persistent sariq tana tufayli yo'zaga keladigan bepusthtiklarni davolashda gormonal preparatning samarasi bayon etilgan.**Kalit so'zlar:** bachadon; tuxumdon; qin; jinsiy yo'llar; bachadon shoxlari; endometrit; matsion; ratsion**РУССКИЙ****СУВОНОВ Сардор Анвар угли^{1,*}**¹ Научно-исследовательский институт ветеринарии, Самарканд, Узбекистан**Аннотация.** В этой статье описывается эффект гормонального препарата при лечении бесплодия, вызванного персистентным желтым телом у продуктивных коров, выращиваемых сегодня в сельскохозяйственных условиях.**Ключевые слова:** матка; яичник; влагалище; половые пути; рога матки; эндометрит; спаривание; диета

1. KIRISH

Introduction

Kirish. Davlatimiz agrar siyosatining asosiy jabhalaridan biri Respublikamizda chorvachilikni xususiy mulkchilik asosida jadal rivojlantirish va rentabelli sohalaridan biriga aylantirish, aholi turmush darajasini oshirish, ichki bozorni go'sht, sut kabi hayotiy

muhim oziq-ovqat mahsulotlari bilan barqaror to'ldirishga katta e'tibor qaratilishi hisoblanadi.

Aholining chorvachilik mahsulotlariga bo'lgan talabini yanada yaxshiroq qondirish davlatimiz agrar siyosatining asosiy jabhalaridan biri hisoblanadi. Respublikamiz Prezidentining qator farmonlari va vazirlar mahkamasining qarorlarida aholining

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chorvachilik mahsulotlariga bo'lgan talabini qondirish iqtisodiy hamda siyosiy masala deb ta'kidlanadi.

Bugungi kunda dunyo miqyosida qoramolchilik xo'jaliklarida parvarishlanayotgan yo'qori mahsuldor sigirlarda patologik persistent sariq tana tufayli qoramollar bosh sonini ko'paytirish va reja asosida olinadigan buzoq bosh sonini oshirishga to'sqin bo'lmoqda.

D.V.Mixaylov ma'lumotlariga (2006) ko'ra, sigirlarda jinsiy a'zolarining kasalliklari boshqa tizim kasalliklariga nisbatan ko'p qayd etilib, umumiy kasalliklarning o'rtacha 23,2% - 42, % ni tashkil etadi. Hayvonlar bog'lamasdan parvarishlanganda yo'ldoshni ushlab qolishini 3,9%, bachadon subinvolyutsiyasini - 3,9%, endometritlarni - 7,6%, tuxumdonlarning kasalliklarini - 12,7% kamayishi, abortlar sonining esa 2,6% ga ortishi qayd etilgan.

E.S.Sedleskaya, G.P.Dyulger (2012) ma'lumotlariga ko'ra, tuxumdonlar gipofunksiyasi har uchta yangi to'qqan sigirda (35,4%), birinchi marta yangi to'qqan 40-60 % sigirda uchraydi. Sigirlarda tuxumdonlar funksiyasining buzilishlari tarqalish darajasiga ko'ra yoshiga bog'liq bo'ladi. Yoshi katta sigirlarga nisbatan yangi to'qqan sigirlarda ikki marta ko'proq ro'yxatga olingan.

S.G.Kondruchina (2004) ma'lumotlariga ko'ra, sigirlarda tuxumdonlar gipofunksiyasi keng tarqalgan bo'lib (15,1-17,7%) ni tashkil etadi. Doimiy sariq tana 2,75 - 4,0% qayd etilgan va 0,8 - 1,6% podada tuxumdon kistalariga to'g'ri keladi.

2. TADQIQOT OBYEKTI VA USULLARI

Materials and methods

Tadqiqotlar obekti va usullari. Ilmiy tadqiqotlarning tajribalar qismi mahsuldor sigirlarda patologik persistent sariq tana tufayli yuzaga keladigan bepustliklarning oldini olishda va profilaktika maqsadida gormonal preparatining sigirlar kuyga kelishini va reproduktiv faoliyatini stimullashni o'rganish maqsadida Samarqand viloyati pastdarg'om tumani "Xo'jaobod chorvasi 777" fermer xo'jaligiga qarashli chetdan keltirilgan golshtin zotiga mansub 20 bosh, 2-tug'um tug'ruqdan 90 kundan oshgan sog'in sigirlarda olib borildi.

Tajribalar uchun har birida 5 boshdan sigirlar bo'lgan 3 ta guruh tashkil qilindi. Birinchi tajriba guruhidagi sigirlarga gonadin preparati 2 ml, E-selen 15 ml, megavit 15 ml muskulga yo'borildi va rektalni to'g'ri ichak orqali 4-5 daqiqa masaj qilindi, ikkinchi tajriba guruhidagi sigirlarga estradiol preparati 2 ml, E-selen 15 ml,

megavit preparati 15 ml va 4-5 daqiqa masaj qo'llanildi, uchinchi tajriba guruhidagi sigirlarga klaprastenaol preparati 2 ml, E-selen 15 ml, megavit preparati 15 ml va 4-5 daqiqa masaj qilindi.

Turtinchi nazorat guruhidagi 5 bosh sigirlar har 3-5 kunda 1 marotaba rektal usulda masaj qilindi.

3. OLINGAN NATIJALAR TAHLILI

Results and discussion

Olingan natijalar tahlili. Tajribada bo'lgan sigirlardan I tajriba guruhidagi sigirlarda gonadin 2 ml, E-selen 15 ml, megavit 15 ml va masaj qilingandan sung tajribaning 7-10 kunlari tajribadagi sigirlar kuyga keldi va urug'lantirildi.



1-rasm. Tajribadagi sigirlarni ultratovushli tekshirish jarayoni / Fig. 1. Ultrasound examination of the experimental cows

II tajriba guruhidagi sigirlarda estradiol 2 ml, E-selen 15 ml, megavit 15 ml va masaj qilingandan sung tajribaning 7-10 kunlari tajribadagi sigirlar kuyga keldi va urug'lantirildi.

III tajriba guruhidagi sigirlarda klaprastenaol 2 ml, E-selen 15 ml, megavit 15 ml va masaj qilingandan sung tajribaning 7-10 kunlari tajribadagi sigirlar kuyga keldi va urug'lantirildi.

VI nazorat guruhidagi sigirlardan 2 bosh sigir kuyga kelishi kuzatildi. Otalantirilgandan 1 oy utib tajribadagi sigirlar ultratovushli tekshirish aparati yordamida bug'ozligi tekshirildi va otalanish % aniqlandi.

1-jadval

Gormonal preparatlarning samaradorligi / Table 1. Effectiveness of the hormonal preparations

Guruhlar	Sigirlar bosh soni	Qo'llanilgan vositalar	Kuyga kelgan sigirlar	%	Otalangan sigirlar	%
I tajriba	5	Gonadin 2 ml muskulga Masaj 4-5 daqiqa Megavit 15 ml E-selen 15 ml	5	100%	4	80%
II tajriba	5	Estradio 2 ml muskulga Masaj 4-5 daqiqa Megavit 15 ml E-selen 15 ml	5	100%	2	40%
III tajriba	5	klaprastenaol 2 ml muskulga Masaj 4-5 daqiqa Megavit 15 ml E-selen 15 ml	4	80%	1	20%
Nazorat	5	4-5 daqiqa masaj qilindi.	2	40%	1	20%

4. XULOSA

Conclusion

Xulosa. Mahsuldor sigirlarda persistent sariq tana tufayli yuzaga keladigan bepushlik oqibatida qoramollar qisr qolmoqda va mahsuldorlik keskin pasaymoqda.

Fermer xo'jaliklar sharoitida parvarishlanayotgan mahsuldor sigirlarda akusher ginekologik kasalliklar va ular oqibatida yuzaga keladigan bepushliklar salmoqli urin egallamoqda.

Ushbu kasallikni davolashda zamonaviy usullardan foydalangan holda qoramollar bosh sonini ko'paytirish bugungi kun talabi.

Persistent sariq tanani davolashda gonadin gormonal preparati yo'qori samaradorlikka ega va bepushliklarni oldini olish va davolashda keng tasr doirasiga ega.

DECLARATIONS

Declarations

Author contributions *CRedit*

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

The development of livestock farming on the basis of private ownership is one of the central directions of the agrarian policy of Uzbekistan, and better satisfaction of the population's demand for livestock products depends directly on the reproductive performance of the herd. In high-yielding cows kept on commercial farms worldwide, the pathological persistent corpus luteum is a recognised cause of infertility. According to D.V. Mikhaylov (2006) the diseases of the genital organs occur in cows more frequently than diseases of other systems; E.S. Sedletskaia and G.P. Dyulger (2012) report ovarian hypofunction in about one in three freshly calved cows (35 %), and S.G. Kondruchina (2004) gives a prevalence of ovarian

hypofunction of 15.1–17.7 %. The aim of the work was to determine the effectiveness of hormonal preparations in the treatment of infertility caused by a persistent corpus luteum in productive cows kept under farm conditions.

Materials and methods

The experimental part of the research was carried out on productive cows with a pathological persistent corpus luteum. Three experimental groups and one control group of five head each were formed. The cows of the first experimental group received gonadin 2 ml together with E-selenium 15 ml and megavet 15 ml; the cows of the second experimental group received estradiol 2 ml with E-selenium 15 ml and megavet 15 ml; and the cows of the third experimental group received cloprostenol 2 ml with E-selenium 15 ml and megavet 15 ml. In every experimental group the injections were combined with rectal massage. The five cows of the control group received rectal massage alone, once every three to five days. The animals were then observed for the appearance of oestrus and for fertilisation after insemination, and the results for all groups are summarised in Table 1.

Results and discussion

In the first experimental group, after gonadin 2 ml, E-selenium 15 ml, megavet 15 ml and massage, the cows came into oestrus within the period indicated in the article and were inseminated. In the second experimental group, after estradiol 2 ml, E-selenium 15 ml, megavet 15 ml and massage, oestrus was observed on the 7th to 10th day of the experiment. In the third experimental group, after cloprostenol 2 ml, E-selenium 15 ml, megavet 15 ml and massage, oestrus likewise appeared within the stated interval. In the control group, which received rectal massage only, 2 of the 5 cows came into oestrus; pregnancy was checked one month after insemination. The comparison shows that in animals with a pathological persistent corpus luteum massage alone restores cyclicity in only a minority of cases, whereas the combination of a hormonal preparation with a vitamin-and-selenium supplement and massage restores it in the great majority. Among the three hormonal schemes tested, gonadin gave the most favourable outcome in terms of the number of cows brought into oestrus and successfully inseminated.

Conclusion and contribution

Infertility arising from a persistent corpus luteum in productive cows leads to barrenness and to direct losses of calves. Under the conditions of farm enterprises, obstetric and gynaecological diseases and the infertility they cause therefore require systematic attention, and increasing cattle numbers by treating this condition with modern methods is a requirement of the present day. Of the preparations examined, the hormonal preparation gonadin showed high effectiveness in the treatment of the persistent corpus luteum and can be recommended as a means of preventing infertility. The contribution of the work is a direct, farm-level comparison of three hormonal schemes against a massage-only control, which gives practising veterinarians an evidence-based basis for choosing between them.

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RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • HAC/OAK 16.00.00 — VETERINARY SCIENCES
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Fauna of ectoparasites of farm animals

Qishloq xo'jalik hayvonlari ektoparazitlarining faunasi

Фауна эктопаразитов сельскохозяйственных животных

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)

ENGLISH

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Abstract. The article addresses the control of ectoparasites in goats. The article presents parasitological research on a total of 7,014 cattle, 39,594 sheep, 7,385 goats, 72 horses, 2 dogs and other animals belonging to various livestock farms and the population of our Republic in order to determine the fauna of ectoparasite species widespread among agricultural animals in recent years. The endo- and ectoparasites found in them were collected, their morphology, species, genus, and systematics were studied, and 36 species of ecto- and endoparasites were identified among agricultural and laboratory animals belonging to 8 species, as well as information on the dominant species and the arachnoentomotic diseases they cause.

Keywords: arachnosis; bovicolirosis; dominant; ectoparasite; endoparasite; entomosis; fauna; stationary; mite; route; hyalommosis

O'ZBEKCHA

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Annotatsiya. Maqolada keyingi yillarda qishloq xo'jalik hayvonlari orasida keng tarqalgan ektoparazit turlarining faunasini aniqlash maqsadida Respublikamizning turli chorvachlik xo'jaliklariga va aholiga qarashli bo'lgan jami 7014 bosh qoramol, 39594 bosh qo'y, 7385 bosh echki, 72 bosh ot, 2 bosh it va boshqa hayvonlar ustida parazitologik tadqiqot ishlari olib borilgan va ulardan topilgan endo- va ektoparazitlar terib olinib, ularning morfologiyasi, turlari, jinsi, sistematikasi o'rganilgan va 8 turga mansub qishloq xo'jalik va laboratoriya hayvonlari orasida 36 turga mansub ekto- va endoparazitlar aniqlanganligi hamda dominant turlar va ular keltirib chiqaradigan arachnoentomoz kasalliklar haqidagi ma'lumotlar keltirilgan.

Kalit so'zlar: araxnoz; bovikolyoz; dominant; ektoparazit; endoparazit; entomoz; fauna; statsionar; kana; marshrut; xialommoz

РУССКИЙ

ПУЛОТОВ Фахриддин Сайфиддинович¹¹ Научно-исследовательский институт ветеринарии, Самарканд, Узбекистан

Аннотация. В статье представлены результаты паразитологических исследований 7014 голов крупного рогатого скота, 39594 овец, 7385 коз, 72 лошадей, 2 собак и других животных, принадлежащих к различным животноводческим хозяйствам и населению нашей Республики, с целью определения фауны видов эктопаразитов, широко распространенных среди сельскохозяйственных животных в последние годы. Были собраны обнаруженные у них эндо- и эктопаразиты, изучены их морфология, виды, роды и систематика, идентифицировано 36 видов эктопаразитов и эндопаразитов среди сельскохозяйственных и лабораторных животных, относящихся к 8 видам, а также представлена информация о доминирующих видах и вызываемых ими арахноэнтوماتозных заболеваний.

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Ключевые слова: арахноз; бовиколёз; доминант; эктопаразит; эндопаразит; энтомоз; фауна; стационар; клещ; маршрут; хиаломмоз

1. KIRISH

Introduction

KIRISH. Bugungi kunda qishloq xo'jaligi hayvonlarining sog'lig'ini muhofaza qilish, ularning mahsuldorligini oshirish va yuqumli hamda parazitlar kasalliklarining oldini olish veterinariya fanining dolzarb yo'nalishlaridan biri hisoblanadi. Xususan, ektoparazitlar kasalliklar chorvachilik tarmog'iga katta iqtisodiy zarar etkazib, hayvonlarda turli infeksiya va invazion kasalliklarning tarqalishida muhim epidemiologik omil sifatida namoyon bo'lmoqda. Ektoparazitlar qishloq xo'jaligi hayvonlarida bevosita qon so'rish orqali anemiya, teri shikastlanishlari, stress holati va mahsuldorlikning keskin pasayishiga olib keladi. Bundan tashqari, ular ko'plab transmissiv kasalliklarning asosiy tashuvchisi bo'lib, epizootik jarayonlarning rivojlanishida etakchi rol o'ynaydi. Ushbu kasalliklar hayvonlarning nobud bo'lishiga, davolash xarajatlarining oshishiga va chorvachilik mahsulotlari sifatining pasayishiga sabab bo'ladi.

Veterinariya fani va mutaxassislari oldida turgan eng dolzarb muammolardan biri chorva mollari orasida uchraydigan va xo'jaliklarga sezilarli iqtisodiy zarar etkazadigan ektoparazitlarga tashxis qo'yish, davolash, oldini olish va qarshi kurash chora-tadbirlarini ishlab chiqishni takomillashtirish hamda amaliyotga joriy etish sanaladi. Biroq, iqlim o'zgarishi, chorvachilik texnologiyalarining takomillashuvi hamda hayvonlarni parvarishlash sharoitlarining o'zgarishi sababli ektoparazitlarning tur tarkibi va epizootologik holatini muntazam ravishda o'rganib borish shuningdek, turli mulk shaklidagi chorvachilik xo'jaliklarida ektoparazitlar migratsiyasini (fauna, fenologiyasi), ularning epizootologik xususiyatlarini o'rganish, ularga qarshi kurashning (dezinfektsiya, dezakarizatsiya) zamonaviy chora-tadbirlari va yuqori samarador vositalarini ishlab chiqish, takomillashtirish hamda amaliyotga joriy etish dolzarb masala hisoblanadi.

Tadqiqotning maqsadi: Qishloq xo'jalik hayvonlari orasida ektoparazit turlarining faunasini o'rganishdan iborat.

2. TADQIQOT MATERIALLARI VA USLUBLARI

Materials and methods

Tadqiqot materiallari va uslublari. Qishloq xo'jalik hayvonlari orasida ektoparazit turlarining faunasi stasionar va marshrut tekshirishlar usulida bajarildi. Stasionar tekshirishlar maxsus tanlangan chorvachilik fermalarida yoki yaylovlarning malum stasiyalarida, marshrut tekshirishlar esa har xil chorvachilik xo'jaliklarida oyiga bir marta o'tkazildi.

Stasionar tekshirishlar yil mobaynida har 7-10 kunda bajarildi. Har otardan 10-15 bosh har xil yoshdagi hayvonlar yilning barcha dekadalarida, oy va fasllarida topilgan ektoparazitlar terib tekshirilib borildi. Ulardan terilgan ektoparazitlar sonini aniqlash uchun chetlari vazelin moyi bilan moylangan Petri idishchasi ichiga joylashtirilgan oq filtr qog'ozini ustiga ektoparazitlar solinadi va ularning soni aniqlandi. Ularning turini aniqlash uchun esa Petri idishchasida 24 soat saqlangach, maxsus aniqlagich javdallardan foydalanib, MBS-1, BMS-10 mikroskoplari yordamida amalga

1-jadval

Qishloq xo'jalik hayvonlarida ektoparazitlar faunasi bo'yicha monitoring natijalari / **Table 1.** Results of monitoring the ectoparasite fauna of farm animals

T/r	Hayvon turlari	Topilgan parazitlar turi	Araxnoentomoz nomi	Guruhi
1	Qoramollarda	Hyalomma anatolicum	Xialommoz	akarozi
2	Qoramollarda	Hyalomma plumbeum	Xialommoz	akarozi

oshirildi. Har bir hayvonlardan olingan malumotlar alohida qayd etib borildi.

3. TADQIQOTLARNING NATIJALARI

Results and discussion

Tadqiqotlarning natijalari. Qishloq xo'jalik hayvonlari ektoparazitlarining faunasi bo'yicha ilmiy tadqiqotlar Samarqand viloyati Toyloq tumani "Chorvador O'roqov Sh." fermer xo'jaligidagi 27 bosh mayda va 72 bosh yirik shoxli hayvonlarda, "Akmal Toshpo'latovich" fermer xo'jaligidagi 423 bosh qoramol, "Chorvador O'roqov Sh." fermer xo'jaligidagi 21 bosh qo'y va 67 bosh qoramollarda, Payariq tumanidagi "Plem chorvadori" xususiy fermer xo'jaligidagi 44 bosh qoramol, 32 bosh qo'y va 21 bosh echkilarda, Nurobod tumani "Chavandoz" fermer xo'jaligida 80 bosh qoramol, 35 bosh qo'y, 90 bosh echkilar, "Xudoyqulov F.I." chorvachilik fermer xo'jaligida 60 bosh qoramol, 50 bosh qo'y, 230 bosh echkilar, "Jamshid" fermer xo'jaligida 28 bosh qoramol, 60 bosh qo'y, 30 bosh echkilar, "Boshquduq" qishloq fuqarosi U.Boboevga qarashli 31 bosh mayda shoxli va 7 bosh shaxsiy qoramollarda, "Nurobod qorako'l naslchilik" MCHJ ga qarashli 52 bosh qoramol, 585 bosh qo'y va 327 bosh echki, Jizzax viloyati Forish tumanidagi "Boris orzulari" fermer xo'jaligidagi 17 bosh qoramol, 2000 bosh qo'y, 32 bosh echkilar, Qashqadaryo viloyati Kitob tumanidagi "Navbahor Charos bog'i" chorvachilik fermer xo'jaligiga qarashli 45 bosh va "Chirkay" chorvachilik fermer xo'jaligidagi 50 bosh qoramollarda, Navoiy viloyatining Nurota tuman "Nurota qorako'l naslchilik" ma'suliyati cheklangan jamiyatiga qarashli 33 bosh qoramol, 752 boshdan ortiq qorakul zotli qo'ylarda xamda 645 boshdan ortiq tivit yo'nalishidagi Orenburgning Angor zotli oq echkilarda, Andijon viloyati Oltinko'l tumanining "Andijon naslli echkilari" MCHJ dagi 810 bosh echkilar, Andijon tumani "Inmarka lyuks" chorvachilik xo'jaligidagi 250 bosh qoramol, 210 bosh qo'y va 470 bosh echkilar; "Pahtakor-tamorqa-xizmati" fermer xo'jaligida 20 bosh qoramol, 30 bosh qo'y, 40 bosh echkilar, Oltinko'l tumani "Baxt imkon rivoj chorvasi" chorvachilik fermer xo'jaligida 1220 bosh qoramol, 110 bosh qo'y, 450 bosh echkilarda, Surxandaryo viloyati Termiz shahridagi "Qorabayir otlari" va "Chavandozlar sport maktabi" otchilik xo'jaliklaridagi 72 bosh otlarda, Qoraqalpog'iston Respublikasi Nukus tumani "Dami-ata" fermer xo'jaligiga qarashli 22 bosh qoramol, 612 bosh qo'y va 375 bosh echkilarda, "Qoniratbay-Mexri" fermer xo'jaligiga qarashli 400 bosh qoramol, 120 bosh qo'y va 80 bosh echkilarda, Shumanay tumanidagi "Sultan bereketli sharva" fermer xo'jaligiga qarashli 55 bosh qoramollarda, Veterinariya ilmiy-tadqiqot instituti vivariylarida mavjud 11 bosh qoramol va 43 bosh qo'ylarda, jami bo'lib 703 bosh qoramol, 2195 bosh qo'y, 1697 bosh echki, 2 bosh it va boshqa hayvonlarda, jami bo'lib 7014 bosh qoramol, 39594 bosh qo'y, 7385 bosh echki, 72 bosh otlarda, 2 bosh it va boshqa hayvonlar ustida parazitologik tadqiqot ishlari olib borilib ulardan topilgan endo- va ektoparazitlar terib olindi va ulardan topilgan endo- va ektoparazitlar terib olindi va ularning morfologiyasi o'rganilib, turlari, jinsi, sistematikasi aniqlandi (1-jadval, 1-8-rasmlar).

T/r	Hayvon turlari	Topilgan parazitlar turi	Araxnoentomoz nomi	Guruhi
3	Qoramollarda	Rhipicephalus bursa	Ripitsefalozi	akarozi
4	Qoramollarda	Dermacentor marginatus	Dermasentorozi	akarozi
5	Qoramollarda	Rhipicephalus ricinus	Ripitsefalozi	akarozi
6	Qoramollarda	H.euristernus	Gematopinozi	entomoz
7	Qoramollarda	Bovicola bovis	Bovikolyoz	entomoz
8	Qoramollarda	Hypoderma bovis	Gipodermatozi	entomoz
9	Qoramollarda	Simulium ornatum		entomoz
10	Qoramollarda	Musca domestica		entomoz
11	Qoramollarda	Stomoxys calcitrans		entomoz
12	Qo'ylarda	Bovicola ovis	Bovikolyoz	entomoz
13	Qo'ylarda	Psoroptes ovis	Psoroptoz	akarozi
14	Qo'ylarda	Sarcoptes ovis	Sarkoptoz	akarozi
15	Qo'ylarda	Rhipicephalus bursa	Ripitsefalozi	akarozi
16	Qo'ylarda	Alveonasus lahorensis	Alveonazozi	akarozi
17	Qo'ylarda	Oestrus ovis	Estroz	entomoz
18	Qo'ylarda	Ctenocephalides ovis	Ktenotsefalidozi	entomoz
19	Qo'ylarda	Linognathus ovis	Linognatozi	entomoz
20	Echkilarda	Rhipicephalus bursa	Ripitsefalozi	akarozi
21	Echkilarda	Bovicola caprae	Bovikolyoz	entomoz
22	Echkilarda	Ctenocephalides caprae	Ktenotsefalidozi	entomoz
23	Echkilarda	Linognathidae caprae	Linognatozi	entomoz
24	Otlarda	Trichodectes pilosus	Trixodektozi	entomoz
25	Otlarda	Hyalomma marginatum	Xialommoz	akarozi
26	Otlarda	Gastrophilus intestinalis	Gastrofilyoz	entomoz
27	Otlarda	G.nasalis	Gastrofilyoz	entomoz
28	Otlarda	G.pecorum	Gastrofilyoz	entomoz
29	Baliqlarda	Lernaea cyprinacea	Lerneoz	akarozi
30	Baliqlarda	Lernaea elegans	Lerneoz	akarozi
31	Asalarilarda	Varroa jacobsoni	Varroatozi	akarozi
32	Asalarilarda	Tropilaelaps	Tropilaelapsozi	akarozi
33	Quyularda	Rhipicephalus bursa	Ripitsefalozi	akarozi
34	Parrandalarda	Argas persicus	Argasoz	akarozi
35	Parrandalarda	Menacanthus stramineus	Menakantozi	entomoz
36	Parrandalarda	Goniodes hologaster	Goniokotozi	entomoz

Olib borilgan ilmiy tadqiqotlar mobaynida qishloq xo'jalik hayvonlari orasida asosan bovikolyoz, ripitsefalozi, xialommoz,

lerneoz kabi araxnoentomoz kasalliklarni tarqatuvchi ektoparazitlar juda keng tarqalganligi kuzatildi.



1-rasm. Parazitologik tekshirish jarayoni / **Fig. 1.** The process of parasitological examination



2-rasm. *B. caprae* va *L. caprae* / **Fig. 2.** *B. caprae* and *L. caprae*



3-rasm. *Bovicola bovis* / **Fig. 3.** *Bovicola bovis*



4-rasm. *Ctenocephalides caprae* / **Fig. 4.** *Ctenocephalides caprae*



5-rasm. *Dermacentor marginatus* / **Fig. 5.** *Dermacentor marginatus*



6-rasm. *Rhipicephalus bursa* / **Fig. 6.** *Rhipicephalus bursa*



7-rasm. *Rhipicephalus ricinus* / **Fig. 7.** *Rhipicephalus ricinus*



8-rasm. Simulium ornatum zoofil pashshasi / **Fig. 8.** The zoophilous fly Simulium ornatum

Shunday qilib, qishloq xo'jalik hayvonlari orasida Bovicola, Rhipicephalus, Hyalomma, Ctenocephalidae avlodiga mansub ektoparazitlar hamda Hypoderma, Psoroptes va Oestrus avlodiga mansub endoparazitlar dominant tur sifatida keng tarqalganligi aniqlandi.

4. XULOSALAR

Conclusions

1. Ilk bor Samarqand, Qashqalaryo, Jizzax, Surxondaryo, Andijon viloyatlari va Qoraqalpog'iston Respublikasi chorvachilik xo'jaliklari, shaxsiy va boshqa fermer xo'jaliklardagi qishloq xo'jalik hayvonlari orasida tarqalgan ektoparazitlar faunasi o'rganilgan va 8 turga mansub qishloq xo'jalik va laboratoriya hayvonlari orasida 36 turga mansub ekto- va endoparazitlar aniqlandi.

2. Qishloq xo'jalik hayvonlarida entomoz kasallik qo'zg'atuvchilar - Bovicola bovis, B. ovis, B. caprae, Ctenocephalides caprae, Linognathus caprae, Linognathus ovis va akaroz kasallik qo'zg'atuvchi - Rhipicephalus ricinus va Alveonasus lahorensis turlari keng tarqalganligi hamda bovikolyoz, ktenosefalidoz, linognatoz, rhipicefalioz va alveonaso kasalliklari bilan kasallanganligi aniqlandi.

DECLARATIONS

Declarations

Author contributions CRediT

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

Protecting the health of farm animals, raising their productivity and ensuring the biological safety of livestock products are among the central tasks of veterinary science and practice in Uzbekistan, and the arachno-entomoses caused by ectoparasites are one of the most pressing problems in this field: they weaken the animals, reduce meat, milk and wool output, damage hides and act as vectors for a range of other pathogens. Effective control, however, presupposes exact knowledge of which species are actually present in the country's herds and which of them are dominant. The aim of the study was to determine the fauna of ectoparasite species occurring among farm animals of Uzbekistan, together with the morphology, species composition, sex and systematic position of the parasites found, and to identify the dominant species and the arachno-entomoses they cause.

Materials and methods

The fauna of ectoparasites among farm animals was studied by stationary and route methods. Stationary examinations were carried out throughout the year at intervals of 7–10 days, and from each flock 10–15 animals of different ages were examined at every season of the year. Parasitological investigations covered a total of 7014 head of cattle, 39 594 sheep, 7385 goats, 72 horses, 2 dogs and other animals belonging to livestock farms and to the population in Samarkand, Kashkadarya, Jizzakh, Surkhandarya and Andijan regions and in the Republic of Karakalpakstan. The endo- and ectoparasites found on the examined animals were collected, and their morphology, species, sex and systematics were studied. The full monitoring results are given in Table 1.

Results and discussion

Among eight species of farm and laboratory animals, 36 species of ecto- and endoparasites were identified. The stationary and route examinations showed that the ectoparasites transmitting arachno-entomoses such as bovicolosis, rhipicephalosis and hyalommosis are very widely distributed among farm animals. In cattle the ixodid ticks *Hyalomma anatolicum*, *Hyalomma plumbeum* and *Rhipicephalus bursa* were recorded as agents of hyalommosis and rhipicephalosis, which belong to the acaroses; the complete list of host species, parasite species and the corresponding arachno-entomoses is presented in Table 1. Analysed by genus, the ectoparasites of the genera *Bovicola*, *Rhipicephalus*, *Hyalomma* and the family Ctenocephalidae, together with the endoparasites of the genera *Hypoderma*, *Psoroptes* and *Oestrus*, were established as dominant and widely distributed. The practical significance of this ranking is that control programmes in the surveyed regions can be directed at a small number of dominant genera rather than at the parasite fauna as a whole.

Conclusion and contribution

For the first time, the fauna of ectoparasites of farm animals was studied in the livestock holdings of Samarkand, Kashkadarya, Jizzakh, Surkhandarya and Andijan regions and of the Republic of Karakalpakstan, and 36 species of ecto- and endoparasites belonging to eight host species were identified. Among farm animals the agents of entomoses — *Bovicola bovis*, *B. ovis*, *B. caprae* and *Ctenocephalides canis* — and the agents of acaroses of the genera *Rhipicephalus* and *Hyalomma* were established as dominant species, alongside the endoparasitic genera *Hypoderma*, *Psoroptes* and *Oestrus*. The contribution of the work is a systematic, multi-region baseline of the ectoparasite fauna of Uzbek livestock, which provides the factual basis for planning targeted acaricidal and insecticidal treatments and for monitoring changes in the parasite community over time.

ADABIYOTLAR RO‘YXATI

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Adabiyotlar matnda birinchi keltirish tartibida raqamlanadi. Oltitagacha muallif to‘liq ko‘rsatiladi; DOI mavjud bo‘lsa, albatta beriladi.

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REFERENCES (ROMAN SCRIPT)

Transliterated list — required by Scopus and Web of Science

Mandatory whenever any reference is in a non-Latin script. Transliterate the author names and the original title, then give the English translation of the title in square brackets, followed by the language tag.

- [1] Kamalova, A. I. (2024). THE SIGNIFICANCE OF ECHINOCOCCOSIS IN VETERINARY MEDICINE AND HUMAN LIFE. Creative Commons Attribution 4.0 International License., 1(5), 90-95.
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RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • HAC/OAK 16.00.00 — VETERINARY SCIENCES
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Development of a method for obtaining lyophilized diagnostic sera

Liofilizatsiyalangan diagnostik zardoblar olish usulini ishlab chiqish

Разработка способа получения лиофилизированных диагностических сывороток

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)

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Abstract. The article presents data on the development of diagnostic sera and on the parameters of their lyophilization, which comprises two main stages. In the first stage the serum vials are placed in a low-temperature chamber and frozen within a defined temperature range. In the second stage the vials containing the frozen serum are transferred to a drying chamber, sealed, and the water vapour is removed from the sera frozen under vacuum until freeze-drying is complete.

Keywords: brucellosis; diagnostics; serum; diagnosticums; lyophilization; sublimation; effectiveness

O‘ZBEKCHA

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Annotatsiya. Maqolada diagnostik zardoblarni ishlab chiqish va ularni liofilizatsiya qilish parametrlari bo‘yicha ma‘lumotlar keltirilgan bo‘lib, ular ikkita asosiy bosqichni o‘z ichiga oladi: muzlatish, bunda zardobli flakonlar turli harorat oralig‘idagi past haroratli kameraga joylashtirish, muzlatib quritish va bunda muzlatilgan zardobli flakonlar quritish kamerasiga o‘tkazilib, germetiklanishi va namlik bug‘i muzlatilgan zardoblardan vakuum nasosda to‘liq muzlatib quritilguncha olib tashlanishi bayon qilingan.

Kalit so‘zlar: brusellyoz; diagnostika; zardob; diagnostikumlar; liofilizatsiya; sublimatsiya; samaradorlik

РУССКИЙ

САИДОВ Акмалжон Акрамович^{1,*}, РУЗИМУРОДОВ Мухиддин Ахрорович¹, УЛУГМУРАДОВ Азамат Даминович¹

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Аннотация. В статье показаны данные по разработке диагностических сывороток и параметров их лиофилизации, включающей два основных этапа: замораживание, при котором флаконы с сывороткой помещали в низкотемпературную камеру с диапазоном температур и сублимационной сушке, при которой флаконы с замороженной сывороткой переносили в сушильную камеру, герметизировали и удаляли пары влаги из замороженных в вакууме сывороток до полного сублимационного высушивания.

Ключевые слова: бруцеллез; диагностика; сыворотка; диагностикумы; лиофилизация; сублимация; эффективность

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HAC / OAK: On the HAC list of national scientific publications (Academy of Sciences of the Republic of Uzbekistan) for 06.00.00 Agricultural Sciences and 16.00.00 Veterinary Sciences. В перечне ВАК при АН РУз: 06.00.00 – Сельскохозяйственные науки; 16.00.00 – Ветеринарные науки.

1. ВВЕДЕНИЕ

Introduction

На сегодняшний день эпизоотическая и эпидемиологическая ситуация по бруцеллезу в мире достаточно острая и обстановка в этом отношении остается достаточно сложной.

Впервые в Узбекистане на основе трансфера технологий разработаны отечественные диагностические средства и реагенты для РБП, РА, РСК и РДСК, наборы для ИФА, изучены их активность и специфичность.

Разработка, внедрение диагностических сывороток, а также организация их производства в Республике необходима, т.к. сыворотки являются эталонными стандартами и могут быть рекомендованы для подтверждения специфичности бруцеллезных антигенов, контроля точности постановки серологических методов и тестирования (РБП, РА, РСК, РДСК, ИФА, КР и др.), а также предназначены для использования в бактериологических исследованиях для предварительного подтверждения выделенных эпизоотических культур бруцелл [1].

Это способствует расширению спектра диагностических исследований бруцеллеза животных, предотвращает его распространение, обеспечивает безопасность продуктов животноводства (молока, молочных продуктов, мяса и мясопродуктов), а также предохраняет людей от этой инфекции [2,3].

Целью исследований являются разработка способа получения лиофилизированных бруцеллезных сывороток для диагностики бруцеллеза.

2. МАТЕРИАЛЫ И МЕТОДЫ

Materials and methods

Объектом исследования являлся материал, полученный в результате патологоанатомических, серологических и аллергических исследований крупного и мелкого рогатого скота из фермерских животноводческих хозяйств Джизакской, Самаркандской и Ташкентской областей и лабораторных животных НИИВетеринарии.

Предметом исследования служили, сыворотки крови морских свинок и кроликов, крупного рогатого скота, овец.

Методы исследований. Использованы методики лиофилизации-получения сухих бруцеллезных диагностических сывороток, путем высушивания из замороженного состояния под высоким вакуумом при наличии криопротектора [4,5].

3. ПОЛУЧЕННЫЕ РЕЗУЛЬТАТЫ

Results and discussion

Диагностические сыворотки лиофилизировали в лабораторной установке «Alfa 1-2 LD plus», принадлежащей лаборатории бруцеллеза НИИВ. Разработка параметров лиофилизации осуществлялась по температуре нагрева продуктов (T0C), температуре замораживания продуктов (сублимационной заморозки T0) и времени их выдержки.

Процесс лиофилизации включал в себя два основных этапа: - замораживание, при котором сыворотки во флаконах, помещенных в кассеты, помещали в низкотемпературную камеру с диапазоном температур от минус 25 до минус 600C. При этом температуру заморозания постепенно снижали при атмосферном давлении сначала до минус 250C, затем до минус 400C в течение 15 минут.

В ходе отработки параметров разработали четыре температурных режима: первый - от начальной температуры до 00C, второй - от 00C до минус 50C. Далее происходил «разворот температуры» к криоскопической температуре, то есть третий период - превращение воды в фазовый лед, а четвертый определяется температурным периодом - затвердевание смеси льда и жидкости.

В то же время нам было важно определить четвертый критический шаг, поскольку необходимо точно знать временные рамки, в течение которых происходит полное затвердевание.

Второй этап лиофилизации заключался в сублимационной сушке, при которой флаконы с замороженной сывороткой быстро переносили в сушильную камеру, герметизировали и включали вакуумный насос для удаления паров влаги из замороженной в вакууме пробы.

Период сублимационной сушки также делился на два периода. В первый период время сушки фиксировали при отрицательных температурах, а во второй период время сушки определяли при положительных температурах. Определение этих периодов было необходимо для определения времени удаления свободной и связанной влаги.

На первом этапе заморозки реагенты заливали в стерильные флаконы объемом 10 см³ по 2,5 мл сыворотки P/s, N/s и комплемента, которые были пронумерованы в специальных индивидуальных кассетах и помещены в морозильную камеру при низкой температуре минус 300C.

При таком режиме замораживания диагностических реагентов разворот температуры составил 3 часа, то есть, зафиксированы полные изменения кристаллической решетки всех испытуемых препаратов.

После замораживания все кассеты с реагентами помещались на отдельные полки вакуумной камеры лиофилизационного аппарата «Alfa 1-2 LD plus», к которой подключался вакуумный насос аппарата, который также и подключался к морозильной камере.

В этот период температура в камере составляла минус 240C. В итоге, экспериментально установлено, что при лиофилизации отечественных реагентов эвтектическая зона должна находиться в диапазоне температур от -70C до -200C, а при сублимации самая высокая температура в эвтектической зоне должна составлять Tэв +3,60C, самая низкая Tэв +28,70C, при этом оптимальное давление должно быть в пределах 0,053-0,055 миллибар.

Установлено, что после определения параметров обратного осмоса (давления) с целью предотвращения избыточной влаги в морозильной камере при диапазоне температур от -520C до -540C, полный цикл сублимационной сушки бруцеллезных сывороток и комплемента происходит в течение 31 часа.

В итоге, результатами комиссионных лабораторных и производственных испытаний с применением производственных сывороток крови крупного и мелкого рогатого скота из хозяйств с различной эпизоотической ситуацией по бруцеллезу доказано, что отечественные реагенты гемолизин и комплемент, обладают высокой активностью и специфичностью в РСК и выявляют максимальное количество комплементсвязывающих антител.

Результаты изучения чувствительности и специфичности изготовленных сывороток бактериологическими методами представлены в таблице.

Таблица 1

Результаты бактериологического исследования, проведённого с целью типирования культур бруцелл с полученными отечественными диагностическими сыворотками / **Table 1.** Results of the bacteriological study carried out to type Brucella cultures with the domestic diagnostic sera obtained

№ п/п	Название штаммов бруцелл	Количество исследований	STS antibrucella-abortus	P/s тестируемая сыворотка	N/s тестируемая сыворотка
Контрольные (referens) штаммы					
1	B. abortus 544	3	+	+	-
2	B.melitensis Novochoerkassk 102	3	+	+	-
3	B.suis 1330	3	+	+	-
Производственные вакцинные штаммы					
4	B. abortus 104MUZ	3	+	+	-
5	B.melitensis Rev-1	3	+	+	-
6	B. abortus 19	3	+	+	-
Эпизоотические штаммы					
7	B. abortus	36	+	+	-
8	B.melitensis	36	+	+	-
ВСЕГО		90	+	+	-

Примечание: результаты реакции агглютинации (РА) в пластинках/пробирках. STS — сыворотка международного стандарта; P/s — сыворотка положительная; N/s — сыворотка отрицательная. / Note: STS — international standard serum; P/s — positive serum; N/s — negative serum.

Результаты оценки экономической эффективности производства отечественных реагентов указывает на следующее, если в настоящее время цена сыворотки крови, используемой при диагностике бруцеллеза, в Российской Федерации составляет 2 000 рублей (2 840 000 сум), а в Республике Казахстан цена аналогичной сыворотки, составляет 1 600 рублей (2 272 000 сум), то стоимость сыворотки крови, приготовленной для диагностики бруцеллеза в Узбекистане составляет 1 250 000 сумов.

Таким образом, установлено, что местная сыворотка крови в 1,82 раза дешевле, чем «Сыворотка крови, изготовленная для диагностики бруцеллеза» в Республике Казахстан, и в 2,27 раза дешевле, чем «Сыворотка крови, изготовленная для диагностики бруцеллеза» в Российской Федерации.

4. ВЫВОДЫ*Conclusions*

1. Установлено, что оптимальные температурные параметры при лиофилизации отечественных диагностических сывороток (P/s, N/s) и комплемента находятся на уровнях: верхний предел T₀ - 240C и нижний предел T₀ - 3,70C.

2. Экспериментально установлено, что при лиофилизации отечественных реагентов эвтектическая зона должна находится в диапазоне температур от -70C до -200C, а при сублимации самая высокая температура в эвтектической зоне должна составлять T_{эв} +3,60C, самая низкая T_{эв} +28,70C, при этом оптимальное давление должно быть в пределах 0,053-0,055 миллибар.

DECLARATIONS*Declarations***Author contributions** *CRedit*

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

The epizootic and epidemiological situation with regard to brucellosis remains acute both worldwide and in the region, and reliable serological diagnosis is the basis of any control programme. Diagnostic sera and reagents for the serological reactions used in brucellosis diagnosis were developed in Uzbekistan for the first time on the basis of technology transfer, but the sera have to be produced, stored and distributed in a stable form, which requires a validated lyophilization regime. Organising domestic production of such sera

widens the range of diagnostic investigations available for animal brucellosis, helps to prevent its spread and reduces dependence on imported reagents. The aim of the research was to develop a method for obtaining lyophilized brucellosis sera for the diagnosis of brucellosis.

Materials and methods

The object of the study was material obtained from pathoanatomical, serological and allergic investigations; the subject of the study was the blood sera of guinea pigs and rabbits, cattle and sheep. Methods of lyophilization were used to obtain dry brucellosis diagnostic sera. The sera were lyophilized in an “Alfa 1-2 LD plus” laboratory unit belonging to the brucellosis laboratory. The process comprised two main stages. In the freezing stage the sera in vials were placed in a low-temperature chamber, and four temperature regimes were worked out: from the initial temperature to 0 °C, and the three subsequent steps described in the article, the fourth of which is critical because the time frame within which it takes place must be known exactly. In the second stage, freeze-drying, the vials of frozen serum were transferred rapidly to the drying chamber; the drying period was itself divided into two, the first being recorded at negative temperatures. In the freezing stage the reagents were poured into sterile 10 cm³ vials, 2.5 ml of P/s, N/s serum and complement per vial.

Results and discussion

Under the regime adopted for freezing the diagnostic reagents the temperature reversal took three hours. After freezing, all cassettes with reagents were placed on separate shelves of the vacuum chamber of the lyophilization apparatus, where the chamber temperature was minus 24 °C. It was established experimentally that during the lyophilization of domestic reagents the eutectic zone must lie within the range defined in the article, and that after the parameters of reverse osmosis, that is of pressure, have been determined, excess moisture in the freezing chamber is prevented. The sensitivity and specificity of the sera produced were assessed by bacteriological methods, and the results of typing *Brucella* cultures with the domestic diagnostic sera are given in Table 1, in which the reference strains, the number of investigations and the reactions with the international standard serum STS and with the tested positive and negative sera are shown. Commission laboratory and production trials using production sera confirmed the results. The economic assessment showed that the price of the blood serum currently used in brucellosis diagnosis is 2000 roubles in the Russian Federation, equivalent to 2 840 000 soums, and the comparison established that the local serum is 1.82 times cheaper than the serum manufactured for brucellosis diagnosis in the Republic of Kazakhstan and 2.27 times cheaper than the corresponding product of the Russian Federation.

Conclusion and contribution

It was established that the optimal temperature parameters for the lyophilization of the domestic diagnostic sera P/s and N/s are those defined in the article, and it was shown experimentally that during the lyophilization of domestic reagents the eutectic zone must lie within the stated range. The sera obtained under this regime retained their sensitivity and specificity in bacteriological typing of *Brucella* cultures, and their production is economically advantageous, the local serum being 1.82 and 2.27 times cheaper than the equivalent products of Kazakhstan and the Russian Federation respectively. The contribution of the work is a validated, locally reproducible lyophilization regime that makes the domestic manufacture of brucellosis diagnostic sera practicable and thereby broadens the diagnostic capacity of the national veterinary service.

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RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • HAC/OAK 16.00.00 — VETERINARY SCIENCES
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Effectiveness of drugs in the treatment of endometritis in cows and in shortening the service period

Sigirlarda endometritni davolash va servis davrini qisqartirishda preparatlar samarasi**Эффективность лекарственных препаратов в лечении эндометрита у коров и сокращении сервис-периода****Otamurod Urazovich KULDASHEV¹, Jamshid Nasirdinovich OCHILOV¹, Mirzobobur Roman o'g'li MAQSUDOV¹**¹ Scientific-Research Institute of Veterinary, Samarkand, Uzbekistan**ARTICLE INFO****ARTICLE TYPE**

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)**ENGLISH****Otamurod Urazovich KULDASHEV¹, Jamshid Nasirdinovich OCHILOV¹, Mirzobobur Roman o'g'li MAQSUDOV¹**¹ Scientific-Research Institute of Veterinary, Samarkand, Uzbekistan**Abstract.** This article discusses the causes of endometritis, a major obstetric and gynecological disease that poses a serious challenge to livestock producers and veterinarians, and the impact of treating this disease and reducing the lifespan of cows on calving.**Keywords:** cow; calf; insemination period; obstetrics and gynecology department; uterus; endometritis; fertilization; artificial insemination**O'ZBEKCHA****KULDASHEV Otamurod Urazovich¹, OCHILOV Jamshid Nasirdinovich¹, MAQSUDOV Mirzobobur Roman o'g'li¹**¹ Veterinariya ilmiy-tadqiqot instituti, Samarqand, O'zbekiston**Annotatsiya.** Ushbu maqolada hozirgi kunda chorvachilik fermer xo'jaliklari va veterinariya mutaxassislarini qiynab kelayotgan muammolardan biri sigirlardan vaqtida buzoq olinmasligini asosiy sabablaridan biri akusher-ginekologik kasalliklar orasida endometritlarni sabablari, kasallik sababli sigirlarning qisqir qolishi o'rganilgan hamda kasallikni davolash va servis davrini qisqarishi sigirlardan buzoq olish samarasi yoritilgan.**Kalit so'zlar:** Sigir; buzoq; servis davri; akusher-ginekologik; bachadon; endometritlar; urug'lantirish; otalandi**РУССКИЙ****КУЛДАШЕВ Отамурод Уразович¹, ОЧИЛОВ Джамшид Насирдинович¹, МАКСУДОВ Мирзобобур Романович¹**¹ Научно-исследовательский институт ветеринарии, Самарканд, Узбекистан**Аннотация.** В данной статье рассматриваются причины эндометрита, одного из основных акушерско-гинекологических заболеваний, представляющего собой серьезную проблему для животноводческих хозяйств и ветеринарных специалистов, а также влияние лечения этого заболевания и сокращения срока службы коров на отел.**Ключевые слова:** корова; теленок; период осеменения; акушерско-гинекологическое отделение; матка; эндометрит; оплодотворение; искусственное осеменение**How to cite / Iqtibos keltirish / Как цитировать:** KULDASHEV, O. U., OCHILOV, J. N., MAQSUDOV, M. R. o. (2026). Effectiveness of drugs in the treatment of endometritis in cows and in shortening the service period. Research Focus International Scientific Journal, 5(8), 99–102. <https://doi.org/10.66073/ReFocus.V5i8.0818>

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1. KIRISH

Introduction

Kirish va mavzuning dolzarbligi. Yurtimizda chorvachilik sohasi jadal rivojlanmoqda, jumladan qoramolchilik sohasiga katta e'tibor qaratilmoqda. Prezidentimiz tashabbusi bilan ushbu sohaga investitsiya kiritilib, xorijiy davlatlardan mahsuldorligi yuqori naslli qoramollar olib kelinmoqda. Sut, sut-go'sht va go'sht yo'nalishiga ixtisoslashgan kompleks fermer xo'jaliklari yurtimizning turli hududlarida tashkil qilindi. Ammo asosiy muammolar ham paydo bo'lmoqda, bu hayvonlar orasida kelib chiqadigan kasalliklardir. Ular orasida akusher-ginekologik kasalliklar ya'ni endometritlarning ortib borishi natijasida sigirlarda mahsuldorlikning pasayishi va qisir qolishiga sabab bo'lmoqda.

Endometrit - Bachadon shilliq qavatining yuza qismini yallig'lanishi natijasida paydo bo'ladigan kasallik bo'lib u bachadondan shilimshiq-yiringli eksudatni oqishi bilan xarakterlanadi [1., 2., 3.].

Bachadon kasalliklari asosan shilliq qavatning tug'ish vaqtida jaroxatlanishi yoki infeksiya tushishi, ushlanib qolgan yo'ldoshni operativ yo'l bilan olishda va bachadonni chiqib ketishi natijasida kelib chiqadi. Bachadonga mikroorganizmlar asosan sigirlarni urug'lantirish, qinni tekshirish vaqtida va to'shamalar hamda ishlatiladigan asbob uskunalar orqali tushadilar. Bundan tashqari, bachadon yallig'lanishi ko'pgina holatlarda qin, bachadon, to'g'ri ichak va siydik pufagini yallig'lanishlari natijasida ham kelib chiqishi mumkin. Ayrim holatlarda bachadonga mikroorganizmlar ichki organlar va sut bezi kasalliklarida qon yoki linfa orqali o'tishi natijasida ham bo'lishi mumkin [4., 5., 6.].

Bachadon kasalliklarini paydo bo'lishiga sigir organizmining kurashuvchanlik (rezistentligini) qobiliyatini pasayishi, hayvonlarni zinch saqlash, oziqlantirishda bo'ladigan kamchiliklar hamda yayratishni (matsionni) yo'qligi oqibatida ham bo'ladi. Endometrit kasalligiga diagnoz qo'yish qiyinchilik tug'dirmaydi. Endometritga diagnoz qo'yishda rektal va qin orqali tekshirishlar hamda anamnestik ma'lumotlar asosida aniq va yengil tashxis qo'yish mumkin [7., 8., 9.].

Tadqiqotning maqsadi. Qoramollar orasida endometrit bilan kasallanish sabablari o'rganish va zamonaviy preparatlarni qo'llab sigirlar servis davrini qisqartirishdan iborat.

1-jadval

Endometritni davolashda preparatlar samaradorligi / **Table 1.** Effectiveness of the preparations in the treatment of endometritis

№	Xo'jalik nomi	Bosh soni	Qo'llanilgan preparatlar	Kuyga kelib otalandi	%
1	"Tohir Yusuf chorvasi"	6	Penstrip 400 20 ml, uteraton 10 ml, E-selin 10 ml	6	100
2	"Laziza Shaydo dalasi"	6	Oksitetrasiklin 10 ml, uteraton 10 ml, E-selin 10 ml	5	83,3
2	Jami	12		11	91,6

2-tajriba guruhidagi sigirlarga oksitetrasiklin preparati 10 ml miqdorda bachadon ichiga, 10 ml uteraton, 10 ml E-selin preparatlari muskul orasiga kun ora 3 marta qo'llanilganda sigirlarning endometritdan tuzalganligi va servis davri 25-30 kunga qisqarganligi, kuyga kelishi hamda birinchi marta urug'lantirilganda 6 bosh sigirdan 5 boshi otalanganligi kuzatildi.

4. XULOSA

Conclusion

Xulosa. Sigirlarda akusher-ginekologik kasalliklar asosan endometritlar sigirlarni qisir qolishiga sabab bo'ladi. Tadqiqot natijalariga ko'ra 1-tajriba guruhidagi sigirlarga penstrip 400

2. TADQIQOT MATERIALLARI VA USULLARI

Materials and methods

Tadqiqot materiallari va usullari. Ilmiy tadqiqot ishlari Samarqand viloyati Narpay tumanidagi "Tohir Yusuf chorvasi", Pastdarg'om tumanidagi "Laziza Shaydo dalasi" chorvachilik fermer xo'jaliklari hamda Veterinariya ilmiy tadqiqot instituti Veterinariya sanitariya va urchitish patologiyasi laboratoriyasida olib borildi. Tadqiqotlar sigirlarni klinik tekshiruvdan o'tkazish va akusher-ginekologik tekshiruv va dispanser tekshirishlar orqali amalga oshirildi. Mazkur xo'jaliklarda 6 boshdan 12 bosh sigirlar 2 guruhga ajratilib, 1-tajriba guruhiga penstrip 400 preparati 20 ml miqdorda bachadon ichiga, 10 ml uteraton, 10 ml E-selin preparatlari muskul orasiga kun ora 3 marta qo'llanildi. 2-tajriba guruhiga 10 ml oksitetrasiklin preparati bachadon ichiga qo'llanildi, 10 ml uteraton, 10 ml E-selin preparatlari muskul orasiga kun ora 3 marta qo'llanildi va davolash usullarini samaradorligini aniqlashda kasallik asoratlari kuzatilishi e'tiborga olindi.

3. OLINGAN NATIJALAR VA ULARNING TAHLILI

Results and discussion

Olingan natilar va ularning tahlili. Tadqiqotlar natijasida olingan ma'lumotlar shuni ko'rsatdiki, homila yo'ldoshining ushlanib qolishi, sigirning buzog'i 50-60 kg dan katta bo'lgan hollarda bachadonning yetarli darajada qisqarmasligi natijasida yashirin endometritlarga sabab bo'ladi.

Narpay tumanidagi "Tohir Yusuf chorvasi" chorvachilik fermer xo'jaligidagi 1-tajriba guruhidagi sigirlarga penstrip 400 preparati 20 ml miqdorda bachadon ichiga, 10 ml uteraton, 10 ml E-selin preparatlari muskul orasiga qo'llanildi. Pastdarg'om tumanidagi "Laziza Shaydo dalasi" chorvachilik fermer xo'jaligidagi 2-tajriba guruhiga sigirlarga 10 ml oksitetrasiklin preparati bachadon ichiga qo'llanildi, 10 ml uteraton, 10 ml E-selin preparatlari muskul orasiga qo'llanildi (1-jadval).

1-tajriba guruhidagi sigirlarga penstrip 400 preparati 20 ml miqdorda bachadon ichiga, 10 ml uteraton, 10 ml E-selin preparatlari muskul orasiga kun ora 3 marta qo'llanilganda sigirlarning endometritdan tuzalganligi va servis davri 15-20 kunga qisqarganligi, kuyga kelishi hamda urug'lantirilganda otalanganlik foizining yuqori bo'lishi kuzatildi.

preparati 20 ml miqdorda bachadon ichiga, 10 ml uteraton, 10 ml E-selin preparatlari muskul orasiga kun ora 3 marta qo'llanilganda sigirlarning endometritdan tezroq tuzalishi va kuyga kelib 100 % otalanishi kuzatildi.

2-tajriba guruhidagi sigirlarga oksitetrasiklin preparati 10 ml miqdorda bachadon ichiga, 10 ml uteraton, 10 ml E-selin preparatlari muskul orasiga kun ora 3 marta qo'llanilganda sigirlar endometritdan tuzalib, tajribadagi 6 bosh sigirlardan 5 boshi birinchi marta urug'lantirilganda otalanganligi kuzatildi.

DECLARATIONS

Declarations

Author contributions CRedit

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Not applicable. This study did not involve humans, animals or other regulated materials.

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Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

Cattle breeding in Uzbekistan is developing rapidly, and considerable attention is being paid to the sector; the failure to obtain a calf from a cow in due time is, however, one of the problems that most trouble livestock farms and veterinary specialists. Endometritis, an inflammation of the superficial layer of the uterine mucosa, is among the principal obstetric and gynaecological causes of this failure. Uterine disease arises mainly from injury to the mucosa during parturition or from the introduction of infection, from retained placenta, and from a reduction in the resistance of the organism of the cow and related factors. The aim of the study was to examine the causes of endometritis in cattle and to determine the effectiveness of modern preparations in treating the disease, restoring reproductive function and shortening the service period.

Materials and methods

The research was carried out on the livestock farms “Tohir Yusuf chorvasi” in Narpay district and “Laziza Shaydo dalasi” in Pastdargom district of Samarkand region. Cows diagnosed with endometritis were divided into two experimental groups of six head each, a total of twelve animals. The cows of the first experimental group received penstrip 400 at 20 ml intrauterinally together with 10 ml of uteraton and 10 ml of E-selenium intramuscularly, administered three times on alternate days. The cows of the second experimental group received oxytetracycline at 10 ml intrauterinally with the same doses of uteraton and E-selenium intramuscularly, on the same schedule. Recovery from endometritis, the length of the service period, the appearance of oestrus and conception at first insemination were recorded for both groups; the results are given in Table 1.

Results and discussion

The data obtained showed that retention of the placenta and the associated conditions described in the article are the leading causes of endometritis in the herds examined. In the first experimental group at “Tohir Yusuf chorvasi”, the scheme based on penstrip 400 with uteraton and E-selenium led to recovery from endometritis in all six cows, all of which came into oestrus and were successfully inseminated, giving an effectiveness of 100 %. In the second experimental group at “Laziza Shaydo dalasi”, the scheme based on oxytetracycline with uteraton and E-selenium also produced recovery, and five of the six cows conceived at first insemination, an effectiveness of 83.3 %; in this group the service period was shortened to 25–30 days. Across both groups, 11 of the 12 cows came into oestrus and conceived, an overall effectiveness of 91.6 %. The comparison therefore shows that both schemes restore reproductive function, but that the combination based on penstrip 400 gave the higher conception rate at first insemination under the conditions of these farms.

Conclusion and contribution

Obstetric and gynaecological diseases of cows, and endometritis above all, are the main cause of barrenness. According to the results, the intrauterine administration of penstrip 400 at 20 ml together with intramuscular uteraton 10 ml and E-selenium 10 ml three times on alternate days gave complete recovery and conception in the first experimental group, while the corresponding scheme with oxytetracycline 10 ml gave recovery with conception at first insemination in five of six cows in the second group. Both schemes shorten the service period and thereby increase the number of calves obtained. The contribution of the work is a direct comparison of two accessible treatment schemes under commercial farm conditions, expressed in the terms that matter economically to the producer — the conception rate at first insemination and the length of the service period.

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RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • HAC/OAK 16.00.00 — VETERINARY SCIENCES
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Distribution and seasonal dynamics of nematode infections in chickens in different geographical and climatic zones of Uzbekistan

O'zbekistonning turli geografik-iqlim mintaqalarida tovuqlar nematodozlarining tarqalishi va mavsumiy dinamikasi

Распространение и сезонная динамика нематодозов кур в различных географо-климатических зонах Узбекистана

Komiljon Shuhrat o'g'li AKRAMOV^{1,*} , Xurshid Abdurajabovich SAFAROV¹ , Behzod Karamat o'g'li ULUQOV¹¹ Scientific-Research Institute of Veterinary, Samarkand, Uzbekistan* Corresponding author: komiljonshuhratovich@gmail.com**ARTICLE INFO****ARTICLE TYPE**

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)**ENGLISH****Komiljon Shuhrat o'g'li AKRAMOV^{1,*} , Xurshid Abdurajabovich SAFAROV¹ , Behzod Karamat o'g'li ULUQOV¹**¹ Scientific-Research Institute of Veterinary, Samarkand, Uzbekistan

Abstract. This study investigated the prevalence, spatial and seasonal dynamics of major nematode infections among chickens kept in household farms and poultry farms located in different geographical and climatic zones of the Republic of Uzbekistan. The study was conducted in 11 regions of the Republic during 2022–2024, and a total of 1,682 fecal samples were examined using helminthocoprological methods. The study employed the Fulleborn flotation method, the sequential washing method, a modified version of the Berman–Orlov method, as well as complete and incomplete helminthological necropsy methods. According to the results obtained, 779 chickens, or 46.31% of the examined birds, were infected with nematode infections. Among the nematode infections, the prevalence of ascariasis was 25.45%, heterakidosis 28.59%, and capillariasis 26.28%. In terms of geographical and climatic zones, the highest infection rate was recorded in the southern zone at 62.84%, while the lowest rate was observed in the eastern zone at 26.15%. Seasonal analysis showed that the highest infection rate occurred in winter (58.23%), whereas the lowest rate was recorded in spring (28.97%). The findings demonstrate the relevance of organizing control measures against nematode infections in chickens based on preventive strategies that take into account geographical and seasonal risk factors.

Keywords: chicken; nematode infections; ascariasis; heterakidosis; capillariasis; prevalence; geographical and climatic zone; seasonal dynamics

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Annotatsiya. Ushbu tadqiqotda O'zbekiston Respublikasining turli geografik-iqlim mintaqalarida aholi xonadonlari va parrandachilik xo'jaliklarida boqilayotgan tovuqlar orasida asosiy nematodozlarning tarqalish darajasi, hududiy va mavsumiy dinamikasi o'rganildi. Tadqiqotlar 2022–2024-yillarda Respublikaning 11 ta viloyatida olib borilib, jami 1682 ta tezak namunasi gelmintokoprologik usullarda tekshirildi. Tadqiqotlarda Fyulleborn, ketma-ket yuvish, Berman–Orlov usulining takomillashtirilgan varianti hamda to'liq va noto'liq gelmintologik yorib ko'rish usullaridan foydalanildi. Umumiy natijalarga ko'ra, tekshirilgan tovuqlarning 779 tasi, ya'ni 46,31% nematodozlar bilan zararlangan. Nematodozlar orasida askaridnoz 25,45%, geterakidnoz 28,59% va kapillarioz 26,28% ekstenszarlanish ko'rsatkichlarini namoyon qildi. Geografik-iqlim mintaqalari kesimida eng yuqori zararlanish janubiy mintaqada 62,84%, eng past ko'rsatkich esa sharqiy mintaqada 26,15% bo'ldi. Mavsumiy tahlil qish faslida 58,23% bilan eng yuqori, bahorda

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esa 28,97% bilan eng past zararlanish qayd etilganini ko'rsatdi. Tadqiqot natijalari tovuqlar nematodozlariga qarshi kurashni hududiy va mavsumiy xavfga asoslangan profilaktika tamoyillari asosida tashkil etish maqsadga muvofiq ekanligini ko'rsatdi.

Kalit so'zlar: tovuq; nematodoz; askaridiaz; geterakidiaz; kapillarioz; ekstenszararlanish; geografik-iqlim mintaqasi; mavsumiy dinamika

РУССКИЙ

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Аннотация. В настоящем исследовании изучены уровень распространения, территориальная и сезонная динамика основных нематодозов среди кур, содержащихся в личных подсобных хозяйствах населения и птицеводческих хозяйствах различных географо-климатических зон Республики Узбекистан. Исследования проводились в 2022–2024 гг. в 11 областях Республики, при этом всего было исследовано 1682 образца фекалий с использованием гельминтокопрологических методов. В исследованиях применяли методы Фюллеборна, последовательного промывания, усовершенствованный вариант метода Берманна–Орлова, а также методы полного и неполного гельминтологического вскрытия. Согласно полученным результатам, из числа исследованных кур 779, или 46,31%, были заражены нематодозами. Среди нематодозов экстенсивность инвазии при аскаридозе составила 25,45%, гетеракидозе - 28,59%, капилляриозе - 26,28%. В разрезе географо-климатических зон наиболее высокий уровень заражённости отмечен в южной зоне - 62,84%, а наиболее низкий - в восточной зоне - 26,15%. Сезонный анализ показал, что наиболее высокий уровень заражённости регистрировался в зимний период - 58,23%, тогда как наиболее низкий показатель отмечен весной - 28,97%. Полученные результаты свидетельствуют о целесообразности организации борьбы с нематодозами кур на основе принципов профилактики, учитывающих территориальный и сезонный риск.

Ключевые слова: курица; нематодозы; аскаридоз; гетеракидоз; капилляриоз; экстенсивность инвазии; географо-климатическая зона; сезонная динамика

1. KIRISH

Introduction

Mavzuning dolzarbligi. Parrandachilik aholini yuqori biologik qiymatga ega bo'lgan oqsil mahsulotlari bilan ta'minlashda muhim o'rin tutadi. Shu bilan birga, parrandalarining mahsuldorligi va saqlanish ko'rsatkichlariga salbiy ta'sir qiluvchi parazitlar kasalliklar, xususan, nematodozlar parrandachilikning iqtisodiy samaradorligini cheklovchi omillardan biri hisoblanadi. Nematodalar tovuqlarning turli a'zolari va to'qimalarida, ayniqsa, hazm qilish tizimida parazitlik qilib, oziq moddalarning o'zlashtirilishini buzishi, organizmning fiziologik holatiga salbiy ta'sir ko'rsatishi va mahsuldorlikning pasayishiga sabab bo'lishi mumkin. O'tkazilgan tadqiqotlar natijalarida keltirilgan ma'lumotlarga ko'ra, tovuqlar nematodozlar bilan zararlanish O'zbekiston hududlarida 24,13–58,04% oralig'ida qayd etilgan.

Xalqaro tadqiqotlarda ham tovuqlarda gelmintozlarning keng tarqalganligi qayd etilgan. Xususan, Shifaw va hammualliflarning tizimli sharhi va tahlilida turli hududlarda xonadonlarda va yerda saqlanadigan tovuqlarda gelmintozlar bilan zararlanishning yuqori darajasi ko'rsatilgan.

O'zbekiston sharoitida tovuqlarning nematodozlari bo'yicha hududiy tadqiqotlar olib borilgan bo'lsa-da, respublikaning bir nechta geografik-iqlim mintaqalarini qamrab olgan holda nematodozlarning tarqalishi, mavsumiy dinamikasi va davolash-profilaktika samaradorligini yagona tadqiqot tizimida baholash amaliy ahamiyatga ega. Mazkur tadqiqotning asosiy vazifalari turli hududlarda askaridiaz, geterakidiaz va kapillariozning tarqalishini aniqlash, ularning mavsumiy dinamikasini baholash hamda optimal profilaktika muddatlarini asoslashdan iborat bo'lgan.

Tadqiqotlar davomida nematodozlarning faqat umumiy tarqalish darajasini aniqlash bilan cheklanmasdan, hududiy xavf darajasi + mavsumiy dinamika o'rtasidagi amaliy bog'liqlikni aniqlashga qaratilgan.

2. TADQIQOT MATERIALLARI VA METODLARI

Materials and methods

Tadqiqot materiallari va metodlari. Tadqiqotlar 2022–2024-yillarda O'zbekiston Respublikasining Andijon, Buxoro, Jizzax, Qashqadaryo, Navoiy, Namangan, Samarqand, Sirdaryo, Surxondaryo, Farg'ona va Xorazm viloyatlarining ayrim tumanlarida olib borildi. Tadqiqot obyekt sifatida parrandachilik xo'jaliklari, shaxsiy yordamchi xo'jaliklar va aholi xonadonlarida boqilayotgan turli yoshdagi, asosan yerda saqlanadigan tovuqlar olindi.

Tadqiqot davomida jami 1682 ta tezak namunasi olindi. Namunalar gelmintokoprologik tekshiruvlardan o'tkazilib, nematodalar tuxumlarini aniqlash va differensial diagnostika qilishda Fyulleborn hamda ketma-ket yuvish usullaridan foydalanildi. Nematodalarning intensivligini aniqlashda K.I.Skryabinning to'liq va noto'liq gelmintologik yorib ko'rish usullari qo'llanildi.

Tadqiqot hududlari geografik-iqlim xususiyatlariga ko'ra sharqiy, markaziy, janubiy, janubiy-g'arbiy va g'arbiy mintaqalarga ajratib tahlil qilindi.

Nematodozlarning ekstenszararlanish ko'rsatkichi quyidagi formula asosida baholandi:

$$EZ = n / N \times 100 \quad (1)$$

bu yerda:

EZ – ekstenszararlanish, %;

n – zararlangan tovuqlar soni;

N – tekshirilgan tovuqlarning umumiy soni.

3. TADQIQOTLAR NATIJALARI VA TAHLILLAR

Results and discussion

Tadqiqotlar natijalari va tahlillar. Tadqiqotlar natijasida O'zbekistonning 11 ta viloyatida tekshirilgan 1682 ta namunadan

779 tasida nematodoz qo'zg'atuvchilari aniqlanib, umumiy ekstenszararlanish 46,31% ni tashkil etdi. Mazkur ko'rsatkich tovuqlarda nematodozlarning Respublika miqyosida keng tarqalganligini va ularni nazorat qilishni tizimli ravishda tashkil etish zarurligini ko'rsatadi.

Nematodozlarning alohida turlari bo'yicha geterakidoz nisbatan yuqori tarqalish ko'rsatkichiga ega bo'lib, 481 ta namunada yoki 28,59% da aniqlandi. Askaridiaz 428 ta namunada (25,45%), kapillarioz esa 442 ta namunada (26,28%) qayd etildi.

Mazkur natijalar nematodozlarning ko'pincha yakka holda emas, balki aralash invaziya shaklida uchrashini ko'rsatadi. Shu sababli faqat bitta gelmint turiga yo'naltirilgan profilaktika strategiyasi o'rniga asosiy nematodozlarning kompleks nazoratini nazarda tutuvchi yondashuv muhim hisoblanadi.

1-jadval

Nematodozlarning tarqalish darajasi geografik-iqlim mintaqalariga ko'ra / **Table 1.** Prevalence of nematode infections by geographical and climatic zone

Geografik-iqlim mintaqasi	Tekshirilgan namuna	Zararlangan	Ekstenszararlani sh
Sharqiy	390	102	26,15%
Markaziy	747	389	52,07%
Janubiy	183	115	62,84%
Janubiy-g'arbiy	168	79	47,02%
G'arbiy	194	94	48,45%

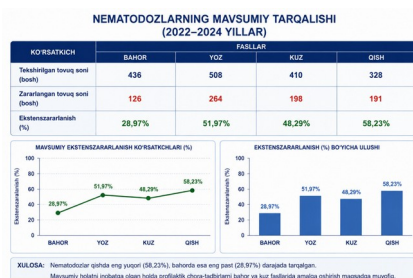
1-jadval ma'lumotlariga ko'ra, eng yuqori zararlanish janubiy geografik-iqlim mintaqasida – 62,84%, eng past ko'rsatkich esa sharqiy mintaqada – 26,15% qayd etildi. Markaziy mintaqada zararlanish 52,07%, janubiy-g'arbiy mintaqada 47,02% va g'arbiy mintaqada 48,45% ni tashkil etdi.

Janubiy mintaqadagi yuqori ko'rsatkich, xususan, Qashqadaryo viloyatining Kitob tumanida qayd etilgan 75,0% ekstenszararlanish bilan tavsiflanadi. Surxondaryo viloyatida esa ushbu ko'rsatkich 58,51% ni tashkil etgan.

Markaziy mintaqada ham nematodozlar muhim epizootologik ahamiyatga ega bo'lib, 747 ta tekshirilgan namunadan 389 tasida, ya'ni 52,07% da nematodozlar aniqlangan. Samarqand viloyatida umumiy zararlanish 58,57%, Sirdaryoda 50,58% va Jizzaxda 41,91% ni tashkil etgan.

Ushbu natijalar nematodozlarning tarqalishini hududlar bo'yicha bir xil deb baholash mumkin emasligini ko'rsatadi. Aksincha, profilaktika tadbirlarini hududning epizootologik xavf darajasidan kelib chiqib differensial tashkil etish maqsadga muvofiq.

Nematodozlarning mavsumiy tarqalishi ham aniq farqlarni namoyon qildi. 2022–2024-yillardagi kuzatuvlar davomida bahorda 436 bosh tovuqdan 126 tasida, yozda 508 boshdan 264 tasida, kuzda 410 boshdan 198 tasida va qishda 328 boshdan 191 tasida nematodozlar aniqlangan (1-rasm).



1-rasm. Nematodozlar bilan zararlanishning mavsumiy dinamikasi / **Fig. 1.** Seasonal dynamics of infection with nematode infections

Demak, qish mavsumida aniqlangan zararlanish bahor mavsumiga nisbatan qariyb ikki baravar yuqori bo'ldi.

Mavsumiy dinamikaning bunday xususiyati tashqi muhit sharoitlari, parazit tuxumlarining tashqi muhitda saqlanishi va tovuqlarning saqlash sharoitlari bilan bog'liq bo'lishi mumkin. Tadqiqot materiallarida parazitlarning biologik rivojlanishi va tashqi muhit omillari nematodozlarning mavsumiy o'zgarishida muhim omil sifatida qayd etilgan.

Shu asosda, bahor va kuz fasllarida rejalashtirilgan degelmintizatsiya tadbirlarini tashkil etish epizootologik jihatdan maqsadga muvofiq deb hisoblaymiz.

Tadqiqotlar natijalariga asosan O'zbekiston hududida tovuqlar nematodozlarining tarqalishi hududiy va mavsumiy jihatdan bir xil emasligi qayd etildi. Umumiy 46,31% zararlanish ko'rsatkichi nematodozlar aholi xonadonlarida boqiladigan tovuqlar orasida asosiy gelmintoz muammo ekanligini ko'rsatdi. Ayniqsa, janubiy mintaqada qayd etilgan 62,84% va markaziy mintaqadagi 52,07% ko'rsatkichlar yuqori xavfli hududlarni ajratib ko'rsatish imkonini berdi.

Nematodozlarning alohida turlari orasida geterakidozning 28,59% bilan nisbatan yuqori ko'rsatkichga ega bo'lishi uning hududiy profilaktika dasturlarida alohida e'tiborga olinishi zarurligini ko'rsatdi. Askaridiaz va kapillarioz ham mos ravishda 25,45% va 26,28% zararlanish darajasi aniqlandi.

Mavsumiy tahlil natijalari qish va yoz oylarida yuqori zararlanish qayd etilishini ko'rsatdi. Qishdagi 58,23% ko'rsatkich tovuqlarning yopiq yoki cheklangan sharoitda saqlanishi, sanitariya-gigiyena holatining yomonlashishi va invazion materialning to'planishi bilan bog'liqligi aniqlandi.

4. XULOSALAR

Conclusions

O'zbekistonning 11 ta viloyatida 2022–2024-yillarda o'tkazilgan tadqiqotlar natijasida tovuqlar nematodozlari keng tarqalgan parazitlar kasalliklardan biri ekanligi aniqlandi. Jami 1682 ta tekshirilgan namunadan 779 tasida nematodozlar aniqlanib, umumiy ekstenszararlanish 46,31% ni tashkil etdi.

Geografik-iqlim mintaqalari bo'yicha eng yuqori zararlanish janubiy mintaqada (62,84%), eng past zararlanish sharqiy mintaqada (26,15%) qayd etildi. Markaziy mintaqada 52,07%, janubiy-g'arbiy mintaqada 47,02% va g'arbiy mintaqada 48,45% zararlanish aniqlandi.

Nematodozlarning asosiy shakllari orasida geterakidoz (28,59%), kapillarioz (26,28%) va askaridiaz (25,45%) qayd etildi.

Mavsumiy dinamika bo'yicha eng yuqori zararlanish qishda (58,23%), undan keyin yozda (51,97%) va kuzda (48,29%) qayd etilgan bo'lsa, bahorda eng past ko'rsatkich (28,97%) kuzatildi.

DECLARATIONS

Declarations

Author contributions CRediT

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

Poultry farming is one of the fastest routes to supplying the population with protein of high biological value, and its efficiency depends directly on the parasitological well-being of the flock. International studies, among them the systematic review by Shifaw and co-authors, have documented the wide distribution of helminth infections in chickens. Regional studies of chicken nematodoses have been carried out in Uzbekistan, but the country as a whole had not been surveyed on a single methodology, so that the relative risk of the different geographical and climatic zones could not be compared. The study was designed not merely to establish the overall prevalence of nematodoses, but to determine the level of territorial risk and the seasonal dynamics of infection, since these are what determine when and where deworming should be planned.

Materials and methods

The investigations were carried out in 2022–2024 in eleven regions of the Republic of Uzbekistan, including Andijan, Bukhara and Jizzakh among others, on chickens kept both in household holdings and on poultry farms. A total of 1682 faecal samples were collected and subjected to helminthocoprological examination for the presence of nematode eggs. The methods used were the Fülleborn technique, successive washing, an improved variant of the Baermann–Orlov method, and complete and incomplete helminthological dissection. The study areas were grouped by their geographical and climatic characteristics into eastern, central, southern, south-western and western zones. The prevalence of infection was calculated as $EZ = n / N \times 100$, where EZ is the prevalence in per cent, n the number of infected chickens and N the total number of chickens examined.

Results and discussion

Of the 1682 samples examined in eleven regions, 779, that is 46.31 %, were positive for nematode infection. Among the individual infections heterakidosis had the relatively highest prevalence, being detected in 481 samples and giving 28.59 %, followed by capillariosis at 26.28 % and ascaridiosis at 25.45 %; since the sum of the individual figures exceeds the overall prevalence, the infections evidently occur not in isolation but frequently as mixed invasions. By geographical and climatic zone, presented in Table 1, the highest infection was recorded in the southern zone at 62.84 % and the lowest in the eastern zone at 26.15 %. The high southern figure is illustrated in particular by the 75.0 % prevalence recorded in Kitab district of Kashkadarya region. The central zone also proved epizootologically important, with 389 of 747 samples examined found positive. These results show that the

distribution of nematodoses cannot be regarded as uniform across the country; on the contrary, it is markedly zonal. The seasonal analysis, shown in Figure 1, revealed equally clear differences: infection reached 58.23 % in winter, 51.97 % in summer and 48.29 % in autumn, so that the winter figure was almost twice that recorded in spring. This pattern is attributable to the external environmental conditions, the survival of parasite eggs in the environment and the management of the birds, and it implies that planned deworming should be organised for the spring and autumn seasons.

Conclusion and contribution

The investigations carried out in eleven regions of Uzbekistan in 2022–2024 established that nematodoses of chickens are widely distributed, with an overall prevalence of 46.31 % among the 1682 samples examined. By geographical and climatic zone the highest infection was recorded in the southern zone (62.84 %) and the lowest in the eastern zone (26.15 %). Among the principal forms, heterakidosis (28.59 %), capillariosis (26.28 %) and ascaridiosis (25.45 %) were recorded. The seasonal dynamics showed the highest infection in winter (58.23 %), followed by summer (51.97 %) and autumn (48.29 %). The contribution of the work is the first country-wide, single-methodology assessment of chicken nematodoses in Uzbekistan resolved by both zone and season, which converts a general awareness of the problem into a concrete basis for planning zonal and seasonal deworming programmes.

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RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • HAC/OAK 16.00.00 — VETERINARY SCIENCES
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Distribution, etiology, pathogenesis, treatment and prevention of lernaosis in cyprinid fish

Karpsimon baliqlar lerneozining tarqalishi, etiologiyasi, patogenez, davolash va oldini olish tadbirlari
Распространение, этиология, патогенез, лечение и профилактика лернеоза карповых рыб

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)

ENGLISH

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Abstract. This article describes the prevalence, etiology, pathogenesis, clinical signs, diagnosis, treatment, and preventive measures of lernaosis in cyprinid fish. Lernaosis is a widespread parasitic disease of freshwater fish caused by parasitic crustaceans of the genus *Lernaea*. The parasite attaches to the skin, muscles, and gills of fish, causing mechanical tissue damage, inflammatory processes, and the development of secondary bacterial and fungal infections. As a result, fish growth is reduced, feeding activity decreases, immunity is weakened, and significant economic losses may occur in aquaculture farms. During the study, a comprehensive treatment approach was applied to cyprinid fish infected with lernaosis. For therapeutic purposes, special feed supplemented with Emikon and Antibak-100 preparations was used. These preparations contributed to improving the general physiological condition of the fish, eliminating secondary bacterial infections, and accelerating the regeneration of damaged tissues. Following treatment, no *Lernaea* parasites were detected on the fish body, and signs of redness, wounds, or secondary infection were absent. An increase in feeding activity and mobility of the fish was also observed. Prevention of lernaosis requires improvement of the sanitary and hygienic condition of water bodies, strengthening of hydrobiological monitoring, quarantine of newly introduced fish, regular parasitological monitoring, and implementation of preventive veterinary measures. The results obtained provide a scientific and practical basis for effective control of lernaosis and improvement of fish productivity in aquaculture farms.

Keywords: *Lernaea* cyprinacea; fish farming; ectoparasites; lernaosis; pathology; aquaculture; antiparasitic therapy

O'ZBEKCHA

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Annotatsiya. Ushbu maqolada karpsimon baliqlarda lerneoz kasalligining tarqalishi, etiologiyasi, patogenez, klinik belgilari, diagnostikasi, davolash va oldini olish tadbirlari yoritilgan. Lerneoz chuchuk suv baliqlarida keng uchraydigan invazion kasallik bo'lib, uning qo'zg'atuvchisi *Lernaea* spp. parazit qisqichbaqasimonlari hisoblanadi. Parazit baliq terisi, mushaklari va jabralariga yopishib, mexanik shikastlanishlar, yallig'lanish jarayonlari, ikkilamchi bakterial va zamburug'li infeksiyalarning rivojlanishiga sabab bo'ladi. Natijada baliqlarning o'sishi sekinlashadi, oziqlanish faolligi pasayadi, immuniteti susayadi hamda xo'jaliklarga sezilarli iqtisodiy zarar yetkaziladi. Tadqiqot davomida lerneoz bilan zararlangan karpsimon baliqlarda kompleks davolash usuli qo'llanildi. Davolash maqsadida Emikon va Antibak-100 preparatlari qo'shilgan maxsus yemlardan foydalanildi. Ushbu preparatlar baliqlarning umumiy fiziologik holatini yaxshilash, ikkilamchi bakterial infeksiyalarni bartaraf etish hamda shikastlangan to'qimalarning tiklanishini tezlashtirishga xizmat qildi. Davolash natijasida baliqlar tanasida lernealar aniqlanmadi, qizarish, jarohatlar va ikkilamchi infeksiya belgilari kuzatilmadi. Baliqlarning oziqlanish faolligi va harakati faolashgani kuzatildi. Lerneozning oldini olishda suv havzalarining sanitariya-gigiyena holatini yaxshilash, gidrobiologik nazoratni kuchaytirish, yangi keltirilgan baliqlarni karantinda saqlash,

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muntazam parazitologik monitoring o'tkazish hamda profilaktik veterinariya tadbirlarini amalga oshirish muhim ahamiyatga ega. Olingan natijalar akvakultura xo'jaliklarida lerneozga qarshi samarali kurashish va baliq mahsuldorligini oshirish uchun ilmiy-amaliy asos bo'lib xizmat qiladi.

Kalit so'zlar: Lernaеа cyprinacea; baliqchilik; ektoparazitlar; lerneoz; patologiya; akvakultura; antiparazitar terapiya

РУССКИЙ

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Аннотация. В статье освещены вопросы распространения, этиологии, патогенеза, клинических признаков, диагностики, лечения и профилактики лернеоза у карповых рыб. Лернеоз является широко распространённым инвазионным заболеванием пресноводных рыб, возбудителями которого являются паразитические ракообразные рода *Lernaea*. Паразит прикрепляется к коже, мышцам и жабрам рыб, вызывая механические повреждения тканей, воспалительные процессы, а также развитие вторичных бактериальных и грибковых инфекций. В результате замедляется рост рыб, снижается их пищевая активность, ослабляется иммунитет, что приводит к значительному экономическому ущербу в рыбоводных хозяйствах. В ходе исследования у карповых рыб, поражённых лернеозом, был применён комплексный метод лечения. С лечебной целью использовали специальные корма с добавлением препаратов «Эмикон» и «Антибак-100». Данные препараты способствовали улучшению общего физиологического состояния рыб, устранению вторичных бактериальных инфекций и ускорению восстановления повреждённых тканей. В результате лечения паразиты *Lernaea* на теле рыб не обнаруживались, признаки покраснения, повреждений и вторичной инфекции отсутствовали. Также отмечалось повышение пищевой активности и двигательной активности рыб. Для профилактики лернеоза важное значение имеют улучшение санитарно-гигиенического состояния водоёмов, усиление гидробиологического контроля, карантинное содержание вновь поступивших рыб, регулярный паразитологический мониторинг и проведение профилактических ветеринарных мероприятий. Полученные результаты могут служить научно-практической основой для эффективной борьбы с лернеозом и повышения рыбопродуктивности в аквакультурных хозяйствах.

Ключевые слова: *Lernaea cyprinacea*; рыбоводство; еktoparazitы; лернеоз; патология; аквакультура; противопаразитарная терапия

1. KIRISH

Introduction

Kirish. Bugungi kunda aholini sifatli oqsil mahsulotlari bilan ta'minlashda akvakultura sohasi, xususan, baliq yetishtirish yetakchi o'rnlardan birini egallaydi. Baliqchilikni rivojlantirish, ularni turli ektoparazitlar bilan zararlanishini oldini olish muhim ahamiyatga ega. Zamonaviy akvakulturaning eng muhim muammolaridan biri bo'lgan baliqlar ektoparazitlari «So'nggi yillar ichida turli mamlakatlarda, jumladan Rossiya, Vetnam, Hindiston, Indoneziya, Sharqiy Avstraliya, Peru, AQSh, Xitoy kabi baliqchilik rivojlangan hududlarda va yovvoyi populyatsiyalar yashaydigan ko'plab mamlakatlarda ham baliqlar tanasida parazitlik qiluvchi qisqichbaqasimonlar tomonidan chaqiriladigan lerneoz kasalligini o'rganish hamda oldini olishga qaratilgan tadqiqotlar olib borilmoqda. Sun'iy havzalarda boqilayotgan chuchuk suv baliqlarining barchasida jumladan karpsimon baliqlarni 45 taga yaqin turida ektoparazitlar bilan 23 foizdan 84,3 foizgacha zararlanishi, shulardan 43,1 foizgacha lerneyalar bilan zararlanish holatlari aniqlangan». Shu sababli baliqlar lerneozini tarqalishini o'rganish, ularga qarshi kurash chora-tadbirlarini ishlab chiqish muhim ahamiyatga ega.

Dunyo miqyosida keyingi yillarda iqlimni global tarzda isib ketishi ko'pgina davlatlar akvakulturasiga ham ta'sir etmasdan qolmadi. Natijada bu jarayon havza suvi tarkibini buzilishiga olib keladi va baliqlar ektoparazitlari uchun optimal sharoit bo'lib, ularni rivojlanishiga zamin yaratadi. «Parazit qisqichbaqasimonlar tomonidan hosil qilingan mexanik jarohatlar natijasida "infeksiya darvozasi" yuzaga kelishi, yosh baliqlarning ommaviy nobud bo'lishi va katta yoshdagi baliqlarning tovarlilik ko'rsatkichlarini pasayishiga hamda baliqchilik xo'jaliklarda iqtisodiy chiqimning sezilarli darajada ortishiga sabab bo'ladi». Baliqlarni intensiv

usulda boqish va havzalardagi zichlikning yuqoriligi turli yuqumli va parazitlar kasalliklarning avj olishiga zamin yaratadi.

Lerneoz - bu parazit qisqichbaqasimonlarni (*Lernaea* spp.) baliqlar tanasida parazitlik qilishi oqibatida yuzaga keladigan invazion kasallik bo'lib u baliqlarning tanasi, suzgich qanotlari, og'iz bo'shlig'i, ko'z sohasi, jabrasi va mushak to'qimalariga jiddiy zarar yetkazadi. Baliqlar tanasida ikkilamchi infektsiyon kasalliklarni kelib chiqishiga, o'sish sur'atlarining sezilarli darajada pasayishiga, baliq va baliq mahsulotlari jumladan baliq go'shti sifatiga ta'sir ko'rsatib, bundan tashqari baliqlarni tovarlilik ko'rsatkichlarini pasayishiga sabab bo'lib, xo'jaliklarga katta iqtisodiy zarar keltiradi.

Krustaseozlar - baliqlarning asosiy ektoparazitlari bo'lib, Bo'g'imoyoqlilar (Arthropoda) - tipi, Qisqichbaqasimonlar (Crustacea) - sinfi, Eshkakoyoqlilar (Copepoda) - kenja sinfi vakillari chaqiruvchi baliqlarni invazion kasalliklaridir.



1-rasm. *L. cyprinacea* ning ko'z sohasida parazitlik qilishi jarayoni / **Fig. 1.** The process of *L. cyprinacea* parasitising the eye region

Hozirda dunyo bo'yicha lerneyalarni 14 avlod 110 ga yaqin turlarini baliqchilik xo'jaliklarida uchrase kuzatilgan. O'tkazilgan tadqiqotlar bo'yicha Respublikamizni baliqchilik xo'jaliklarida boqilayotgan karp turidagi baliqlarda

1 ta turi *L. cyprinacea* (Linnaeus, 1758.) aniqlangan.

2. LERNEALARNING BIOLOGIYASI VA RIVOJLANISH SIKLI

Biology and life cycle of Lernaea

Lernealarni biologiyasi. Qo'zg'atuvchisi jinsiy voyaga yetgan urg'ochi qisqichbaqalarning tanasi uzunchoq bo'lib, 10-16 mm gacha, silindrsimon shaklda, tanasi bo'g'imlarga bo'linmagan, orqa qismi biroz kengaygan.

Bosh tomonida 4 ta o'simtasi bo'lib, 2 tasi shoxlangan va 2 tasi shoxlanmagan, ular yordamida lernealar baliq tanasiga kiradi. 5 juft ikki bo'lmalı suzgich oyoqchalari mavjud. Bir juft tuxumdoni uzunchoq shaklda bo'lib, unda 300 tadan 700 tagacha tuxumlari bo'ladi.

Rivojlanish sikli: *Lernaea cyprinacea* (Linnaeus, 1758 Crustacea: Copepoda) chuchuk suv va boshqa suv havzalarida parazitlik qiluvchi parazit qisqichbaqasimonlaridan bo'lib, ko'pgina xorijiy adabiyotlarda "langarsimon qurt" deb ham ataladi. U termofil organizm bo'lib, 23-30°C haroratda rivojlanib, 9 ta bosqichdan iborat murakkab rivojlanish (metamorfosis) siklini o'taydi: 1-bosqich – nauplii 3 ta bosqich tuxumdan chiqqandan keyingi bosqich bo'lib, asosan lernealarni erkin hayot kechuruvchi asosan suvda hayot kechuruvchi bosqichidir. 2-bosqich – kopepodit bosqichi, 5 ta bosqichdan iborat bo'lib, lernealar bu bosqichda har gal tullashdan so'ng shaklini o'zgartirib, 3-bosqichda – jinsiy yetilgan davri, 2 ta jinsdagi erkak va urg'ochi jinsdagi lernealar baliq tanasida juftlashgandan so'ng erkak jinsdagi lernealar nobud bo'ladi. Urg'ochi

jinsdagi lernealar (metamorfosislashadi), tangalarini yemirib, terisi, mushak sohalarigacha kirib jarohat joylarida absess, shishlar hosil bo'lib, og'ir parazitoozlarni keltirib chiqaradi va yosh baliqlarda ommaviy nobud bo'lish holatlari kuzatiladi. Shu bilan birga ikkilamchi bakterial va zamburug'li infeksiya kasalliklarni paydo bo'lishiga sabab bo'lib, xo'jaliklarni jiddiy iqtisodiy yo'qotishlarga olib keladi [2,14].

Lernaea cyprinacea - 45 tur karpsimon baliqlarda, ba'zida suvda va quruqlikda yashovchilarda ham parazitlik qilishi aniqlangan. Lernealar zamonaviy akvakulturani dolzarb muammolaridan biri bo'lib, ayniqsa yosh baliqlar uchun juda xavflidir. Yosh baliqlar

tanasida ochiq holdagi chuqur yaralar hosil qilib, asosan ularni jabrasi, ko'z sohasi, og'iz bo'shlig'i, ba'zida ichki organlar, umurtqa pog'ona qismiga kirib borib baliq tanasini qiyshayib qolishiga sabab bo'ladi. Yosh baliqlar tanasida 5-6 donagacha lerneyalarni bo'lishi ularni nobud bo'lishiga olib keladi Asosan baliqlarda zararlanishlar janubiy mintaqalarda aprel oyini ohirida, markaziy mintaqalarda yozni o'rtalarida uchratish mumkin. *Lernaea cyprinacea* parazitining baliq to'qimalariga sanchilishi oddiy mexanik shikastlanish bilan cheklanib qolmaydi. Bunda, parazit baliqning epidermis va derma qatlamlarini yorib o'tib, mushak tolalariga, ba'zan esa ichki a'zolariga (jigar, yurak atrofi) qadar etib boradi. Bu jarayonda, lokal nekroz ya'ni hujayralarning nobud bo'lishi va lizisi kuzatiladi. Bundan tashqari, gemorragiya-mayda qon tomirlarining yorilishi natijasida to'qima ichiga qon quyiladi.

3. TARQALISHI VA TARQALISHGA TA'SIR ETUVCHI OMILLAR

Distribution and the factors influencing it

Tarqalishi. Lerneoz yer sharining deyarli barcha chuchuk suv havzalarida uchraydi. *L. cyprinacea* nafaqat chuchuk suvli havzalarda balkim sho'r suvli havzalardagi baliqlarda ham tarqalishi kuzatilgan. Bunda Kaspiy dengiz atrofidagi chuchuk va sho'r suvlarda hamda Eronning shimoliy qismida joylashgan dekorativ baliqlar boqilayotgan baliq fermalarda 14 turdagi madaniylashtirilgan, sanoat miqyosidagi baliqlar va 4 ta oila, 13 ta turkumga mansub tabiiy havzalardagi baliqlarni asosan jabra, tanasi va suzgichlarida kuzatiladi. Baliqlarda lerneoz asosan yilning issiq paytida uchrab, suv harorati ko'tarilgach janubiy mintaqalarda aprel oyidan, oktyabr oyigacha ko'payish jarayoni kechadi. 5-6 marta tuxum qo'yib, nasl qoldiradi. Yirik jinsiy yetilgan urg'ochi jinsdagi lernealar kuz fasliga borib nobud bo'ladi. Baliq tanasida lichinkalar va to'liq yetilmagan urg'ochi jinsdagi lernealar qishlab qoladi. Bu lernealar qishlovdan so'ng bahorda tuxum qo'ygach iyun oyiga borib nobud bo'ladi. Tangachalarini yemirib, ichki teri qatlamigacha kirib boradi. Bu baliqning tuzilishi va to'qimalarida sezilarli o'zgarishlarga olib keladi. Baliq o'zini himoya qilish uchun tashqi tarafdan himoya qobiq hosil qiladi.

Bu membrana epiteliy va biriktiruvchi to'qimalarning qalin qatlamlardan iborat. Ushbu membrananing shakllanishi baliq to'qimalarining shishishiga olib keladi [5,6,8,11]

Bu shishgan to'qimalar ko'pincha parazit faolligi oshishi tufayli qizil rangga ega bo'ladi. Gambuziya baliqlarida lernealar asosan suzgich qanotlariga shikast yetkazib, ularni harakat funksiyasiga salbiy ta'sir ko'rsatadi. Yilning istalgan vaqtida baliqlarda parazitlar uchrasada, baliqlarning nobud bo'lishiga olib keladigan yuqori zararlanish faqat yoz faslida kuzatiladi. Ko'pgina baliq turlari lernealar uchun oraliq va asosiy xo'jayin hisoblanadi. Karpsimon baliq tur vakillari bu parazitlar uchun asosiy xo'jayin hisoblanadi. Ko'pgina baliqlar yuqori invazyalar paytida ham oraliq, ham yakuniy xo'jayin bo'lib xizmat qiladi. Parazit baliqning ichki to'qimalari bilan oziqlanadi. Asosan baliqlarni jabra kameralarida va tashqi tarafdan parazitlik qiladi [2,10,12]

Lernaea cyprinacea chuchuk suv baliqlari, tabiiy havza baliqlari, hatto suvda va quruqlikda yashovchilarda ham parazitlik qilishi aniqlangan. *Lernaea cyprinacea* – turli baliq turlaridan tashqari, baqa, qurbaqa, salamandalarni lichinkalarida ham parazitlik qilishi aniqlangan. Bundan tashqari, to'rtta turdagi suv hasharotlari lichinkalarini tashqi qavatidan 5 nusxadagi *L. cyprinacea*lar ajratib olingan.

Baliq havzalarida lernealarni tarqalishiga quyidagi omillar bevosita sabab bo'ladi:

Suv harorati: Parazit termofil (issiqsevar) bo'lib, 14°C dan past haroratda rivojlanishdan to'xtaydi. Past haroratlarda lernealar rivojlanishdan to'xtaydi va baliq tanasida anabiyoz holatda yashovchanligini saqlab qoladi va kasallangan baliqlar keyingi yili

kasallikning tashuvchisiga aylanadi. Bahor va yoz oylarida suv harorati 18 °C dan ko'tarilishi bilan lernealarda rivojlanish boshlanadi va baliq tanasid ko'payib, kasallik kuchayadi.

Havzadagi zichligi: Intensiv baliqchilikda havzaga me'yordan ortiq baliq tashlanishi lichinkalarning sog'lom baliqlarga yuqishiga sharoit yaratadi[7,11,12]

Gidrologik holat: Suvi almashmaydigan, oqmaydigan yoki kam oqadigan, organik moddalarga boy ko'llarda parazit lichinkalarining saqlanib qolish darajasi yuqori bo'ladi.

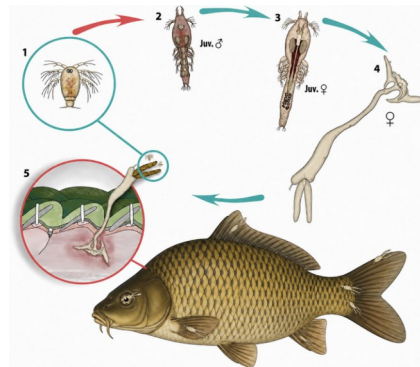
Lernealar bir havzadan ikkinchi havzaga zararlangan baliqlarni transportirovkasi orqali ham tarqaladi. Lernealarni tarqalish yo'llaridan yana biri, zararlangan baliqlar saqlanadigan suniy havza suvini boshqa yana bir baliq havzasiga to'g'ridan to'g'ri kelib tushish orqali ham sodir bo'ladi. Baliqlarda lerneoz kasalligini paydo bo'lishi, kechishini asosiy sabablaridan bular, bu baliq havzasida suv almashinuvini va baliqlarni oziqlantirishni talabga javob bermasligi hamda organik moddalar bilan ifloslanishi hisoblanadi[2,3,5].

4. PATOGENEZI VA KLINIK BELGILARI

Pathogenesis and clinical signs

Patogenezi va klinik belgilari - lernealar baliqlarning teri qavatida, suzgich qanotlarida, burun bo'shlig'ida, ko'z sohasida, jabra va og'iz bo'shlig'ida parazitlik qiladi. 10-15 ta nusxa parazitlarni baliq tanasida bo'lishi baliqlarni bezovtalanishiga olib keladi va teri qavatida shilliqni ko'payishi hisobiga tashqi qavatida moviy yoki kulrang qoplama paydo bo'ladi. Bu holat esa baliqlarni zamburug'li va bakterial kasalliklarga chaluvchanligini oshiradi. Lernealar yosh baliqlar qorin bo'shlig'ida ham parazitlik qilib, ichaklar va jigar sohasiga zarar yetkazib, jigarda hepatit rivojlanishiga sabab bo'ladi. Jigar shikastlanganda qorin bo'shlig'iga qon quyilishi, jigarning seroz qavati va ichak muskul to'qimalarining nekrozi qayd etiladi. Amfibiyalarda lernealar asosan dumning pastki qismiga yaqin organlarda va bir qator ichki organlarida ham zararlanishi mumkin parazitlik qilishi aniqlangan (masalan, jigar, orqa miya). Baliqlarini og'iz bo'shlig'ida parazitlik qilib, chuqur yaralar hosil qiladi. Natijada jag' sohasining qiyshayib, deformatsiyaga uchrashiga va nobud bo'lish holatini kuzatilgan. Zararlangan baliqlarni havzadagi holati kuzatilganda baliqlarda bezovtalanish, tanasini yonboshga suzish, harakatlari o'zgaruvchan ekanligi aniqlangan. Tanasi to'liq parazitologik tekshiruvdan o'tkazilganda to'qimalarda nekroz, proliferatsiya holatlari ham kuzatildi. Bundan tashqari, ikkilamchi infeksiya belgilari ham kuzatilgan. Lernealar jabra sohasida parazitlik qilganda baliqlarda nafas olishni qiyinlashuvi natijasida nobud bo'lish holatlari ko'proq uchraydi [6,8,9]

Baliq tanasiga mustahkam joylashgan qisqichbaqasimonlar chuqur yaralar hosil qiladi, atrofi oq chiziqli bilan boshqa sog'lom to'qimalardan farqlanadi. Baliqlarda teri sohasida dermatitlar, chuqur yaralar, zararlangan baliqlar jabrasida ko'plab shilliqni to'planishi baliqlarni hayotiy yashovchanligini pasaytiradi. Ko'z sohasida shoh pardasiga shikast yetkazishi natijasida, baliqlarni ko'r bo'lish holatlari kuzatilgan. Parazit sanchilgan joyda chuqur yaralar, abscesslar va nekroz o'choqlari hosil bo'ladi. Bu yaralar orqali baliq organizmiga ikkilamchi infeksiyalar-bakteriyalar (*Aeromonas*, *Pseudomonas*) va zamburug'lar (*Saprolegnia*) oson kiradi.



2-rasm. Lerneoz bilan zararlangan baliq tanasidagi jarohatlar / **Fig. 2.** Lesions on the body of a fish infested with lerneaeosis

2023-2025-yillarda Samarqand viloyati baliqchilik havzalarida baliqlar lerneozini tarqalishi bo'yicha olib borilgan tadqiqotlar natijalari.

Klinik ko'rinishi: Kasallanib zaiflashgan baliqlar suv yuzasida suzadi, harakatlari sekinlashadi. Tanasida aniq ko'rinib turuvchi, osilib yotgan ipsimon parazitlar va ularning atrofiga qizargan, qontalash yaralarini ko'rish mumkin. Jabralar shikastlanganda baliqda asfiksiya (havo etishmasligi) kuzatiladi.

Diagnostikasi: Diagnostik tashqi ko'rinishini vizual ko'rikdan o'tkazish va jabra hamda teridan olingan qirindilarni mikroskopik tekshirish asosida qo'yiladi. Voyaga yetgan urg'ochilarni oddiy ko'z (vizual) bilan ham ajratish mumkin, biroq mikroskop ostida kopepodit lichinka bosqichlarini aniqlash kasallikning erta bosqichida tashxis qo'yish imkonini beradi.

O'tkazilgan tadqiqotlar natijasida Samarqand viloyatini ba'zi tumanidagi baliq havzalarida baliqlar lerneozini mavsumiy dinamikasi (2023-2025-yy.) tahlil qilindi va qo'yidagicha holatlar kuzatildi.

5. DAVOLASH TAJRIBALARINING NATIJALARI

Results of the treatment experiments

Baliqlar lerneozini davolash bo'yicha o'tkazilgan tajribalar natijalari: Tajriba havzalarda saqlanayotgan 83 dona bir yozli (segoletka) 180-220 grammli karp turidagi baliqlar tutilib tekshiruvdan o'tkazildi.

Tekshiruv natijasida 83 dona baliqdan 61 dona (EI-73,49 %, II-5-10 nusxa/bosh) baliqlar tanasida lernealar topildi. 83 dona baliqdan 61 donasi lerneoz bilan 12 donasida argulioz, 3 donasida lugilioz va 7 donasida kasallik aniqlanmadi. Lerneoz kuzatilgan baliqlarda hozirda amaliyotda qo'llanilib kelinayotgan «Эмикон» va «Антибак100» preparatlarini ketma-ketlikda kompleks tarzda davolash maqsadida 20 dona baliqda laboratoriya sharoitida akvariumda 10 kun davomida baliqlarga ozuqasiga qo'shib qo'llanildi. Nazorat guruhidagi 20 dona baliqlarga esa multivitaminli yemlar va akvarium suviga dezinfektsiylovchi preparatlar qo'llanildi. Preparatlarni qo'llashdan oldin baliqlar vazni o'lchanganda 180-220 grammni tashkil etdi va baliqlarni o'rtacha vazni 200 gramm deb hisoblab olindi, shunda bitta guruhning umumiy vazni 12,2 kg ni tashkil etishi aniqlandi.

Tajriba guruhidagi 20 dona baliqlarni umumiy vazni 4 kg ga «Эмикон» preparatini yo'riqnomasi bo'yicha 1 kg baliq tana vazniga 0,15 gr dan hisoblanganda 1-tajriba guruhidagi baliqlarga 0,6 gramm preparatini 4 kg baliq tana vaznini 2 foiziga 1 martalik ozuqa miqdori 80 gr yemga 0,6 gramm preparatni suspenziya shaklida tayyorlab shimdirilib xona haroratida quritib bir kunda ikki marta ertalabki va kechki ozuqasiga qo'shib 5 kun davomida oziqlantirildi.

2-tajriba guruhidagi 20 dona baliqlarni umumiy massasi ham 4 kg hisoblanib, «Multivitamin»li yemlardan granula hajmi 2,5 mmli

2 mahal 126 grammdan yem bir kunda ikki marta ertalabki va kechki ozuqasida berildi.

5 kundan keyin baliqlar holati tekshirildi, shunda tajriba guruhidagi 20 dona baliqlarni tanasi tekshirilganda 1 dona baliq tanasida (EI-10,0%, II-1-2 nusxa/bosh) lernealar aniqlandi.

Nazorat guruhidagi baliqlarni 3–5% li tuzli suvda kun ora 5–10 daqiqa davomida ekspozitsiya qilindi. 1 dona baliq nobud bo'ldi va 19 dona baliqdan 15 dona baliq tanasida lernealar (EI-90,54%, II-7-11 nusxa/bosh) aniqlandi.

Tajribadagi baliqlar tanasida lernealar hosil qilgan jarohatlar natijasida ikkilamchi infektsiyaga qarshi 3 kundan keyin tajriba guruhidagi baliqlarga «Антибак100» preparatini yo'riqnomasida ko'rsatilganidek 1 dona baliq tana vazniga 0,1gramm deyilgan,

1-jadval

Baliqlar lerneozini davolash bo'yicha o'tkazilgan tajribalar natijalari / **Table 1.** Results of the experiments on the treatment of lernaecosis in fish

Tajriba bosqichi	Guruh	Baliqlar soni	Davolash usuli	Natija (EI, II)	Nobud bo'lgan
1-kun	Tajriba	20	«Эмикон» 0,15 g/kg (0,6 g/4 kg), 80 g yemga, kuniga 2 mahal, 5 kun	Boshlang'ich zararlanish	-
1-kun	Nazorat	20	«Multivitamin»li yem	Boshlang'ich zararlanish	-
5-kun	Tajriba	20	«ЭМИКОН»	1 dona (EI–10,0%; II–1–2 nusxa/bosh)	0
5-kun	Nazorat	19	3–5% tuz eritmasi, 5–10 daqiqa	15 dona (EI–90,54%; II–7–11 nusxa/bosh)	1
6–10-kun	Tajriba	20	«Антибак100» 0,1 g/kg (0,4 g/4 kg), 1 mahal, 5 kun	Ikkilamchi infektsiyaga qarshi	0
6–10-kun	Nazorat	20	Preparatsiz, «Multivitamin»li yem	Davolashsiz	0
10-kun	Tajriba	20	«ЭМИКОН» + «Антибак100»	Sog'ayish 100%, EI–0%	0
10-kun	Nazorat	17	1:500 000 metilen ko'ki, 15 daqiqa	12 dona (EI–70,6%; II–5–7 nusxa/dona)	2

6. PROFILAKTIKA TADBIRLARI

Preventive measures

Baliqlar lerneozini profilaktika qilish bo'yicha tavsiyalar:

Karantin choralari: Xo'jalikga olib kelinayotgan yangi baliqlar kamida 14–21 kun davomida alohida karantin havzalarida saqlanishi va profilaktik tuzli vannalardan (2 foizli osh tuzi eritmasida 5 daqiqa)o'tkazilishi shart.

Havzalarni quritish va dezinfeksiya qilish: Baliq boqish mavsumi yakunida havza suvi to'liq oqizilib, tubi quritiladi va so'ndirilgan ohak (CaO) bilan (1 gektaga 25–30 sentner) ishlov beriladi. Bu parazit tuxumlarini butunlay yo'q qiladi.

Gidroteknik nazorat: Suv kirish tarmoqlariga maxsus mayda ko'zli to'r-filtrlar o'rnatilishi shart. Bu yovvoyi baliqlar va ular orqali parazit lichinkalarining kirishini oldi olinadi.

Baliqlar lerneozini baliqchilik xo'jaliklariga ikki xil zarar keltiradi:

1. To'g'ridan-to'g'ri zarar-baliqlarning ommaviy nobud bo'lishi (ayniqsa chavoqlar va bir yillik baliqlar orasida o'lim darajasi 80% gacha etishi mumkin).

2. Bilvosita zarar: Baliqning tovarlik ko'rinishining yo'qolishi. Tanasida jarohat, qon quyulishlar va shishlar va oqarishlar natijasida baliqlarni tovarlilik ko'rinishi yo'qoladi va tannarxini tushib ketishuga sabab bo'ladi.

shunda tajribadagi baliqlar tana vazniga 4 kgga 0,4 gramm preparat suspenziya shaklida baliq yemiga shimdirilib 5 kun davomida 1 mahal ertalabki ozuqasida baliqlar oziqlantirildi. Nazorat guruhidagi 20 dona baliqlarga hech qanaqa preparat qo'llanilmadi, granulani hajmi 2,5 mmli "Multivitamin"li baliq yemlari bilan 2 mahal 126 grammdan oziqlantirildi.

10 kundan so'ng baliqlar qayta tekshirildi, shunda tajriba guruhidagi baliqlarda butunlay sog'ayish kuzatildi va preparatlarni ekstenssamaradorligi 100 foizgacha samarali ekanligi aniqlandi.

Nazorat guruhidagi baliqlarni 1:500 000 nisbatdagi metilin ko'ki eritmasida 15 daqiqa ekspozitsiya qilindi. 2 dona baliqlar nobud bo'ldi. 17 donadan 12 donasida lernealar (EI-70,6 %, II-5-7 nusxa/dona) kuzatildi.

7. XULOSA VA TAVSIYALAR

Conclusions and recommendations

Xulosa va tavsiyalar: Baliqlar lerneozini nazorat qilish faqatgina kimyoviy usullar bilan samara bermaydi. Biz tomonimizdan qo'llanilgan «Эмикон» va «Антибак 100» kombinatsiyalangan davolash sxemasining 100% lik mutloq samaradorlik ko'rsatishi uning ikki tomonlama sinergik ta'sir mexanizmiga ega ekanligi bilan izohlanadi. «Эмикон» preparatining tarkibiy qismlari parazit qisqichbaqasimonlarning asab-mushak tizimini bloklay, ularning baliq tanasidan to'liq uzilishini va nobud qilsa, «Антибак 100» preparati esa lernealar tomonidan hosil qilingan jarohatlar natijasida ikkilamchi bakterial (Aeromonas, Pseudomonas) va zamburug'li (Saprolegnia) infeksiyalariga qarshi kurashishda yaxshi samara beradi.

Lernaea cyprinacea o'zining 9 bosqichli murakkab metamorfoz hayot sikli va termofil tabiati tufayli suv harorati 23–30°C bo'lganda maksimal darajada ko'payadi, past haroratlarda esa baliq tanasida anabioz holatida qishlab, bu yiliga esa kasallik tashuvchi bo'lib xizmat qiladi.

Kasallik baliq tanasida chuqur tizimli patologiyalarni, jumladan, dermatit, nekroz, jigarning patologik o'zgarishlari va jabra asfiksiyasini keltirib chiqaradi hamda bakterial-zamburug'li infeksiyalar uchun zamin yaratadi.

Baliqlar lerneoziga qarshi kurashda an'anaviy yakka tartibdagi dori vositalaridan ko'ra, kombinatsiyalangan «Эмикон» + «Антибак 100» sxemasi o'zining mutloq 100 foizlik terapevtik va ekologik xavfsiz samaradorligi aniqlandi.

Baliqchilik xo'jaliklarida baliqlar lerneozini oldini olish va qarshi kurashishda quyidagi amaliy yo'riqnomalar tavsiya etiladi:

Profilaktik ohaklash: Har yili bahor va yoz oylarida, havza suvi harorati parazit ko'payishi uchun kritik hisoblangan 25°C ga yetganda, havza tubi va suv qatlamiga gektariga 100 kg me'yorda yangi so'ndirilgan ohak suspenziyasi bilan majburiy profilaktik ishlov berilsin. Bu suv muhitidagi erkin suzib yuruvchi naupliial va kopepodit lichinkalarini nobud bo'lishiga olib keladi.

Kompleks davolash: Havzada baliqlar lerneozini kuzatilsa ketma-ket 5 kun davomida «Эмикон» + «Антибак 100» preparatlari shimdirilgan dorivor yemlar bilan oziqlantirish orqali davolash tadbirlari o'tkazilsin.

Havzaga tashlashdan oldingi tekshirish jarayoni: Bir xo'jalikdan ikkinchisiga baliqlarni ko'chirishda qat'iy parazitologik ko'rik o'tkazilib, kasallik aniqlanganda umumiy havzalarga qo'yilmasdan, alohida karantin havzalarida to'liq sanatsiya qilinishi lozim.

DECLARATIONS

Declarations

Author contributions CRedit

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

Aquaculture, and fish rearing in particular, is now one of the principal means of supplying the population with high-quality protein, and the global warming of recent years has not left the aquaculture of most countries untouched. Lernaosis is an invasive disease caused by the parasitic crustaceans of the genus *Lernaea*, which attach to the skin, musculature and gills of the fish and provoke mechanical injury, inflammatory processes and secondary bacterial and fungal infections;

as a result growth slows, feeding activity and immunity decline, and farms suffer appreciable economic losses. The purpose of the article is to set out the distribution, aetiology, pathogenesis, clinical signs, diagnosis, treatment and prevention of lernaosis in cyprinid fish, and in particular to test a combined therapeutic approach under the conditions of the fish farms of Samarkand region.

Materials and methods

Crustaceoses are the principal ectoparasites of fish, belonging to the phylum Arthropoda and the subphylum Crustacea. Around 110 species in 14 genera of *Lernaea* have been recorded on fish farms worldwide, and one species, *L. cyprinacea* (Linnaeus, 1758), has been identified in the investigations reported here. *Lernaea cyprinacea* has been established as a parasite of 45 species of cyprinid fish and occasionally of amphibians, and its nine-stage metamorphic life cycle is described in the article. Investigations on the distribution of lernaosis in the fish ponds of Samarkand region were carried out in 2023–2025. For the treatment experiment, 83 one-year-old fish held in the experimental ponds were examined; the treatment group of 20 fish with a total weight of 4 kg received Emicon in medicated feed according to the manufacturer's instructions at the rate specified per kilogram of fish body weight, the second experimental group of 20 fish with the same total weight received feed with multivitamins in granules of 2.5 mm, and the control group was subjected to alternate-day exposure in 3–5 % salt water for 5–10 minutes and, subsequently, to a 15-minute exposure in methylene blue at a dilution of 1:500 000. Antibak-100 was added after three days against the secondary infection arising from the lesions produced by the lernaes.

Results and discussion

Examination showed that 61 of the 83 fish carried lernaes on the body, an extensity of infestation of 73.49 % with an intensity of 5–10 specimens per fish. The parasite is thermophilic and ceases development below 14 °C, so that water temperature, stocking density and the hydrological regime of the pond are the direct determinants of its spread; ponds whose water is not exchanged, or is stagnant or slow-flowing and rich in organic matter, favour the larvae, and the parasite also spreads between ponds through the transport of infested fish. Clinically, affected and weakened fish swim at the surface with slowed movements and bear visible lesions; the firmly attached crustaceans produce deep ulcers surrounded by a white ring, and the swollen tissues frequently take on a red colour as parasite activity increases. Diagnosis was based on visual inspection of the external appearance of the fish together with examination of scrapings from the gills and skin. Five days after the start of treatment, only one fish in the treatment group still carried the parasite; after ten days the fish of the treatment group had recovered completely. In the control group one fish died under the salt-water regime and two under the methylene blue exposure. The results of all groups are given in Table 1. Lernaosis was found to damage fish farms in two ways: directly, through mass mortality especially among fry and one-year-old fish, and indirectly, through the loss of marketable appearance caused by lesions, haemorrhages, swellings and discolouration.

Conclusion and contribution

Control of lernaosis in fish cannot be achieved by chemical means alone. Because *Lernaea cyprinacea* has a complex nine-stage metamorphic life cycle and a thermophilic nature, the risk is concentrated at water temperatures of 23–30 °C, and the disease produces deep systemic pathology in the fish, including dermatitis, necrosis and pathological changes in the liver. In the experiments the combined use of Emicon and Antibak-100 proved more effective than the traditional single-agent treatments. The following practical measures are recommended: quarantine of newly introduced fish in separate ponds for at least 14–21 days; complete drainage, drying and disinfection of ponds at the end of the rearing season; the installation of fine-mesh filter screens on the water inlets to exclude wild fish and larvae; prophylactic liming in spring and summer when the water temperature approaches the critical level for parasite reproduction; a five-day combined course of Emicon and Antibak-100 when lernaosis appears; and strict parasitological examination before fish are moved from one farm to another. The contribution of the work is to combine a regional epizootiological picture with a tested, farm-applicable combined treatment protocol.

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O'zbekiston Respublikasi Fanlar akademiyasi huzuridagi OAK ro'yxatiga kiritilgan: 06.00.00 – Qishloq xo'jaligi fanlari; 16.00.00 – Veterinariya fanlari.

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