

RESEARCH ARTICLE • PEER-REVIEWED • OPEN ACCESS • SERIES C • HAC/OAK 16.00.00 — VETERINARY SCIENCES • UDC: 638.15:615.32:615.9

Comparative efficacy of chemical and phytopreparations against invasive diseases of honey bees and a scientifically justified optimal scheme of treatment and prevention

Asalarilar invazion kasalliklarida kimyoviy va fitopreparatlarning qiyosiy samaradorligi hamda davolash-profilaktika tadbirlarining ilmiy asoslangan optimal sxemasi

Сравнительная эффективность химических препаратов и фитопрепаратов при инвазионных болезнях пчёл и научно обоснованная оптимальная схема лечебно-профилактических мероприятий

IBRAGIMOV Furqat Buriyevich^{1*}, **YUNUSOV Khudaynazar Beknazarovich¹**

¹ Samarkand State University of Veterinary Medicine, Livestock and Biotechnologies, Samarkand, Uzbekistan

* Corresponding author: ibragimovfurkat694@gmail.com

ARTICLE INFO

ARTICLE TYPE

Research Article

LANGUAGE OF FULL TEXT

O'zbekcha (UZ)

SCIENTIFIC FIELD / OAK

☒ 16.00.00 – Veterinary Sciences

Veterinariya fanlari

HAC Presidium decision No. 371/5, 13.06.2025

Series C

UDC / UDK

638.15:615.32:615.9

ARTICLE HISTORY

Received: 2026-09-11

Revised: 2026-09-19

Accepted: 2026-09-25

Published: 2026-09-30

DOI

<https://doi.org/10.66073/ReFocus.V5I9.0919>

CONTACT

ReFocusJournal@gmail.com

LICENSE



Creative Commons Attribution 4.0 International (CC BY 4.0). This is an open access article distributed under the terms of the CC BY 4.0 licence.

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

ENGLISH

IBRAGIMOV Furqat Buriyevich^{1*}, **YUNUSOV Khudaynazar Beknazarovich¹**

¹ Samarkand State University of Veterinary Medicine, Livestock and Biotechnologies, Samarkand, Uzbekistan

Abstract. This article presents a comparative evaluation of the therapeutic efficacy of the chemical preparations Bipin-T and Flutsin and an infusion of asafoetida (*Ferula assa-foetida*) against varroosis and tropilaelapsosis in honey bees. Based on changes in the number of Varroa destructor and Tropilaelaps mites, the acaricidal activity, specific effects, and potential application of the preparations in therapeutic and preventive measures were analyzed. Taking into account the advantages and limitations of chemical acaricides and the phytopreparation, scientifically justified approaches to an integrated treatment and prevention scheme for invasive diseases of honey bees are presented.

Keywords: honey bees; varroosis; tropilaelapsosis; Varroa destructor; Tropilaelaps clareae; Bipin-T; Flutsin; asafoetida; phytopreparation; comparative efficacy; acaricidal activity; treatment and prevention; scheme

O'ZBEKCHA

IBRAGIMOV Furqat Bo'riyevich^{1*}, **YUNUSOV Xudaynazar Beknazarovich¹**

¹ Samarqand davlat veterinariya meditsinasi, chorvachilik va biotexnologiyalar universiteti, Samarqand, O'zbekiston

Annotatsiya. Ushbu maqolada asalarilarning varroatoz va trapilelapsoz kasalliklariga qarshi kimyoviy preparatlar - Bipin-T va Flutsin hamda kavrak (*Ferula assa-foetida*) damlamasining terapevtik samaradorligi qiyosiy baholandi. Varroa destructor va Tropilaelaps kanalari sonining o'zgarishi asosida preparatlarning akaritsid faolligi, ta'sir xususiyatlari va davolash-profilaktika tadbirlarida qo'llash imkoniyatlari tahlil qilingan. Kimyoviy akaritsidlar va fitopreparatning afzalliklari hamda cheklovlarini hisobga olgan holda, asalarilar invazion kasalliklariga qarshi kurashishning ilmiy asoslangan kompleks davolash-profilaktika sxemasi haqida ma'lumotlar keltirilgan.

Kalit so'zlar: asalarilar; varroatoz; trapilelapsoz; Varroa destructor; Tropilaelaps clareae; Bipin-T; Flutsin; kavrak; fitopreparat; qiyosiy samaradorlik; akaritsid faollik; davolash-profilaktika; sxema

РУССКИЙ

ИБРАГИМОВ Фуркат Буриевич^{1*}, **ЮНУСОВ Худайназар Бекназарович¹**

¹ Самаркандский государственный университет ветеринарной медицины, животноводства и биотехнологий, Самарканд, Узбекистан

How to cite / Iqtibos keltirish / Как цитировать: IBRAGIMOV, F. B., YUNUSOV, K. B. (2026). Comparative efficacy of chemical and phytopreparations against invasive diseases of honey bees and a scientifically justified optimal scheme of treatment and prevention. Research Focus International Scientific Journal, 5(9), 135–139. <https://doi.org/10.66073/ReFocus.V5I9.0919>

© 2026 The Author(s). Published by Research Focus International Scientific Journal. Open access article under the CC BY 4.0 licence.

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.

Аннотация. В статье проведена сравнительная оценка терапевтической эффективности химических препаратов Бипин-Т и Флуцин, а также настоя каврака (*Ferula assa-foetida*) при варроатозе и тропилелапозе пчёл. На основании изменения численности клещей *Varroa destructor* и *Tropilaelaps* проанализированы акарицидная активность препаратов, особенности их действия и возможности применения в лечебно-профилактических мероприятиях. С учётом преимуществ и ограничений химических акарицидов и фитопрепарата представлены научно обоснованные подходы к комплексной системе лечебно-профилактических мероприятий против инвазионных болезней пчёл.

Ключевые слова: пчёлы; варроатоз; тропилелапоз; *Varroa destructor*; *Tropilaelaps clareae*; Бипин-Т; Флуцин; каврак; фитопрепарат; сравнительная эффективность; акарицидная активность; лечебно-профилактические мероприятия; схема

1. KIRISH

Introduction

Asalarilarning varroatoz va trapilelapsoz invazion kasalliklari asalarichilik tarmog'ining samaradorligi, asalari oilalarining hayotchanligi va mahsuldorligiga salbiy ta'sir ko'rsatuvchi muhim muammolardan hisoblanadi. Ushbu kasalliklarga qarshi kurashishda kimyoviy akaritsidlar keng qo'llanilsa-da, ularning samaradorligi, qo'llash davomiyligi va xavfsizligini hisobga olgan holda muqobil fitopreparatlarni o'rganish dolzarb ahamiyatga ega. Shu jihatdan, Bipin-T va Flutsin preparatlari hamda kavrak (*Ferula assa-foetida*) damlamasining *Varroa destructor* va *Tropilaelaps* kanalari soniga ta'sirini qiyosiy baholash, ularning terapevtik samaradorligi va qo'llash imkoniyatlarini aniqlash muhim ilmiy-amaliy vazifa hisoblanadi. Tadqiqotning maqsadi kimyoviy akaritsidlar va kavrak asosidagi fitopreparatning samaradorligini o'zaro taqqoslash hamda asalarilar invazion kasalliklariga qarshi ilmiy asoslangan davolash-profilaktika sxemasini ishlab chiqishdan iborat.

2. MUAMMONING O'RGANILGANLIK DARAJASI

Literature review

Olimlar tajriba davomida oksalat kislotasi, timol va neem (*Azadirachta indica*) ekstrakti asosidagi preparatlarning samaradorligini taqqoslagan. Oksalat kislotasi qo'llangan koloniyalarda davolashdan keyingi 21 kun davomida *Varroa* soni 92,1 foizga kamaygan. Timol preparati bilan ishlov berilgan oilalarda samaradorlik 84,6 foizni, neem ekstrakti qo'llangan guruhlarda esa 73,8 foizni tashkil qilgan. Tadqiqot davomida Fitopreparatlar sintetik akaritsidlarga nisbatan sekinroq ta'sir ko'rsatishi aniqlangan, biroq ular asal tarkibida zararli qoldiq moddalar hosil qilmasligi va asalari oilalari uchun xavfsizligi bilan ajralib turgan. Mualliflarning kuzatuvlariga ko'ra, *Varroa* bilan kuchli zararlangan koloniyalarda brood maydoni 21,3 foizga, asal mahsuldorligi esa 19,7 foizga kamaygan [1]. Olimlar *Thymus saturoideus* va *Origanum elongatum* o'simliklari efir moylarining kimyoviy tarkibi hamda *V. destructor* ga qarshi akaritsid xususiyatlarini o'rganagan. Tadqiqotda ushbu moylarning asalari uyasida fumigatsiya usulida qo'llanganda samarali ta'sir ko'rsatishi aniqlangan. Ayniqsa, tarkibida karvakrol ko'p bo'lgan efir moyining fumigant ta'siri yuqoriroq bo'lgan. Ushbu natijalar mahalliy dorivor o'simliklardan olinadigan biologik faol moddalarni varroatozga qarshi vositalar yaratishda o'rganish muhimligini ko'rsatadi [5].

Italiyalik olim Giuseppe Pietropaoli va hamkorlari asalari oilalarida *Varroa destructor* ga qarshi organik kislotalardan foydalanish samaradorligini o'rganagan. Tadqiqotlar asosan Italiya hududidagi tijorat va havaskor asalarichilik xo'jaliklarida olib borilgan. Mualliflar oksalat kislotasining turli qo'llash usullarini - tomchilash, purkash va sublimatsiya usullarini taqqoslaganlar. Tadqiqot natijalarida oksalat kislotasi ayniqsa brood mavjud bo'lmagan davrda qo'llanganda yuqori akaritsid ta'sir ko'rsatishi aniqlangan.

Sublimatsiya usulida kanalarining nobud bo'lish darajasi ayrim tajriba guruhlarida 95 % dan yuqori bo'lgan. Tomchilash usuli esa amaliy jihatdan qulayligi bilan ajralib turgan, ammo takroriy qo'llash talab qilingan.

Mualliflar oksalat kislotasining asosiy afzalligi sifatida: asal tarkibida uzoq muddatli qoldiq hosil qilmasligi; arilar uchun nisbatan xavfsizligi; ekologik tozaligi; rezistentlik rivojlanish ehtimoli pastligini ko'rsatganlar [4].

Olimning “Средства неспецифической профилактики варроатоза пчёл на основе растительного сырья и научные основы их применения” mavzusidagi dissertatsiyasida varroatozga qarshi o'simlik xomashyosidan foydalanishning ilmiy asoslari o'rganilgan. Tadqiqotda achchiq shuvoq (*Artemisia absinthium*) va qarag'ay kurtaklari asosida tayyorlangan KAS-81 preparatining terapevtik-profilaktik xususiyatlari baholangan. Muallif ma'lumotlariga ko'ra, preparatni oziqlantirish orqali qo'llash asalari oilalarining kanalariga zararlanish darajasini kamaytirishga yordam bergan. Ishda preparatning asalari oilalarining qishlashi, nasl rivojlanishi va hayotchanligiga ta'siri ham o'rganilgan [7]. Tadqiqot Hindistonning Himachal-Pradesh shtatidagi Kangra vodiysi va Rajasthan hududlarida *Tropilaelaps clareae* bilan zararlangan asalari oilalarida olib borilgan. Uch marta ishlov berilgandan so'ng, kekik (*Thymus vulgaris*) moyi nasldagi zararlanishni 42,33% dan 2,00% gacha kamaytirgan, ya'ni 94,83% samaradorlik qayd etilgan. Evkalipt (*Eucalyptus globulus*) moyi qo'llangan guruhda zararlanish 3,00% gacha tushib, 91,36% kamayish kuzatilgan. Ish ushbu ikki o'simlik moyining trapilelapsozga qarshi istiqbolli ekanligini ko'rsatadi [2]. Mualliflar *V. destructor* va *T. clareae* bilan birgalikda zararlangan *Apis mellifera* oilalarida kekik, evkalipt, qalampirunchoq va limon o'ti (lemongrass) efir moylarini laboratoriya hamda dala sharoitida tekshirgan. *T. clareae* ga qarshi nisbiy samaradorlik kekik moyida 81,70%, qalampirunchoq moyida 76,95%, evkalipt moyida 74,53% va limon o'ti moyida 69,74% bo'lgan. Kekik moyi eng yuqori natijani ko'rsatgan; uning qo'llanilishi nasl maydonining sezilarli oshishi bilan ham bog'langan [6].

Mualliflar *Tropilaelaps mercedesae* biologiyasi, tarqalishi va unga qarshi kurash usullarini umumlashtirgan sharh maqola tayyorlagan. Unda timol, limonen va limon o'ti moyi kabi o'simliklardan olinadigan birikmalarning akaritsid imkoniyatlari yoritilgan. Shu bilan birga, laboratoriyada kuzatilgan ta'sir har doim ham dala sharoitida takrorlanmasligi, optimal konsentratsiya va qo'llash usullarini yanada takomillashtirish zarurligi ta'kidlangan [3].

Xulosa qilib aytganda, xorijiy va mahalliy tadqiqotchilar tomonidan olib borilgan tadqiqotlar asalariilarning invazion kasalliklariga qarshi kimyoviy akaritsidlar, organik kislotalar va dorivor o'simliklar asosidagi fitopreparatlarning samaradorligini tasdiqlaydi. Biroq ularning ta'sir tezligi, xavfsizligi va qo'llash sharoitlari o'zaro farqlanadi. Shu sababli kimyoviy preparatlar va fitopreparatlarning qiyosiy samaradorligini baholash, optimal dozalar hamda qo'llash muddatlarini belgilash asosida ilmiy

asoslangan davolash-profilaktika sxemasini ishlab chiqish muhim ilmiy-amaliy ahamiyatga ega.

3. MATERIALLAR VA TADQIQOT USULLARI

Tadqiqotlar davomida asalarilarning invazion kasalliklari - varroatoz va trapilelapsozga qarshi qo'llaniladigan kimyoviy preparatlar hamda dorivor o'simliklar asosidagi fitopreparatlarning terapevtik va profilaktik samaradorligi qiyosiy o'rganildi. Bunda kavrak (Ferula assa-foetida) o'simligidan tayyorlangan suvli damlamaning akaritsid faolligi, kimyoviy akaritsidlar bilan taqqoslagandagi samaradorligi hamda asalari oilalari uchun xavfsizligi baholandi.

Preparatlar asalari oilalariga romlar oralig'iga purkash usulida qo'llanildi. Tadqiqotlarda parazitlar bilan zararlanish darajasining o'zgarishi, preparatlarning terapevtik ta'siri, asalari oilalarining fiziologik holati va nasl rivojlanishiga ta'siri asosiy baholash

1-jadval

Kimyoviy va fitopreparatlarning Varroa destructor kanalari soniga qiyosiy ta'siri / **Table 1.** Comparative effect of chemical preparations and phytopreparations on the number of Varroa destructor mites

№	Preparat	Preparat konsentratsiyasi / dozasi	Tajriba davomiyligi, kun	Boshlang'ich kanalar soni, dona (M±m)	Yakuniy kanalar soni, dona (M±m)	Kanalar sonining kamayishi, %	Nazorat guruhida yakuniy ko'rsatkich, dona (M±m)
1	Bipin-T	Tajriba dozasi	14	34,0±0,5	3,0±0,6	91,2	38,0±0,3
2	Flutsin	Tajriba dozasi	21	35,0±0,2	4,0±0,6	88,6	39,0±0,4
3	Kavrak damlamasi	Tajriba dozasi	21	32,0±0,2	6,0±0,1	81,2	39,0±0,4

Yuqoridagi jadval ma'lumotlari kimyoviy va Fitopreparatlarning Varroa destructor kanalari soniga yuqori darajada ta'sir ko'rsatganligini ko'rsatadi. Tajriba boshida barcha guruhlarda kanalar soni nisbatan yaqin bo'lib, Bipin-T guruhida 34,0±0,5, Flutsin guruhida 35,0±0,2 va kavrak damlamasi guruhida 32,0±0,2 donani tashkil etgan. Kuzatuv yakunida kanalar soni mos ravishda 3,0±0,6; 4,0±0,6 va 6,0±0,1 donagacha kamaygan. Hisob-kitoblarga ko'ra, kanalar sonining eng yuqori kamayishi Bipin-T guruhida 91,2% va Flutsin guruhida 88,6% va 15% li kavrak damlamasi qo'llanilgan guruhda 81,2%, ni tashkil etdi.

Demak, berilgan tajriba sharoitida kavrak damlamasi Flutsinga nisbatan 5,2 foiz punkt, Bipin-Tga nisbatan esa 2,6 foiz punkt yuqori natija ko'rsatgan. Nazorat guruhlarida esa 14-21 kun davomida kanalar sonining kamayishi kuzatilmagan, aksincha, ularning soni 38,0-39,0 donagacha oshgan. Bu holat tajriba guruhlaridagi ijobiy o'zgarishlar preparatlarning akaritsid ta'siri bilan bog'liqligini ko'rsatadi.

2-jadval ma'lumotlari kimyoviy va Fitopreparatlarning Tropilaelaps kanalari soniga sezilarli akaritsid ta'sir ko'rsatganligini ko'rsatadi.

Tajriba boshida kanalar soni Bipin-T guruhida 32,0±0,3, Flutsin guruhida 28,0±0,2 va kavrak damlamasi guruhida 29,0±0,2 donani tashkil etgan. Kuzatuv yakunida ushbu ko'rsatkichlar mos ravishda 5,0±0,6; 3,0±0,1 va 6,0±0,1 donagacha kamaygan. Hisoblangan kamayish darajasi Flutsin guruhida 89,3%, 15% li kavrak damlamasi guruhida 79,3%, Bipin-T guruhida esa 84,3% ni tashkil

2-jadval

Kimyoviy va fitopreparatlarning Tropilaelaps kanalari soniga qiyosiy ta'siri / **Table 2.** Comparative effect of chemical preparations and phytopreparations on the number of Tropilaelaps mites

№	Preparat	Preparat konsentratsiyasi / dozasi	Tajriba davomiyligi, kun	Boshlang'ich kanalar soni, dona (M±m)	Yakuniy kanalar soni, dona (M±m)	Kanalar sonining kamayishi, %	Nazorat guruhida yakuniy ko'rsatkich, dona (M±m)
1	Bipin-T	Tajriba dozasi	14	32,0±0,3	5,0±0,6	84,3	36,0±0,1
2	Flutsin	Tajriba dozasi	21	28,0±0,2	3,0±0,1	89,3	33,0±0,4
3	Kavrak damlamasi	Tajriba dozasi	21	29,0±0,2	6,0±0,1	79,3	37,0±0,4

mezonlari sifatida belgilandi. Olingan natijalar asosida kimyoviy preparatlar va fitopreparatlarning qiyosiy samaradorligini aniqlash hamda davolash-profilaktika tadbirlarining maqbul sxemasini asoslash ko'zda tutildi.

4. TADQIQOT NATIJALARI

Results

Varroatoz va trapilelapsozga qarshi kurashishda qo'llaniladigan preparatlarning terapevtik va profilaktik samaradorligini to'g'ri baholash kasalliklarni nazorat qilishning ilmiy asoslangan tizimini ishlab chiqishda muhim ahamiyatga ega. Tadqiqotlar jarayonida dastlab kimyoviy preparatlar, keyingi qismda esa o'simlik xomashyosi asosida tayyorlangan fitoterapevtik vositalarning samaradorligi o'rganildi. Mazkur tadqiqot natijalarini qiyosiy tahlil qilish orqali preparatlarning parazitlarga ta'sir tezligi, akaritsid samaradorligi, asalarilar uchun xavfsizligi va ularni davolash-profilaktika tadbirlarida qo'llash imkoniyatlari baholandi.

etdi. Demak, Tropilaelaps kanalari sonini kamaytirish bo'yicha eng yuqori natija Flutsin preparatida qayd etildi.

Kimyoviy hamda fito preparatlarning qiyosiy tahlili Varroa destructor va Tropilaelaps kanalari sonini kamaytirishda yuqori biologik faollikka ega ekanligini ko'rsatdi. V. destructor bo'yicha kanalar sonining kamayishi Bipin-T da 91,2%, Flutsinda esa 88,6%, 1:10 nisbatdagi kavrak damlamasi qo'llanilgan guruhda 81,2%, ni tashkil etib, Bipin-T eng yuqori natijani namoyon qildi. Tropilaelaps bo'yicha Flutsin 89,3%, kavrak damlamasi 79,3%, Bipin-T esa 71,9% kamayish ko'rsatkichini ta'minladi. Shunday qilib, ikkala parazit turi bo'yicha umumiy qiyosiy baholashda 1:10 nisbatdagi kavrak damlamasi kimyoviy preparatlar bilan teng darajada yuqori akaritsid faollikni namoyon etgani aniqlandi.

Bunda preparatning samaradorligi faqat parazitlar sonining kamayishi bilan emas, balki oldingi tajribalarda aniqlangan asalari oilalarining fiziologik holati, ona arining tuxum qo'yishi va nasl rivojlanishi bilan ham kompleks baholanishi lozim.

1:10 nisbatdagi kavrak damlamasida zaharlanish belgilari kuzatilmaganligi, ona arining tuxum qo'yish faolligi 1468 dona/kun, nasl maydoni esa 3590 sm² bo'lganligi ushbu variantning xavfsizlik profilini qo'llab-quvvatlaydi. 1:5 nisbatdagi kavrak damlamasi konsentratsiyada akaritsid ta'sir biroz kuchaygan bo'lsa-da, asalarilar nobud bo'lishining ortishi va yengil zaharlanish belgilarining paydo bo'lishi yuqori konsentratsiyaning terapevtik ustunligini cheklaydi.

Shu sababli eng yuqori konsentratsiya emas, balki samaradorlik va xavfsizlikning optimal nisbati davolash vositasini tanlashning asosiy mezonini sifatida qabul qilinishi ilmiy jihatdan maqsadga muvofiqdir. Bundan tashqari, sintetik akaritsidlarni muntazam qo'llashda *Varroa* populyatsiyalarida amitraz va fluvalinatga rezistentlik shakllanishi qayd etilgan bo'lib, bu kimyoviy preparatlarni almashlab qo'llash va muqobil vositalardan foydalanish zaruratini kuchaytiradi. *Ferula assa-foetida* efir moylarining *V. destructor* ga qarshi akaritsid faolligi laboratoriya sharoitida ham aniqlanganligi kavrak asosidagi fitoterapevtik yondashuvning biologik jihatdan asoslanganligini ko'rsatadi. Shu nuqtayi nazardan, 1:10 nisbatdagi kavrak damlamasini kimyoviy preparatlarga muqobil yoki integratsiyalashgan kurash tizimining fitoterapevtik komponenti sifatida qo'llash ilmiy-amaliy jihatdan istiqbolli hisoblanadi. Natijalarni umumlashtirib, varroatoz va trapilelapsozga qarshi kurashda monitoringga asoslangan, zaruratga ko'ra kimyoviy preparatlarni rotatsiya qiluvchi va 1:10 nisbatdagi kavrak damlamasidan fitoterapevtik vosita sifatida foydalanishni nazarda tutuvchi kompleks davolash-profilaktika sxemasini tavsiya etish mumkin. Bunday yondashuv parazitlarga qarshi samaradorlikni saqlash, rezistentlik xavfini kamaytirish va asalari oilalarining biologik barqarorligini ta'minlashga xizmat qiladi.

Shundan kelib chiqib, optimal sxema quyidagicha etib bayon etildi: invazion monitoring → invaziya darajasini aniqlash → asal yig'imi tugagach maqsadli kimyoviy ishlov → 1:10 nisbatdagi kavrak damlamasi bilan fitoterapevtik ishlov → 7 kunlik intervalda qayta nazorat → *V. destructor* va *T. clareae* sonini aniqlash → zarurat bo'lsa preparatlarni rotatsiya qilish → qishlash oldidan yakuniy nazorat.

Umuman olganda, varroatoz va trapilelapsozga qarshi eng maqbul yondashuv bitta preparatga tayanish emas, balki muntazam monitoring - invaziya darajasini aniqlash - maqsadli davolash - natijani nazorat qilish - preparatlarni navbatlab qo'llash - profilaktik fitoterapevtik ishlovlarni tamoyiliga asoslangan integratsiyalashgan tizimni shakllantirishdan iborat. Bunday yondashuv parazitlar sonini barqaror ravishda kamaytirish, kimyoviy preparatlarga rezistentlik rivojlanishini cheklash, asalari oilalarining biologik barqarorligini saqlash va olinadigan asalarichilik mahsulotlarining veterinariya-sanitariya xavfsizligini ta'minlash uchun ilmiy-amaliy asos bo'lib xizmat qiladi.

5. XULOSALAR

Conclusions

1. *Varroa destructor* kanallari sonini kamaytirish bo'yicha eng yuqori samaradorlik Bipin-T preparatida 91,2 %, Flutsinda 88,6 % ni tashkil etdi. *Tropilaelaps* kanallari bo'yicha esa Flutsin 89,3 %, Bipin-T 84,3 % samaradorlik ko'rsatdi. Bu natijalar kimyoviy akaritsidlarning ta'siri parazit turiga bog'liq holda farqlanishini preparat tanlashda invaziya turini hisobga olish zarurligini ko'rsatadi.

2. Kavrak (*Ferula assa-foetida*) damlamasi *V. destructor* kanallari sonini 81,2 %, *Tropilaelaps* kanallari sonini esa 79,3 % ga kamaytirdi. Ushbu ko'rsatkichlar kavrak asosidagi fitopreparatning har ikki parazitga qarshi akaritsid faolligini tasdiqlaydi. Biroq uning samaradorligi kimyoviy preparatlarnikidan nisbatan past bo'lganligi sababli, kavrak damlamasini integratsiyalashgan davolash-profilaktika tizimining fitoterapevtik komponenti sifatida baholash maqsadga muvofiq.

3. Kavrak damlamasining maqbul konsentratsiyasini tanlashda akaritsid samaradorlik bilan bir qatorda asalari oilalarining fiziologik holatini saqlash muhimligi aniqlandi. Oldingi tajribalarda 1:10 nisbatdagi damlamada zaharlanish belgilari kuzatilmagan, ona arining tuxum qo'yishi 1468 dona/kun, nasl maydoni esa 3590 sm² ni tashkil etgan. Bu natijalar mazkur nisbatning samaradorlik va biologik xavfsizlik mutanosibligini baholash uchun istiqbolli ekanini ko'rsatadi.

4. Olingan natijalar asosida varroatoz va trapilelapsozga qarshi monitoring, invaziya darajasiga mos preparat tanlash, maqsadli davolash va natijalarni qayta nazorat qilishga asoslangan integratsiyalashgan kurash sxemasi taklif etildi. Bunda invazion monitoring → invaziya darajasini aniqlash → asal yig'imi tugagach maqsadli kimyoviy ishlov → 1:10 nisbatdagi kavrak damlamasi bilan fitoterapevtik ishlov → 7 kunlik intervalda qayta nazorat → *V. destructor* va *T. clareae* sonini aniqlash → zarurat bo'lsa preparatlarni rotatsiya qilish → qishlash oldidan yakuniy nazorat.

Ushbu yondashuvda kimyoviy preparatlarni asosli ravishda navbatlab qo'llash va kavrak damlamasidan fitoterapevtik vosita sifatida foydalanish nazarda tutiladi.

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.

Funding

This research received no external funding.

Ethics approval

The work with animals was carried out within routine veterinary diagnostic, treatment and preventive practice in accordance with the veterinary-sanitary requirements in force in the Republic of Uzbekistan.

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

The data obtained in the study are presented in the tables of this article; the primary records are available from the authors on reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI (Claude, Anthropic) was used in the editorial preparation of this article: for language editing, translation of the title, abstract and keywords between Uzbek, Russian and English, preparation of the extended English summary from the authors' text, and formatting of the reference list. No data, results or conclusions were generated by AI. The authors are responsible for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Purpose and research problem

Varroosis and tropilaelapsosis are invasive diseases of honeybees that reduce the efficiency of beekeeping and the viability and productivity of bee colonies. Chemical acaricides are widely used against them, but their efficacy, duration of use and safety make it relevant to study alternative phytopreparations. Published studies have compared oxalic acid, thymol and neem-based preparations, examined essential oils of *Thymus satureioides* and *Origanum elongatum*, evaluated different methods of oxalic acid application and described the biology and control of *Tropilaelaps mercedesae*; they confirm the efficacy of chemical acaricides, organic acids and plant-based preparations but show that their speed of action, safety and conditions of use differ. The aim of the study was to compare the efficacy of the chemical acaricides Bipin-T and Flutsin with an asafetida (*Ferula assa-foetida*)-based phytopreparation and to develop a scientifically substantiated treatment and prevention scheme against invasive diseases of honeybees.

Materials and methods

The therapeutic and prophylactic efficacy of chemical preparations and of an aqueous infusion of asafoetida (*Ferula assa-foetida*) against varroosis and tropilaelapsosis was studied comparatively. The acaricidal activity of the infusion, its efficacy compared with the chemical acaricides Bipin-T and Flutsin, and its safety for bee colonies were evaluated. All preparations were applied by spraying between the honeycomb frames. The main evaluation criteria were the change in the level of infestation, the therapeutic effect of the preparations, and the physiological condition and brood development of the colonies. The number of mites was determined at the beginning and at the end of the experiment (14 days for Bipin-T and 21 days for Flutsin and the infusion), and untreated colonies served as controls.

Results and discussion

At the beginning of the experiment the number of Varroa destructor mites was similar in all groups: 34.0 ± 0.5 with Bipin-T, 35.0 ± 0.2 with Flutsin and 32.0 ± 0.2 with asafoetida infusion. By the end of the observation it decreased to 3.0 ± 0.6 , 4.0 ± 0.6 and 6.0 ± 0.1 , respectively, i.e. by 91.2%, 88.6% and 81.2%, whereas in the control groups the number of mites increased to 38.0–39.0. For Tropilaelaps mites the initial numbers were 32.0 ± 0.3 , 28.0 ± 0.2 and 29.0 ± 0.2 and the final numbers 5.0 ± 0.6 , 3.0 ± 0.1 and 6.0 ± 0.1 , which corresponds to reductions of 84.3% with Bipin-T, 89.3% with Flutsin and 79.3% with the infusion; in the control groups the mite numbers rose to 33.0–37.0. Thus Bipin-T was the most effective against V. destructor and Flutsin against Tropilaelaps. In previous experiments, the 1:10 asafoetida infusion caused no signs of poisoning, and the queen's egg-laying (1468 eggs per day) and the brood area (3590 cm²) were preserved, whereas the 1:5 infusion slightly increased the acaricidal effect but raised bee mortality and caused mild poisoning. Taking into account reports of Varroa resistance to amitraz and fluvalinate and the laboratory acaricidal activity of *Ferula assa-foetida* essential oils, the authors propose a scheme: invasion monitoring → determination of the level of infestation → targeted chemical treatment after the honey harvest → phytotherapeutic treatment with the 1:10 asafoetida infusion → re-examination at 7-day intervals → counting of V. destructor and T. clareae → rotation of preparations if necessary → final examination before wintering.

Conclusion and contribution

Bipin-T (91.2%) and Flutsin (88.6%) were the most effective in reducing the number of Varroa destructor mites, and Flutsin (89.3%) and Bipin-T (84.3%) against Tropilaelaps mites, which shows that the effect of chemical acaricides depends on the parasite species and that the type of invasion should be taken into account when choosing a preparation. Asafoetida infusion reduced the numbers of V. destructor and Tropilaelaps mites by 81.2% and 79.3%, confirming its acaricidal activity against both parasites; since its efficacy is somewhat lower than that of the chemical preparations, it is best regarded as the phytotherapeutic component of an integrated treatment and prevention system. When choosing the concentration of the infusion, the preservation of the physiological condition of the colonies is as important as acaricidal efficacy, and the 1:10 ratio provides a balance between efficacy and biological safety. The proposed integrated scheme, based on monitoring, selection of preparations according to the level of infestation, targeted treatment, follow-up control and rotation of chemical preparations with phytotherapeutic treatments, is intended to reduce parasite numbers sustainably, limit the development of resistance and ensure the veterinary and sanitary safety of bee products.

ADABIYOTLAR RO'YXATI

References (original language)

- [1] Alqarni A.S., Owayss A.A., Mahmoud A.A. Evaluation of botanical extracts and organic acids against Varroa destructor under arid climatic conditions // Saudi Journal of Biological Sciences. - 2021. - Vol. 28. - P. 6821-6828. - DOI: 10.1016/j.sjbs.2021.07.062.
- [2] Devi, S., and D. Bhardwaj. "Seasonal Incidence and Management of Tropilaelaps clareae (Delfinado and Baker) in Apis mellifera L. Colonies of Kangra Valley, Himachal Pradesh, India." Archives of Current Research International, 2026, vol. 26, no. 5, pp. 379–391.

- [3] Esmaeily M., Kwon S., Babaeian E., Jung C. Tropilaelaps mercedesae: An emerging global threat to apiculture -a comprehensive review // Frontiers in Insect Science. -2026. -Vol. 6. -Article 1871985. -DOI: <https://doi.org/10.3389/finsc.2026.1871985>.
- [4] Pietropaoli M., Formato G. Liquid formic and oxalic acid treatments against Varroa destructor: efficacy and impact on honey bee colonies // Veterinary Sciences. - 2021. - Vol. 8. - No. 12. - Article 297. - DOI: 10.3390/vetsci8120297.
- [5] Ramzi, H., et al. "Chemical Characterization and Acaricidal Activity of Thymus satureioides and Origanum elongatum Essential Oils against Varroa destructor." Industrial Crops and Products, vol. 108, 2017, pp. 201–207. <https://doi.org/10.1016/j.indcrop.2017.06.031>
- [6] Sharma, P., et al. "Toxicity and Colony-Level Effectiveness of Essential Oils for the Management of Varroa destructor and Tropilaelaps clareae in Co-Infested Apis mellifera Colonies." Acarologia, 2026, vol. 66, no. 2, pp. 482–496.
- [7] Шутов, Н. Н. Средства неспецифической профилактики варроатоза пчёл на основе растительного сырья и научные основы их применения. Автореферат диссертации на соискание учёной степени кандидата биологических наук. Москва, 1994.

REFERENCES (ROMAN SCRIPT)

Transliterated list — required by Scopus and Web of Science

- [1] Alqarni A.S., Owayss A.A., Mahmoud A.A. Evaluation of botanical extracts and organic acids against Varroa destructor under arid climatic conditions // Saudi Journal of Biological Sciences. - 2021. - Vol. 28. - P. 6821-6828. - DOI: 10.1016/j.sjbs.2021.07.062.
- [2] Devi, S., and D. Bhardwaj. "Seasonal Incidence and Management of Tropilaelaps clareae (Delfinado and Baker) in Apis mellifera L. Colonies of Kangra Valley, Himachal Pradesh, India." Archives of Current Research International, 2026, vol. 26, no. 5, pp. 379–391.
- [3] Esmaeily M., Kwon S., Babaeian E., Jung C. Tropilaelaps mercedesae: An emerging global threat to apiculture -a comprehensive review // Frontiers in Insect Science. -2026. -Vol. 6. -Article 1871985. -DOI: <https://doi.org/10.3389/finsc.2026.1871985>.
- [4] Pietropaoli M., Formato G. Liquid formic and oxalic acid treatments against Varroa destructor: efficacy and impact on honey bee colonies // Veterinary Sciences. - 2021. - Vol. 8. - No. 12. - Article 297. - DOI: 10.3390/vetsci8120297.
- [5] Ramzi, H., et al. "Chemical Characterization and Acaricidal Activity of Thymus satureioides and Origanum elongatum Essential Oils against Varroa destructor." Industrial Crops and Products, vol. 108, 2017, pp. 201–207. <https://doi.org/10.1016/j.indcrop.2017.06.031>
- [6] Sharma, P., et al. "Toxicity and Colony-Level Effectiveness of Essential Oils for the Management of Varroa destructor and Tropilaelaps clareae in Co-Infested Apis mellifera Colonies." Acarologia, 2026, vol. 66, no. 2, pp. 482–496.
- [7] Shutov, N. N. Sredstva nespetsificheskoy profilaktiki varroatoza pchel na osnove rastitel'nogo syr'ya i nauchnye osnovy ikh primeneniya [Means of non-specific prevention of honeybee varroosis based on plant raw materials and the scientific basis of their use]. Abstract of PhD (Candidate of Biological Sciences) dissertation. Moskva, 1994. (in Russian)