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Fauna of fruit moths in the southern regions of Uzbekistan

O'zbekistonning janubiy hududlarida meva kuyalari faunasi

Фауна плодовых молей в южных регионах Узбекистана

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ENGLISH

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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

O'ZBEKCHA

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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

РУССКИЙ

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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 плодового 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 zararkunandalarga oid 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'chatxonalari 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>Euzophera 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 zararkunandalardan 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 zararkunandalardan 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.

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

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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 Surkhondaryo and Kashkadaryo — 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 Surkhondaryo 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 Surkhondaryo 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 punicea* is described in the literature as a typical monophagous and carpophagous species; its damage in Uzbekistan was first recorded in Surkhondaryo and later in Tashkent, Syrdaryo 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 Surkhondaryo and Kashkadaryo, 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 punicea* 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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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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