FThe importance of entomophages in protecting pests of vegetable, potato crops through – “trap crops"

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Abstract. This article presents studies on the species composition and importance of entomophages in the protection of vegetables and potatoes from pests through the use of bait crops. According to the results of the study, 26 species of entomophages of the order Coleoptera, 26 species of the family Carabidae, order Hymenoptera, 16 species of parasitic entomophages of the family Ichneumonidae, 6 species of parasitic entomophages of the family Hymenoptera were identified. and 6 species of parasitic entomophages of the family Braconidae. Based on the results obtained, practical conclusions and proposals for production are given.

1 Introduction

Today, the world pays special attention to the production of synthetic, chemical-free organic products. Particular attention is paid to the creation and application of environmentally friendly technologies instead of artificial fertilizers that pollute the environment and soil. If you look at the organic agriculture market, in 2019, the turnover of organic agriculture on international markets amounted to 96.7 billion euros 2.8 million producers. [1-5].

Experts say that the global market for organic products has been growing by an average of 15% annually since 2016. At the end of 2022, its trade turnover amounted to $183.35 billion, and it should be noted that our country has an abundance of suitable land for the production of organic fruits. But the availability of a land plot is not enough for the production of environmentally friendly products. Today, plant protection technologies are being introduced in world practice, free from harmful chemicals that can be transmitted to humans through nature and agricultural products. One of these technologies is the use of bait crops to protect against pests. [6-16].

To date, experiments on bait crops have been successfully completed in countries such as the USA, Italy, Spain, India, and species such as Coleoptera, *Hemiptera* and *Lepidoptera* have reached the level of commercialization. In many agricultural areas of the European continent, trap plants are planted together with the main crop. At the same time, the current

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area of traps is 10% of the area of the main crop. It is important to ensure food security by developing environmentally friendly measures to combat rodents and absorbing pests of vegetable and potato crops not only in Europe, but also in the Central Asian states [14-16].

Growing vegetables in Uzbekistan is carried out mainly on household plots, that is, on small areas. To date, work has begun on the distribution of 80 thousand hectares of cotton and grain to the population, and the population has been leased from 10 hundred to 1 hectare for a period of 10 years, through an open electronic competition, for the organization of a peasant farm. In the future, more than 300,000 homeowners are expected to appear in our country. [7-10].

Different trap cultures can emit different volatile substances that attract not only insect pests, but also their natural prey [10]. For example, it has been found to attract lacewing, *Chrysoperla carnea* (Neuroptera, Chrysopidae), a volatile substance that is secreted by some plants [1]. Rapeseed flower beetle (*Meligethes aeneus* Fabricius (Coleoptera: Nitidulidae)) is a pest attracted to the insect of turnips and rapeseed [14]. Insecticides of phytophages (1999–1999).

Traps are attractive to the pest and draw the pest away from the main crop and should be planted in the pest's main crop. This practice is based on the visual and smell signals of the trap plant and depends on the insect's preference for the trap plant [11].

Entomophage species play an important role in controlling the number of subsoil pests of vegetable and potato crops in agrobiocenoses, and in some periods significantly control their number. Entomophages are considered to be relatively active, they account for a higher number of animals than predators in nature.

According to the data of studies carried out in the south of Russia to identify subsoil passages and their parasitic entomophage species, the family *Ichneumonidae (Ichneumonidae*) by 45.4–79.0%; from bracon (*Microplitis pseudomutrina* Abd., *Apanteles Cossack* Tel., *A.plutellae* Kurd., *Habrobracon hebetor* Tell me.) - 13.2–4.5%, while the rest of the parasites received 5.4–9.7% [3]. The species reduced the number of pests to 50% [14-16].

Taking into account the above, studies have been carried out on the types of entomophages of soil pests of vegetable and potato crops grown in the Tashkent and Samarkand regions, and their systematic analysis. The main goal is to select effective entomophage species on the basis of their species composition, systematic analysis, as well as to determine their relationship in the entomofauna in the agrobiocenosis. [15,16].

2 Research methods

The research was carried out on the basis of continuous observations of vegetable and potato crops from 2019 to 2023.

Accordingly, the collection of samples of subsoil pests on vegetable and potato lands, soil sampling with a thickness of 5, 10, 15 and 20 cm was carried out on the basis of light pens.

All collected insect species were divided into species based on systematic analysis, and their species were identified based on various sources. According to these data, 57 species of entomophages of 5 categories were identified.

3 Results of the study

According to the results of the study, 26 species of entomophages of the order Coleoptera, 26 species of predatory entomophages of the family Carabidae, 16 species of parasitic entomophages of the family Ichneumonidae, 6 species of parasitic entomophages of the

family Hymenoptera, 6 species of parasitic entomophages of the family Braconidae were identified.

In addition, 2 species of parasites of eggs of the family Hymenoptera, Trichogrammatidae, 7 species of parasitic entomophages of the family Diptera and Tachinidae were identified. Only one of these species was identified in the adult species *Calosoma auropunctatum* Hb., belonging to the family Carabidae*, Spallanzania hebes* Fll.

These species were systematically analyzed in the Antiparasitic Laboratory of the Institute of Zoology. In the period 2019-2023, various developments of the identified species were collected. They also used various literary and online sources about their biological properties and nutrition.

Phytophages of the identified species make up a certain part of the entomofauna of vegetable and potato crops and play an important role in controlling the amount of phytophagus.

In the samples collected during the study, it was found that their population was high mainly in areas with a high population of underground phytophage, namely in the Jomboy and Bulungur districts of the Samarkand region, and in vegetable and potato crops of farms in the Kibray and Zangiota districts of the Tashkent region (Table 1).

Table 1. Entomophage species, nutritional specialization and occurrence of soil pests of vegetable and potato crops (Samarkand and Tashkent regions, 2019-2023))

No	**Types of entomophages**	**Phytophage type**	**Nutrition Specialization**	**Frequency of occurrence**
Coleoptera is a genus in the family Carabidae				
A.	*Cicindela campestris* L.	Subsoil moths	Small and adult larvae	+
B.	*Cicindela hybrid* L.	(((	(((	+
C.	*Cicindela germanica* L.	(((	(((	+
D.	*Calosoma auropunctatum* Hb.	(((	(((	++
E.	*Calosoma denticolle* Gebl.	(((	(((	+
F.	*Carabus granulates* L.	(((	(((	++
		Clickers, Colorado potato beetle	Eggs, larvae, pupae	
G.	*Carabus cancellatus* Ill.	(((	(((	+
		-////-	-////-	
H.	*Clivina fossor* L.	(((	(((	++
		-////-	-////-	
I.	*Broscus cephalotes* L.	(((	(((	++
		-////-	-////-	
J.	*Bembidion lampron* Hbst.	(((	(((	+++
		-////-	-////-	
K.	*Bembidion properan* Steph.	(((	(((	+++
		-////-	-////-	
L.	*Trechus quadristriatus* Schr.	-////-	-////-	+++
M.	*Pterostichus sericeus* Fisch	(((	(((	++
		-////-	-////-	
N.	*Pterostichus cupreus* L	(((	(((	++
		-////-	-////-	
O.	*Calathus halensis* Schall	(((	(((	+++

		-////-	-////-	
P.	*Calathus melanocephalus* L.	-//-	-//-	+++
		-////-	-////-	
Q.	*Amara aenea* Deg.	-////-	-////-	++
R.	*Amaraingenua* Duft	-////-	-////-	+++
S.	*Ophonus rufipes* Deg	-////-	-////-	+++
T.	*Ophonusgriseus* Pz.	-////-	-////-	++
U.	*Harpalus affinis* Schr.	-////-	-////-	++
V.	*Harpalus tardus* Pz.	-////-	-////-	+++
W.	*Anisodactylus signatus*Pz.	(((	(((	+++
		-////-	-////-	
X.	*Metabletus obscuroguttatus* Duft.	-////-	-////-	+++
Y.	*Microlestes minutulus* Gz.	-////-	-////-	++
Z.	*Brachinus crepitans* L.	-////-	-////-	++
Hymenoptera – order, Ichneumonidae – family				
AA.	*Ichneumon sarcitorius* L.	Subsoil moths	Small and adult larvae	++
BB.	*Ophion luteus*L.	(((	(((	++
CC.	*Tersilochus melanogaster*Thoms.	(((	(((	+
DD.	*Diadegma fenestralis* Holmgr.	(((	(((	++
EE.	*Netelia testacea* Grav.	(((	(((	+++
FF.	*Netelia fuscicornis* Holmg.	(((	(((	+++
GG.	*Itoplectis invocator* F.	Subsoil moths	Larvae and pupae	+++
HH.	Instigator Pimpla F.	(((	(((	+
II.	*Barylypa amabilis* Tosg.,	(((	(((	++
JJ.	*Hypozoter Didymator*	(((	(((	++
KK.	*Eutanyacra crispatoria* Linnaeus.,	(((	(((	+
LL.	*Barylypa delictor* Thund;	(((	(((	+
MM.	*Therion circumflexum* L.,	(((	(((	+++
NN.	*Diadegma crassicornis* Grav.	(((	(((	+++
OO.	*Ichneumon sartorius L.*	Subsoil moths	Larvae and pupae	++
PP.	*The mediator of microplitite* Hal.	Subsoil moths	Doll	
Hymenoptera – order, Trichogrammatidae – family				
QQ.	*Trishogramma pintoi* Voeg,	Subsoil moths	Bollocks	++
RR.	*Trichogramma evanescens*	Subsoil moths	Bollocks	+
Hymenoptera – order, Braconidae – family				
SS.	*Apanteles ruficrus* Hal.	Subsoil moths	Small and adult larvae	++
TT.	*Apanteles* telengaiTobias.	(((	(((	+++
UU.	*Apanteles kazak* Tel.	(((	(((	++
VV.	*Bracon Hebetor* Sai.	(((	(((	++
WW	*Rogas dimidiatus* Spin.	(((	(((	+

XX.	*Macrocentrus collaris* Spin.	(((	(((	+
Diptera – order, Tachinidae – family				
YY.	*Tachina feraL.*	Subsoil moths	Small and adult larvae	++
ZZ.	*Exorista xanthaspis* Wd.	Subsoil moths	Small and adult larvae	+++
AAA	*Gonia cilipeda* Rd.,	Subsoil moths	Small and adult larvae	+++
BBB	*Spallanzania hebes* Fll.	This species was identified in the adult *of the ground beetle* (*Calosoma auropunctatum* Hb.)		+
CCC	*Parhamaxia discalis* Mesn.	Cockchafer	Imago	++
DDD	*Dexiosoma caninum* F.	Cockchafer	Imago	++
EEE	*Dexia rustica* F.	Cockchafer	Imago	+

Note: Small and adult larvae of subsoil moths- (((,
Clickers, Colorado potato beetle eggs, larva, pupa - -////-

The ratio of entomophages identified in the study was different depending on feeding by subsoil phytophages. At the same time, the most common species were considered to be coleoptera beetles, that is, representatives of the Carabidae family, the species that feeds on phytophages.

According to the study of parasitic-predatory entomophages in vegetable and potato agrobiocenosis in 2019-2023 in the conditions of the Tashkent region, it was found that 65.4% of the total number of entomophages consist of parasites (Figure 1).

Also, in the conditions of the Tashkent region, damage caused by a number of soil pests of repeated crops was observed. But in nature, entomophages of these pests occur, reducing their number to a certain extent. In this regard, studies have been carried out to study the role of subsoil pests in controlling the number of phytophages and their entomophages, their ratios and phytophages. The studies were carried out on crops such as cotton, grain, corn, tomatoes, potatoes, beans and mung beans.

Samples of eggs, larvae and pupae of different ages were collected in the districts of UrtaChirchik, Yukorichirchik and Kuyichirchik districts of the Tashkent region. The collected samples are constantly monitored in the laboratory and put into development. In total, more than 520 samples were collected, including 76 eggs, 292 extinct larvae and 152 pupae.

Of the total number of collected samples, 11.0 (14.4) eggs were infected with Trichogramma, 199.1 (68.2%) middle-aged and adult larvae were infected with parasites, and the remaining 92.4 (31.8%) died due to various diseases. Of these, it was found that 59.3 (19.6%) units of larvae infected with parasitic entomophages were infected with ichnemonids, 76.4 (38.4%) with braconoids, and 35.0 (17.6%) with tahini flies. 15.5 (10.2%) pupae were infected with ichnemonids.

The collected samples were placed in laboratory conditions at an air temperature of +25°C and a relative humidity of 60%. At the same time, parasitic entomophages from the samples were systematically analyzed in laboratory conditions (Entomological Laboratory of the Institute of Zoology of the Academy of Sciences of Uzbekistan) using determinants.

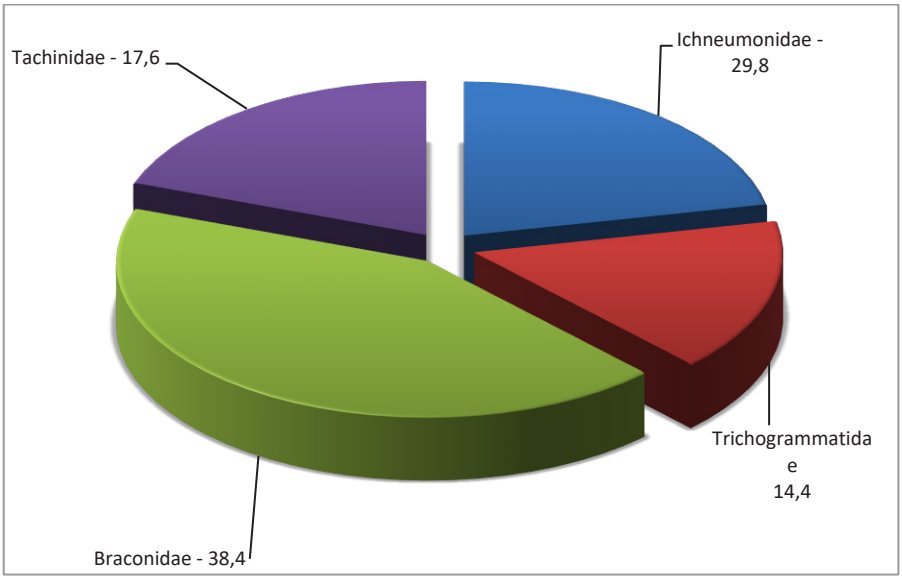

Fig. 1. Comparison of parasitic species of entomophages of subsoil melodies (Tashkent region, 2019-2023)

Trichogramma accounted for an average of 14.4% of the above parasites compared to the samples. *The families* Trichogrammatidae are found in the species *Trichogrammatidae pintoi* Voeg*, Trichogramma evanescens.* And in adult larvae of subsoil moths, from the family Braconidae. The species was registered as representing 38.4% of the total sample. Among the young larvae of subsoil larvae there are several *representatives of the family* Ichneumonidae: *Barylypa amabilis* Tosg., *Barylypa delictor* Thund, *Therion circumflexum* L., *Ichneomon sarcitorius* L., *Diadegma crassicornis* Grav. *Eutanyacra crispatoria* Linnaeus., *Hyposoter didymator*. Of the larvae in the sample, 148.0 units were found to be infected with representatives of the family *Ichneumonidae*, which accounted for 23.8%.106.9 larval units in the sample *were infected with members of* the Tachinidae family, accounting for 17.2%. *From the family* Tachinidae, *Tachina fera* L., *Exorista xanthaspis* Wd., *Gonia cilipeda* Rd., *Spallanzania hebes* Fll. This species was not abundant in agrobiocenosis, but it was observed that some species were found in the larvae of the Fall Armyworm, damaging it.

Although the biological characteristics of these pests and their damage and entomophages in crops have been studied by several scientists, the lack of effective methods and means of controlling their numbers requires continued scientific research on this pest.

Based on the relevance of the above problem, the formation of soil pests and their entomofun in vegetable and potato crops in the conditions of the Samarkand region and their ratio during the season were studied. These studies naturally highlight the importance of the laws governing the debate between master and entomophage.

To this end, in 2020-2023, research was carried out on a grain-free plot in the Jomboy district of the Samarkand region. Initially, subsoil pests in an area free of vegetables and potatoes were studied on vegetable and potato crops on an area of 5.2 hectares, which were planted. According to these data, the land was first carried out during the period of preparation for planting potatoes, that is, watering, and then from the period of land until the potatoes ripened. The study collected samples of phytophages and entomophages found in the planted area at 10-day intervals from continuous observations, after Santa potato seeds

were planted in the ground on July 15. Samples were taken from 10 places of 1 m2 of soil layer up to 20 cm and entomological sieves were carried out. The collected samples were placed in separate containers and analyzed in laboratory conditions.

According to the results of the studies, all the insects collected were divided into three types, namely soil pests of potatoes, such as terrestrial pests and their entomophagic species.

The average number of samples collected for individual species was collected by year that was observed and counted during the study.

According to the data collected, in 2020, ground pests of post-grain potatoes averaged 6.3 units per 1m2 of area, while surface pests averaged 14.4 units per potato bush. In addition, natural entomophages observed during the control of their number amounted to 4.2 units.

Underground phytophages found mainly in them *include Agrotis segetum* Den.et, *Agrotis exclamationis* L., *Polyphylla adspersa* Motsch, *Agrotis meticulosus* Cond, *Gryllotalpa gryllotalpa* L., *Dailognatha nasute* I. L was calculated.

Entomophages include *Calosoma auropunctatum* Hb., *Bembidion lampron* Hbst., *Amara ingenua* Duft, Chrysoperla carnea, *Microlestes minutulus* Gz, *Brachinus crepitans* L., Pimpla instigator F., *Diadegma crassicornis* Grav., *Microplitis mediator* Hal, Bracon *hebetor* Say., *Apanteles* telengai Tobias., *Gonia cilipeda* Rd. species.

According to this, in 2021, the number of subsoil pests increased from an average of 4.2 units per 1 m2 to 16.3 units per catch. It was found that entomophages account for 7.3 units per 1 m2 of area (Fig. 1).

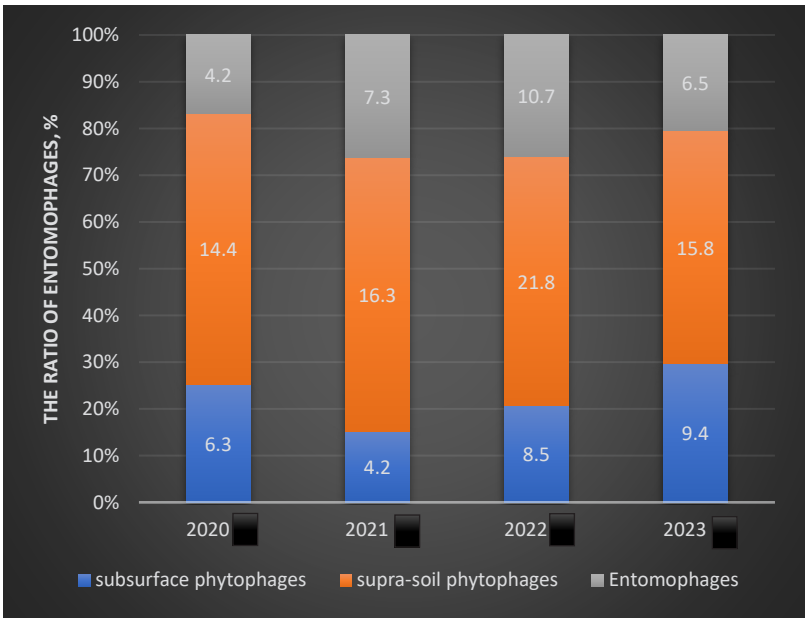

Fig. 2. Ratio of entomofauna in the agrobiocenosis of potatoes (Samarkand region, 2020-2023)

In 2022, the number of subsurface pests detected in this case averaged 8.5 units per 1m2, while the number of above-ground pests increased even more, amounting to 21.8 units per potato. The number of entomophages increased slightly this year, reaching 10.7 units per 1 m2. Retrieved 2012-01-20. In the 2023 season, terrestrial phytophage species in post-grain potatoes increased to an average of 9.4 pieces per 1m2 of area, and surface pests were identified up to 15.8 pieces per potato bush. Up to 6.4 units were observed as entomophages

of terrestrial and subsoil phytophages on an area of 1 m2. It was noticed that this year there was a sharp increase in the presence of terrestrial pests.

This page lists articles related to the name Phytophage. It has been noted that representatives of Coleoptera and Lepidoptera are the leaders as the main species of phytophages, but the density of their population has been maintained for many years.

Agrotis segetum *Den.et,* Agrotis exclamationis *L. Agriotes lineatus* L., *Agriotes meticulosus* Cand, click beetles *Gryllotalpa gryllotalpa* L. It has been found that up to 22% of crops are damaged by these pests, especially during periods of increased winter hardiness.

4 Findings

The role of the Trichogramma parasite in agrobiocenosis in protecting vegetables and potatoes from pests when using bait crops was at least 14.4%. Several factors can be attributed to this condition, such as climatic conditions, food diversity, etc., which can lead to an insufficient presence of this parasite.

According to the results of studies conducted in 2020-2023, it was found that in the agrobiocenosis of potatoes there are 57 species of entomophages belonging to 5 categories, of which, 26 species of predatory entomophages belonging to the family Coleoptera, Carabidae, 16 species of parasitic entomophages belonging to the family Ichneumonidae, 6 species of parasitic entomophages belonging to the family Hymenoptera, Hymenoptera. 2 species of parasites of the family Trichogrammatidae, 7 species of parasitic entomophages of the family Diptera, Tachinidae were extracted.

When studying the ratio of entomofauna in agrobiocenoses of vegetables and potatoes, subsoil phytophages amounted to 6.3 units per m2 in 2020, 4.2 units in 2021, 8.5 units in 2022 and 9.4 units in 2023. in 2022 - 21.8 grains, in 2023 - 15.8 grains. When studying entomophages of subsoil and aboveground phytophages, 1 m2 was 4.2 units in 2020, 7.3 units in 2021, 10.7 units in 2022 and 6.5 units in 2023.

This means that the interaction of soil pests and their parasitic species in agrobiocenosis is formed to a certain extent, and the density of populations of these species changes according to the above indicators depending on environmental factors in a given territory.

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