Methods Of Introduction And Acclimatization Of Representatives Of The Family Trichogrammatidae

[1] Jumaev Rasul Axmatovich
[2] Alaviddinkhojayeva Malikakhon Jamoliddin qizi
[1] DSc, Professor, Tashkent State Agrarian University, Uzbekistan
[2] Master's student of the Department of plant protection and quarantine, Tashkent State Agrarian University, Uzbekistan

Received: 28th Nov 2025 | Received Revised Version: 15th Dec 2025 | Accepted: 28th Dec 2025 | Published: 23th Jan 2026

Volume 08 Issue 01 2026 | Crossref DOI: 10.37547/tajabe/Volume08Issue01-03

Abstract

The article presents scientific research conducted on the introduction and acclimatization of effective species of the Trichogrammatidae family. The study mainly focuses on the introduction and acclimatization of the species Trichogramma ostriniae. This species is considered an effective parasitic entomophage of representatives of the order Leoidoptera occurring in the maize agrobiocenosis. In the conducted research, trichogramma species were introduced and acclimatized under biolaboratory conditions. During the acclimatization process, scientific studies were carried out on feeding, reproduction, and storage of trichogramma. When breeding trichogramma in the biolaboratory, 65% relative humidity and an air temperature of +27-280C were maintained. It was determined that the introduced Trichogramma ostriniae produced 8 generations per year under biolaboratory conditions.

Keywords: Trichogrammatidae, Lepidoptera, Trichogramma ostriniae, интрадукция, аккилимизатция, тадқиқот, самара. Trichogrammatidae, Lepidoptera, Trichogramma ostriniae, introduction, acclimaztization, research,efficieny.

Cite This Article: Jumaev Rasul Axmatovich, & Alaviddinkhojayeva Malikakhon Jamoliddin qizi. (2026). Methods Of Introduction And Acclimatization Of Representatives Of The Family Trichogrammatidae. The American Journal of Agriculture and Biomedical Engineering, 8(01), 14–21. https://doi.org/10.37547/tajabe/Volume08Issue01-03

1. Introduction

In recent years, the biological protection of agriculture in our country has been expanding steadily. Ensuring the population with organic products has become one of the major global challenges. In this regard, numerous practical and innovative projects are being implemented in our country. Recently, the activities of biological laboratories have been broadened, and more than 600 biolaboratories are now multiplying entomophages. At the same time, scientific research is being conducted on the introduction and acclimatization of new species belonging to the family Trichogrammatidae. In particular, many entomophages have been introduced and acclimatized in Uzbekistan by Kh.Kh.Kimsanbaev and colleagues.

In order to further advance these studies, we conducted scientific research on the introduction of an effective parasitoid entomophage from the family Trichogrammatidae, originating from the People's Republic of China, which parasitizes Lepidoptera species occurring in the maize agrobiocenosis. As a result, we obtained several significant findings.

2. Methods

During the implementation of the scientific research, the main methods used included the collection of materials and the study of the key representatives of the order Lepidoptera as well as the characteristics of their parasitoid entomophages. Observations were carried out to investigate the ecology of these parasitoids. Specimens of the major Lepidoptera representatives at different developmental stages were collected from field conditions. The collected insects were placed in separate containers and reared under laboratory conditions, where their species composition and developmental periods were determined. The degree of damage caused by moths, caterpillars, and noctuids to agricultural crops, as well as the difference between the obtained yield and the standard and non-standard yields, were calculated relative to the healthy control plants using the following formula.

To study the relationships between parasitoid entomophages and their hosts, and to investigate the feeding specialization of moths, caterpillars, and noctuids, the collected plant species were identified and herbarium samples were prepared. In order to determine the overwintering sites and overwintering hosts of the parasitoid entomophages, at the end of October, moth eggs and larvae were collected from fields where parasitoid entomophages (Trichogrammatidae) were distributed. The overwintering status and the average number of these specimens were subsequently determined.

Statistical analyses were performed based on the method of G.F. Lakin.

The quality indicators of parasitoid entomophages (Trichogrammatidae; Braconidae), such as their resistance level, the degree of parasitism of host eggs, and their viability, were determined in accordance with the methodological guidelines “Methods for Assessing the Quality of Trichogramma” by R. Ochilov, T. Atamirzaeva, and colleagues.

During the experiments, the following microscopes were used: MBS-2, MBI-3, and the Tesla-BS-613 electron microscope (Czech Republic), as well as a MEMMERT E05273 thermostat (Russia) and other laboratory equipment. The mass rearing of moths and noctuids in the laboratory was carried out in accordance with the methodological manuals of Kh.Kh. Kimsanbaev and R.A. Jumaev. Throughout the research process, entomological methods were extensively employed.

3. Results

The research was conducted between 2023 and 2025, and the species Trichogramma ostriniae was studied in collaboration with scientists from the Guangzhou Entomological Research Institute of China.

The population density of Lepidoptera representatives in the maize agrobiocenosis has been steadily increasing year by year, causing significant economic damage. Despite ongoing control efforts, the extent of damage caused by these pests continues to expand.

In the first stage of the research, 10 grams of Trichogramma ostriniae were transported to Tashkent in a specialized Duyar container and subsequently kept under quarantine for three days. During this period, the Trichogramma generations were stored in a thermostat at +5 °C. No predatory mites or harmful organisms that could have accompanied the Trichogramma colonies were detected during quarantine. On the fourth day, the parasitoid entomophages were released from quarantine, transferred to the biolaboratory, and placed in a thermostat set at +28 °C. After 2–3 days, the initial Trichogramma adults began to emerge. By the last 5–6 days, the emergence of adults was complete, and the colonies were supplied with a 20% sugar solution. During this period, the air temperature was maintained at +29 °C, and the relative humidity of the air was set at 65%.

Figure 1. Morphological characteristics of the introduced representatives of the family Trichogrammatidae (TSAU, 29.11.2025)

To acclimatize the introduced species Trichogramma ostriniae under biolaboratory conditions, host eggs of the moth were used. One-day-old eggs of the moth, which had been mass-produced and extracted in advance, were parasitized by Trichogramma ostriniae. The parasitized eggs began to turn reddish after 3-4 days and darkened after 6-7 days. After 8-9 days, the emergence of Trichogramma ostriniae adults from the host eggs was observed.

In the next stage of our research, we continued the studies by applying the laboratory-reared Trichogramma ostriniae adults in open-field conditions against representatives of the order Lepidoptera occurring in the maize agrobiocenosis.

Preliminary studies were conducted in cooperation with Dr. Dilbar Hussain Royni from the University of Punjab, Pakistan (2018-2019), who was invited to our country. Together, we studied the species of Lepidoptera occurring in forest biocenoses over a period of two years. The main objective of this work was to select suitable species of the family Trichogrammatidae that are effective in controlling the Lepidoptera representatives, which are currently widely distributed in our forest ecosystems and cause significant economic damage.

Thus, Dr. Dilbar Hussain Royni proposed the introduction of Trichogramma ostriniae into our country, identifying it as the most effective egg parasitoid among 18 Trichogramma species tested against major pests in forest biocenoses, namely the apple ermine moth (Yponomeuta malinellus Zell) and the goat moth (Cossus cossus G), which cause significant economic damage on fruit trees.

Dr. Dilbar Hussain Royni emphasized that this parasitoid entomophage is not only an effective agent against the apple ermine moth (Yponomeuta malinellus Zell) and the goat moth (Cossus cossus G), but it can also be applied against the eggs of the entire Lepidoptera fauna in forest biocenoses.

In the second phase of studying pests in the forest biocenosis, the species Trichogramma ostriniae, recommended by Dr. Dilbar Hussain Royni, was introduced from the University of Punjab, Pakistan, into the laboratory of the Scientific Research Center for Biological Plant Protection of Tashkent state agricultural university. Subsequently, research was conducted to investigate the bioecological characteristics of this species.

Indeed, it was established that the introduced species Trichogramma ostriniae is closely related to the biological development of the target pests the apple ermine moth (Yponomeuta malinellus Zell) and the goat moth (Cossus cossus G). During the acclimatization process of Trichogramma ostriniae, optimal temperature and relative humidity conditions were maintained to facilitate its adaptation to the new environment. The ecological characteristics of the species were investigated under laboratory conditions, and the parasitoid was subsequently adapted to field conditions.

A methodology consisting of several stages was developed for the introduction and acclimatization of Trichogramma ostriniae. Based on the information presented above, it was determined that conducting research in accordance with the purpose and objectives of introduction is indeed effective. It is well known from foreign and national scientific literature that the introduction process involves selecting local hosts for entomophages, choosing the appropriate entomophage species, transporting the selected species, studying its habitat, maintaining quarantine, investigating its biological characteristics, selecting hosts in the laboratory, developing mass-rearing technologies, large-scale application, and evaluating efficiency. However, the acclimatization and application of introduced entomophages against target pests do not always proceed successfully. During the introduction process, the development of the introduced entomophage species may be influenced not only by ecological factors but also by resistance from local insect species. If the introduced entomophage is not monophagous, its application against a target pest may disrupt the existing host-parasitoid relationships in the ecosystem. Some introduced entomophage species may remain active during the season but completely disappear during the overwintering period. Such entomophage species are mass-reared under laboratory conditions during the growing season, released into the field, and their populations are replenished through natural hosts during winter. In the laboratory, they are maintained under optimal conditions during the dormancy period.

Figure 2. Systematization and morphological identification of the introduced Trichogramma ostriniae (TSAU. Photo by M.Alaviddinxojaeva, 29.11.2025)

In the first stage of our research, before releasing the introduced species Trichogramma ostriniae into natural forest biocenoses, we conducted scientific and practical studies to assess how the sharp climatic variations in our country affect the biological development of certain local entomophage species, their interactions with native Trichogramma species, and their efficiency against target pests. The introduction process of this Trichogramma species from the University of Punjab, Pakistan, into our country comprised ten stages.

Selection of an effective species from among the Trichogramma taxa is a crucial step. In this process, it is essential to take into account the climate of the region where the species will be introduced and the degree of adaptation to local hosts. In addition, the characteristics of the entomophage species in regulating pest populations, its position in the trophic chain, and the density of the pest population must be thoroughly studied. If an entomophage is incorrectly selected for introduction, it may feed on other insect species, potentially disrupting the ecosystem of the area. This can lead to a decline in certain species and, consequently, a sharp decrease in several entomophage species that depend on those hosts.

Figure 3. Mass rearing process of Trichogramma ostriniae on moth eggs in the biolaboratory (TSAU. Photo by M. Alaviddinxojaeva, 29.11.2025)

While conducting this research, we also reviewed the scientific works of Professor A.R.Anarbaev, who successfully introduced Trichogramma chilonis into our country. According to him, when a single Trichogramma species is introduced into several countries, populations of that species emerge in each region, and these populations may differ biologically from one another. Significant differences arise between entomophages collected from nature and those obtained from laboratory-reared colonies. Isolating laboratory populations and evaluating their biological performance is challenging, and their efficiency against pests, adaptability to different hosts, and resistance to environmental factors may be lower. Therefore, species collected from natural populations tend to exhibit higher efficacy against pests, and their natural biological characteristics and adaptability to the environment must be studied comprehensively. During collection from nature, procedures such as identifying populations of specialized phytophagous hosts and isolating parasitoids from infested hosts are carried out. In addition, collection can also be performed using light traps or entomological nets.

Global experience shows that not all introduced entomophages yield positive results. This is because many entomophage species are not sufficiently specialized to their hosts or unable to adapt to the ecological environment. The introduction process therefore involves several distinct stages, and conducting research in accordance with these stages is essential.

Thus, in our work on the introduction of Trichogramma ostriniae, the study of the safety of the parasitoid entomophage and the maintenance of quarantine are of crucial importance. Transferring any parasitoid entomophage to a new region involves a specific responsibility and accountability. In addition, the effects of the introduced Trichogramma ostriniae on local entomophage and phytophagous species are investigated.

Table 1.
Average biological parameters of Trichogramma ostriniae Ishii at an air temperature of +27-28 °C and relative humidity of 65-70% (TSAU, 2025)

Namuna №	Pushtdorlik darajasi, dona	Urg‘ochi zotning hayotining davomiyligi, kun	Tuxumdan to yetuk zotgacha bo‘lgan rivojlanish davri, kun	Jinslar nisbati ♂: ♀
1	40	11.7±05	9,3	1:5
2	62	12.3±03	8,6	1:4
3	56	11.0±06	10,8	1:7
4	52	7.6±04	9,0	1:4
5	66	8.5±06	8,5	1:6
6	50	13.5±07	9,2	1:8
7	45	9.8±08	11,5	1:5
8	57	13.2±06	8,5	1:6
9	59	13.6±04	10,0	1:5
10	60	10.7±06	9,0	1:8
11	63	11.3±02	8,3	1:6
12	56	7.4±05	11,5	1:4
13	50	12.8±04	8,0	1:7
14	46	8.6±06	9,4	1:6
15	67	13.9±07	8,2	1:5
16	46	12.7±08	11.8	1:4
17	55	12.3±05	9,3	1:6

18	61	9.9±09	8,0	1:4
19	64	13.4±07	10.0	1:7
20	53	11.5±05	9,0	1:5
Jami	**52.7**	**11.2±06**	**9,3**	**1:5**

Assessment of the biological characteristics of Trichogramma ostriniae. The biological traits and systematics of the introduced Trichogramma ostriniae were comprehensively studied under laboratory conditions. Subsequently, the laboratory population was released into an open forest biocenosis. After one generation completed its developmental cycle, samples were collected from the forest biocenosis, and the systematics of the newly obtained Trichogramma individuals were examined and identified to species level. The aim of this work was to determine the parasitism rate of host eggs by Trichogramma ostriniae among the Trichogramma species present in the biocenosis. In addition, identifying the trophic relationships of the introduced Trichogramma ostriniae was considered to be of significant importance.

4. Conclusions

In our research, we also placed considerable emphasis on theoretical perspectives. In this regard, two conceptual approaches are recognized, both of which highlight the importance of Trichogramma ostriniae's host specificity and feeding characteristics for the parasitoid's biological performance.

Host specificity in T. ostriniae refers to the degree to which successive generations of the parasitoid infest only one particular host species in nature or, alternatively, parasitize species belonging to several related families or orders. In terms of feeding characteristics, this concept can be associated with the entomophage's ability to utilize a specific developmental stage of the chosen host. In such cases, species of entomophages belonging to the same family may feed on different developmental stages of the same host. Although this theory is documented among parasitoid entomophages in general, it is particularly characteristic of T. ostriniae.

At the next stage of our study, we examined the developmental rate of T. ostriniae under biolaboratory conditions, as this parameter is considered one of its key biological traits. This process is linked to fecundity, generational turnover, and sex ratio. The ability of an entomophage to produce several generations within a single host generation enhances the efficiency of pest population regulation. However, abrupt changes in climatic conditions may negatively affect the entomophage, reducing its fecundity and altering the sex ratio.

The host-searching ability of Trichogramma is also of great significance, as it increases the economic value of the introduced species. This trait is defined by the parasitoid's capacity to locate and identify pests even when their population density is relatively low. Trichogramma strains with strong host-searching ability typically demonstrate increased population density and improved efficiency in biological control programs.

References

1. Jumaev R.A, Karimbaevich S.S., Jumaeva N.B.. Bioecology of generations of Trichogramma diluted by different methods. - European science review, 2018. 7-11.
2. Jumaeva N.B, Khimsanbaev X.X, Rustamov A.A. Study and determination of the most suitable microorganism and entomophage against cotton bollworm in Uzbekistan //Scientific Journal Of Medical Science And Biology. – 2024. - T. 2. - №. 2. - C. 21-28.v
3. Rasul Jumaev. Methods of determining the optimal temperature and humidity in dryness and storage of in vitro propagated parasitic entomophages. E3S Web of Conferences. 2024. – P. 553. https://doi.org/10.1051/e3sconf/202456303003.
4. Rasul Jumaev, Abdurakhim Kuchboev, Nozimakhon Jumaeva, Farukh Yakubov, Shamsi Esanbaev. Molecular identification and polymerase chain reaction analysis of Xanthogaleruca Luteola (Chrysomelidae) species. E3S Web of Conferences. 2024. –P. 563. https://doi.org/10.1051/e3sconf/202456303001.

5. Rasul Jumaev. Invitro rearing of parasitoids. E3S Web of Conferences 371, 01032 (2023). https://doi.org/10.1051/e3sconf/202337101032.
6. Rasul Jumaev. Methods of determining the optimal temperature and humidity in dryness and storage of in vitro propagated parasitic entomophages. E3S Web Conf. Volume 563, 2024. 1-6. https://doi.org/10.1051/e3sconf/202456303003.
7. Lebedeva N, Akhmedova Z, Kholmatov B, Jumaev R. Revision of stoneflies insecta: plecoptera fauna in Uzbekistan. E3S Web of Conferences 258, 08030 (2021). https://doi.org/10.1051/e3sconf/202125808030.
8. Sulaymonov O, Jumaev R., Sobirov B, Gazibekov A. Representatives of Lepidoptera groups occurred in forestry and agricultural crops and their effective entomophage types. E3S Web of Conferences 244, 02020 (2021). https://doi.org/10.1051/e3sconf/202124402020.
9. Kimsanboev K, Rustamov A, Usmonov M, R.Jumaev. Euzophera Punicaella Mooze Lepidoptera bioecology and development of host entomophagic equilibrium in biocenosis. E3S Web of Conferences 244, 01003 (2021). https://doi.org/10.1051/e3sconf/202124401003.
10. Rasul Jumaev. In vitro mass reproduction of parasitic entomophages Braconidae Trichogrammatidae. E3S Web of Conferences 389, 03100 (2023). https://doi.org/10.1051/e3sconf/202338903100.
11. Esanbaev Sh, Jumaev R. Study on stem pests of elm tree in Uzbekistan. E3S Web of Conferences 563, 03004 (2024). 162-169. https://doi.org/10.1051/e3sconf/202456303004.
12. Jumaev R, Sobirov S, Jumaeva N. Bioecology of generations of Trichogramma diluted by different methods. European science review 3-4, 25-28 (2018).
13. Jumaev R.A, Kimsanbaev X. Rearing of Trichogramma species T.evanescens, T.pintoi, T.chilonis in vitro culture. European science review 1-2, 29-31 (2018).