World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

Research on the behavior of the predator species *Orius laevigatus* in eggplant cultivation.

Ionuț ȚABĂRĂ, Lenuța Constantina CHIRA, Mirela Olga BOLOACĂ, Mihaela VLAD, Daniel NAGY and Ligia ION *

University of Agronomic Sciences and Veterinary Medicine of Bucharest, faculty of Horticulturte, 59 Marasti Blvd, District 1, Bucharest, Romania.

World Journal of Advanced Research and Reviews, 2025, 27(03), 1222-1227

Publication history: Received on 11 August 2025; revised on 16 September 2025; accepted on 19 September 2025

Article DOI: https://doi.org/10.30574/wjarr.2025.27.3.3263

Abstract

Orius laevigatus is a predatory bug from the *Anthocoridae* family. This bug eats thrips pests as well as pollen. Adults can fly and find prey very easily. Once prey is found, it splits it open and eats its contents. *Orius laevigatus* can eat up to 20 thrips per day. At a ratio of one predator to 180 thrips, thrips populations were suppressed, and at a ratio of one predator to 40 victims, thrips populations were kept below the damage threshold. The first inoculations with natural predators were made in June around the 20th, with the second inoculation to be made two weeks later, on June 28, when the plants had a much better developed foliar system. *Orius laevigatus* was tested against *Frankliniella occidentalis* in greenhouses for eggplant crops, together with *Orius niger*. Several releases of adults (1-6 individuals/m^2) were carried out. Three experimental variants were set up: V1—inoculation was performed only with the species *Orius laevigatus*; V2—inoculation with a mixture of the predators *Orius laevigatus* and *Orius niger*; and variant V3—mixture with the predators *Macrolophus pygmaeus* and *Amblyseius swirskii*. For each species, inoculations began with 1 ind/m^2.

Keywords: *Orius laevigatus*; Predators; Inoculation; Thrips; Eggplants

1. Introduction

The use of basic substances in crop protection is an active area of research, with several promising substances demonstrating efficacy in controlling plant pathogens and pests. Therefore, the number of active substances available is expected to increase in the future, even though the regulatory process for approving new active substances can be complex and may discourage some applicants. Chitosan is currently the most widely used and well-studied active substance [2]. The composition of the basic substance is extremely relevant, as demonstrated by the different levels of protection achieved by red and white onion extracts against early blight of potatoes [3]. However, the use of these substances in the field has often not been demonstrated. The application of elicitors and botanical fungicides, beneficial microorganisms, and basic substances should be a combination of compounds and microorganisms with different modes of action, starting from the early stages of potato plant growth [6], [9], [8], [4]. This strategy of minimizing risk to the ecosystem is a global trend, especially in the EU, where the policy of greening agriculture is being promoted. Chitosan significantly inhibits mycelial growth and in vitro germination of *P. infestans* spores, induces resistance to the pathogen in vegetable pieces and leaves [7], and forms a mechanical barrier to the penetration of the pathogen [1],[5].

* Corresponding author: Ligia ION

2. Material and methods

2.1. Polifag material

Orius laevigatus was tested against *Frankliniella occidentalis* in greenhouses for eggplant crops, together with *Orius niger*. Several releases of adults (1-6 individuals/m^2) were carried out. Multiple releases (including in spring and autumn) resulted in significant thrips control, with *Orius laevigatus* being more effective than *Orius niger*. Three experimental variants were set up: V1—inoculation was performed only with the species *Orius laevigatus*; V2—inoculation with a mixture of the predators *Orius laevigatus* and Orius niger; and variant V3—mixture with the predators *Macrolophus pygmaeus and Amblyseius swirskii*. For each species, inoculations began with 1 ind/m^2. (Figures 1. and 2.)

(source:original)

Figures 1 and 2 Aspects of the preparation of the *Orius laevigatus* inoculum

Table 1 Results of experimental variants for inoculating eggplant crops in greenhouses

Variants	Natural predators	Inoculation I 20.06.2022, 2023,2024	Inoculation II 28.06.2022,2023,2024
V1	Orius laevigatus	1 ind/mp	1 ind/mp
V2	Orius laevigatus	1 ind/mp	1 ind/mp
	Orius niger	1 ind/mp	1 ind/mp
V3	Macrolophus pygmaeus	1 ind/mp	1 ind/mp
	Amblyseius swirskii	1 ind/mp	1 ind/mp

(source:original)

Table 7.5.1. shows the inoculation variants (Figures 1 and 2) for the eggplant crop, where the predator species *Orius laevigatus* was used both alone and in combination with other predator species to highlight its aggressiveness in attacking thrips.

2.2. Plant material

The Frankliniella occidentalis and T. vaporariorum cultures were initiated in June 2021 from individuals collected in the USAMVB greenhouses. These cultures were maintained in separate greenhouse compartments on pesticide-free pepper and eggplant plants. Eggplant plants cv. Mirval, at the six-leaf stage, were obtained through seedlings at a farm in Sălcioara, Dâmbovița, in greenhouses of 1000 m^2 each. Ninety plants were also transplanted into 10 L pots with mineral wool and grown individually in insect-proof cages (75 × 75 × 115 cm, mesh size 150 µm, insect growth tent in a greenhouse compartment (144 m^2). The plants were grown without pesticides and fed a standard vegetable nutrient solution until used in experiments. Liquid fertilizers were applied at a rate of 260 mL per day, adjusted as necessary depending on weather conditions.

2.3. Work made

To assess the relative abundance of the different *Orius* species released on plants, we took destructive samples from the five additional replicates of the combined treatments in week 7 (four weeks after the release of the last pest and predator). In addition, in week 12, all remaining plants (with single or combined predator release) were sampled destructively. This destructive procedure consisted of cutting all the leaves and flowers of each plant and counting the *Orius* predators present on the leaves or flowers. Juvenile and adult predators from treatments where multiple species were released were collected using a vacuum cleaner from flowers or leaves and transported separately to the laboratory. There, all adults were immediately stored in 70% alcohol in 1.5 ml Eppendorf tubes, while nymphs were incubated to adulthood in standard plastic containers (Ø 8 × 5 cm; perforated lid and covered with fine insect mesh (80 × 80 µm)), where a section of bean pods and *Orius, E. kuehniella* eggs were provided once every two days in each container as food sources at 25 ± 1 °C, 70 ± 10% relative humidity. The nymphs were incubated in groups according to the plant and plant part (flowers or leaves) from which they originated. Once all nymphs had transformed into adults, they were stored in alcohol and identified under a stereoscope.

3. Results and discussion

The results in Table 2 showed the average number of thrips consumed per day correlated with predator species over the three years of research (Figures 3 and 4) and validated the hypotheses that *Orius laevigatus* consumes an average of 20-21 thrips/day when inoculated alone in the eggplant culture, 17-19 thrips consumed when inoculated together with *Orius niger*, while the other predators.

Table 2. Results regarding the average number of thrips consumed/day correlated with predator species *Macrolophus pygmaeus* and *Amblyseius swirskii* in variant V3 consume an average of 7-10 thrips/day. It was observed that *Orius laevigatus* has a high predatory capacity, which decreases when competition for food occurs, as is the case in variant V2 - *Orius laevigatus* and *Orius niger*.

Table 2 Results regarding the average number of thrips consumed/day correlated with natural predator species

Variants	Natural predators	Average number of trips taken per day in 2022	Average number of trips taken per day in 2023	Average number of trips taken per day in 2024
V1	*Orius laevigatus*	21 trips/day	20 trips/day	22 trips/day
V2	*Orius laevigatus*	19 trips/day	17 trips/day	18 trips/day
	Orius niger	14 trips/day	12 trips/day	13 trips/day
V3	*Macrolophus pygmaeus*	10 trips/day	11 trips/day	9 trips/day
	Amblyseius swirskii	8 trips/day	7 trips/day	9 trips/day

(source:original)

(source:original)

Figures 3. and 4. Aspects from the solariums with the harvest of eggplants inoculated with *Orius laevigatus*

Table 3 shows the results regarding the correlation between eggplant production and the number of predators inoculated per square meter, where it was observed that the average eggplant production increases with the number of predators released into the crop, thus at 1 predator/square meter, productions of 2229 kg/ 1000 m^2 of greenhouse space in 2022, followed by 2023 with an average production of 2224 kg/1000 m^2 of greenhouse space, down to a production of 2194 kg/1000 m^2 of greenhouse space in 2024. In variant V2 with 3 predators/m^2, it was observed that production increased from 2487 kg/1000 m^2 in 2023 to 2563 kg/1000 m^2 in 2022. Interestingly, in variant V3, eggplant production began to decline from 1974 kg/1000 m^2 of solar area in 2024 to 2001 kg/1000 m^2 of solar area in 2022. This demonstrated that at higher densities, competition may occur, but of course there are also environmental factors that influence the entire process. (Figures 3 and 4.)

Table 3 Results regarding the correlation of eggplant production with the number of inoculated predators per m.p.

Variants	Natural predators	Number of individuals inoculated in eggplant cultures	Average eggplant production in 2022 (kg/1000 sq m of greenhouse space)	Average eggplant production in 2022 (kg/1000 sq m of greenhouse space)	Average eggplant production in 2022 (kg/1000 sq m of greenhouse space)
V1	Orius laevigatus	1 ind/mp	2229	2224	2194
V2 V3	Orius laevigatus	3 ind/mp	2563	2487	2511
	Orius laevigatus	6 ind/mp	2001	1988	1974

(source:original)

(source:original)

Figures 5. and 6 Inoculum preparation and eggplant production in organic greenhouses

Orius laevigatus was tested against *Frankliniella occidentalis* in eggplant greenhouses, together with *Orius niger*. Several releases of adults were carried out, ranging from 1 to 6 individuals/m^2. Multiple inoculations (including in spring and autumn) resulted in significant thrips control, with the predator *Orius laevigatus* being more effective than the predator *Orius niger*.

Commercial products containing *Orius laevigatus* are therefore also recommended for eggplants, especially for thrips control. The recommended dose is approximately 1 adult/m^2 as a preventive measure, and when the problem is more advanced, larger or repeated releases or a larger number of individuals can be used. It has been observed that adult *Orius laevigatus* can consume approximately 20 thrips/day under good conditions. (Figures 5 and 6.)

The data presented in the study allow for a comparative analysis of the biological efficiency of different inoculation variants with natural predators. In terms of average daily thrips consumption, variant V1 (*Orius laevigatus* singular) recorded the highest values (20–22 thrips/day), followed by variant V2 (mixture of *Orius laevigatus* and *Orius niger*), where *Orius laevigatus* consumed between 17–19 thrips/day, and *Orius niger* between 12–14 thrips/day. Variant V3 (*Macrolophus pygmaeus* and *Amblyseius swirskii*) showed the lowest efficiency, with a consumption of between 7–11 thrips/day. These differences suggest a significant superiority of *Orius laevigatus* in thrips control, with a reduction in

efficiency under conditions of interspecific competition (V2). In terms of impact on production, variant V2 (3 individuals/m^2) achieved the most consistent results, with average yields of 2487–2563 kg/1000 m^2 solar, reflecting the synergistic potential of the predator mixture. Variant V1 (1 ind/m^2) generated moderate yields (2194–2229 kg/1000 m^2), while variant V3 (6 individuals/m^2) recorded the lowest values (1974–2001 kg/1000 m^2), indicating the possible occurrence of competition or maladaptation of predators to the specific conditions of the crop.

Temporal analysis of the data (2022–2024) did not reveal any significant linear trends in thrips consumption or production, suggesting relative stability of predator-prey interaction under experimental conditions. However, the minor annual variations observed may be attributed to unaccounted environmental or management factors. *Orius laevigatus* demonstrates statistically significant efficacy in reducing thrips populations, with a positive impact on production, especially when used in combination with *Orius niger*. However, the study highlights the need to optimize inoculation density and avoid interspecific competition in order to maximize the benefits of biological control.

4. Conclusions

The predator *Orius laevigatus* has real potential to control thrips in eggplant crops, especially if introduced preventively and used correctly (sufficient numbers, adapted to the stage of the pests). Its effectiveness depends significantly on prey density, the availability of other food sources (eggs, larvae), environmental conditions (temperature, humidity), and the timing of release. Fertility and prey consumption are lower when the prey is on eggplants compared to peppers, probably due to differences in food quality or physiological aspects of eggplant leaves.

Limitations and risk factors

- If *Orius laevigatus* is introduced too late, pests can spread and damage becomes greater, and predation no longer recovers the losses.
- •At lower temperatures, the predator's development cycle slows down, reducing its effectiveness in controlling thrips, which have a faster cycle.
- If there is no alternative food source (e.g., pollen or secondary prey) during periods of low thrips density, *Orius laevigatus* populations may be weak.

The conclusion is that *Orius laevigatus* is an effective predator against thrips in protected eggplant crops, especially if released preventively and under favorable environmental conditions. Maximum efficiency is achieved when the following are combined: correctly dosed releases, careful monitoring, provision of alternative resources (pollen), and avoidance of pesticides harmful to the predator. However, the lack of specific data from Romania makes it advisable to conduct local trials before widespread adoption.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Amborabé B.E., Bonmort J., Fleurat-Lessard P., Roblin G. (2008), Early Events Induced by Chitosan on Plant Cells. J. Exp. Bot.;59:2317–2324. doi: 10.1093/jxb/ern096.

[2] Behiry S.I., Philip B., Salem M.Z.M., Amer M.A., El-Samra I.A., Abdelkhalek A., Heflish A. (2022), Urtica dioica and Dodonaea Viscosa Leaf Extracts as Eco-Friendly Bioagents against Alternaria Alternata Isolate TAA-05 from Tomato Plant. Sci. Rep.;12:16468. doi: 10.1038/s41598-022-20708-4.

[3] Catuna (Petrar) T., Odagiu A., Balint C., Darjan S., Bordea D., Mihaiescu R. (2021)Testing the Anti-Alternariosis Effect of Aqueous Extract of Allium cepa L. in Potato. ProEnvironment.;14:87–90.

[4] Dong S.M., Zhou S.Q. (2022), Potato Late Blight Caused by Phytophthora infestans: From Molecular Interactions to Integrated Management Strategies. J. Integr. Agric.;21:3456–3466. doi: 10.1016/j.jia.2022.08.060.

[5] El Hadrami A., Adam L.R., El Hadrami I., Daayf F. (2010), Chitosan in Plant Protection. Mar. Drugs.;8:968–987. doi: 10.3390/md8040968.

[6] He D.C., He M.H., Amalin D.M., Liu W., Alvindia D.G., Zhan J. (2021) Biological Control of Plant Diseases: An Evolutionary and Eco-Economic Consideration. Pathogens.;10:1311. doi: 10.3390/pathogens10101311.

[7] Huang X., You Z., Luo Y., Yang C., Ren J., Liu Y., Wei G., Dong P., Ren M. (2021), Antifungal Activity of Chitosan against Phytophthora infestans, the Pathogen of Potato Late Blight. Int. J. Biol. Macromol.;166:1365–1376. doi: 10.1016/j.ijbiomac.2020.11.016.

[8] Kowalska J., Tyburski J., Matysiak K., Tylkowski B., Malusá E. (2020), Field Exploitation of Multiple Functions of Beneficial Microorganisms for Plant Nutrition and Protection: Real Possibility or Just a Hope? Front. Microbiol.;11:1904. doi: 10.3389/fmicb.2020.01904.

[9] Palmieri D., Ianiri G., Del Grosso C., Barone G., De Curtis F., Castoria R., Lima G. (2022), Advances and Perspectives in the Use of Biocontrol Agents against Fungal Plant Diseases. Horticulturae.;8:577. doi: 10.3390/horticulturae8070577.