COMPARATIVE EVALUATIONS OF RECOGNITION AND SIZE OF HELICOVERPA AND OSTRINIA POPULATIONS IN CORN CROPS IN BIHOR COUNTY

Jozsef-Zsolt VERES, Anca RADU, Liana MOCUTA ISPRAVNIC, Ana Maria VIRTEIU, Ioana GROZEA
University of Life Sciences "King Mihai I" Timisoara, Romania
Corresponding authors: ioanagrozea@usab-tm.ro; anamaria.badea@gmail.com

Abstract. *Lately, 2 species of lepidopteran insects, Ostrinia nubilalis and Helicoverpa armigera, are very common in corn crops in the west of the country. They have the status of a pest in the larval stage and are a big problem for the phases after the formation of the cob when the attack itself is manifested. Recent studies as well as the opinions of farmers speak of an increase in the size of the adult populations and implicitly of the reproductive capacity and the number of harmful larvae in the crops. The present work comes with recognition information and comparison between the 2 species, both at the adult and larval levels, but also at other important stages in identification (pupa and egg). Among others already known, the identification of adults is easier because those of Helicoverpa are larger, with a more pronounced coloration than those of Ostrinia which are thinner in body, small in wingspan and lighter in color, more uniform. Our studies of corn crops in Palota locality (Bihor County) showed that the larvae are also differentiated by size and coloration in the same trend as the adult. The damage phenophases are somewhat staggered but concentrated especially during the cob formation period. While Ostrinia is specific to corn, Helicoverpa can attack various plants. The analysis of the size of the populations from the last 2 years highlighted a preponderance of the Helicoverpa species at the expense of Ostrinia. These differences are useful in identifying the species more quickly and taking appropriate measures for effective control.*

Keywords*: corn, Ostrinia, Helicoverpa, identification, population size*

INTRODUCTION

Recently, 2 species of lepidoptera are common in corn crops in Romania. These are the European corn borer from the Crambidae family and the Corn earworm (*Helicoverpa armigera*) from the Noctuidae family.

The impact on corn crops of both species is quite large and their management strategies are focused specifically on insecticides or on the resistance of hybrids, 2 debatable approaches, one polluting and the other subject to legislation.

The damage caused by Ostrinia larvae on maize crops shows significant variations depending on the type and variety of maize, the environmental conditions and the monitoring and control methods applied (BHATTARAI, 2019). In Europe, the percentages range from 32.45%-59.34% in stalk and 8.93%-25.73% in cobs (DEMIREL AND KONUSKAN, 2017). In the USA, damage to conventional maize remains a significant economic problem despite the introduction of resistant hybrids (BOHNENBLUST ET AL., 2014).

Damage caused by Helicoverpa larvae shows significant variation depending on larval density, type of maize, system of cultivation and control methods (RUIU AND LENTINI, 2022). In Europe, in an advanced monitoring study from Hungary, they showed damage with up to 82% accuracy, helping farmers in crop management decisions (SÁRI-BARNÁCZ ET AL., 2024). In Serbia, the damage caused reached 40% in the absence of insecticides (VUKOVIĆ ET AL., 2015). In Asia, it was responsible for 80-90% of all maize damage, especially in the cob formation phase, suggesting the need for intensive monitoring and the use of insecticides for effective control (KIM ET AL., 2018).

Ostrinia larvae attack prepondrently corn plants, while those of Helicoverpa are polyphagous (GROZEA, 2006; PALAGESIU ET AL., 2000). Ostrinia affects the stems, cobs and leaves, while Helicoverpa affects the fruiting organs in general (GROZEA, 2015; VIRTEIU ET AL., 2021).

A positive correlation was also found between the attacks of Ostrinia and Helicoverpa and those of the phytopathogenic agent Fusarium (Darvas et al., 2011).

Recent studies of Ostrinia and Helicoverpa (adult) populations in maize crops and catch levels in pheromone and light traps indicate increasing trends. For example, in Europe trap catches have shown the presence of both species in the main maize growing areas, with a peak flight in July (ANDERBRANT ET AL., 2023). In Asia, captures from pheromone traps confirmed the continuous presence of *H. armigera* during the corn pollination period (KIM ET AL., 2018). In some areas, catches in pheromone traps can vary, with large numbers of adults caught in late July and August, the most vulnerable periods for maize (LI ET AL., 2023). In South America, captures from agricultural districts varied significantly depending on the season (SPECHT ET AL., 2021).

All this points to increased monitoring and the use of traps to track population growth and assess risks to crops.

Through this paper, we proposed to analyse the recognition and bioecological characteristics of the 2 species with the aim of providing farmers with relevant, summarized and comparative knowledge.

MATERIAL AND METHODS

From 2 corn crops in Bihor County, Palota locality, biological material consisting of different stages of the 2 pests as well as affected plant organs was taken.

The collection activity was carried out with the help of specific traps (Csalomon Pheromone Traps) and manually during routine observations at the request of farmers, on an area of 1 half hectare untreated, for the period 2023-2024, summer and autumn, from June to September, to cover the 2 important generations.

The determination and quantification of the samples as well as the evaluation of the affected plant samples were done with the help of the practical guide from the Phytosanitary Diagnostic and Expertise Laboratory within the ULST.

RESULTS AND DISCUSSION

All developmental stages (adult, larva, pupa and egg) were observed in the 2 maize crops in Palota. Only in 2024, Helicoverpa eggs were not observed, although the adults were very present. (Table 1).

Table 1

The status of the presence or absence of the development stages of the 2 species of lepidoptera

Place	Year	Stages observed in corn crops			
		Adult	Egg	Larva	Pupa
Culture 1	2023	yes	yes	yes	yes
	2024	yes	yes	yes	yes
Culture2	2023	yes	yas	yes	yes
	2024	yes	no	yes	yes

From what we observed, we found that although both species are lepidopterous, there are still morphological differences in adult stage (Figure 1) such as: size, coloration, shape and structure of the wings, the shape of the antennae, the head and the eyes. There are also differences in behaviour between them, but also in host plants and damage.

All this is presented in a table for a better comparison and understanding (Tabel 2).

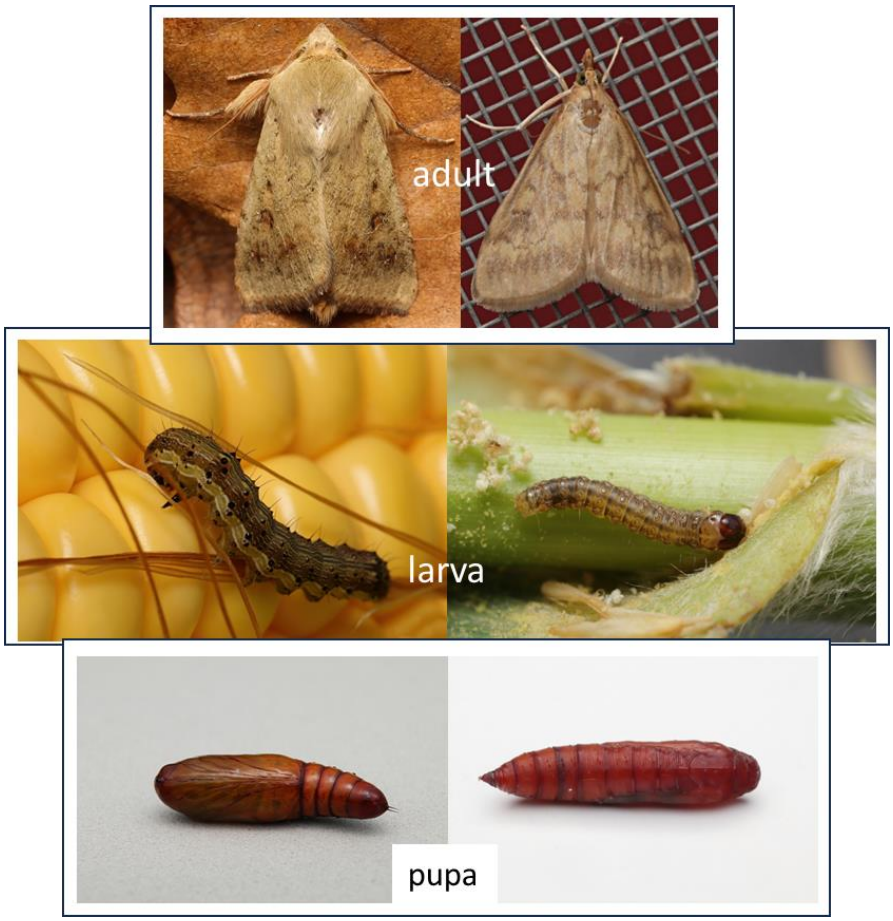

Figure 1. Active and inactive stages of the 2 pests: Helicoverpa: adult, larva and pupa (left) (by Veres JZ); Ostrinia: adult (by Grozea I), larva and pupa right (taken by Veres JZ)

Depending on the criterion addressed, the characteristics of adults clearly differ between the 2 species, from size to habitat. As seen in Table 2, recognition in corn crops can be done through the observations of adults on various plant organs, as it is known that they do not attack these organs.

As far as the larva is concerned, it is also differentiated by morphological characteristics, but especially by the way of damage, being the most active stage for food and permanently found on plants or indoors, it depends on the species.

Table 2

Comparative differences useful in recognizing the 2 species in crops

Criterion	*Morphological characteristic of adult*	
	Ostrinia nubilalis	Helicoverpa armigera
Body color	generally yellow-brown with various patterns; sometimes striped or spotted.	variable color, ranging from light brown to green or yellow-brown; often appears more uniform.
Forewings	slightly elongated, with a combination of light colors and zig-zag lines.	broader wings, lighter shades with occasional thin lines or spots.
Hindwings	typically white or light-colored with dark edges.	more uniform in color, often white-brown, without distinct markings.
Antennae	relatively short and straight, finely segmented.	longer, slightly curved, with more visibly segmented structure.
Body Size	average length around 10-12 mm.	usually a bit larger, between 15-18 mm.
Preferred habitat and host plants	primarily found in agricultural areas and on host plants like corn	found in various crop fields, including tomato, cotton, and corn
Criterion	*Larvae differences*	
Color body	light brown or creamy in color, with darker, longitudinal stripes running along the body, often have a smooth appearance with faint spots	variable in color, from green, yellow; tend to have darker spots and markings along the sides, giving them a more patterned look
Size body	smaller in terms of larval length, with fully-grown larvae reaching around 25 mm	can grow up to 40 mm, making them visibly more robust than O. nubilalis larvae
Head	yellowish-brown, matching the body more closely, with minimal patterning	darker and more robust, with a slightly larger and well-defined appearance compared to O. nubilalis
Host plants	corn	corn, soybeans, peas, chickpeas, peppers, tomatoes and many other vegetables, beans, sunflower, cotton
Damage	bore into the plant stems, particularly in corn, leaving characteristic tunnels and holes.	external feeding on leaves, flowers, and fruits of host plants, causing more visible damage on the surface
Criterion	*Pupae differences*	
Color, structure	brown, smooth, with less distinct segments with normal posterior tip	brown, segmented, with a prominent posterior tip
Criterion	*Eggs difference*	
Egg structure, grouping and place of identification	flattened, small, rounded, deposited in groups, on the underside of the leaves	more spherical, deposited individually or in small groups, on the upper surface of the leaves

The pupa is an inactive stage, hidden and difficult to see. Anyway, clear identification and distinction between the 2 species can only be done through detailed studies and usually using magnifying instruments (Table 2, Figure 1).

Eggs are easily recognized by being observed on the leaves of corn plants, in groups or isolated by clear characteristics (Table 2).

The variations of the adult populations of Ostrinia and Helicoverpa are shown in the graph in Figure 2. There are no statistical differences between the values of 2023 and 2024 (p= 0.375) and they are statistically significant at an ordinary level of significance (p, 0.05).

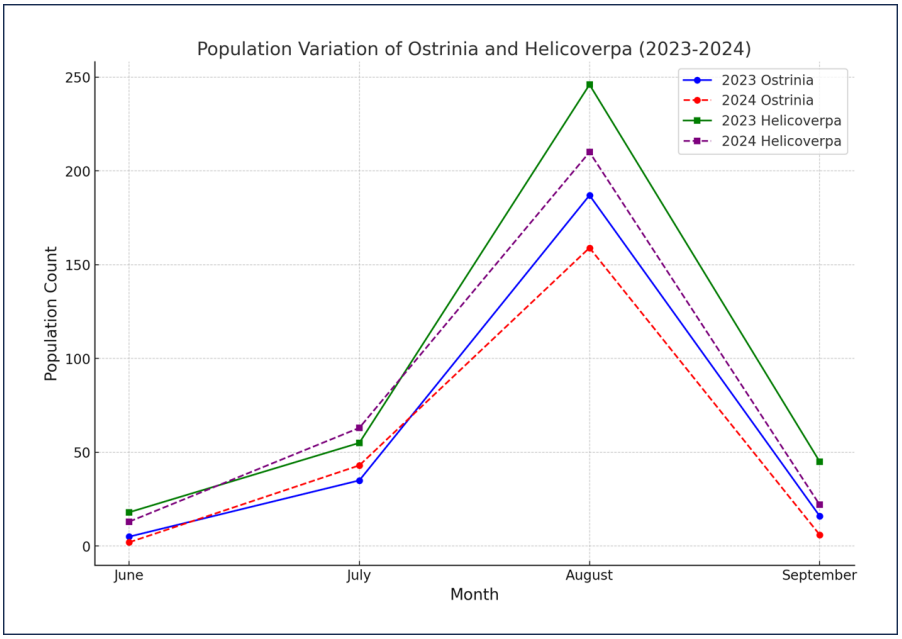

Figure 2. Statistical graph for the periodic variation of Ostrinia and Helicoverpa populations

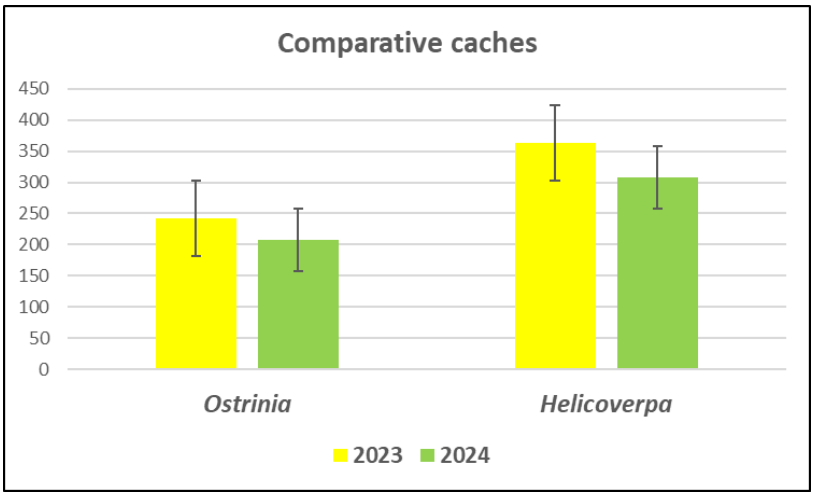

Figure 3. Comparative caches of Ostrinia and Helicoverpa populations on entire period

The values quantified annually showed that in 2023 the populations of both harmful species were more consistent, with a number of adults of Ostrinia of 243 and of Helicoverpa of 364. In 2024, the populations had fewer individuals (but still at a high level) of 208 for Ostrinia and 308 for Helicoverpa (Figure 3).

These values, however, indicate a level that can lead to significant damage in corn crops. An average of 4-5 adults per day in the case of Ostrinia and 6-7 adults in the case of Helicoverpa for 1 consecutive week was recorded during the period of their maximum activity. Thus, the premises for damages over the PED were created.

CONCLUSIONS

Adults of *Ostrinia nubilalis* and *Helicoverpa* armigera show clear differences in size and morphology, which can help to identify them more quickly in the field. Of course, trap catches are obviously monitoring elements on the basis of which effective control strategies can be made. From the results it is clear that the population level is increasing towards Helicoverpa, therefore the attention must be directed towards this pest which in time can affect corn but also other crops, being a polyphagous specie in adaptation.

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