RESEARCH ON THE ATTACK PRODUCED BY *OSTRINIA NUBILALIS* HBN (EUROPEAN CORN BORER) LARVAE TO SOME AGRICULTURAL CROPS IN THE CONDITIONS OF CENTRAL MOLDOVA

CERCETĂRI PRIVIND ATACUL PRODUS DE LARVELE SPECIEI *OSTRINIA NUBILALIS* HBN. (SFREDELITORUL PORUMBULUI) LA UNELE CULTURI AGRICOLE ÎN CONDIȚIILE DIN CENTRUL MOLDOVEI

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Abstract: *Ostrinia nubilals Hbn. larvae it attacks many species of plants belonging to very different families. Maize is recognized as the preferred host, but the larvae attack hemp, sorghum, millet, hops, peppers or weeds (Echinochloa crus galli, Artemisia vulgaris). In maize crops the larvae are identified on different parts of the plant (stem, cobs, inflorescence) where it favors the installation of pathogens, weaken the resistance of the plant being prone to break or depreciate the grains. At hemp, the larvae feed on the stem tissues, including the support system and the conducting vessels. The effect of the attack produced by larvae is materialized by young plants stagnation in vegetation and the decrease of production capacity in more mature plants. Sorghum shows tolerance to larval attack especially in the booting phenophase, tolerance decreasing to flowering, which is higher than that found in maize. This paper presents the results obtained on the attack of Ostrinia nubilalis Hbn produced at maize, hemp and sorghum in the period 2019-2021. At the analyzed crops, the larvae produced attacks between 3.65% (sorghum) and 32.63% (maize). The maize crops were the most affected by the larval attack, registering on average an attack of 32.63%. In hemp, the larval attack was on average between 2% and 21%. At sorghum crops it was found that the larval attack was reduced to sporadic, between 2% and 9%.*

Key words: hemp, corn, sorghum, attack, larvae

Rezumat: *Larvele de Ostrinia nubilals Hbn. atacă multe specii de plante aparținând unor familii foarte diferite. Porumbul este recunoscut ca gazda preferată, dar larvele de sfredelitor atacă cânepa, sorgul, meiul, hamei, ardei sau buruieni (Echinochloa crus galli, Artemisia vulgaris). În culturile de porumb larvele sunt identificate pe diferitele părți ale plantei (tulpină, știulete, inflorescență) unde favorizează instalarea agenților patogeni,*

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slăbesc rezistența plantei fiind predispusă frângerii sau depreciază boabele. La cânepă, larvele se hrănesc cu țesuturile tulpinii, cuprinzând sistemul de susținere și vasele conducătoare. Efectul atacului produs de larve se materializează prin stagnarea din vegetație a plantelor tinere și scăderea capacității de producție la plantele mai mature. Sorgul arată toleranța la atacul larvelor în special în fenofaza de burduf, toleranță care scade până la înflorit, care este mai ridicată față de cea întâlnită la porumb. Lucrarea de față prezintă rezultatele obținute privind atacul produs de Ostrinia nubilalis Hbn culturilor de porumb, cânepa și sorg în perioada 2019-2021. În cazul culturilor analizate, larvele au produs atacuri cuprinse între 3,65%(sorg) și 32,63%(porumb). Cultura de porumb a fost cea mai afectată de atacul larvelor înregistând în medie, frecvențe de 32,63%. La cânepă, atacul produs de larve a fost în medie cuprins între 2% și 21%. La culturile de sorg s-a constat că atacul larvelor a fost redus spre sporadic, cuprins între 2% și 9%.

Cuvinte cheie: cânepa, porumb, sorg, atac, larve

INTRODUCTION

Ostrinia nubilalis Hbn is a special polyphagous (Bengtsson *et al.*, 2006) attacks a very large number of plants. Franeta (2018) states that the plants attacked by the species *Ostrinia nubilalis* Hbn are part of the families: *Poaceae, Polygonaceae, Amaranthaceae, Solanaceae, Fabaceae, Malvaceae, Cannabaceae, Iridaceae, Cucurbitaceae* and *Apiaceae.*

Maize is recognized as the preferred host, although in some european areas, larvae have been identified on other plant species, such as hemp, hops. Some host plants are not attractive to the oviposition of first-generation female pests or favorable to larval survival. Sorghum, cotton and some of the vegetable crops are more susceptible to attack by the second or third generation when maize becomes unattractive to oviposition. It has been shown that the species can be kept alone for two or more generations on some common weeds in the cornfield. Many weed species present in cornfields become infested by migrating larvae to more advanced stages of development (Brindley and Dicke, 1963).

In Romania, the larvae attack maize, hemp, sorghum, millet, hops, peppers or weeds such as *Echinochloa crus galli* and *Artemisia vulgaris* (Perju *et al.*, 2004).

In hemp, the larvae feed on the stem tissues, including the support system and the conducting vessels. The effect of the attack produced by larvae is materialized by the stagnation of young plants in vegetation and the decrease of production capacity in more mature plants. If the attack takes place in the upper third, the plant will emit new branches that will vegetate and bloom. On the other hand, if the attack takes place when the plant is towards the end of the ripening period and is located at the mid-plant, it breaks and dries (Șandru *et al.*, 1996).

Sorghum crops presents a particular interest, because it consumes smaller amounts of fertilizers and capitalizes on some soil conditions and climate better than corn, the harvests being higher. In the past, sorghum was

used in animal feed, obtaining brooms, but now its role has grown, sugar sorghum being used in the bioethanol production industry, food industry (Pochișcanu and Druțu, 2016).

Studies conducted by a series of researchers by performing sections on sorghum stems showed a small number of *Ostrinia* larvae inside the stems, correlated with the reduction of the length of the galleries, but also the number of holes.

Observations by Dyatlova and Frolov (1999) show the tolerance of the species to larval attack especially in the bellows phenophase, a tolerance that decreases to flowering (Guthrie *et al.*, 1985), but which is still higher than that found in maize.

Beres (2012) studied, in the period 2008-2010, the attack of larvae in sorghum crops, finding that the frequency of attacked plants was reduced being, on average, 10.9%. Inside the plants, the number of identified larvae ranged from 0.1 to 0.2. In sorghum, the average number of holes and galleries was closely correlated, the number of holes created on plant was between 0.1 to 0.5 holes, and the galleries number created by larvae in sorghum plants ranged from 0.1 to 0,3 galleries. Regarding the length of the galleries, Beres (2012) mentions small values, on average, between 3.7 cm and 8.2 cm.

The present paper includes the results obtained in the period 2019-2021 regarding the attack produced by the larvae of the species *Ostrinia nubilalis* Hbn. in some crops that are considered host plants for the growth and evolution of the insect.

MATERIAL AND METHOD

In the period 2019-2021 in the experimental field of the Research Station - Agricultural Development Secuieni - Neamț was monitored the attack produced by the larvae of the species *Ostrinia nubilalis* Hbn. in some agricultural crops that are considered host plants for the growth and evolution of insect larvae. The crops that were the subject of observations and determinations were maize, hemp and sorghum.

The cultivation technology of these species was specific to the conditions in Central Moldova, in compliance with the experimental protocol (Trotuș *et al.*, 2020).

The attack was noted at the end of the vegetation period and aimed to determine the parameters that describe the attack produced by the larvae of *Ostrinia nubilalis* Hbn. By sectioning the plants, it was established: the frequency of the attacked plants; average number of holes / plant; average number of larvae / plant; average length of galleries (cm).

Climatic conditions: The meteorological data were recorded from the weather station VANTAGE PRO 2, located in the experimental field, the station being automated with the recording and storage of data in the computer. In the climatic interpretation of the years of experimentation we used data on the average air temperature (°C) and the amount of precipitation (mm).

RESULTS AND DISCUSSIONS

The climatic conditions recorded during the vegetation period of the three crops were very varied, years being characterized by extreme conditions in terms of temperatures and rainfall.

The temperatures recorded between April and September in 2019 and 2020 characterized the warm range (tab. 1). The spring months, April and May, were normal in 2019 and 2020, but cool in may -2020 and 2021. Regarding the summer months, it is observed that June, August and September were warm in 2019 and 2020, and the increase in temperatures was maintained in 2021.

Table 1

Temperatures recorded during the vegetation period, Secuieni-Neamț

Period	April	May	June	July	August	September
2019	9.7	15.3	21.3	20.1	21.2	16.2
	normal	normal	very warm	normal	warm	warm
2020	10	13.9	20	20.9	22.2	18.0
	normal	cool	very warm	normal	very warm	very warm
2021	7.5	14.7	19.2	22.2	20.5	14.7
	cool	cool	warm	very warm	normal	normal
Multiannual	9.5	15.4	18.8	20.4	19.5	15.0

In terms of precipitation there is a decrease in the amount of water that fell during the 6 months, characterizing the vegetation period during the three years as dry (tab. 2).

The uneven distribution of precipitation during the vegetation period is noticeable, but also the fact that spring is dry in April, May 2019 and 2021, respectively April - 2020. The lack of precipitation being registered in the summer months of 2019, 2020 and July – 2021, which negatively influenced the evolution of corn, sorghum, and hemp crops.

Table 2

Rainfall recorded during the vegetation period, Secuieni-Neamț

Period	April	May	June	July	August	September
2019	38.0	95.0	55.8	46.6	20.4	64.8
	less dry	very rainy	very dry	very dry	very dry	very rainy
2020	1.2	69.6	72.6	39.0	51.2	60.4
	very dry	normal	less dry	very dry	less dry	rainy
2021	23.8	31.4	79.4	51.6	76.8	9.2
	very dry	very dry	normal	very dry	rainy	very dry
Multiannual	46.9	65.7	85.0	82.3	60.2	45.7

In the period 2019-2021, the flight of the species *Ostrinia nubilalis* Hbn. it was continuous, without interruption, the first adults being registered in the first decade of June, and the insect's flight ended at the end of September.

The intensity of the flight was maximum during the three years starting with the third decade of June, continuing in the first decade of July, but the appearance of larvae and adults was staggered in July and August.

The climatic conditions in the summer months have negatively influenced the appearance and evolution of the larvae causing their perish, especially in 2019.

Regarding the attack produced by the *Ostrinia nubilalis* Hbn larvae at maize, sorghum and hemp, the results are as follows.

The attack produced on maize by the larvae of the species *Ostrinia nubilalis* was distinguished by high attack frequencies between 12.04% and 32.62%.

The attack materialized through a large number of holes and larvae in the three years of experimentation.

It have been identified between 0.44 larvae/plant (2019) and 0.23 larvae/plant (2020). Regarding the number of holes, between 0.76 holes/plant (2019) and 0.54 holes/plant (2020) were identified.

The galleries created by the larvae reached an average length of 6.39 cm in 2019, being larger in 2020, of 10.45 cm (tab. 3).

Table 3

The attack produced by *Ostrinia nubilalis* Hbn. larvae at maize, Secuieni – Neamț

Year	Attack frequency (%)	Average number of holes/plant	Average number of larvae/plant	Average number of galleries/plant	Average galleries length (cm)
2019	12.04	0.76	0.44	0.73	6.39
2020	32.63	0.54	0.23	0.40	10.45
Average	**22.34**	**0.65**	**0.34**	**0.57**	**8.42**

In hemp crops, the frequency of attack was between 2.3% (2019) and 21% (2021). An average of 0.01 holes / plant (2020) and 0.27 holes / plant (2021) were identified, on average, and the larvae created galleries with lengths from 5.4 cm to 12.82 cm (tab. 4).

The highest attack was recorded in 2021 when the frequency of attack was 21%, and the galleries created by the larvae were 12.82 cm long.

Table 4

The attack produced by *Ostrinia nubilalis* Hbn. larvae at hemp, Secuieni – Neamț

Year	Attack frequencies (%)	Average number of holes/ plant	Average number of larvae / plant	Average number of galleries/ plant	Average galleries length (cm)
2019	2.3	0.05	0.05	0.05	7.1
2020	2	0.01	0.01	0.01	5.4
2021	21	0.27	0.05	0.24	12.82
Average	**8.4**	**0.11**	**0.04**	**0.10**	**8.44**

Sorghum is relatively new in the crop structure. The crops registered a very low attack, on average of 3.65%, the galleries created having a length of 4.64 cm (tab. 5).

The highest attack was recorded in 2021 when the frequency of attacked plants was 9%.

Table 5

The attack produced by *Ostrinia nubilalis* Hbn. larvae at sorghum, Secuieni – Neamț

Year	Attack frequencies (%)	Average number of holes/ plant	Average number of larvae / plant	Average number of galleries/ plant	Average galleries length (cm)
2019	0	0	0	0	0
2020	2	0.01	0.01	0.01	5.00
2021	9	0,07	0,05	0.07	8.93
Average	**3.65**	**0.03**	**0.02**	**0.03**	**4.64**

CONCLUSIONS

1. In the period 2019-2021, the larvae of *Ostrinia nubilalis* Hbn.produced attacks between 3.65% (sorghum) and 32.6% (maize).

2. The maize crop was the most affected by the larval attack, registering on average an attack of 32.63%

3. In hemp, the larval attack was on average between 2% and 21%.

4. In sorghum crops it was found that the larval attack was reduced to sporadic, between 2% and 9%.

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