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BEHAVIOUR AND DYNAMICS OF *Mamestra brassicae* SPECIES (LEPIDOPTERA: NOCTUIDAE) IN AN AGRICULTURAL ECOSYSTEM IN THE TOWN SIBIEL, SIBIU COUNTY IN REGIM OF THE YEARS 2014-2015

Cristina STANCĂ-MOISE

"Lucian Blaga" University of Sibiu, Faculty of Faculty of Agricultural Sciences, Food Industry and Environmental Protection, Sibiu, Romania, Phone: 0040269234111, Fax: 0040269234111, E-mail: cristinamoise1@yahoo.com

***Corresponding author*:** cristinamoise1@yahoo.com

Abstract

The constitution of the local geographical populations, print also a behaviour (flight, locomotion, reproduction) characteristic for each zone of the area. The biology, ecology and behavior of populations study is allowing to establish the specific features of the populations associated with the possibility of control and fighting. Regarding ecological studies of populations based on data captured in conditions of the years 2014-2015 in the village of Sibiel, district Sibiu, significant results were obtained with both light traps and pheromone traps. This paper is a summary of data on the dynamics and abundance of Mamestra brassicae populations in a vegetable garden in the town Sibiel of district Sibiu in terms of the years 2014-2015.

***Key words*:** *agricultural ecosystem, Mamestra brassicae, pheromonal traps, Romania, Sibiel City*

INTRODUCTION

Mamestra brassicae L. (cabbage owl) (Fig.1.) is a very important species in economic terms, flagged as an polyphagous pest to a large number of plants, but with preference for brassicas. The species is detected in both agricultural crops and natural ecosystems (forests) up to altitudes of 2000 m [8,9].
Characterized by a relatively constant-small populations and by a specific behavior, put a number of issues regarding environmental studies, monitoring programs and management, control and combat. The ability of species to occupy a stretched area, builds on the success in adaptation possibilities, at least in part, they are associated with genetic variability of local populations [11].
On the other hand, *Mamestra brassicae* is a native species, with sedentary behavior with a reduced flight capacity and therefore without too great capacity of leaving the confines of a certain particular climatic zone [10]. Ecological research (population abundance, dynamic distribution model, ecosystem division) were also made for *Mamestra brassicae* populations in our country by [816].Our research has been undertaken and refers to behavior in response to light stimulation and sexual attractant.
This paper is a summary of data on the dynamics and abundance of *Mamestra brassicae* populations in a vegetable garden in the town Sibiel of district Sibiu in terms of the years 2014-2015.

Fig. 1. *Mamestra brassicae* L. (cabbage owl), adult and larva (foto.orig.)

MATERIALS AND METHODS

Research with pheromone traps were made in 2014 and 2015 in a vegetable garden in the town Sibiel. The lots that represented the agro-ecosystem were cultivated annually with vegetables and the natural ecosystems in the immediate vicinity of the garden cost of hardwood Suparatel located adjacent agricultural cultures.

Sexual attractant traps (pheromone traps), which was arranged in rows of cabbage perpendicular to the dominant wind direction at a distance of 30-50 m and 1 m height from the ground.

The trap was checked every 2-3 days, when the observations of the current record number of individuals were made, the cleaning or changing the adhesive lanes [1,2,3,4]

Light trap was installed in the middle of the culture of vegetables and a light bulb in the habitat grasses near the vegetable garden.

Population dynamics was registered based on the values of capture using averages/trap/day, or number of individuals/trap/day observed during both flights. Based on estimated values of capturing its coefficient of variation (CV) to characterize the level of pest abundance, including data obtained with pheromone traps, by the model interpretation of the light trap.

On the basis of the average catch among both types of traps, has characterized the *Mamestra brassicae* populations from different batches, using hibernate index (HI) and coefficient generation (CG). The capturing data from the light trap were used to characterize the emerging model.

To analyze the trends in the population evolution in the area studied and for highlighting the relationships between capturing with two types of traps was used the regression equation ($y = a + bx$) and the correlation coefficient (r).

RESULTS AND DISCUSSIONS

The dynamics and abundance of *Mamestra brassicae* populations through research with pheromone traps.

Some of the data obtained during the years 2014-2015 are shown in curves obtained by the total number of males captured highlights a constant low level of populations throughout the range. On the other hand a relatively high level in 2015 alternated with a low level in 2014, without a clear periodicity. In all years, the first generation (flight I G1) the population level was small. The curves trend show an overlap of one period and the distinction between the two generations is distinct. A slightly modified behavior was recorded in 2015, a flight dynamics curve with several peaks. For the generation (G2), the flight occurred most frequently at the beginning of August. Also at this generation, when the flight spanned the entire month of August and even early September, it appeared a second maximum in 2015. We associate this aspect with the influence of ecological factors and with the behavior of species in the area and we do not associate it the existence of a third generation.

Mamestra brassicae flight dynamics characterize in reality the particularities and adaptive values of local geographical populations, dependent on a number of internal and external factors. In this fact, the flight dynamics study of *Mamestra brassicae* populations is similar to the population of Transylvania [30].

Variability in flight dynamics based on capturing with the pheromone traps, were not only temporal but also spatial. The phenomenon was found among very close [16,31].

Population dynamics and abundance of *Mamestra brassicae* through comparative analysis of the data obtained from trap light. In Figure 3 the results obtained in years 2014 and 2015 are presented as a model.

Research with pheromone traps are shown compared to the two types of ecosystems. In the forest area near the vegetable field the level of populations was higher and relatively constant. On the other hand, in the G1 the level was significantly higher compared to the situation of the vegetables field (where also the variability in space and time was accentuated) and approached to that of the G2. In terms of form flight curves, these were more extensive in forest where the male flight was initiated before the culture ones, more disctinct in G1 and sometimes also in G2.

Dynamic data obtained do not reveal a repeating pattern with distinct differences, which in fact made more difficult the possibility of highlighting correlations between adult flight (capture) in different ecosystems and frequency of larval attack, ovipozitor and damages.

Data captured at the light trap did not reveal yet notable differences on flight dynamics of

Mamestra brassicae populations. Flight times overlapped, pheromone beeing more obvious when the population level was higher, especially in G2.

Although light traps captured significantly only females, could not establish a clear relationship between the population of males and females, in the vegetable garden the behavioral patterns of species involving research over longer periods of time and between different local populations.

From practical point of view (using sex pheromone in population control) it is of interest to the beginning of the flight. Although characterized as a protogin species for our population this phenomenon has not been clear (probably also because we are referring to just an area). Moreover, comparing the data of the flight dynamics of pheromone traps of cabbage crop to those from the nearby forest Subparatel (Sibiel), males flight was sooner initiated in the natural ecosystem and flight period was extended even compared to that of adults in the trap light. In addition the phenomenon was not clear even if the data from the trap light was compared to those in pheromone traps.

From comparative research of *Mamestra brassicae* populations in France, made with two types of traps, showed a similar period of activity for adults (). Pheromone traps were remarkable efficiency in generation (G1) for the first flight while light traps were more efficient in the second flight (G2).

Variability dynamics as a normal population characteristic manifested itself in both time and space associated with the type of trap, but the curves trend was broadly similar.

Regression equation (y = 0.9 + 0,056x) showed a similar trend. Obviously due to the marked variability the correlation coefficient was small. The results show the existence of a stable population in the area, with significance for monitoring and management programs [5,6,7]. Precisely this aspect of research is needed lengthend, if not, the metods used for short periods research may not be relevant.

The tendency for evolution of the *Mamestra brassicae* population for such a period, less presented (2014-2015) is shown. This time the data of pheromone traps, the regression shows a slightly decreasing trend in both well studied agroecosystem and also in the neighboring natural ecosystem [13-16, 17-22]. However in terms of comparing the direct data capture from two types of traps, placed one in agro cabbage culture and the other in the neighboring forest ecosystem Subparatel (Sibiel), even for short dynamics model was similar [28,29].

Mamestra brassicae populations characterization with respect to growth and abundance based on fields from the two types of traps, also revealed a number of interesting issues. Processing of data from pheromone traps by using the coefficient generation (CG), hibernation index (IH) and the coefficient of variation (CV) was an effective way of assessing changes in abundance from one generation to another and from one year to another.

Even if these parameters were used for data processing from light trap, we first introduced the results of pheromone traps, relying on the fact that the rate of the sexes is around 1 and given the behavior response of the two sexes to the light stimulation.

Mamestra brassicae is one of the species of Noctuidae responders in the field of variants sexual pheromone, similar studies were done in the same locality Sibiel in an apple orchard, where it was studied the behavior of response to pheromone traps of the species *Cydia pomenella* (worm apples) [12,23, 24]. The processing of catching traps data, with the help from the above indices, revealed that extrapolating methods from processing the data in pheromone traps is more advantageous in some situations and correct.

The generation coefficient is the ratio of the average number of G2 and G1 adults in the same year and the hibernate index is the ratio between the average number of adults captured in the first generation of a year and the average G2 of the next year.

The coefficient of variation was used also for this action in editing the data from the light trap.

After analyzing the data obtained in the two years of study and interpretation CG values, finds the largest population of *Mamestra brassicae* in generation G2. The fluctuations

were sometimes significant, but there was a clear correlation between the populations of the two generations of the same year. Also no values IH could reveal any clear correlation between the population of G2 (2014) and G1 population (2015).

CONCLUSIONS

Mamestra brassicae species behavioral model in the field was imagined and based on the results obtained for the capturing observations. On the other hand, behavioral observations have revealed no damage or attack to the natural ecosystem, and using light traps and pheromone traps revealed a reduced number of females.

In cabbage cultivated agroecosystems [26,27] there is a population represented by both sexes and in the habitat of its features is running phases of the general behavior, including reproduction (associated with stimuli from the host plant), the female remains in the area, for the ovipozitor behavior and males may behave indifferently.

On emerging, beeing typical the protogin, the females perform a behavioral activity (feeding, flight) to sexual maturation, situations in which they accept also biotops and neighboring ecosystems and in our case the Subparatel Forest (Sibiel), ensuring the optimum conditions to these species. In this situation a part of the population, each year, arrives in natural ecosystems where it takes place the behavior of call, followed by a response behavior of males (those in the bordering area of the agroecosystem studied but also from the culture of cabbage, which will follow the same route for their sexual maturity) and pairing.

After pairing the males can stay here or can accompany females (or a part of them) on the reverse route, area of host plant where ovipozitor behavior occurs.

The behavior described characterize every ecosystem, but we consider that there are not two distinct populations but a permanent interaction (a local migration) between the two ecosystems that determine and adjust the population in the area. Low level of populations didn't allow us to succeed in this study, by using the captured adults.

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