

ORIGINAL PAPERS

ASSESSMENT OF SEXUAL AND REPRODUCTIVE CORRELATION IN THE SEASONAL DYNAMICS OF THE *AGROTIS SEGETUM* POPULATION AT IMAGO STAGE

Tudor Nastas, Iuliana Rusu

Key words: *Agrotis segetum*, light trap, male, female, spermatophores, eggs.

INTRODUCTION

A thorough analysis of long-term data on the response of crops to pests, due to the increase in factors determining the degree of development of these two groups, shows us that agricultural crops have much less adaptive potential and are inferior in competition to pests. Climate change trends worldwide require research to determine the effects between agricultural plants and harmful organisms that will favor harmful organisms. Climate change is a key that requires urgent action to change attitudes towards the environment. In this regard, the role of science and research is huge to find alternative solutions and replace harmful methods for the global, regional and local climate [1].

Currently, about 12534 species of insects have been registered on the territory of the Republic of Moldova, which is 85.2% of the taxonomic diversity of the terrestrial, edaphic and aquatic animal world [2].

Ecosystem functionally is ensured by the relationships between the species that make them and their interactions with abiotic factors. The existence and activity of any pest population is determined by the consumption of the necessary nutrients. About 140 species of phytophagous attack cultivated plants. In the event of an invasion and development of the hazardous pests, crop losses can exceed 50-60% and crops can be completely compromised. 409 species of the Noctuidae family are registered in the fauna of the Republic of Moldova, some of which periodically cause significant damage to crops. One of species is *Agrotis segetum*, which harms about 140 species of plants, but wheat, soybean, pea, corn, tomato and others will be the most severely affected. Chemical treatments are undesirable in such cultures, especially since, given the hidden lifestyle of the larvae, this method will not yield the expected result. The use of sex pheromones for development monitoring and control of this pest is welcome, but a deeper study of sexual and reproductive correlation is needed.

The aim of the study is to assess the total and reproductive potential in seasonal dynamics,

depending on the generation of the *Agrotis segetum* pest.

MATERIALS AND METHODS

The tests were conducted in both the field and laboratory settings. The development of the *Agrotis segetum* population in seasonal dynamics was monitored with a light trap. The light trap developed by the institute of Genetics, Physiology and Plant Protection, was located at a height of 2 m from the ground, near the experimental field. The record of the biological material captured and the replacement of the collector (copulatory bag) was carried out 3 times a week throughout the vegetation period of agricultural crops (fig. 1).

Under laboratory conditions, the biological materials captured on a light trap was analyzed and then only the species of *A. segetum* pests were taken. The sex correlation of the pest was determined by numerical systematization of males and females. The total and reproductive properties of the species were estimated by anatomical dissection of the females. The anatomical analysis of females was carried out in seasonal dynamics during the growing season of the crops. The amount of spermatophore in the copulatory bags and the number of eggs in the egg tubes of the females were also estimated. The results were processed in Microsoft Excel.

RESULTS AND DISCUSSIONS

The development of the *Agrotis segetum* population was considered throughout the growing season with a light trap. It has been shown that the pest reacted to a light trap from the first decade of May to the second decade of September. During seasonal activity, the species *A. segetum* evolved over three generations. The development of the first generation was noted during the first decade of May until the second decade of June. Development of the second and third generations overlapped and were observed in the first decade of July and the second decade of September (fig. 2).



a. b.
Figure 1. Monitor the development of the *Agrotis segetum* pest population with a light trap:
a. Light trap; b. Analysis of the biological material caught in the trap.

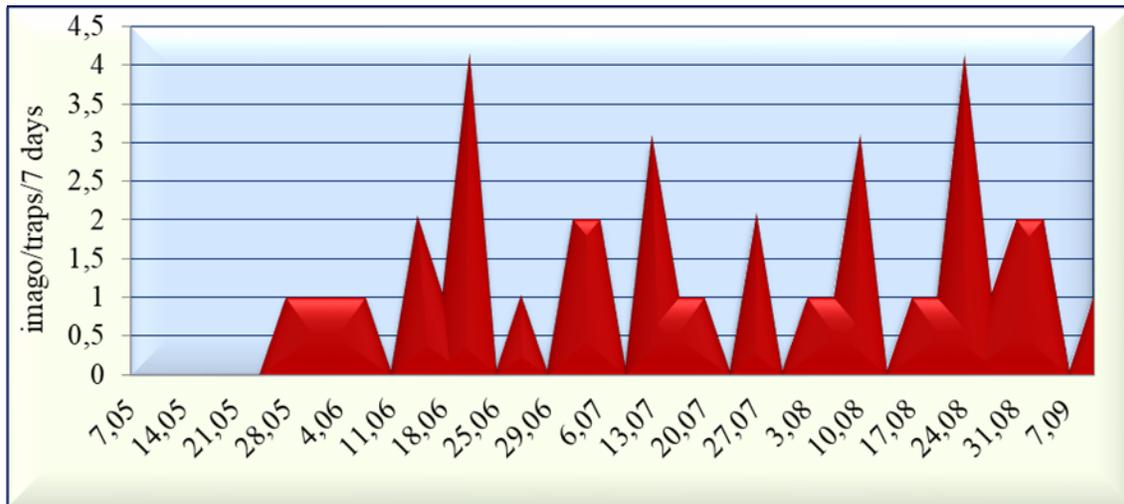


Figure 2. Monitor the development of the *Agrotis segetum* population with a light trap

The biological material caught in a light trap was carefully analyzed under laboratory conditions. Only species of the *Noctuidae* family were selected. Thus, it was found that 473 imagoes belonging to different species of *Noctuidae* have been harvested throughout the growing season.

Then, out of the total number of *Noctuidae* species caught on a light trap, only the species *Agrotis segetum* was selected. Analysis of the biological material revealed that a total of 70 imagoes species were caught. Subsequently, the image of this species was separated by sex, of which 40 males and 30 females were found.

The evaluation of the sexual correlation of imago *A. segetum*, caught in a light trap during

growing crops, showed that the number of males was 57% and females 43% (ratio 1,3♂ : 0,8 ♀) (fig. 3).

As a result of the anatomical dissection of the females caught in the light trap, it was found that the species was polygamous. Analysis of the females showed that the copulative bags contained between 1 and 6 sperm, which means that they were paired with the males up to six times. Females with 2 (30%) and 3 (23%), representing 53% of the total number of captured females. It should be noted, however, that the number of females with more than 3 mating sessions was also significant (13%). So only 20% of all captured females were fertilized in one mating. At the same time, it was found that about 10% of the captured females did not mate at all (fig. 4).

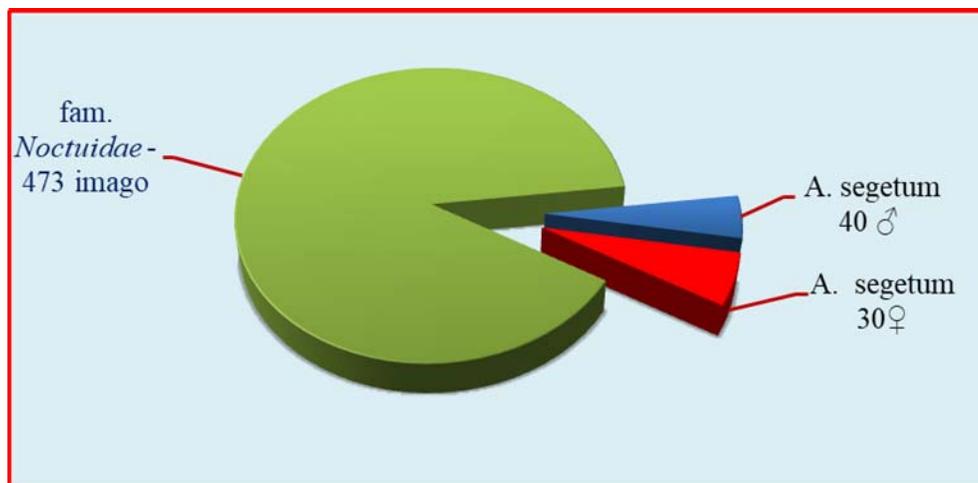


Figure 3. Sexual correlation of *Agrotis segetum* pests from the total number of *Noctuidae* species caught in a light trap during the growing season of crops

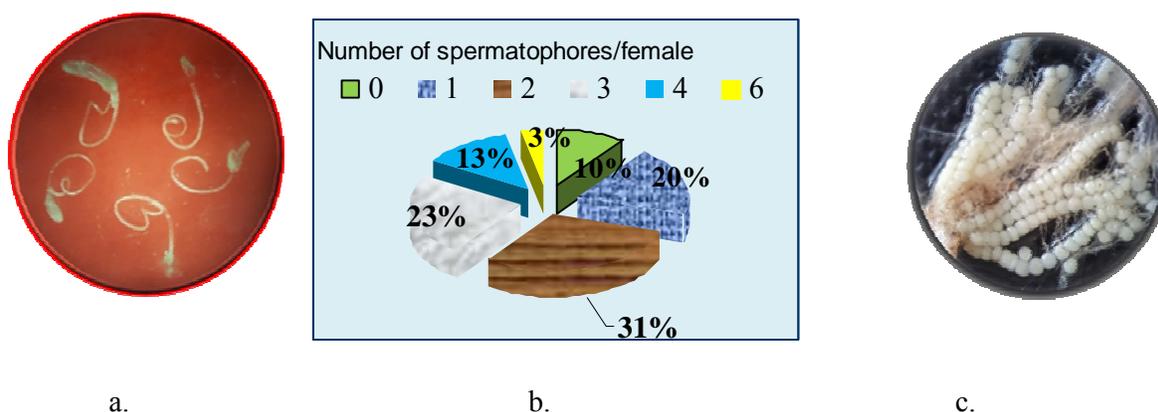


Figure 4. Copulative potential of *Agrotis segetum* pests in natural habitat: a) a form of sperm extracted from the copulatory bags of females; b) number of spermatophore/female; c) eggs in female egg tubes

Analysis of the data obtained showed that the number of eggs in the egg tubes of the captured females was independent of the number of pairs (estimated by the amount of sperm in the copulatory bags). Thus, it was noted that the number of eggs in the egg tubes of females caught in the seasonal trend, three generations of pests were present, that has been confirmed by the monitoring of the population by pheromones and light traps. So, analysis of the data revealed that the reproductive potential of females trapped in light traps throughout the growing season, the distribution was 25% for the first generation, 24% for the second generation and 51% for the third generation.

Having evaluated the result, it can be seen that the phytophag *Agrotis segetum* in the present climatic conditions of the Republic of Moldova has increased its aggression on crops. Thus, it can have up to three generations and has great copulatory and reproductive potential. This potential can allow the species to develop intensively throughout the

growing season, causing significant crop damage at all phenological stages of development. Researches suggest that the types of relevant pests require continuous monitoring, and modify the non-metological system of population reduction over the entire growing season of crops.

CONCLUSIONS

The *Agrotis segetum* phytophagus has been shown to increase its aggressiveness in the current climate of the republic of Moldova increases aggressiveness on crops and the number of eggs in the egg tubes of the females does not depend on the number of copulatory acts (estimated by the number of sperm in the copulatory bags).

ABSTRACT

During seasonal activity *A. Segetum* has been shown to evolve over three generations. The

development of the first generation was noted during the first decade of May and the second decade of June. The development of the second and third generations was established between the first decade of July and the second decade of September. The assessment of the sexual correlation of imago *Agrotis segetum* during crop growing, showed the ratio of males to females is 1,3 : 0,8.

The *Agrotis segetum* phytophagus has been shown that the present climate of the Republic of Moldova, increased aggressiveness on crops, and the number of eggs in the egg tubes of the females does not depend on the number of copulatory acts (estimated by the number of spermatophores in the copulatory bags of females).

Analysis of the females showed that the copulative bags contained between 1 and 6 sperm, which means that they were paired with the males up to six times. Females with 2 pairs (30%) and 3 pairs (23%), representing 53% of the total number of captured females.

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AUTHORS' ADDRESS

NASTAS TUDOR, RUSU IULIANA –
Institute of Genetics, Physiology and Plant
Protection, Pădurii Str., 20, Chișinău, Republic of
Moldova, e-mail: tudor_nastas@mail.ru