

Introduction

The beet webworm *Loxostege sticticalis* (L.) is a dangerous agricultural pest with high migratory and outbreak capacities. Its taxonomy at the generic level has been changed several times, the two most acknowledged genera being *Loxostege* and *Pyrausta*. The beet webworm *Loxostege sticticalis* (L.) (Pyraloidea, Crambidae) is a dangerous outbreak pest, causing serious damage to the crops such as soybean, sugar beet, alfalfa and sunflower in Eurasia, including Northern China and steppe zones of European and Asian parts of Russia (Chen et al. 2008, Frolov et al. 2008). It was initially described as *Pyralis sticticalis* (Linnaeus 1761), later it was attributed by the different authors to the genera of *Botys* Latreille, 1802, *Loxostege* Hübner, 1825, *Margaritis* Stephens, 1827 and *Phlyctanodes* Hampson, 1899. The combination *Loxostege sticticalis* is the one most widely accepted by the modern taxonomic summaries (de Jong 2011, Goater et al. 2005, Heppner 1998, Karsholt and Razowski 1996).

Research question

The question of the research monitoring and forecasting methods of appearing of the beet webworm *Loxostege sticticalis* (L.) investigation of harmfulness and the current state of the beet webworm *Loxostege sticticalis* (L.) population in Ukraine.

Main method

The field data was obtained in 2017-2018 at the research field in the different region of Ukraine (Zaporizhia, Luhansk, Donetsk, Kherson, Kyiv, Kharkiv, Dnipropetrovsk, Cherkasy regions). Commonly accepted methods of faunal studies in entomology and calculation of insect numbers, field and laboratory studies, modeling the population dynamics of insects were used. The analysis of Department of Forecasting reports, Phytosanitary Diagnostics and Risk Analysis of Ukraine were conducted. Direct observations and records of the depredator development began to be carried out in the spring, after the changing of the average daily temperature of air to +5° C, in the wild (when there was enough number of them). For this purpose, there were about 15 caterpillar cocoons collected with the depredator on the agricultural lands, forest belts, roadsides. Then the cocoons were open carefully and the conditions of the individuals were recorded (like live caterpillars, caterpillars lost from illness or other causes, caseworms, larvae or puparium of the depredator, etc.). Such records were repeated once every ten days until middle of April, and then once every five days before the flight period of the beet webworm *Loxostege sticticalis* (L.) (Figs. 1 and 2). With the appearing of the first caseforms there were spring control surveys conducted on the population of the phytophagans on the agricultural lands to determine the condition of the depredators after overwintering. For this reason, soil excavation was carried out in fields on areas with the highest population of cocoons of the meadow moths that were found the previous autumn. On each field up to 100 hectares in two diagonals there were carefully selected 12 quadrats of 50x50 cm in size, on which the layer of soil was carefully removed to 10 cm and paddled by hands. Collected during the day the cocoons were opened in the laboratory and the total number was calculated, including live caterpillars or caseworms, caterpillars or caseworms died from diseases or entomophages and for other reasons. The results of the research were recorded in the logbook, then compared to those data registered in the logbook in these fields during the autumn period and the percentage of decrease of number and survival of the depredator was determined (Truskavetska 2018).

The number of the beet webworm *Loxostege sticticalis* (L.) population in crops and other agricultural lands is better to conduct by counting the flying individuals during the going through the fields. To do this, on each accounting field, at least once every three days in five places along the diagonal, at equal intervals (50, 100 steps), there were ten steps made and all meadow moths flying from under the feet were counted. The average number of them in the field was taken within the distance of ten steps. In a first place for the survey, the fields of row crops (beets, corn, vegetables, etc.) were taken as well as crops of perennial legumes and areas with blooming agrestic weeds (Omelyuta et al. 1980, Page 1996, Tribel 1976).



Fig. 1 Conducting spring control research of sunflower seeds in Zaporizhia region



Fig. 2 Conducting spring control research of sunflower seeds in Luhansk region

Key words

Sunflower, beet webworm *Loxostege sticticalis* (L.), insects

Main results

In 2018, the first spring generation had the most favorable conditions for development - enough moisture, moderate temperatures, presence of flowering vegetation, which led to a significant increase in the number of depredators, especially in the centers of the south eastern and sometimes central areas. In most areas in the spreading zones, the beet webworm *Loxostege sticticalis* (L.), developed within three generations, except for Kharkiv, Poltava and Vinnytsia regions, where only two generations were noted. The beet webworm *Loxostege sticticalis* (L.) flight began in mid-May last year. At the edges of the field of sunflower, winter wheat, corn, on noncroplands, in perennial grasses in Kyiv, Kharkiv, Dnipropetrovsk, Cherkasy regions where the average number of depredators of bulla was from 10 to 25 ex. /10 steps, some times in the centers of Zaporizhia, Luhansk, Donetsk regions its number ranged from 10 to 150 ex. /10 steps. The flight strength of the meadow moths of the 1st generation (from 2 to 50 ex. /10 steps) was observed within all areas of the steppe zone and somewhat smaller (from 1 to 12 ex. /10 steps) in Kyiv, Cherkasy and Sumy region. Mass rebirth of caterpillars began in early June. The caterpillars damaged beets, sunflower, corn, leguminous crops, perennial grasses. The average number of depredators was 3.0-8.0 ex./m², in Zaporizhia, Luhansk, Donetsk, Kharkiv, Sumy regions locally on lucerne, sunflower, soybeans, corn, sugar beet amounted to 8.0-14.0 ex./m². That means 5-18% of plants were damaged. Beet webworm *Loxostege sticticalis* (L.) flight of the 2nd generation began in the middle of June. Second generation of caterpillars was populated in the central and western regions and therefore from 4 to 22% of plants within 2-10% of areas of sunflower, corn was damaged. But the most locally were planted up to 46% of areas of perennial grasses in Cherkasy region with the number of 0.3-6.0 ex./m². In the southern and eastern regions 8-28% of plants were planted on the territory of 17-45% of sunflower areas, corn, in the amount from 2 to 12 ex./m², maximum - up to 30-65% of plants, that means up to 20 ex/m² that is on the threshold level in Zaporizhia and Mykolaiv regions (Figs. 3-4).



Fig. 3 The caterpillars of II generation of a meadow moths of the second generation in the Mykolaiv Region



Fig.4 Damage of sunflower crops by caterpillars of the meadow moth or the II generation Zaporizhia region

The flight intensity of the beet webworm *Loxostege sticticalis* (L.) of the second generation (from 2 to 4 ex./10 steps) remained high in Luhansk, Odessa and Kherson regions. The reproduction capability of the wintering generation of meadow moths was high (100-180 eggs /female), except for the Cherkasy and Zaporizhia regions, whereas the reproduction capability of the second generation was lower in the steppe areas (10-50 eggs / female, except Luhansk (76), Mykolaiv (152) regions). The centers with a high number of caterpillars of the meadow moths were found in the central, steppe and eastern regions of the forest steppe zone on sunflower, corn, vegetable and cucurbit. The centers with a phytophagous of II generations high number were stored in Luhansk, Donetsk, Zaporizhia, Mykolaiv regions, and of III generation - in Kherson and Mykolaiv regions.

Main conclusion

1. Considering the degree of beet webworm *Loxostege sticticalis* (L.) threat, it is necessary to observe the dynamics of their dispersal constantly, which would allow to avoid "unexpected" destruction of agricultural crops by caterpillars.
2. In 2019 it is necessary to strengthen the beet webworm *Loxostege sticticalis* (L.) appearing, to monitor the depredator's development and to use pesticides in time.
3. It is necessary to conduct the complex of preventive, agronomic, organizational - management and chemical inspections, including scientifically based - swapping sunflower crops with another crops in crop rotation.

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