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OBSERVATIONS ON ARTHROPODS FROM THE SEED CABBAGE CROP DURING THE GROWING SEASON AND UNDER THE CLIMATIC CONDITIONS IN BACAU

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Key words: *Brassica oleracea, seed production, insect pest that attack cabbage crops*

INTRODUCTION

Among the oldest cultivated plants is white cabbage, known and widely used as a vegetable. *Brassica oleracea* L. has been cultivated for thousands of years (15; 16). There are many morphologically diverse species in the Brassicaceae family, including common heading cabbage, cauliflower, broccoli, kale and Brussels sprouts. White cabbage (*B. oleracea* L.) is a biennial species because seed production lasts for 2 years. In the first year the mother plants are obtained and in the second year the seeds. These vegetables, have been widely noticed lately as scientists have claimed them as examples of medicinally significant foods (4; 15). The culture intended for seed production is realized in the fall. After the soil preparation, the molds are opened, in which the mother plants are placed, so that the heads are at the ground level. The earth is pressed by ironing, around the roots. After planting, the head is covered with a layer of soil that are completed before the frost comes. In the early spring, the heads are discovered and then their growth was executed in order to favor the appearance of flowering rods (5; 10). In the field, cabbage is susceptible to insect pest infestations, contributing to low seed yield. Damage and impact of damage on yield is determined by the variety of cabbage grown as well as other aspects of the ecosystem, including natural enemies, weather conditions, fertilizer, and water availability (13; 14). To control the insect pests of cabbage, smallholder farmers in Romania heavily rely on synthetic broad-spectrum pesticides. Incorporating synthetic insecticides indiscriminately and intensively reduces the diversity of natural enemies ecosystems by killing beneficial predators such as spiders and hoverflies, pollinators like bees and butterflies that pollinate flowers, and ladybird beetles that can help reduce aphids. By applying synthetic insecticides indiscriminately and intensively, the biodiversity of natural enemy ecosystems is threatened by killing useful natural enemies, such as spiders and hoverflies, as well as beneficial pollinators, such as bees and butterflies that pollinate flowers and ladybird beetles that reduce aphids (2; 3; 11; 12; 14). This paper presents the arthropod fauna of the seed cabbage crop during the growing season of 2022 in the climatic conditions of the Bacau area, focusing on the pest species of this crop.

Besides other species the main pests were:

- Cabbage stem weevil - *Ceutorhynchus pallidactylus* (Marsham, 1802) - it is a completely black insect, except for the red tarsi and the dark red antennae, the adult measuring 2.4 - 3.3 mm (fig. 7) (7; 8).
- Cabbage seed pod weevil - *Ceutorhynchus assimilis* (Paykull, 1800) - the adult has a black body, covered with greyish perisphores and scales, the length is 2-2.8 mm (fig. 8) (9; 17).
- Rape beetle - *Meligethes aeneus* (Fabricius, 1775) – is a small, black, univoltine beetle that depends on brassicaceous plants for oviposition and larval development (fig. 9) (6)

MATERIAL AND METHOD

The arthropod species were observed in the seed cabbage crop (*Brassica oleracea* L.) from VRDS Bacău in the conventional agriculture scientific polygon (4000 m^2) between 21.04. and 16.05. 2022, during the growing season. Arthropods were collected by hand from ground level and from the canopy of cabbage using a japanese umbrella with sides of about 60 cm. The instrument was placed under the canopy of the cabbage bush and three successive taps of the plant were made with the palm of the hand (fig. 5). Due to the shock the insects fell onto the canvas from where they could be easily collected, identified and counted. The observations were made in the morning. The numeric density (ND) per plant of the main identified pests was also carried out. ND is expressed as the average number of individuals of a pest per control unit (1), in ouer case per plant, and was calculated as the ratio of the total number of adult individuals of the same species per 100 plants controlled. Climatic factors (Air temperature [°C], Soil temperature [°C], Relative humidity [%], Precipitation [mm] and Wind speed

[m/s]) were monitored using the FieldClimate weather station.

RESULTS AND DICUSSIONS

The average air and ground surface temperature during the observation period was not greater than 15°C, indicating that the observed arthropod populations may be influenced by the transfer of energy from the environment to the seed cabbage crop. The relative humidity was 65%, the total rainfall was 56.2 mm and the average wind speed did not exceed 1.15 m/s (fig. 1).

A total of 458 arthropods belonging to five orders were collected (fig 2). The *Coleoptera* order made up 34% of the collected specimens, followed by the *Araneae* and *Hemiptera* orders with 22% each and the *Hymenoptera* and *Trombidiformes* with 11% each. Predators and parasitoids like spiders and *Trombidium holosericeum* (fig. 6) can play an important role in the regulation of pests populations.

Among the insects considered harmful to the cabbage seed crop grown at VRDS Bacau are:

- Cabbage stem weevil - *Ceutorhynchus pallidactylus* (Marsham, 1802) (fig. 7)
- Cabbage seed pod weevil - *Ceutorhynchus assimilis* (Paykull, 1800) (fig. 8)
- Rape beetle - *Meligethes aeneus* (Fabricius, 1775) (fig. 9)
- Cabbage flea beetle - Phyllotreta atra (Fabricius, 1775) (fig. 10)
- Cabbage aphid - *Brevicoryne brassicae* (Linnaeus, 1758) (fig. 11).

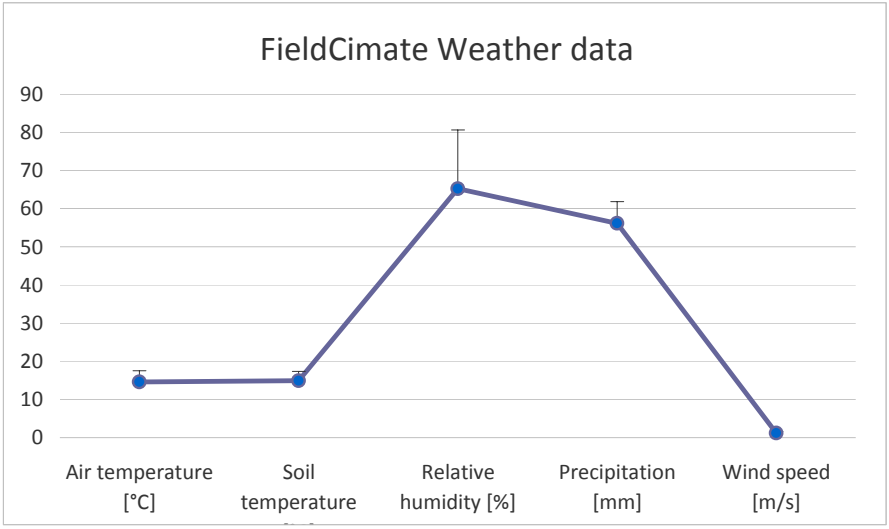

Fig. 1. Climatic factors measured by FielClimate weather station

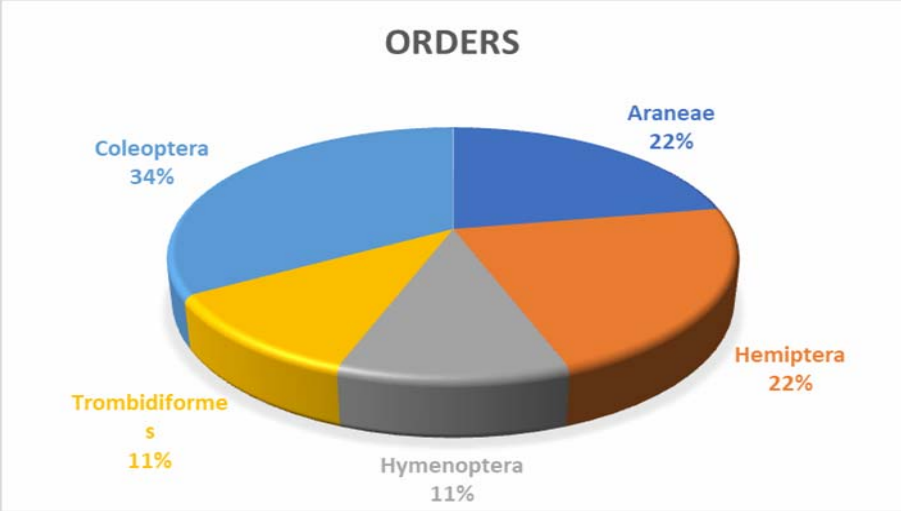

Fig. 2. Orders of arthropods identified and collected from the seed cabbage crop

After identification of arthropod pests in the seed cabbage crop and establishment of plant density, a foliar insecticide for pest control in field was applied. **Decis® Expert** acts by contact and ingestion on insect pests for larval and adult stages, and the dose recommended by the producer was used for cabbage (75 mL/ha). It can be seen from figure three that the highest density was recorded by *C. pallidactylus* species with an average of nine specimens per plant. After application of the treatment (fig. 4) it can be seen that the density of *C. pallidactylus* and *P. atra* is 0 individuals per plant, however the density of *M. aeneus* species has increased from 0.8 individuals per plant before treatment to 2.2 individuals per plant after treatment, and for *C. assimillis* from 0.2 individuals per plant to 1.5. The ND *B. brassicae* remained low before and after treatment. There is a possibility that *M. aeneus* and *C. assimillis* species are resistant to Deltamethrin, a pyrethroid ester insecticide, the active ingredient in Decis insecticid.

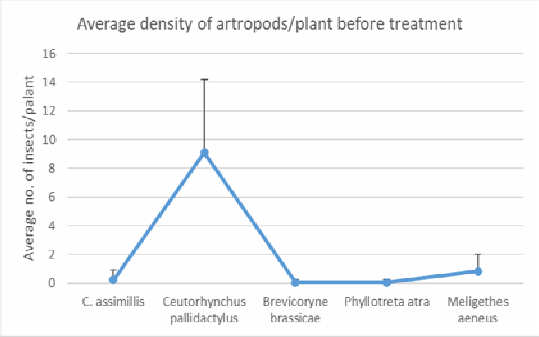

Fig. 3. Density of pests identified before treatment

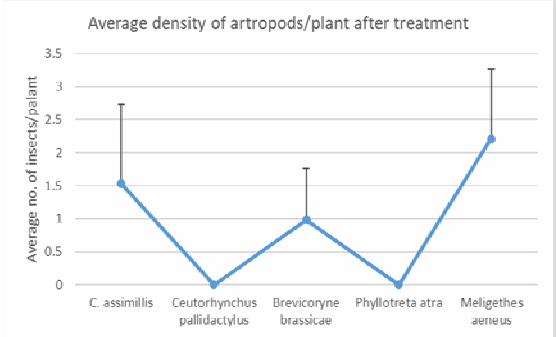

Fig. 4. Density of pests identified after treatment

Fig. 5. Collecting the arthropods from cabbage canopy using a japanese umbrella

Fig. 6. *Trombidium holosericeum* (Linnaeus, 1758) on a cabbage leaf

Fig. 7. Cabbage stem weevil - *Ceutorhynchus pallidactylus* (Marsham, 1802), dorsal view at stereomicroscop

Fig. 8. Cabbage seed pod weevil - *Ceutorhynchus assimilis* (Paykull, 1800), dorsal view at stereomicroscop

Fig. 9. Rape beetle - *Meligethes aeneus* (Fabricius, 1775), on *B. oleracea* flower

Fig. 10. Cabbage flea beetle - *Phyllotreta atra* (Fabricius, 1775) on a cabbage leaf

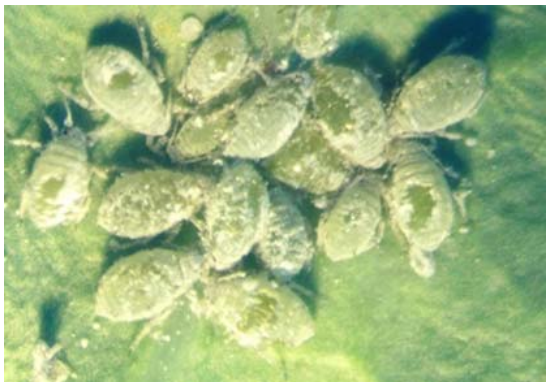

Fig. 11. Cabbage aphid - *Brevicoryne brassicae* (Linnaeus, 1758)

CONCLUSIONS

White cabbage (*B. oleracea* L.) is among the oldest cultivated plants in the world, known and widely used as a vegetable. Despite being a biennial, cabbage suffers from insect pest infestations in the field, resulting in a low seed yield. There are several destructive insect pests that affect seed cabbages at VRDS Bacau, including: rape beetle - *Meligethes aeneus* (Fabricius, 1775), Cabbage stem weevil - *Ceutorhynchus pallidactylus* (Marsham, 1802), Cabbage seed pod weevil - *Ceutorhynchus assimilis* (Paykull, 1800), Cabbage aphid - *Brevicoryne brassicae* (Linné, 1758).

After application of Decis insecticide, we can see that the density of *C. pallidactylus* and *P. atra* is 0 individuals per plant, but the density of *M. aeneus* and *C. assimillis* has increased. Due to these observations we think that *M. aeneus* and *C. assimillis* are resistant to Deltamethrin, but future studies are needed to confirm this theory. In the future, to reduce pest populations in cabbage cultures and to support sustainable agricultural practices such as biological control (attracting, maintaining and sustaining populations of natural enemies of pests), we will need to focus on reducing natural enemy mortality by reducing pesticide application and improving natural enemy capacity and effectiveness through habitat management.

ABSTRACT

White cabbage (*Brassica oleracea* L.) is a biennial species. The culture intended for seed production is realized in the fall. Insect pest attack is a key factor contributing to low seed yield. Data show that, several arthropos were found to attack cabbage crops and have been identified as belonging to five orders. The most numerous order was represented by the order Coleoptera with 34% of the collected specimens followed by the orders Araneae and Hemiptera, each with 22% and the orders Hymenoptera and Trombidiformes with 11% each. This paper presents the arthropod fauna of the seed cabbage crop during the growing season in the climatic conditions of the Bacau area, focusing on the pest species of this crop. Pests affecting seed cabbages at Vegetable Research and Development Station from Bacau include: rape beetle - *Meligethes aeneus* (Fabricius, 1775), Cabbage stem weevil - *Ceutorhynchus pallidactylus* (Marsham, 1802), Cabbage seed pod weevil - *Ceutorhynchus assimilis* (Paykull, 1800), Cabbage aphid - *Brevicoryne brassicae* (Linné, 1758).

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