Volume 22(4), 1- 6, 2018
JOURNAL of Horticulture, Forestry and Biotechnology
www.journal-hfb.usab-tm.ro

Particularities of the blossom feeder attack, *Tropinota hirta* Poda (Coleoptera: Scarabaeidae), on blueberry (*Vaccinum corymbosum*) in a commercial orchard from Vrancea county

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Abstract The importance of the highbush blueberry (Vaccinum corymbosum) given by their highly nutraceutical properties lead to a spectacular extensions of the orchards in the last ten years. Being known as a tolerant crop to pest and disease, our study bring data about a new pest for blueberry found out to be active in Romania, the blossom feeder (Tropinota hirta Poda). It is a polyphagous insect who attack the flowers of plants in first decade of May, when the blueeberry orchards are in full blossom.The present work focus on the results of monitoring the blossom feeder attack in a blueberry orchards from Vrancea county and the possibilities to control it. The most efficient results were obtained using pheromone traps with Atrahir.

Key words

highly nutraceutical fruit, 'Duke' variety, pheromone traps, polyphagous insect

Blueberry (*Vaccinum corymbosum* L.) is an important and valuable crop, the current offer is still lower than the demand on the market. In Romania, after a decline of blueberry orchards before 2000 year (25 ha) it were registered 650 ha in 2015 and there is an estimation of 1000 ha in 2018 (2, 9). In 2016, the National Research Institute for Fruit Growing Pitesti - Maracineni authorized for planting 340 ha new orchards, most of them in organic system.

Blueberry is a highly nutritional fruit with antioxidant and antidiabetic activity. It has more than 2 mg/100 g vitamin E, 22 mg/100 g vitamin C, vitamin P (1, 7, 12).

Fig. 1 – Blueberry flowers and fruits in different ripenning stages in Vrancea county orchard (original)

The origin of highbush blueberry is in east and north est of USA. The plant requires low pH in the soil (under 5.5). It is very resistant to cold (-30 degree C), and usually is resistant to pest and diseases (13, 16). The blueberry are sensitive to water deficits (6, 12).

The height of shrub is between 2 and 3 m, is autofertile, with white or light red flowers in raceme inflorescences with 6-20 flowers, entomophilous pollination (fig. 1) (8). The berries are 5-10 mm in size, with blue to dark blue colour or even pink or violet, covered with pruine. It can produce fruits from the first year of planting. At the maturity (5th year), a plant can produce 3-5 kg depending on the variety (8). The extension of the harvest period can be done in solars with differed protective films (3).

Blossom feeder (*Tropinota hirta* Poda, old *Epicometis Hirta* Poda) is clasified in order: Coleopetera, family: Cetoniidae, genre: Epicometis. It is a polyphagous insect (17), in the adult stage has 8-13 mm, the body colour is black with grey points, covered with white-yellow little hairs. It has a single generation / year.
In the winter the adults are hidden in the soil. In the spring, they became active and attack different flowers until the end of May (fig. 2) when lodge the eggs in the superficial soil layer (14). Larvae begin to grow slowly from June to September. At the end of July to mid-August they are transforming in nymph stage. The new adults appear in the last decade of August, the first decade of September. They remain in the soil over the winter until the next spring when they became active to a constant temperature of 7°C and relative humidity 55-60%.

Fig. 2 – Blossom feeder (*Tropinota hirta* Poda) in blueberry flower (original)

The aim of this research was to study the attack of blossom feeder (*Tropinota hirta* Poda) on highbush blueberry in a commercial orchard from Vrancea county. Blossom feeder is not a common pest on blueberry, in this moment being very little known by the producers.

Materials and Methods

The research was conducted on a commercial orchard from Vrancea county and the biologic material was represented by 'Duke' variety (fig. 3). The monitored plants were of 5 years old and planted on the raised beds with soil and peat (20-40) 150 m^3 per ha, at 100 x 40 x 40 cm covered with agro-textile 165 cm width. In the planting area, the agro-textile was perforated in a circle form by 15 cm diameter. The planting system provided 300 cm between rows and 70 cm between plants on rows.
An automatic fertirigation system was installed, with double dripping lines on each bed, 1.1 liter/drainer, 16 mm diameter and 30 cm distance between drainers installed under the agro-textile.
Three experimental areas were settled out: Area 1, control plot, with 904 plants with an average of 2,894 flowers/ plant; Area 2 with 4,772 plants with an average of 2,703/plant and Area 3 with 4,806 plants with an average of 2,813 flowers/plant. In Area 2, seven chemical treatments were applied with contact and systemic insecticides at every 3 days (tiacloprid 240 g/l , deltametrin 10 g/l , zeta-cipermetrin 100 g/l , lambda-cihalotrin 50 g/l, dimetoat 400 g/l).
In Area 3, pheromone traps with ATRAHIR (5 ml in 5 liter of water) in white or blue buckets were placed on the head of rows. Monitoring the affected flowers covered the counting and estimations the average of the flowers on each plant before bloom (end of April) and after the attacked flowers on each plant. In Area 2, after each treatment were counted the affected flowers by the pest and calculated the average. In Area 3, the pheromone traps were renewed to each 3 days, counting the numbers of attacked flower in each interval, similar with Area 2.

Fig. 3 – Vrancea county blueberry orchard (original)

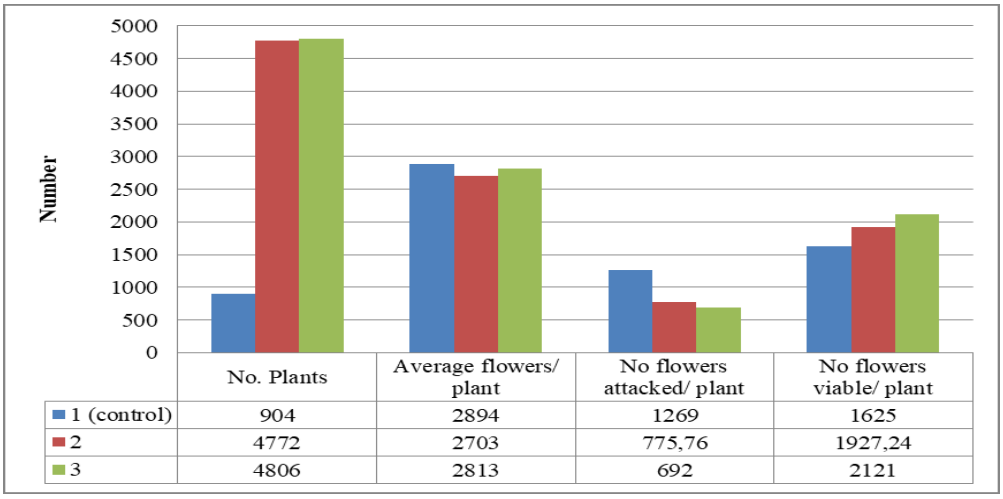
Results

The results showed the maximum density of *Tropinota hirta* Poda on the beginning of flowering stage. In the studied period, on the 'Duke' variety, the first adults were observed at the end of April (before the flower opening) (fig. 4) similar for the three experimental areas. The maximum degree for damage were in the first decade of May (fig. 5) similar with the results of Vuts et al, 2010 and Subchev et al, 2011.

Fig. 4 - Attack registered between 30th April and 7th May (original)

Fig. 5 - Flowers damaged on 7th and 10th of May (original)

Comparing the average flowers/plant, number of flowers attacked/plant and number of flowers viable/plant between the experimental areas, the best variant of controlling the pest, minimize the costs and protect environment was using pheromone traps (Fig. 6 and 7).



	No. Plants	Average flowers/ plant	No flowers attacked/ plant	No flowers viable/ plant
1 (control)	904	2894	1269	1625
2	4772	2703	775,76	1927,24
3	4806	2813	692	2121

Fig. 6 - Number of damaged plants

The minimum number of flowers attacked were in Area 3 (692) followed by Area 2 (775.76). The control area has the maximum number of damaged flowers (1269) respectively the maximum damage percentage (48.5%). The minimum damage percentage was in Area 3 with 24.60%.

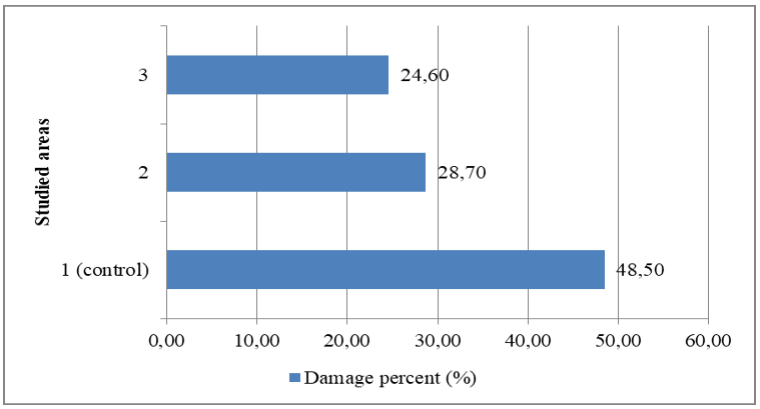


Fig. 7 – Damage percent of flowers

Data shown in the table 1 indicate the estimated the principal economic indicators, according to an average plants number of 4.762 per hectare. An average of 1.2 g/fruit and 15 Ron/ kg of blueberry were used in calculus.

Table 1

Estimated economic indicators per ha

No area	No. plants	Kg/plant*	Damages kg/plant*	Kg/plant* viable flowers	Kg/ha*total no of flowers	Damages*kg/ha	Kg/ha* no viable flowers	Supplementary costs/ha (Ron)	Incomes/ha*, minus supp. costs
1	904	3.47	1.52	1.95	16538.43	7251.58	9286.85		139302.8
2	4772	3.21	0.90	2.31	15446.02	4300.60	11013.0	1600	163595.0
3	4806	3.38	0.83	2.55	16074.60	3952.50	12122.0	200	181631.5

For all three experimental areas, the average yield per plant was similar, between 3.24 kg/plant and 3.47 kg/plant. The losses were significant different between the areas, in the control area being almost half of the production lost (fig. 8). For the remained production left in the orchard, the maximum amount of incomes was in Area 3, even after eliminated the supplementary costs with treatments (fig. 9).

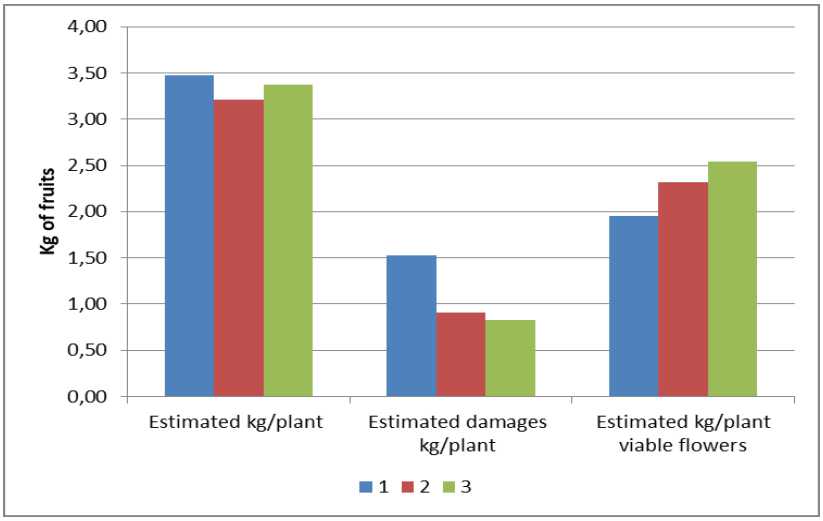


Fig. 8 - Analyses of data in the three experimental areas

In the analyzed region there were not cruciferous crops (ex. *Brassica napus*) or fruit orchards on a 3 km area that could influence the degree of damage. Intense attacks (even with 100%) were observed at the edge of the plots.

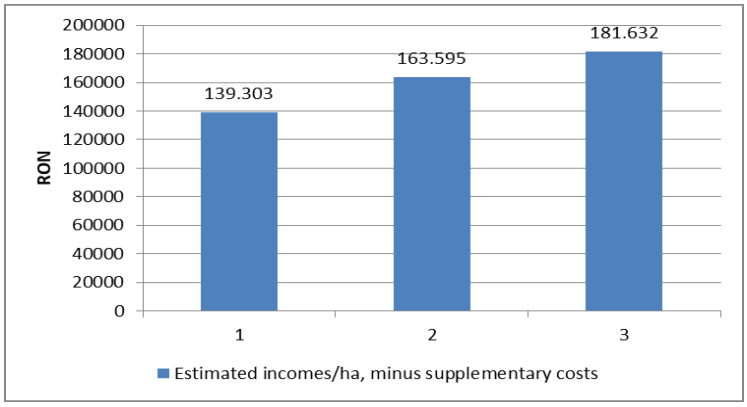


Fig. 9 - Estimated incomes/ha without supplementary costs done by the treatments

Conclusions

Tropinota hirta Poda it is a new pest in the Romanian blueberry orchards that can affect the flowers up to 50%**.** The maximum point on the fly curve was in May. The optimum variant to control was with pheromone traps ATRAHIR (5 ml in 4-4.5 liter of water). The chemical treatment encountered no expected effect on insects, it only generated a latency stage

In the plantation, it is recommended to implement hygienic measures, through continue mowing of the interval between plants and control the weeds from the basal area of the plants, to maintain the spontaneous flora without flowering and destroying as much as possible of the adults that are on the soil level.

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