

NON-TYPICAL PESTS ON VEGETABLES IN ISTRIA

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ABSTRACT

In Croatian ecological areas, species which bionomy are less known, are to be identified and circumstances for their development determined in order to predict their show up and in rational ways prevent them from creating damage to the least possible measure. The species *Helicoverpa armigera* Hübner, cotton bollworm was determined in 2003 and 2004 in west Istria on vegetable plots in a massive population. By monitoring the larvae on tomato and bell pepper we estimated the place and share of damaged fruits. Damaged fruits of tomato and bell pepper were noticed in the surroundings of Poreč and Rovinj in 2003, while damages on tomatoes were noticed in river Mirna valley in 2003 and 2004. The mean loss of yield due to damage on the tomato fruits in 2003 in Poreč was 33 % and in Rovinj 37 %. In Mirna river valley, this loss was 42 % (2003) and 13% (2004). Damages, in about 25 % in Rovinj and 35 % in Mirna river valley, were noted on bell pepper in 2003. The most of larvae on tomatoes were 15 to 40 mm long, while on bell pepper they were 30 mm long. Also in 2004 we determined the appearance of *Beosus maritimus* (two-spotted ground bug) on cabbage and oilseed rape. On cabbage fields there were 248 bugs per m², while on oilseed rape fields there were 322 bugs per m². Also this bug usually causes no damage on cabbage because it is feeding on dead organic matter; but its appearance caused panic among inhabitants in Vrsar. On the road Vrsar-Limski canal hordes of bugs were crossing the road and creating a slippery and smelly mass.

Key words: cotton bollworm, *Helicoverpa armigera* Hübner, *Beosus maritimus*, vegetables, Istria, Croatia

IZVLEČEK

NETIPIČNI ŠKODLJIVCI NA VRTNINAH V ISTRI

V ekoloških razmerah Hrvaške je treba za vrste, ki so manj znane izpeljati njihovo identifikacijo in ugotoviti razmere za njihov razvoj. Tako bi lahko pravočasno predvideli njihovo pojavljanje, našli racionalno rešitev za zatiranje in s tem, kolikor je mogoče zmanjšali škodljivost njihovega napada. Južna plodovrta (*Helicoverpa armigera* Hübner) je bila najdena v letih 2003 in 2004 na zahodu Istre. Na vrtnih zemljiščih se je pojavila množično. S spremljanjem ličink na paradižniku in papriki sta bila ugotovljena mesta napada in obseg poškodb. Poškodbe na paradižniku in papriki so bili ugotovljene v okolici Poreča in Rovinja leta 2003, medtem ko so bile poškodbe na paradižniku opažene v dolini reke Mirne v letih 2003 in 2004. Pridelek se je zaradi poškodb na plodovih paradižnika v

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letu 2003 v Poreču zmanjšal za 33 %, v Rovinju pa za 37 %. V dolini reke Mirne je bil pridelek v letu 2003 manjši za 42 %, v letu 2004 pa za 13 %. Poškodbe na papriki, ki so bile opažene samo v letu 2003 so nihale med 25 % (Rovinj) in 35 % (dolina reke Mirne). Ličink na paradižniku so bile velike od 15 do 40 mm, ličinke na papriki pa do 30 mm. V letu 2004 je bil ugotovljen tudi množični pojav stenice *Beosus maritimus* na rastlinskih ostankih križnic (zelje in oljna repica). Na zemljiščih posajenih z zeljem je bilo najdenih 248 stenic/m², na površinah z oljno repico pa 322 stenic/m². Čeprav ta stenica ne povzroča poškodb na zelju, ker se prehranjuje z neživo organsko snovjo, je povzročila preplah med prebivalci Vrsarja. Na glavni cesti med Vrsarjem in Limskim kanalom je bilo cestišče zaradi odmrlih žuželk spolzko, širil pa se je tudi neprijeten vonj.

Ključne besede: južna plodovrtka, *Helicoverpa armigera* Hübner, *Beosus maritimus*, vrtnine, Istra, Hrvaška

1 INTRODUCTION

Changes in vegetable production systems in Croatia, respectively introducing intensive monoculture production has a consequence of big change on fauna in production areas. Beside this we are witnesses of global climate changes which also affects on fauna content and number in these agro-ecological spaces. Under the influence of these two mentioned factors the dynamics of some species populations is changeable and therefore some less known species are starting to show up in strong damaging populations, performing problems in treatments.

Taking in consideration that these species, which biology and ecology in our climate conditions are less known, the aim of this paper was to carry out their identification and determine circumstances for their development in order to predict their occurrence and create possible rational pest treatments which could rate the damages as less as possible.

2 MATERIALS AND METHODS

Determination and identification of pests was done by their appearance on production plots. The attack of cotton bollworm (*Helicoverpa armigera*) was noticed in 2003 on production plots of bell pepper and tomato in Rovinj and Poreč surroundings, while in the Mirna river valley the attack was noticed on tomato in 2003 and 2004.

Field check ups on plots planted with low determinant tomato, during 2003, were executed during August on 40 randomly selected plants per each plot on Rovinj location (3 plots-total 9,000 m²), Poreč (3 plots-total 25,000 m²) and Mirna river valley (5 plots-total 15,000 m²). On each plant pest identification was carried out and percentage of damaged fruits per plant was estimated. In 2004 we noticed the attack only in Mirna river valley where on 3 tomato plots (total 6,500 m²), on randomly selected 40 plants we measured a certain percentage of damaged fruits.

On bell pepper, damages were noticed only in 2003, on two plots of total surface 2,800 m², in Rovinj surroundings, on three plots of total 4,000 m² in Poreč surrounding, respectively also in Mirna river valley on two plots with total surface of 6,700 m². As for tomatoes we also have chosen for bell pepper randomly 40 plants on which we have counted healthy and damaged fruits, and then upon these rates we have estimated the percentage of damages. The fruit damage estimation was done in August.

Appearance of *Beosus maritimus* was noticed only in 2004 and on green leftovers after cabbage harvesting, and on green leftovers of oilseed rape where it made no evident damages, but it made people of the surroundings of Vrsar alert of their presence because the population was so large that it could have been seen on roads and throughout the city of Vrsar.

Identifications of the bugs were done on randomly selected 20 plots with range 1 m wide x 1 m long with planted cabbage (cca 5,000 m²) and rape cole (100,000 m²). From these plots we have identified and counted each bug of *Beosus maritimusa* and their identification was confirmed by the Department of agricultural zoology at the Faculty of Agriculture in Zagreb.

During May, June, July and August in 2003 and 2004 as it is shown in Figure 1 and 2 we have noticed that both years were significantly warmer and dryer comparing to the long-term average (1980-1990). Temperature and precipitations were measured in Poreč weather station.

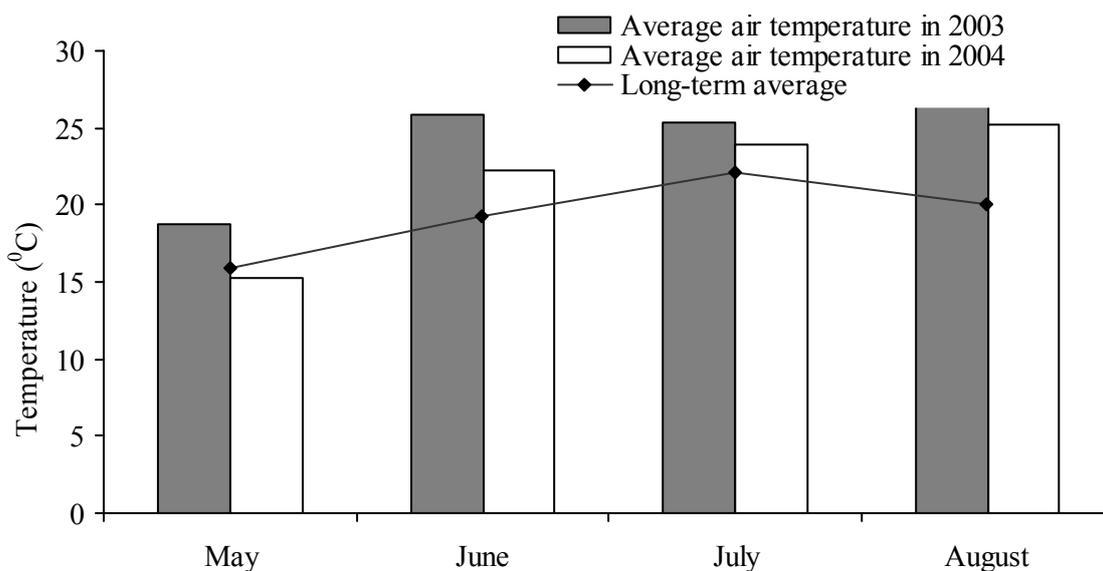


Figure 1: Average air temperature during vegetation in Poreč

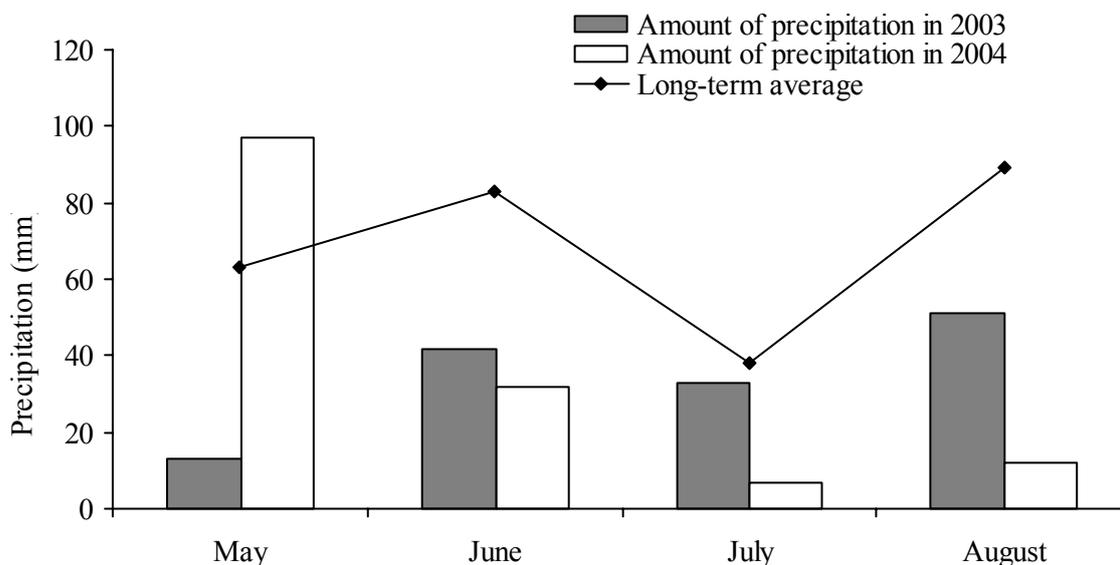


Figure 2: Amount of precipitation during vegetation in Poreč

3 RESULTS AND DISCUSSION

3.1 Research on *Helicoverpa armigera*

Helicoverpa armigera (Hübner) (Lepidoptera: Noctuidae) has been known as the cotton bollworm, corn earworm, grub tomato, tobacco budworm as well it has other synonym names (Toyoshima *et al.*, 2001). The cotton bollworm larva can feed itself on all vegetative plant parts above ground, but it prefers the flower and fruit of one year plants (Bird and Akhurst, 2007).

The massive attack of cotton bollworm was evident in 2003 in Slavonija and Baranja where severe amounts of damage were found on corn (up to 60 % of damaged corncobs), soy and sunflower (Ivezić *et al.*, 2004).

In Istria, during 2003 and 2004 we have also spotted some evident damages from this pest on several vegetables, especially on fruiting vegetables as tomato and bell pepper.

In Figure 3 we have shown the damages on tomato fruits which were counted from 33% on plots in Poreč surroundings and up to 42 % in Mirna river valley. Damages on fruits in 2004 were noticed only for tomato production in Mirna river valley which were significantly lower (only 13 %) comparing to previous year.

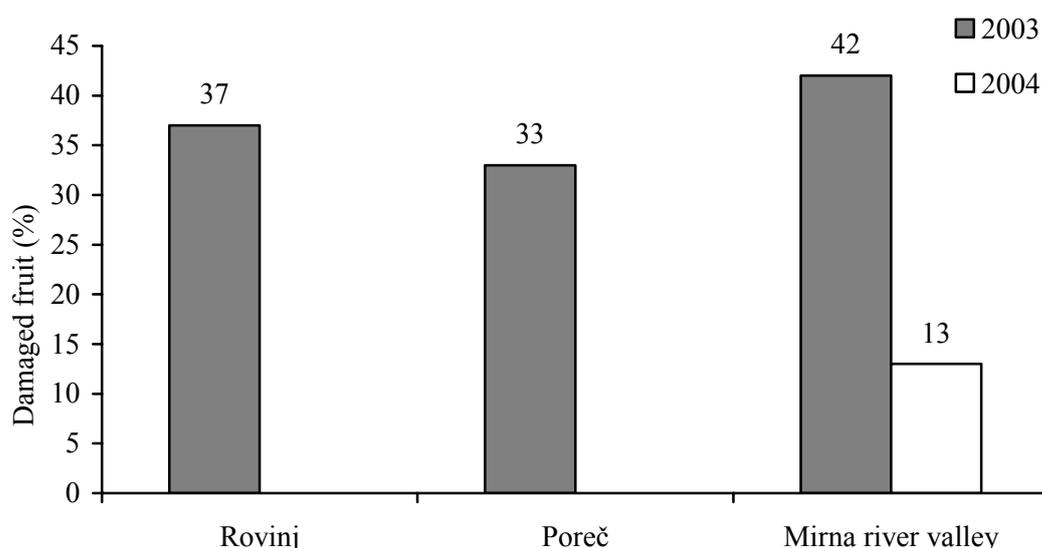


Figure 3: Damage on tomato fruits by cotton bollworm (*Helicoverpa armigera*) in 2003 and 2004 in Istria

According to Ivezić *et al.* (2004) the stronger attacks of this pest is usually provoked by dry weather along with temperatures above 15 °C. From Figure 1 and 2 we can actually see that temperatures in 2003 and 2004 during vegetation of tomato were significantly higher than in the whole decade what along with the precipitation lack has provoked this pest development. Therefore in years with average higher temperatures and absence of rains as a precondition and consequence of global warming we can expect a much larger attack of armyworm on vegetables in Istria.

Up till today the *Helicoverpa armigera* according to Ivezić *et al.* (2004) and Maceljski (2002) was spreaded throughout south Europe, northern and southern America, Africa, Asia, Australia and south Pacific, what means in areas with warmer climates. As the pest is a polyphag it attacks over 250 plant species. The most economic damage of cotton bollworm is seen on corn, tomato, tobacco, cotton, oats, onion flowers, watermelon, citrus

fruits, carrots and young pine needles (Ivezić *et al.*, 2004; Maceljki, 2002; Pollini, 2002; Cunningham, 1999; Alma, 1975 and 1977).

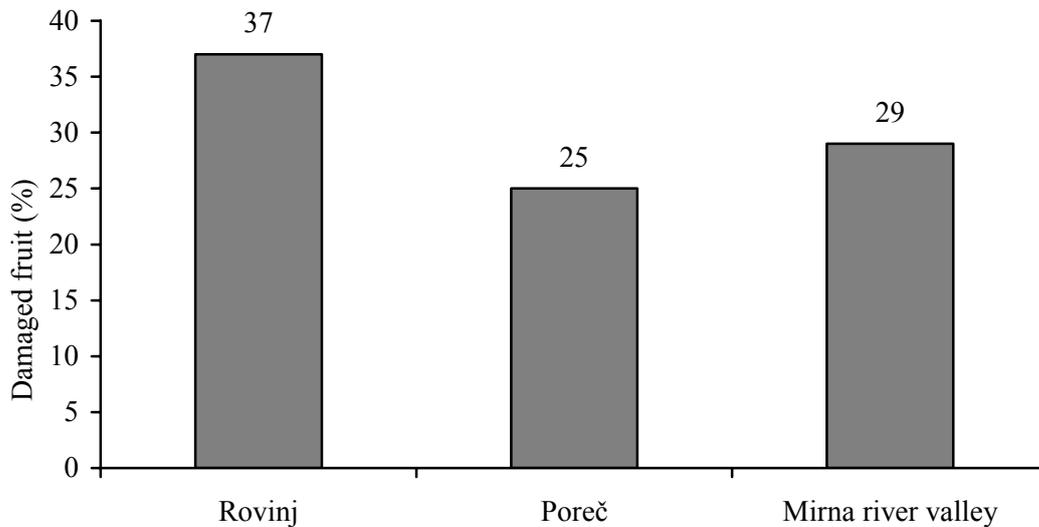


Figure 4: Damage on bell pepper fruits by cotton bollworm (*Helicoverpa armigera*) in 2003 in Istria

The female moth is light brown colour with brown forewings (wings span 2.8-3.7 cm), while male moth is light yellow colour with olive colour forewings and darker tracery around a single dark on each wing. The hind wings are buff with dark border which contains a light patch. As the moth is a good flyer it can easily concur new areas (Ivezić *et al.*, 2004).

The colours of caterpillar is ranging from light green, red up to black with stripes along the length, these stripes are placed on the sides and can be lighter or darker. Caterpillars pass through four development stages (instars). The imago has three pairs of chestal and four pairs of abdominal legs. The grown up imago reach 30 to 40 mm in length (Alma, 1977). It is cocooning on soil deepness 5-10 cm. It has been known that 60 % of first generation cocoon is going to dia-pause and hibernating, while imagoes and other generations are hibernating during winter times in 99 % of cases. The female lies about 4,000 eggs. The eggs are oval shaped, about 0.5 mm large and colored from light green till light yellow at start and black before the imagoes are coming out of the ground.

In Istria according to Maceljki (2002) we have 2-3 generations annually. It is a periodical pest for which high temperatures and dry periods are necessary.

The development of one generation in suitable climate periods is lasting somewhat over a month.

3.2 Research on *Beosus maritimus*

Two-spotted ground bug (*Beosus maritimus* (Scopoli)) belongs to the family Lygaeidae. It has been of little recognition therefore we can find it under synonym grass bug either as rape cole bug. According to Maceljki (2002) it feeds itself with dead organic matter, while according to Barić (2003) it makes damages on peach fruits. Periodically it turns up and therefore we find it as a molesting pest, and its massive presenting is bothering people because it crawls into houses, it crawls over roads and streets and according to Maceljki (2002) their presence has scared tourist of a camp and their tents in Umag. Beside in exceptional cases such as the one in Umag we do not recommend its treatment.

Exactly in year 2004 in Vrsar surroundings we have noticed the large population of this bug. It has shown itself also in Istria in some previous years with large populations in Umag and Rovinj (Maceljski, 2002). The bug appearance can be expected only in years which are warmer and dryer, as was in 2004.

By determining and counting the bugs in 2004 we have measured about 30 % larger amounts of bugs on fields with rape cole considering the fields with cabbage leftovers (Figure 5). However, in the first and second case the number of bugs by square meter was in average very high and rated above 248 pieces, therefore the oilseed rape and cabbage fields were literally black of bugs, as the roads around the fields.

Its appearance is not harmful, but it is unpleasant in coastal areas which have developed tourism, therefore it is necessary to monitor the bugs and when the population grows above some critical point it should be treated.

In literature data about this bug is scarce, therefore, through the next years when its appearance is expected we shall continue to research and examine its biological cycle of development in Istria.

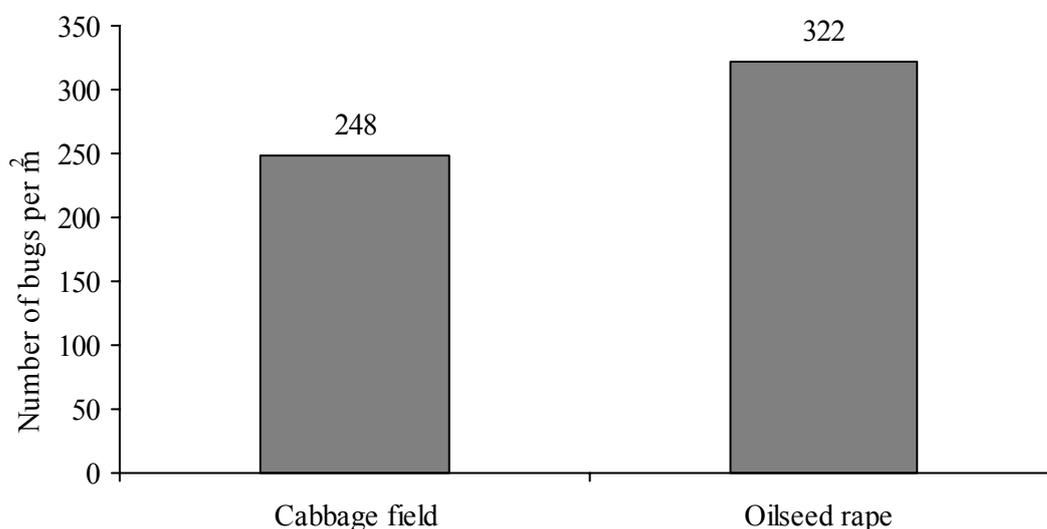


Figure 5: Average population size of *Beosus maritimus* on cabbage and oilseed rape fields in 2004 in Istria

4 CONCLUSION

Development of *Helicoverpa armigera* and *Beosus maritimus* needs suitable warm and dry weather. As a consequence of global warming we are witnesses that from year to year the temperatures are above average ones for Istria and precipitations are becoming scarcely anything, what directs to the future that researched tow bugs will show in much larger populations than now. Therefore it is necessary to get acquainted with these bugs in order to prepare for their treatment if the population becomes harmful.

5 REFERENCES

- Alma, P.J. 1975. Infection of pupae of *Heliothis armigera* by *Paecilomyces farinosus*. New Zealand Journal of Forestry Science, 5: 42-43.
- Barić, B. 2003. Integrirana proizvodnja breskve. Report 2003, www.hzpsp.hr/infhzpsp/vip/2003/0122026h.doc

- Alma, P.J. 1977. *Helicoverpa armigera* Hübner (Lepidoptera, Noctuidae). New Zealand Forest Service, Forest and Timber Insects in New Zealand, 9: 1-2.
- Cunningham, J.P., Zalucki, M.P., West, S.A. 1999. Learning in *Helicoverpa armigera* (Lepidoptera: Noctuidae): A new look at the behavior and control of polyphagous pest. *Bulletin of Entomological Research*, 89: 201-207.
- Bird, L. J., Akhurst, R. J. 2007. Effects of host plant species on fitness costs of Bt resistance in *Helicoverpa armigera* (Lepidoptera: Noctuidae). *Biological control*. 40, 2: 196-203.
- Ivezić, M., Raspudić, E., Brmež, M., Pribetić, Đ. 2004. Pojava i jačina napada sovice *Helicoverpa armigera* Hübner u 2003. godini. *Glasilo biljne zaštite*, 4: 18-21.
- Maceljčki, M. 2002. *Poljoprivredna entomologija*, Zrinski, Čakovec, 464 p.
- Pollini, A. 2002: *Manuale di entomologia applicata*. Ed agricole, Bologna, 1462 p.
- Toyoshima, G., Kobayashi, S., Yoshihama, T. 2001. Control of *Helicoverpa armigera* (Hubner) by mating disruption using diamolure in lettuce fields. *Japanese Journal of Applied Entomology and Zoology*, 45: 183-188.