POPULATION DYNAMIC OF Z STRAIN OF EUROPEAN CORN BORER IN BEČEJ,VOJVODINA PROVINCE

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Abstract: Wordwide in maize fileds, the three different pheromone strains (Z, E, H) of European corn borer (ECB) are identified. The aim of the study was to investigate the presence of ECB pheromon strains in Vojvodina province, leading production area of maize in Serbia. In three years, the presence of different strains were verified. Population dynamic according to obtained data idicate high differences in population strenght. The occurance of this pest in the field fluctuates. The earliest cach was on June 2nd (2016) and the latest on July 17th (2014). In 2015, when the highest temperature and the lowest humidity were registerd, the first ECB specimen was caught on June 23rd. The last catch of moths was earlier in vegatation on August 20th (2014) and the latest on October 9th (2016). In 2015 the last catch was on September 10th.

Key words: ECB, maize, pheromone strains, population dynamic

Introduction

European corn borer (ECB), *Ostrinia nubilalis* Hbn. (Lepidoptera, Pyralidae) is a pest present worldwide in maize fields (Oerke et al., 1994). It is one of the most destructive and econmicaly important maize pests (Kocmánková et al., 2008; Raspudić et al., 2013). This insect is a polyphagous herbivore (Mason et al., 1996), which can feed and reproduce on more than 224 plants (Lewis, 1975; Ponsard et al., 2004). The presence of ECB in European entomophauna was established around year 1500 (Bethenod et al., 2005). The first indetification of ECB as economicaly important maize pest in Europe, dates back in XIX century i.e. 1835 in France (Coffrey and Worthley, 1927). ECB occures from June to August with the higest activity during night. ECB moths live 10 days average (Hill, 1987), while adults longevity and fertility increase in conditions of high humidity and good nutrition (Leahy and Andow, 1994). Population dynamic of ECB is highly influenced by climatic conditions (Bača et al., 2002; Tanasković et al., 2015; Popović et al., 2016). Also, vegetation, assortment, growing tehnology, cropping system and production of maize in the region has a strong influence on ECB biology. From mostly univoltine pest in Balkan during eighties of XX century, ECB was identified as polivoltine insect (Hadžistević, 1983). In Serbia, ECB represents economicaly very important maize and pepper pest (Kereši et al., 2004; Kereši and Almaši, 2009; EPPO, 2014).

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ECB sexual pheromon was isolated for the first time in 1963 (Sparks) and the isolation and identification was confirmed by Klun (1968). In the seventhies of the XX century, the presence tree different pheromon raceses or strains (Z, E, and H) of ECB were disclosed (Klun et al., 1975). The main pheromone component in Z and E races is 11- tetradecenil acetate (Kochansky et al., 1975). The Z males give response to pheromone mixture of Z: E / 97:3 (Klun et al., 1973). The first identifications of Z race specimens, in the Balkans, were identified on the territories of Belgrade and Osijek (Anglade et al., 1984). The presence of Z strain of ECB was confirmed on the territory of Hungary (Anglade et al., 1984), Italy (Maini et al., 1987), Switzerland (Peña et al., 1988) and South Moravia and Slovakia (Kalinova et al., 1994). In Croatia, Z race of ECB is present in the north part of the country, while in the west side, the presence of Z and E strains was identifed (Bazok and Igrc Barcic, 2010). Also in France, Bethenod et al. (2005) cofirmed the presence of both strains, Z in maize and E in hop (*Humulus lupulus*) and black absinthe (*Artemisia absinthium)*. The aim of this study was to investigate the presence of ECB phero-strains and at the same time, to verify the efficiency of used pheromone traps.

Material and method

The experiment was set up in Bečej, the north of Vojvodina province, Serbia, in the field with low western corn rootworm (*Diabrotica virgifera virgifera*) natural infestation. It was carried out for three years (2014, 2015 and 2016). The Serbian cultivar NS-640 was used in experiment.

Pheromone delta traps (Picture 1) for ECB were placed along the edges of a maize field. Traps, lures and sticky bases were obtained from Institute for plant protection, Hungarian academy of science, Budapest-Hungary.

Traps were installed on maize plant, at the top of plant in tassel zone (Picture 1).

Slika 1. Klopka i položaj na biljci kukuruza (original)

Picture 1. Pheromone trap and position on the maize plants (origin)

Pheromone traps for three different races of ECB (Z, E and H) were used. Empty traps represented the control traps and were deployed in the same manner as the pherotraps and were labeled with C. During the experimental period 2014-2016, the traps were deployed at the beginning of the vegetation, i.e. on June 26th, 23rd and May

25th, respectively, depending of sowing times per vegetation. The field was inspected weekly, from June until the end of the vegetation i.e. harvest.

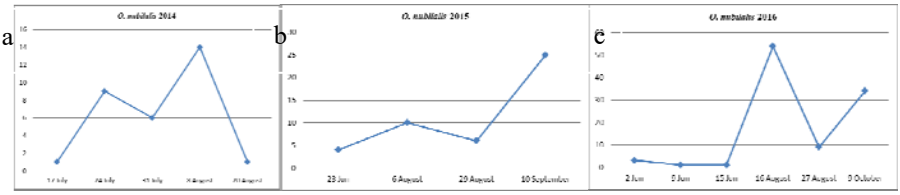
During weekly filed inspections, the presence of ECB on sticky bases was recorded and sticky bases were replaced. Once a month, the lure was replaced as well. All collected specimens were kept in a fridge for GS-MS strain confirmation.

Results and discussion

Regular inspection during experimental period indicates the presence of specimens at sticky bases of pheromone traps (Picture 2).

Slika 2. Imago *Ostrinia nubilalis,* mužjak - na lepljivoj površini (original)
Picture 2. Adult of ECB - male on the sticky base of pheromone trap (origin)

According to the obtained data, the number of caught ECB specimens in pheromone traps was fluctuating and progressed during the vegetation period in 2014, 2015 and 2016. The number of caught ECB specimens in the pheromone traps in 2014 indicates a fluctuating flight during vegetation period. The highest number of caught specimens (Graph 1a) in 2014 was on August 14th (14 specimens) and the lowest in the last catch, on August 20th (1 specimens). The first registered catch was on July 17th (1 specimen).



Grafik 1. Dinamika populacije plamenca kukuruza – Z tip
Graph 1. Population dynamics of ECB- Z strain

During vegetation period of 2015, the number of caught ECB was progressive (Graph 1b). The first catch and at same time the lowest was on June 23rd (4 specimens) and the highest and also the last catch in vegetation period was on September 10th (11 specimens). During vegetation period in 2016, the flight of ECB was fluctuating (Graph 1c). The first catch on sticky bases in pheromone traps was earlier than in previous experimental years. The first caught specimens in this vegetation period were at the

begging of June i.e. June 2nd (3 specimens). The last caught moth's i.e. 34 specimens were recorded in October 10th. The highest number of 54 caught specimens in 2016, was registered on August 16th. On June 9th 1 specimen was caught and it represents the lowest number of caught moths at sticky bases in this vegetation.

According to Čamprag (2002) and Vajgnad (2010), flight of the first generation was registered on May 1st and the flight of the second generation was in mid of July - beginning of August. During our research period, the first catches were in July 17th 2014, June 23rd 2015 and June 2nd 2016, which is in compliance with catches of the second generations according to Čamprag (2002) and Vajgnad (2010). Using the pheromone traps, Bereś (2012) had the first catches in Poland between 27 and 28 June (2007 - 2008). The use of light traps registered much higher number of caught moths then pheromone traps (Żołnierz and Hurej, 2007). It was expected because light traps cache all nocturnal species on wider region. However, the use of pheromone traps enables catches of moths five days earlier than in light traps (Bereś, 2012).

Obtained data indicate that in Bečej region, ECB is bivoltine insect. In Vojvodina province during vegetation period 2008 and 2010, ECB had three generation per year (Vajgnad, 2010). Depending on climatic conditions in vegetation period, the number of ECB generations per year in Croatia varies from one to two incomplete (Maceljski, 2002 cit. in Bayzok and Igrc Barcic, 2010). According to Gomboc et al. (1996) ECB in Slovenia had two generations in continental part and three generations in the coastal region.

Cold period is much more suitable for ECB flight than the warm, rainy periods with hot and humid weather (Kania, 1961). This indicates that climatic factors having the high influence of population dynamic and ECB flight (Kimmins, 1987). According to those data it could be concluded that prolonged or extended flight in 2016, compared to previous year's, is a consequence of lower temperatures in the second part of the vegetation. Shortest flight activity was registered in 2015 (Jun 23rd - August 20th) and 2014 (July 17th – September 10th). Differences in total number of caught specimens per vegetation i.e. 31 (2014), 52 (2015) and 102 (2016), indicate at progressive population increase. The prevalent number of caught moths belongs to Z strain. In 2014, only catches on Z traps were registered. However, in the next two vegetations, chatches were also registered on H (2015) i.e. H and E traps (2016). These results represent preliminary identifications of ECB strains presence in maize field in Bečej region. Detiled GS-MS analysis will confirm strains of caught specimens in Bečej field.

Conclusion

This research and literate data indicate that the use of pheromone traps in the filed is the necessity as a prediction, prevention and confirmation measure for ECB presence in the field. In further research, we will continue to follow the influence of ECB on plant damages and yield losses in maize field with different tools of precision agriculture.

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