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Flight dynamics of olive fly *Bactrocera oleae* Gmel. (Diptera, Tephritidae) in the region of bar

Dinamika leta muhe masline *Bactrocera oleae* Gmel. (Diptera, Tephritidae) na području bara

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ABSTRACT

Bactrocera oleae is the most importanat olive pest in Montenegro. The infestation is located only on the fruit and results in significant damage and for this reason, induces the neccessity for its control. Various control methods and applications of chemical substances are directed towards suppression of adults and have preventive character, therefore monitoring of abundance and flight dynamics is of high importance.

Trials were set in olive plantation of Centre for subtropical cultures in Bar, on native variety Žutica, in three years period (the year of 2005, 2006 and 2007). Flight dynamics was monitored by chromotropic and pheromone traps of Dacotrap type, during the period from July to the end of October in all years of monitoring. Traps were monitored once a week and the flight dynamics of fly is showen through the average abundance of females and males on chromotropic and pheromone traps.

In the region of Bar, which is the biggest olive area in Montenegro seaside, olive fly developes several generations during one year. Generations interleave with each other and therefore the fly is present in plantations, with different appearance intensity, from begining of July untill the middle of December, and in some years the flight lasts even longer, so the presence of adults is also detected in January. The maximum abundance, reffering to the most intensive flight is during September and October. Chromotropic traps hold out a more precise evaluation of population abundance present in the plantation, while pheromone traps are very important in infestation forecast and appropriate treatment timing determination.

Key words: olive fly, olive, chromotropic traps, pheromone traps

SAŽETAK

Bactrocera oleae je najznačajniji štetnik masline u Crnoj Gori. Napada isključivo plod i pričinjava značajne štete, zbog čega se nameće potreba njenog suzbijanja. Različite metode suzbijanja i upotreba kemijskih sredstava usmjereni su na suzbijanje imaga i imaju preventivni karakter, te je praćenje brojnosti i dinamike leta od izuzetnog značaja.

Istraživanja su izvedena u zasadu masline Centra za suptropske kulture u Baru, na autohtonoj sorti žutica, u trogodišnjem periodu (2004, 2005 i 2006. godine). Dinamika leta muhe masline praćena je pomoću hromotropskih i feromonskih lovki tipa Dacotrap, u periodu od srpnja do kraja listopada u svim godinama posmatranja. Pregled lovki vršen je jednom tjedno, a dinamika leta muhe izražena je preko prosječnog broja ženki i mužjaka na hromotropskim i feromonskim lovkama.

Na području Bara, koje je i najveće maslinarsko područje na crnogorskom primorju, muha masline razvije više generacija u tijekom godine. Generacije se međusobno preklapaju pa je muha u zasadima, sa različitim intenzitetom pojave, prisutna od početka srpnja do polovice prosinca, a pojedinih godina let traje i duže, pa se prisustvo imaga detektuje i u siječnju. Najveća brojnost, odnosno najintenzivniji let je tokom rujna i listopada. Hromotropske lovke nude precizniju procjenu brojnosti populacije prisutne u zasadu, dok su feromonske lovke veoma značajne za prognozu infestacije i određivanje pravog momenta za tretiranje.

Ključne riječi: muha masline, maslina, hromotropske lovke, feromonske lovke

INTRODUCTION

Olive fly *B. oleae* is the most important olive pest in Montenegro as it is in other Mediterranean countries. It infests only the fruit which prematurely falls off, and the oil produced from infested fruts is of a low quality. In years which are especially favourable for the devlopement, the olive fly makes significant damage and may bring the production into question (Delrio, 1979; Michelakis & Neuenschwander, 1983).

There is a little data on the olive fly biology and its control in Montenegro (Mijušković, 1955; Mijušković i Mirčetić, 1957; Mijušković, 1999; Perović et al., 2007). Distribution and reproductive ability of olive fly varies subject to agroecological conditions. Number of generations per year varies, it usually developes two to three generations which fold over each other and they are difficult to differ conspicuously (Mijušković, 1955; Mijušković i Mirčetić, 1957). Basilios et al. (2002) point out that generation fold over is a consequence of the adult longevity and the long oviposition period.

The risk of olive fly infestation is in function of number of generations it can develop in a certain climatic area (Belcari et al.,1989). The period of highest risk for fly infestation is from the phase of lignification of the stone to the fruit ripening, when meteorological conditions are favourable for the developement.

Various control methods and application of chemical substances are directed towards suppression of adults and have preventive character. For this reason, determination of abundance and flight dynamics are of high importance for fly appearance forecast and represent the essential control measure.

MATERIAL AND METHODS

Flight dynamics of the olive fly was monitored in the olive plantation of Centre for subtropical cultures in Bar, on native variety Žutica, during the three year period (the year of 2005, 2006 and 2007).

Adult flight was monitored by:

a) Chromatropic traps (CT), yellow sticky plates sized 20 x 15 cm, in period from July 2004 to December 2006, without discontinuation;
b) Pheromone traps (PT) type "Dacotrap", Isagro Biofarming product, in the period from July to the end of October in the mentioned years.

Traps were monitored once a week and olive fly flight dynamics is showen through the average abundance of females and males on CT and male abundance on PT.

Besides flight activity of the olive fly, temperature and precipitation in the Bar region were also monitored during the trial period.

RESULTS AND DISCUSSION

In the year of 2004, from the begining of July untill the end of December permanent presence of adults, with the exception of the first week of August, was evidented. Adults flight untill the end of August is characterised by low abundance (Chart 1). Adult abundance during September multiplies several times. Maxiumum abundance was registered from 21. to 28. of September (50 individuals per trap on CT and 40 males on PT). During October adult abundance gradually decreases. Adult abundance in November rapidly declines, but their presence is registered untill the end of the year and prolonges into the year 2005 to the middle of January. The reason for this is probably average daily temperature which in December was around 16 °C, and the lowest threshold for flight of adults is 14 ^{o}C (Girolami, 1982).

Meteorogical conditions in the year of 2004 are characterised by optimal temperatures for the olive fly developement, 20 – 26 ^{o}C (Lopez - Villalta, 1999), but also the drought in the period from 10. August to 20. September which caused population stagnation during this period. Rapid abundance increase is noticed with the first precipitation in the third decade of September. Favourable conditions for olive fly developement continued to the end of the year. Kotlar and Bičak (2005) studies in Croatia show that in the same year in Dubrovačko–neretvanska county was registered low population abundance of olive fly. In some localities, flight was not registered at all, while in others first adults were observed at the begining of September. Yet, in the locality of

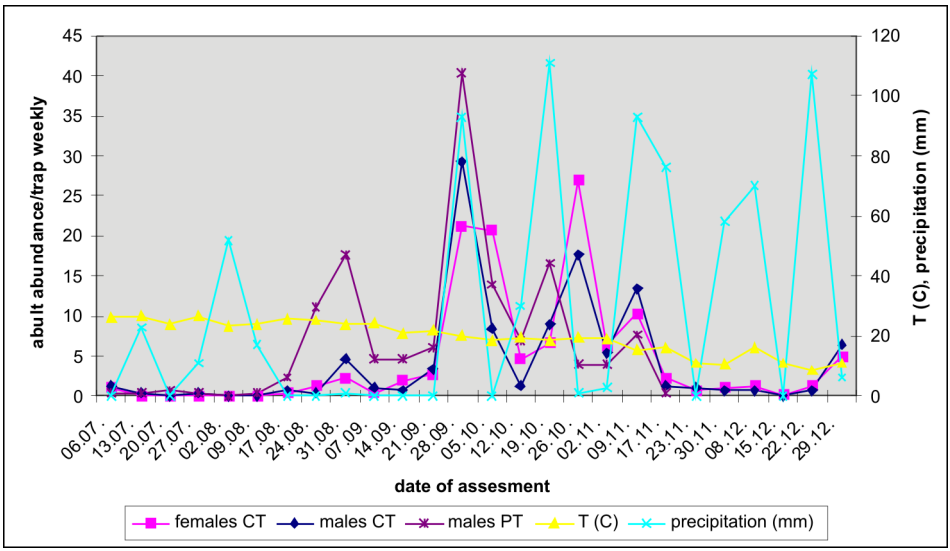

Chart 1. Olive fly flight dynamics in the region of Bar in 2004

Brsečine mass flight during September was observed and flight peaks of fly correspond with first two peaks in the region of Bar.

The first activity of adults in 2005 was registered at the begining of July (Chart 2). Low adult abundance on CT and PT is characteristic for the period untill the end of August. During September rapid increase of abundance on PT is observed, with the maximum from 06. to 13. September when 24 males per trap was registered, which is simultaneously the maximum abundance on PT in this year. During the same period, the abundance on CT gradually increases, and the rapid increase is noticed during October when 10.8 – 17 females and 14.7 – 19.2 males per trap was weekly registered. This is, at the same time, the maximum abundance on CT in the year 2005. Presence of adults in the plantation was registered during November and in the first decade of December.

High temperatures in July and a lack of precipitation (below 100mm per month) from July to the middle of September were a limiting factor for olive fly developement in the year of 2005. From the middle of September to the middle of October, average daily temperatures were within favourable range for olive fly developement (17.1 to 20.6°C) and therefore with the first heavy precipitation by the end of September comes the significant increase in fly abundance.

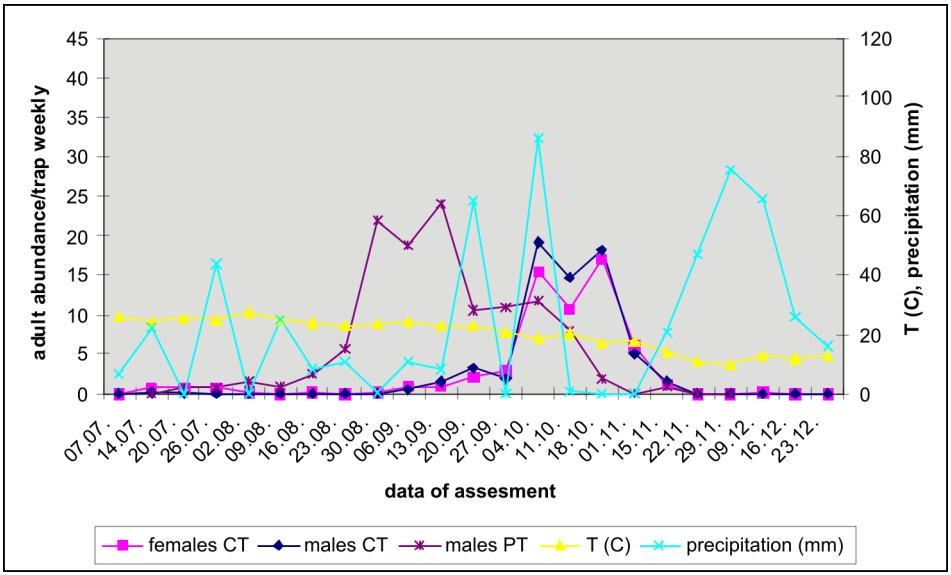

Chart 2. Olive fly flight dynamics in the region of Bar in 2005

In 2006 the initial flight activity was recorded at the begining of July (Chart 3). Untill the middle of August there is a low abundance of adults on CT and PT. The first maximum on both types of traps was recorded on 30. of August and the abundance of trapped adults is significantly higher on PT compared to CT. During September adult abundance on CT rapidly increases, and on September 27. on average 36.2 females and 150.7 males per trap were recorded, which is the maximum abundance not only in this year, but also in the three years period. Adult abundance during October is several times lower on PT than on CT. In November, adult abundance rapidly decreases, but their presence is observed to the end of the year.

Very favourable meteorological conditions for olive fly developement are characteristic for the year 2006. Average daily temperatures around 20 °C in the period from the mid September to the middle of October, heavier precipitation at the end of August and again in the middle of September, as the very high yield, have caused the highest abundance of fly in the monitored period.

In all three years of the study, it is noticed that the abundance of trapped adults in CT is low in the period to the begining of September, and than rapidly increases and gains its maximum in the last decade of September and during October, which according to Mijušković (1955) coincides with the period of

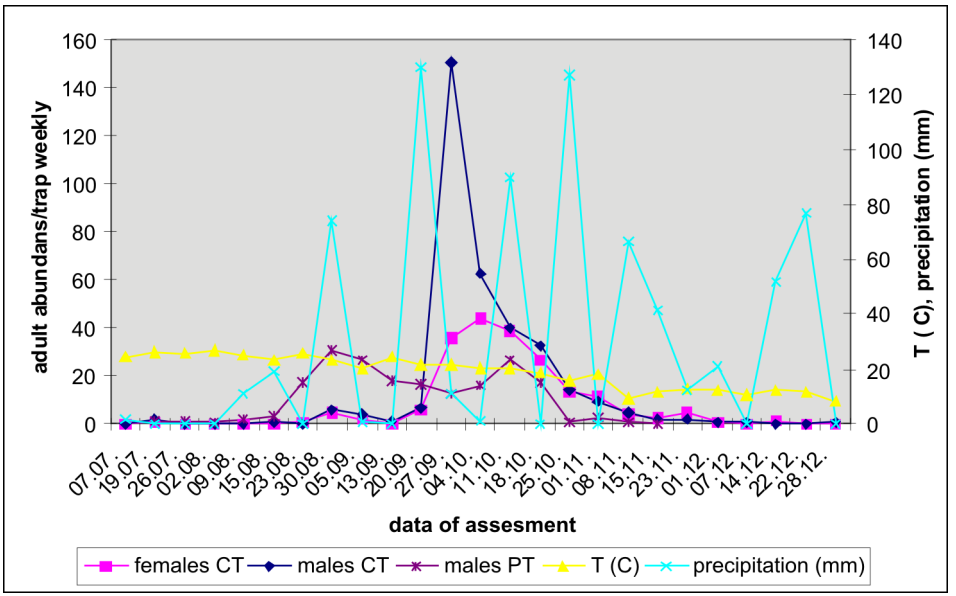

Chart 3. Olive fly flight dynamics in the region of Bar in 2006

high infestation of fruits. The reason for this is a visual attraction of CT traps which manifestates on induviduals of both genders; they are less selective and atractive than PT traps and therefore offer a more precise evaluation of population abundance present in the olive plantation. Data on correlation between adults on CT and fruit infestation are found in papers Ricci et al. (1979), Ricci et al. (1982) i Pucci et al. (1990).

Contrary to CT, PT are all highly selective attracting only individuals of the monitored species, in this case *B. oleae*, and only males. As a result of their strong attraction there is a tendence of overrating the real population abundance in the olive plantation (Pucci & Gianantoni, 1996). According to Bjeliš (2005) males have a very strong reaction to the given pheromone at the begining of *B. oleae* population emergence and during the autumn, while in the summer their reaction is very weak.

Maximums, registered on CT and PT in 2004 coinside, except for the third maximum which on pheromone traps was registered seven days earlier. In 2005 and 2006 the maximum abundance on PT was observed four weeks earlier than on CT. Therefore, PT do not reflect real status of *B. oleae* population abundance, yet it is a fact that they register low abundance at the the begining of population emergence better, which makes them very significant for infestation forecast and determination of treatment timing. In all three years of the research

the highest abundance of trapped adults on PT was registered from the third decade of August to the third decade of September, which corresponds with the period of intensive protection from this pest.

Meteorological conditions have a significant effect on population abundance of olive fly. High temperatures and drought during the summer period usually limit and delay the increase of population abundance of *B. oleae*. On contrary, the increase of minimmum temperature and precipitation have a positive impact on fly population and its fertility (Ricci et al., 1982a; Kotlar i Bičak, 2005).

Maximum abundance of adults *B. oleae* in the region of Bar was noted during 2006, when the most favourable conditions for its developement were registered. The lowest abundance was evidented in 2005, and it is a consequence of less favourable conditions for olive fly developement, high temperatures in July and the lack of precipitation (below 100mm per month) in the period from July to the middle of September. Kotlar i Bičak (2005) report that in Dubrovačko-neretvanski county major pest abundance regulators are extremely high temperatures and drought. They are giving an example from the year 2003 which was distinguished for a very low population abundance as a consequence of unfavourable meteorological conditions, and they are reporting similar situation in the following year also.

CONCLUSION

Researches made in the olive plantation in the region of Bar in three years period (from June 2004 to December 2006) indicate that *B. oleae* is present in olive plantations from the begining of July to the middle of December, and in some years the flight activity lasts even longer and adult presence is also detected during January (the year 2005).

In conditions of low population abundance, significantly higher number of adults is present on pheromone traps compared to chromotropic traps, and by increase of population abundance this difference is slowly vanishing.

Chromatropic traps enable more precise assesment of population abundance in the plantation, while pheromone traps have greater significance in the infestation forecast and determination of appropriate timing for chemical substances application.

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