RESEARCH ARTICLE (Open Access)

Population dynamic of tomato leaf miner, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae)

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Abstract

In climatic conditions of Albania, tomato crop is attacked by a various number of pests, which are divided in primary and secondary pests. Now tomato growers have a serious problem in their farms caused by tomato leaf miner, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae), which is a harmful pest of tomato originating from South America. Firstly it was detected in eastern Spain and after that, it rapidly was distributed in various other European countries and spread throughout the Mediterranean basin. In the lack of control measures, the percentage of damage caused by this pest on tomato in greenhouses and open-field can achieve up to 90% of production. To increase the performance of control, it is very important to know biological cycle as well as its ecology. Using of proper and compatible methods is the best way to control this pest by reducing of pesticide using. Based on our monitoring using pheromone traps both in greenhouses and open-field, *Tuta absoluta* gives more than four to five generations accompanying whole the vegetation period of the tomato crop. *Tuta absoluta* is distributed all over the coastal area of Albania. The more distributed and causing damages is second crop which often is damaged totally. Using of chemical pesticides until now resulted not effective, excepted Spinosad. Mass capture technique used in our conditions has resulted very effective. So, we recommended using it for controlling of this serious pest of tomato crop.

Key words: Tomato, Tuta absoluta, control, pheromone, mass capture.

1. Introduction

Tomato plant is one of the most important Solanaceous vegetable crops [4]. Tomato crops are infected with many serious pests, recently the most destructive ones, *T. absoluta* [4]. *Tuta absoluta* is one of the most devastating pests of Tomato in South America [8,12]. This pest was initially reported in eastern Spain in late 2006 [6], and has subsequently spread throughout the Mediterranean Basin and Europe [19]. In climatic conditions of Albania, tomato crop is attacked by a various number of insects, which are divided in primary and secondary one. As result of the movements` dynamism of the plants material, *Tuta absoluta* is present all over the Albanian coastal area [17]. The first infections were observed in the field tomatoes in July 2009 in Levan (Fier) and Novosel (Vlore). In the lack of control measures, the percentage of damage caused by this pest on tomato in greenhouses and open-field can achieve very high level.

Tuta absoluta full classification is: Kingdom: Animal, Phylum: Arthropod, Class: Insects, Order: Lepidoptera, Family: Gelechiidae, Genus: Tuta, Species: absoluta

Tuta absoluta synonyms are: Phthorimaea absoluta (Meyrick, 1917) Gnorimoschema absoluta (Clarke, 1962) Scrobipalpula absoluta (Povolny,1964; Becker, 1984) Scrobipalpuloides absoluta (Povolny, 1987)

Tuta absoluta biology

Tuta absoluta is a micro lepidopteron moth with high reproductive potential [11]. Its lifecycle has four developmental stages: egg, larva, pupa and adult. Females usually depositing eggs on the underneath of tomato leaves or stems, and on immature fruits. After hatching, young larvae penetrate leaves, fruits or stems, on which they feed and develop. T. absoluta eggs are small cylindrical, creamy white to yellow 0.35 mm long. In the optimum conditions T. absoluta has 10 to 12 generations per year, since the hatching of its eggs takes 4–5 days, the four larval instars takes 13–15 days, pupae phase takes 9–11 days, and yet the one generation total duration is about 26-31days [1]. Adults are active at night and females lay eggs on the aerial parts of the host

plants. Adults are 6–7 mm in length and present filiform antennae and silver to grey scales [10]. The maximal lifetime fecundity is 260 eggs per female [15]. Larvae do not enter in diapauses when food is available [11]. Although tomato (Lycopersicon esculentum Mill.) is the preferred host plant of T. absoluta, its larvae can also develop on other cultivated plants such as Solanum tuberosum L. (potato), Solanum melongena L. (eggplant), Solanum muricatum Aiton (sweet pepper), Nicotiana tabacum L. (tobacco), Phaseolus vulgaris L. (bean) and Physalis peruviana L. (cape gooseberry) [1]. The larvae instar which is the source of infection was difficult to control because of its presence inside the plant. Larvae can damage tomato plants during all growth stages, producing large galleries in their leaves, burrowing stalks, apical buds, green and ripe fruits [9]. Some populations of T. absoluta have developed resistance to organophospate and pyrethroid pesticides [3]. Newer compounds such as spinosad, imidacloprid, and Bacillus thuringiensis [13] have demonstrated some efficacy in controlling European outbreaks of this moth. In order to reduce the excessive use of insecticides in tomato fields, additional alternative control methods have been used. The insect's sex pheromones have also been developed to control T. absoluta. Lepidoptera pheromones have been successfully used for insect monitoring and mating disruption of insects [18]. Virgin female tomato leafminer releases a sex pheromone that strongly attracts males [14]. This pheromone was identified by Attygalle [7] as (3E, 8Z, 11Z)-3, 8, 11-tetradecatrien-1-xyl acetate. By monitoring T. absoluta males using pheromone traps, it may be possible to determine the correct timing for insecticide applications leading to a reduction and rational use of pesticides. Captures in traps baited with synthetic pheromone lures accurately show whether a specific insect species is present, and when its seasonal flight period starts [6]. After pest detection, synthetic sex pheromones are principally used to monitor population levels and trigger applications of chemicals or other control methods [5]. To monitor T. absoluta, pheromone lures are principally coupled with Delta traps [2]. The objectives of this study are: (1) Identification of the tomato moth (Tuta *absoluta*) as a dangerous pest of this crop. (2) The dynamics of population and its management via bio chemical method. (3). The effectiveness of these methods to control this pest (mass capture).

2. Material and Method

The experiment of 2014 was carried out in low coastal area, at the Sukth greenhouses, with surface of 2 ha covered with glasses (Figure 1). The experiment was developed in the first culture of the planted tomatoes in the greenhouse. In order to monitor the tomato moth *Tuta absoluta* in experimental area, 4 pheromone traps were installed. The experimental scheme was divided into 4 variants with an area of 0.5 ha. The flies counting and their monitoring into pheromone were performed on regular weekly basis intervals.

Figure 1. View from the place of study 2014.

2.1. Monitoring with pheromone traps

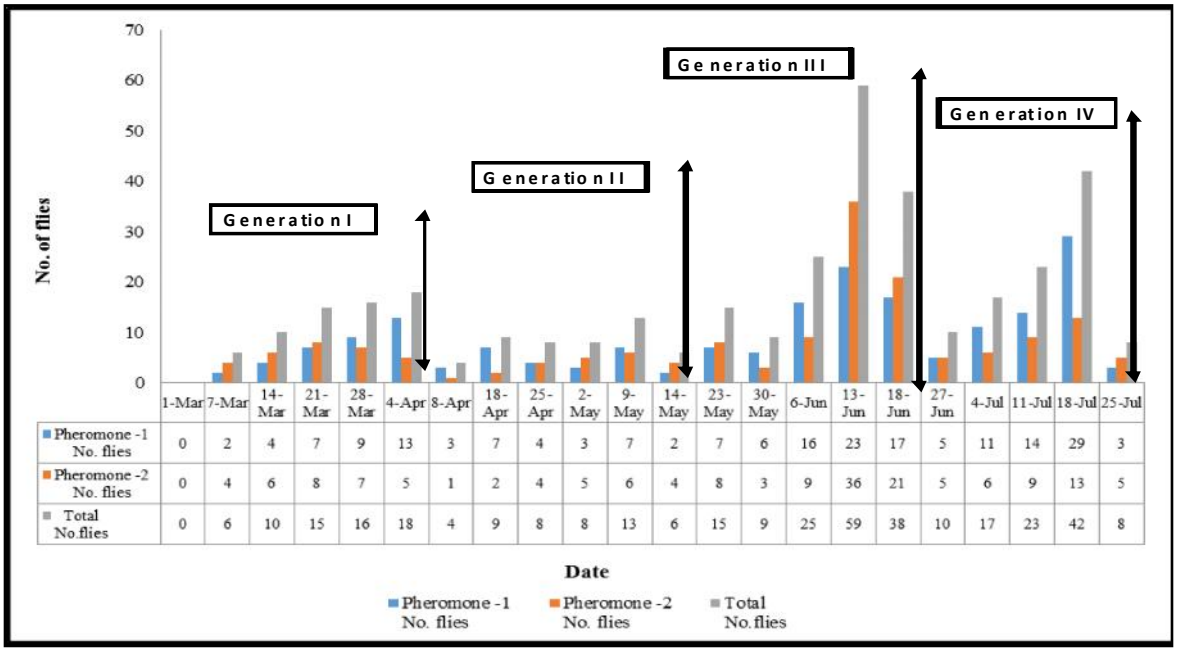
The used method was the biotechnical one, monitored with pheromone traps (figure 2). The traps were placed inside the greenhouse, in the center of it with height less than one meter. Traps were checked once per week. The traps delta types were placed in the monitored plots for identifying the evolution of the tomato moth populations. The pheromones were changed after 4 weeks. In this variant with a surface of 0.5 ha were placed 2 pheromone traps.

Figure 2. The pheromones Delta for monitoring of *Tuta absoluta*

3. Results and Discussion

In the climatic conditions of our low coastal area, tomato moth *Tuta absoluta* gives four generation as first cultivated tomatoes plants, and continues infecting the tomato as a secondary culture. Using of chemical pesticides until now resulted not effective, excepted Spinosad. The monitoring techniques, is a basic element to determine the correct timing for insecticide applications leading to a reduction and to implement mass capture.

The first generation appears in the 1st ten decades of March; it reaches the maximum at April 4, and finish at April 8. The second generation appears at the April 18; it reaches the maximum at May 9, and finish at May 14. The third generation appears at the May 23; it reaches the maximum at June 13, and finish at June 18. The fourth generation appears at the June 27; it reaches the maximum at July 18, and finish at July 25 (Figure 3).



	1-Mar	7-Mar	14-Mar	21-Mar	28-Mar	4-Apr	8-Apr	18-Apr	25-Apr	2-May	9-May	14-May	23-May	30-May	6-Jun	13-Jun	18-Jun	27-Jun	4-Jul	11-Jul	18-Jul	25-Jul
Pheromone -1 No. flies	0	2	4	7	9	13	3	7	4	3	7	2	7	6	16	23	17	5	11	14	29	3
Pheromone -2 No. flies	0	4	6	8	7	5	1	2	4	5	6	4	8	3	9	36	21	5	6	9	13	5
Total No.flies	0	6	10	15	16	18	4	9	8	8	13	6	15	9	25	59	38	10	17	23	42	8

Figure 3. The dynamics of *Tuta absoluta* during the year 2014 of the study

Conclusion

To undertake all measures to reduce pests' population while damaging tomato's culture, so to elaborate a strategy, overacting on different stages of pests' tendency, especially on sowing second season (summer-autumn), when tomato's multiplication moth reaches its highest level.

5. References

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