THE FLYING CURVE OF *TUTA ABSOLUTA* (MEYRICK, 1917) IN EXPERIMENTAL CONDITION DURING THE YEAR 2015 - 2016

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ABSTRACT

Greenhouse tomatoes in Albania generally available in the market with a production peak in the summer months around 600-800 kv/ha. Recently, certain disease and pest problems have inflicted heavy losses of tomato production. The tomato leaf miner, *Tuta absoluta* Meyrick, (Lepidoptera: Gelechiidae) is a serious pest of both outdoor and greenhouse tomatoes. The insect deposits egg usually on the underside of leaves stems and to a lesser extent on fruits and leaves on which they feed and develop creating mines and galleries. Using of proper and compatible methods is the best way to control this pest by reducing of pesticide using. In order to monitor the tomato moth *Tuta absoluta* in experimental area of 2 hectare, 4 pheromone traps were installed. The experimental scheme was divided into 4 variants with an area of 0.5 hectare. In this variant with a surface of 0.5 ha were placed 2 pheromone traps. The used method was the biotechnical one, monitored with pheromone traps. 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. The flies counting and their monitoring into pheromone were performed on regular weekly basis intervals. Based on our monitoring using pheromone traps *Tuta absoluta* gives four generation as first cultivated tomatoes plants, and continues infecting the tomato as a secondary culture. The monitoring technique is the basic element to determine the time of intervention and to implement mass capture technique. During the monitoring process results that the first infections starts early in March.

Keywords: Tomato, *Tuta absoluta*, pheromone, control.

INTRODUCTION

Tomato *Lycopersicon esculentum* Mill is a vegetable crop of large importance throughout the world. Tomatoes are grown both under plastic covered greenhouses and in open field [18]. Greenhouse tomatoes in Albania generally available in the market with a production peak in the summer months around 600-800 kv/ha. Recently, certain disease and pest problems have inflicted heavy losses of tomato production. The tomato leaf miner, *Tuta absoluta* Meyrick, (Lepidoptera: Gelechiidae) is a serious pest of both outdoor and greenhouse tomatoes [18]. The insect deposits egg usually on the underside of leaves stems and to a lesser extent on fruits and leaves on which they feed and develop creating mines and galleries. On leaves, larvae feed only on mesophyl leaving the epidermis intact [9]. Tomato plants may be attacked at only developmental stage, from seedlings to mature stage. Originating from South America, *Tuta absoluta* has been reported since the early 1980s from Argentina, Brazil and Bolivia [19]; the insect rapidly invaded many European and Mediterranean countries. It was

first recorded from eastern Spain in late 2006 [12], then Morocco, Algeria, France, Greece, Malta, Egypt and other countries [8, 10, 5].

The use of sexual pheromones as lures in monitoring traps is now widespread. Although they usually trap only males, they are particularly useful where large areas have to be surveyed. Monitoring serves four functions: detection of outbreaks, establishment of emergence times of adults insects, distribution mapping, and assessment of change in abundance. Pheromone monitoring systems can thus provide vital intelligence for the timing of insecticidal control measures. However, there are no known cases of control by trapping using female sexual pheromones alone. [1].

The basic components of a monitoring system are the attractant source, the trap design and where to place them [1]. Currently, different loadings of pheromone are suggested for monitoring *Tuta absoluta* populations: 0.5 mg in greenhouses for 4–6 weeks of longevity, 0.8 mg in open fields for 4–6 weeks of longevity and 3.0 mg in open fields in hot desert climates for a long lasting lure [3]. To monitor *Tuta absoluta*, pheromone lures are principally coupled with Delta traps [3, 7, 17]. The trap height must be adapted according to the growth stage of the plant, knowing that a higher proportion of moths are found in the upper parts of the canopy but never beyond 1 m high [3, 4, 11, 14]. Traps placed up to 60 cm high captured significantly more males than traps at higher heights, irrespective of the stage of plant growth (before planting, 20 cm high plants, or blooming plants). Therefore, it was suggested to deploy monitoring traps in a field at a height of 20 cm before planting and then move them up to 60 cm high as the plants grow [3, 6].

For monitoring *Tuta absoluta* populations in greenhouses, different trap densities have been proposed and different sources are not always in agreement. It is usually suggested to use 1 trap·ha -1 in greenhouses smaller than 2,500 m2 and 2–4 traps·ha -1 in greenhouses wider than 2,500 m2 [3, 13, 16, 14]. Russell IPM advised that a total of 4–5 traps·ha -1 should be deployed, with one trap near the entrance and 1–2 traps in the warmest part of the greenhouse [3, 17]. Laore (2010) suggested placing traps only in a central position in the greenhouse [3]. Finally, it is recommended to count the trap catches every week to follow the evolution of the insect population and change the traps every 4–6 weeks [3, 13, 16, 14].

METHODOLOGY

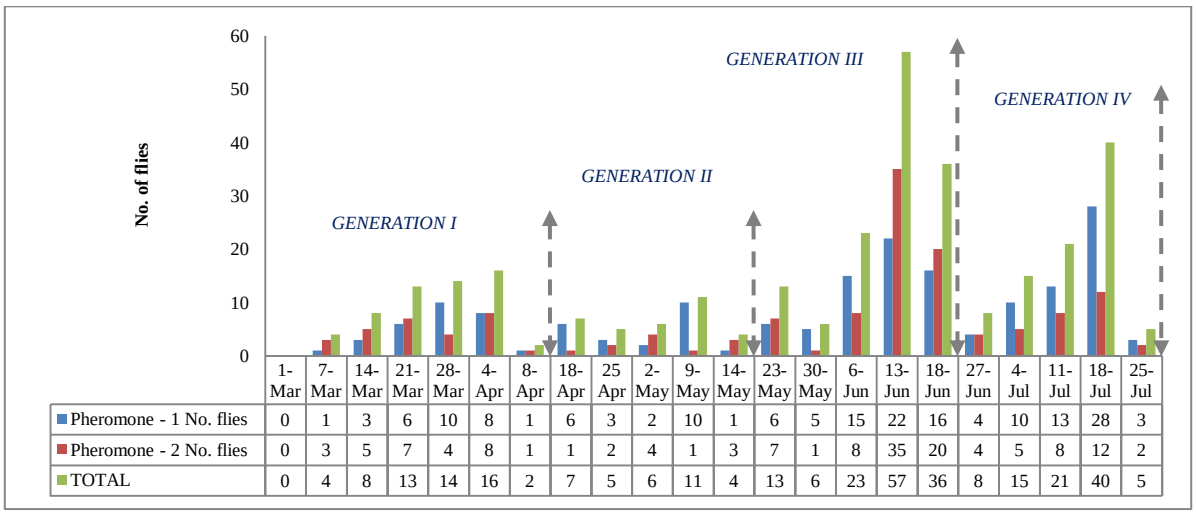
The experiment is carried out at the lower coastal area, at the Sukth`s greenhouses. It is performed in the first culture of the planted tomatoes in greenhouse, with surface of 2 ha covered with glasses. In order to monitor the tomato moth *Tuta absoluta* in experimental area, 4 pheromone traps were installed. The experimental scheme was divided into 4 variants with an area of 0.5 hectare. In this variant with a surface of 0.5 ha were placed 2 pheromone traps. The used method was the biotechnical one, monitored with pheromone traps. 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. The flies counting and their monitoring into pheromone were performed on regular weekly basis intervals. There are used pheromone lures couplet with Delta traps (0.5 mg E3Z8Z11-14Ac, 0.024 mg E3Z8-14Ac) Product Code PH-937-IRR) [17].

RESULTS AND DISCUSSION

In experiment condition, the data are generated through the monitoring of Delta type pheromone. During the monitoring of 4 pheromones placed in control variants, the evolution of dynamic population in our climatic condition are as following:

- 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 [2]. The first generation appears in the 1st ten decades of March, and finish at April 8. The second generation appears at the April 18, and finish at May 14. The third generation appears at the May 23, and finish at June 18. The fourth generation appears at the June 27, and finish at July 25 [2].

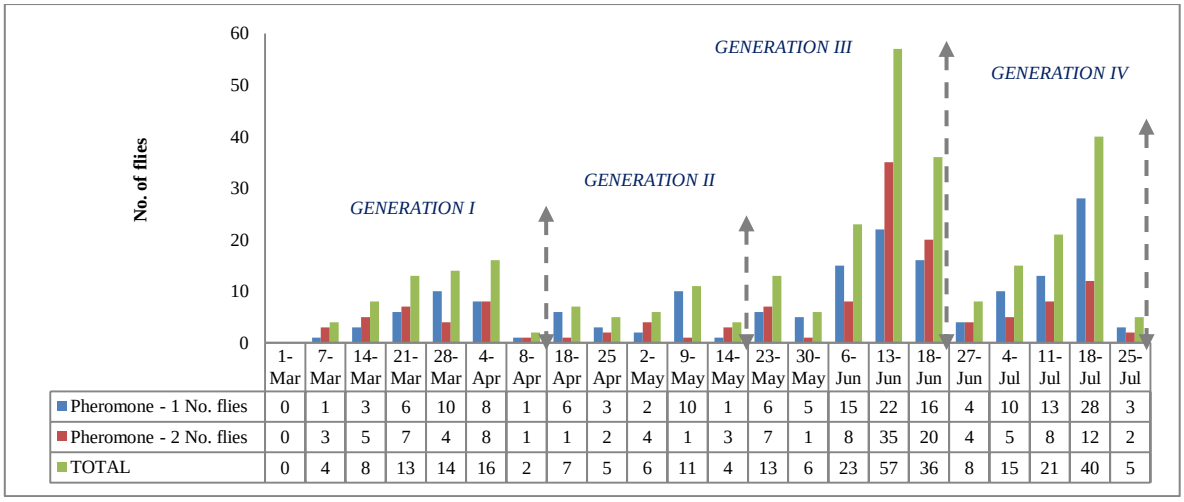
The biological evolution of tomato moth *Tuta absoluta* (Meyrick) based on regular intervals monitoring in the year 2015 result as following: (Table 1): In the 1st generation the number of flies reaches the maximum at April 4 with 16 flies and the minimum at April 8 with 2 flies. In the 2nd generation the number of flies reaches the maximum at May 9 with 11 flies and the minimum at May 14 with 4 flies. In the 3rd generation the number of flies reaches the maximum at June 13 with 57 flies and the minimum at May 30 with 6 flies. In the 4th generation the number of flies reaches the maximum at July 18 with 40 flies and the minimum at July 25 with 5 flies.



	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	1	3	6	10	8	1	6	3	2	10	1	6	5	15	22	16	4	10	13	28	3
Pheromone - 2 No. flies	0	3	5	7	4	8	1	1	2	4	1	3	7	1	8	35	20	4	5	8	12	2
TOTAL	0	4	8	13	14	16	2	7	5	6	11	4	13	6	23	57	36	8	15	21	40	5

Table 1. The biological evolution of tomato moth *Tuta absoluta* (Meyrick) based on regular intervals monitoring during year 2015

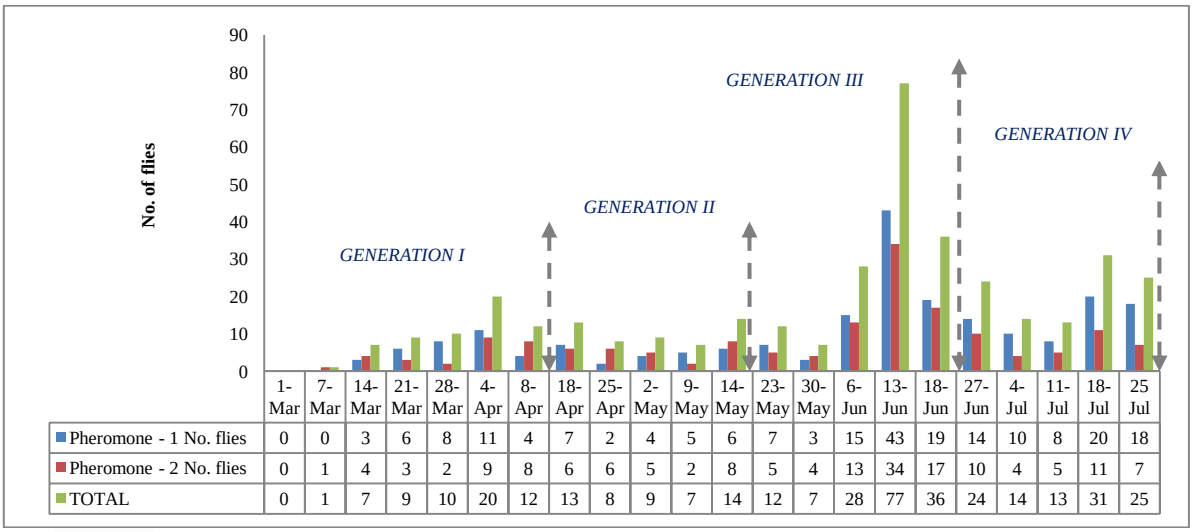
During year 2016 the biological evolution of tomato moth *Tuta absoluta* (Meyrick), result as following (Table 2): In the 1st generation the number of flies reaches the maximum at April 4 with 21 flies and the minimum at April 8 with 6 flies. In the 2nd generation the number of flies reaches the maximum at May 9 with 14 flies and the minimum at May 14 with 7 flies. In the 3rd generation the number of flies reaches the maximum at June 13 with 61 flies and the minimum at May 30 with 13 flies. In the 4th generation the number of flies reaches the maximum at July 18 with 44 flies and the minimum at July 25 with 9 flies.



	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	1	3	6	10	8	1	6	3	2	10	1	6	5	15	22	16	4	10	13	28	3
Pheromone - 2 No. flies	0	3	5	7	4	8	1	1	2	4	1	3	7	1	8	35	20	4	5	8	12	2
TOTAL	0	4	8	13	14	16	2	7	5	6	11	4	13	6	23	57	36	8	15	21	40	5

Table 2. The biological evolution of tomato moth *Tuta absoluta* (Meyrick) based on regular intervals monitoring during year 2016

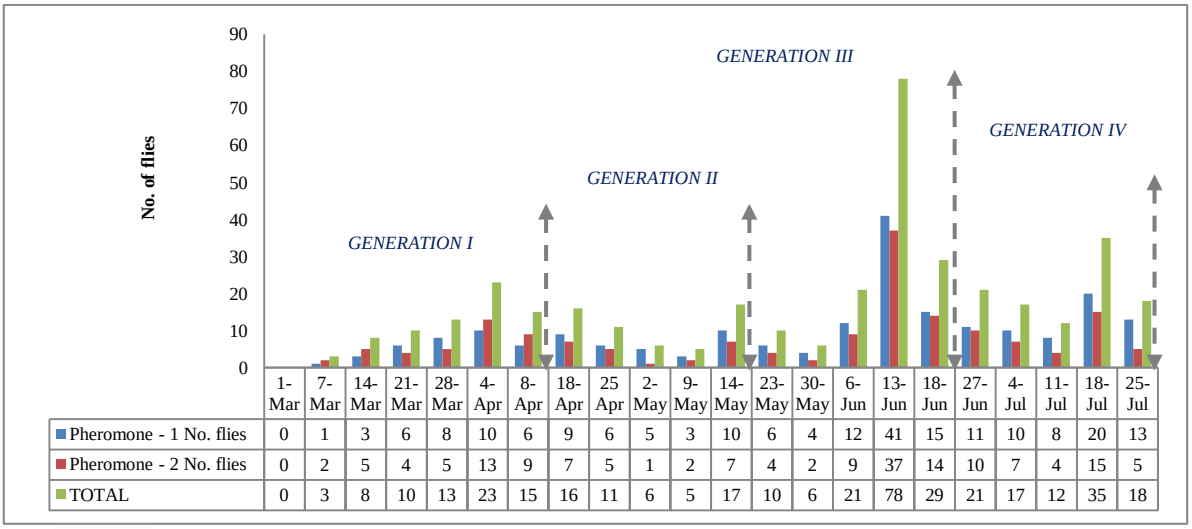
Based on the identification of adult insects *Tuta absoluta* (Meyrick) captured in the pheromones during year 2015, the evolution of dynamic population results as presented below (Table 3): In the 1st generation the number of butterflies reaches the maximum at April 4 with 20 flies and the minimum at March 7 with 1 fly. In the 2nd generation the number of flies reaches the maximum at May 14 with 14 flies and the minimum at April 25 with 8 flies. In the 3rd generation the number of flies reaches the maximum at June 13 with 77 flies and the minimum at May 30 with 7 flies. In the 4th generation the number of flies reaches the maximum at July 18 with 31 flies and the minimum at July 11 with 13 flies.



	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	0	3	6	8	11	4	7	2	4	5	6	7	3	15	43	19	14	10	8	20	18
Pheromone - 2 No. flies	0	1	4	3	2	9	8	6	6	5	2	8	5	4	13	34	17	10	4	5	11	7
TOTAL	0	1	7	9	10	20	12	13	8	9	7	14	12	7	28	77	36	24	14	13	31	25

Table 3. The identification of adult insects *Tuta absoluta* (Meyrick) captured in the pheromones during year 2015

The evolution of dynamic population during year 2016, based on the identification of adult insects *Tuta absoluta* (Meyrick), captured in the pheromones results as presented below (Table 4): In the 1st generation the number of flies reaches the maximum at April 4 with 23 flies and the minimum at March 7 with 3 flies. In the 2nd generation the number of flies reaches the maximum at May 14 with 17 flies and the minimum at May 9 with 5 flies. In the 3rd generation the number of flies reaches the maximum at June 13 with 78 flies and the minimum at May 30 with 6 flies. In the 4th generation the number of flies reaches the maximum at July 18 with 35 flies and the minimum at July 11 with 12 flies.



	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	1	3	6	8	10	6	9	6	5	3	10	6	4	12	41	15	11	10	8	20	13
Pheromone - 2 No. flies	0	2	5	4	5	13	9	7	5	1	2	7	4	2	9	37	14	10	7	4	15	5
TOTAL	0	3	8	10	13	23	15	16	11	6	5	17	10	6	21	78	29	21	17	12	35	18

Table 4. The identification of adult insects *Tuta absoluta* (Meyrick) captured in the pheromones during year 2016

CONCLUSIONS

During the experiment results that tomato moth *Tuta absoluta* gives four generation in the first cultivated tomatoes plants, and continues infecting the tomato in the secondary culture. The monitoring technique is the basic element to determine the time of intervention and to implement mass capture technique. During the monitoring process results that the first infections starts early in March.

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