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Damage caused by the South American pin worm, *Tuta absoluta* Meyrick (Lepidoptera: Gelechiidae) on tomato var. Saaho at Raipur, Chhattisgarh

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Abstract

Field experiments on Integrated Farming System, (IFS) were carried out at the Research cum Instructional Farm and Biocontrol laboratory, IGKV, Raipur, (C.G), for monitoring activity of the South American pin worm, *Tuta absoluta* in tomato var. Saaho. Daily catches of male moths of *T. absoluta* were recorded by using Wota T traps with lure and there by weekly collections were computed. Highest leaf infestation (1.60 broad mines/plant) was observed during 11th standard meteorological week (SMW), followed by (1.40 broad mines/plant) during 12th SMW. The average leaf infestation was 0.65 broad mines/plant. Data revealed that there was a non significant negative correlation ($r = -0.420$), ($r = -0.248$) between peak populations of *T. absoluta* with morning, and evening humidity respectively at 1% level of significance. The maximum temperature, minimum temperature evening relative humidity, rainfall and sunshine hour showed significant positive effect on the population build up of *T. absoluta*. Correlation of meteorological factors with adult *Tuta absoluta* population revealed that the population exhibited a highly significant positive correlation with maximum temperature and sunshine with their respective values of ($r = 0.649$), ($r = 0.674$) at 1% level of significant and negative but significant correlation with relative humidity ($r = -0.521$) However, these adults were non-significant and negatively correlated with minimum temperature, morning RH, rainfall (mm) ($r = 0.398$) ($r = 0.469$) ($r = -0.119$) at 5% level of significant respectively.

Keywords: IFS, *T. absoluta*, Wota T trap, SMW

Introduction

Tomato, (*Lycopersicon esculentum* Philip Miller) belongs to the genus *Lycopersicon* under the family Solanaceae. It is rich in vitamin A, C, potassium, minerals and fibres. India ranks second in the area as well as production of tomato next to China. Tomato production is expected to be 19.33 million tonnes, up 1.68 per cent in India, compared to 19.01 million tonnes in 2018-19. Total horticulture production in the country stood at 310.74 million tonnes in 2018-19, as per final estimates released by the ministry of agriculture and farmers welfare. This is marginally higher than the horticulture production in 2017-18. In Chhattisgarh, total production of tomato is 868.60 MT from an area of about 52.89 ha which accounts for about 4.98% of the total production of tomato in the country with a productivity of 16.42 MT/ha⁻¹, lower to the all India average of 21.99 MT/ha⁻¹. The major tomato producing districts of Chhattisgarh are Raipur, Durg, Bastar, Balod and Jashpur, with a total production of 11,33,435 MT from an area of about 64,681 Ha (2017-18).

Tomato production faces problems from several causes such as seasonal weather, temperature, humidity, diseases and insect pests. There are several insect species which feed on tomato such as thrips, whiteflies, fruit borer, leaf miner, leafhoppers, aphids, mites and mealybugs. Recently, the South American tomato borer, *T. absoluta* (Povolny) (Lepidoptera: Gelechiidae) has emerged as one of the most devastating pests of tomato crop in South America (European and Mediterranean Plant Protection Organization, 2010).

The tomato leaf miner, *T. absoluta* (Povolny), also known as South American tomato moth, tomato borer and South American tomato pinworm, is a neotropical oligophagous moth. As indicated in its local name, this important tomato pesto is native to South America. *T. absoluta* as a South American species was first described in 1917 by Meyrick under the name *Phthorimaea absoluta*. The currently accepted name of *T. absoluta* assigned by Povolny in 1994 following a number of earlier changes in nomenclature (Dandria and Catania, 2009) [3]. Since 1960s, this moth has become one of the key pests of tomato crops in South America (Tosevski *et al.*, 2011) [7].

Materials and Methods

In order to monitor the population of the South American tomato moth, *Tuta absoluta* on tomato, a single Wota T trap with lure was installed at each field, and the lure was changed after every 60 days as per the recommendation given on the pack. Daily catches of male moths of *T. absoluta* were recorded and there by weekly collections were computed.

Infestation of *T. absoluta* was recorded on leaves, buds, flowers and fruits by counting the number of mines on three leaves /5 randomly selected plants. In case of fruits, number of pin holes /5 fruit from five randomly selected plants were recorded. The correlation between the data on population fluctuation of *T. absoluta* on tomato, along with prevailing weather conditions were also computed.

Results and Discussion

1. On leaves of tomato var. Saaho

Periodical observations, on the incidence of *T. absoluta* in tomato crop, revealed that the symptoms in the form of infested broad mines on leaf (0.20) first appeared during the 49th SMW. Highest leaf infestation (1.60 mines/leaf) was observed during 11th SMW, followed by (1.40 mines/leaf) during 12th SMW. The average leaf infestation was 0.65mines/leaf.

2. On bud and flower of tomato var. Saaho

Bud infestation of 0.01mines/ bud was recorded during the 5th SMW and on flowers, an infestation of 0.01mines/flower was observed during the 10th SMW.

3. On fruits of tomato var. Saaho

Initial fruit infestation (0.10 pin holes/fruit) was recorded during 10th SMW which was highest and there by increased during the next three consecutive weeks to 0.23, 0.37 and then rising to 0.72 in the 13th SMW and reaching to another peak of 1.22 during the 15th SMW. The average maximum temperature of (32.44 °C), minimum temperature of (15.33

°C), morning (78.68%) and evening (29.26%) relative humidity, rain fall of (1.32 mm) and bright sunshine hours (5.92 hrs/day) was observed during the period of study. *T. absoluta* was active from nursery to harvesting stage of the crop.

Data on correlation with weather parameters revealed a non-significant negative correlation ($r = -0.420$), ($r = -0.248$) between peak populations of *T. absoluta* with morning, and evening humidity at 1% level of significance, while maximum temperature, minimum temperature, rainfall and sunshine hour showed positive significant effect on the population build-up of *T. absoluta*.

Table 1: Damage (per plant) due to South American pin worm, *Tuta absoluta* on tomato crop var. Saaho

Date of Observation	SMW	Damage on different plant parts of tomato				
		Leaves	Bud	Flower	Fruit	Total
06-12-22	49	0.20	0.00	0.00	0.00	0.20
13-12-22	50	0.20	0.00	0.00	0.00	0.20
20-12-22	51	0.40	0.00	0.00	0.00	0.40
27-12-22	52	0.30	0.00	0.00	0.00	0.30
03-01-23	1	0.20	0.00	0.00	0.00	0.20
10-01-23	2	0.10	0.00	0.00	0.00	0.10
17-01-23	3	0.10	0.00	0.00	0.00	0.10
24-01-23	4	0.30	0.00	0.00	0.00	0.30
31-01-23	5	0.50	0.01	0.00	0.00	0.60
07-02-23	6	0.70	0.00	0.00	0.00	0.70
14-02-23	7	0.90	0.00	0.00	0.00	0.90
21-02-23	8	1.00	0.00	0.00	0.00	1.00
28-02-23	9	1.30	0.00	0.00	0.00	1.30
07-03-23	10	1.40	0.00	0.01	0.1	1.60
14-03-23	11	1.60	0.00	0.00	0.23	1.83
21-03-23	12	1.40	0.00	0.00	0.37	1.77
28-03-23	13	0.70	0.00	0.00	0.72	1.42
04-04-23	14	0.60	0.00	0.00	0.46	1.06
11-04-23	15	0.40	0.00	0.00	1.22	1.62
	Mean	0.65	0.01	0	0.26	0.82

Table 2: Correlation of infestation due to *T. absoluta* on tomato var. Saaho along with weather parameters

Tomato	Max. temp. (°C)	Min. temp. (°C)	Morning RH%	Evening RH%	Total Rainfall (mm)	Sunshine (Hours)
<i>T. absoluta</i>	0.656**	0.597**	-0.420NS	-0.248NS	0.488*	0.520*

*: Significant (5%)

** : Highly significant (1%)

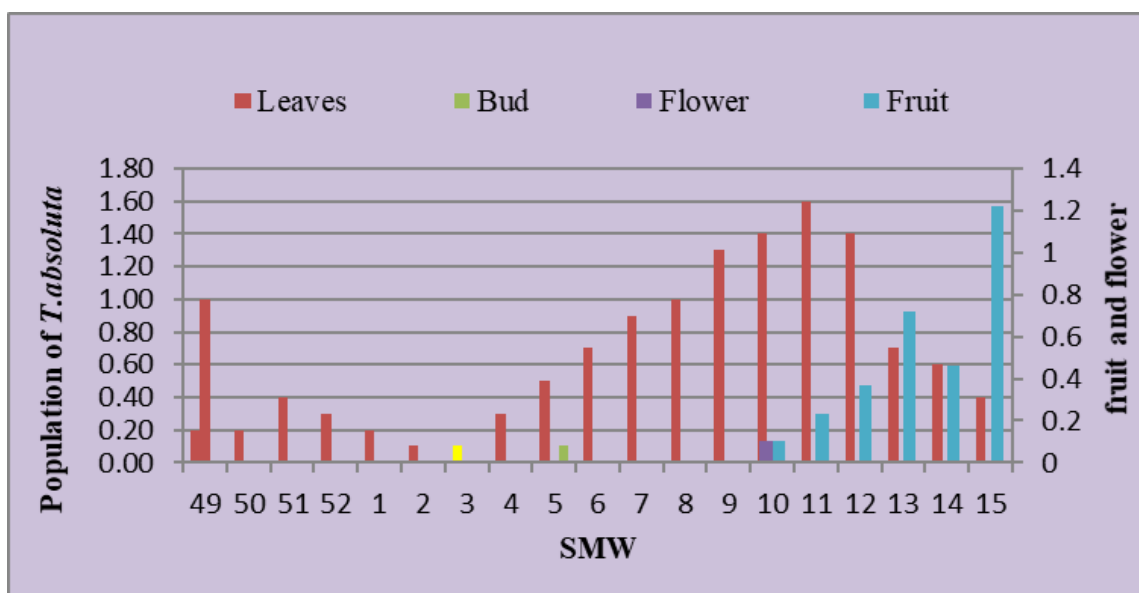


Fig 1: Damage of *T. absoluta* on different plant parts of tomato crop var. Saaho

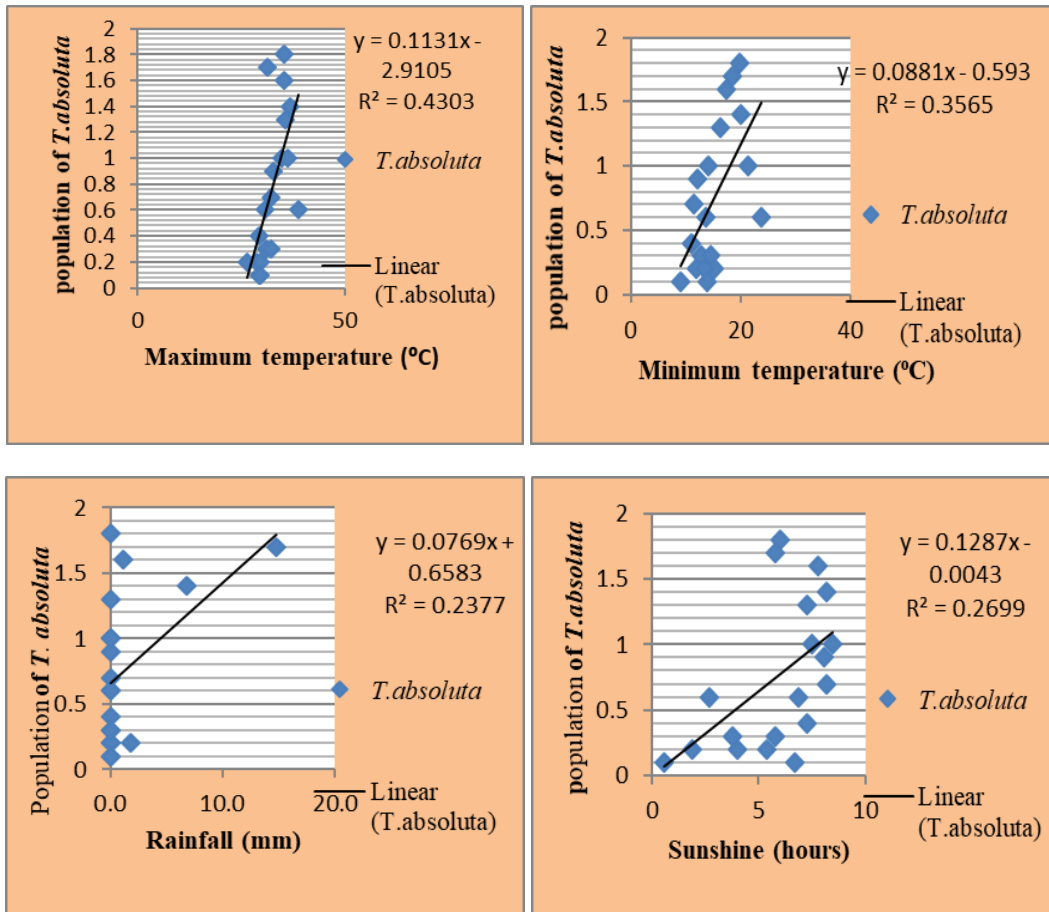


Fig 2: Regression on incidence of *T. absoluta* and weather parameters on tomato crop var. Saaho

Correlation of adult moth *T. absoluta* population on tomato var. Saaho with weather parameters

Observations were recorded from 1st SMW and Maximum adult moth (17.0) were trapped during the 10th SMW. Correlation of meteorological factors with adult *Tuta absoluta* population revealed that the population exhibited a highly significant positive correlation with maximum temperature

and sunshine with their respective values of ($r = 0.649$), ($r = 0.674$) at 1% level of significant and negative but significant correlation with relative humidity($r = -0.521$) However, these adults were non-significant and negatively correlated with minimum temperature, morning RH, rainfall(mm) ($r = 0.398$) ($r = -0.469$) ($r = -0.119$) at 5% level of significant respectively.

Table 4: Correlation of population of adult moth *T. absoluta* on tomato var. Saaho along with weather parameters

Tomato	Max. Temp. (°C)	Min. temp.(°C)	Morning RH %	Evening RH%	Total Rainfall (mm)	Sun shine (hours)
<i>T. absoluta</i>	0.649**	0.398NS	-0.469NS	-0.521*	0.119NS	0.674**

Table 3: Adult moth *T. absoluta* population trapped in Wota T trap along with weather parameters

Date of Observation	SMW	Max. Temp. (°C)	Min. temp. (°C)	Morning RH %	Evening RH%	Total Rainfall (mm)	Sun shine (hours)	<i>T. absoluta</i> moth trap week
03-01-23	1	26.4	13.4	82	50	1.8	1.9	0.0
10-01-23	2	29.3	9.2	91	31	0.0	6.7	1
17-01-23	3	29.6	14	84	41	0.0	0.6	1.3
24-01-23	4	32.1	14.6	86	33	0.0	3.8	1.7
31-01-23	5	30.7	13.7	80	24	0.0	2.7	3.3
07-02-23	6	32.2	11.5	83	20	0.0	8.2	7
14-02-23	7	32.7	12.2	79	17	0.0	8.1	9.7
21-02-23	8	34.9	14.2	82	22	0.0	8.5	10.0
28-02-23	9	35.7	16.4	73	20	0.0	7.3	12.3
07-03-23	10	35.4	17.4	74	24	1.2	7.8	17.0
14-03-23	11	35.2	19.9	69	31	0.0	6	12.7
21-03-23	12	31.4	18.6	85	39	14.8	5.8	9.0
28-03-23	13	36.8	20.1	76	34	6.8	8.2	8
04-04-23	14	36.3	21.3	68	28	0.0	7.5	7.7
11-04-23	15	38.9	23.7	60	21	0.0	6.9	5.7
	Mean							7.1

*: Significant (5%)

** : Highly significant (1%)

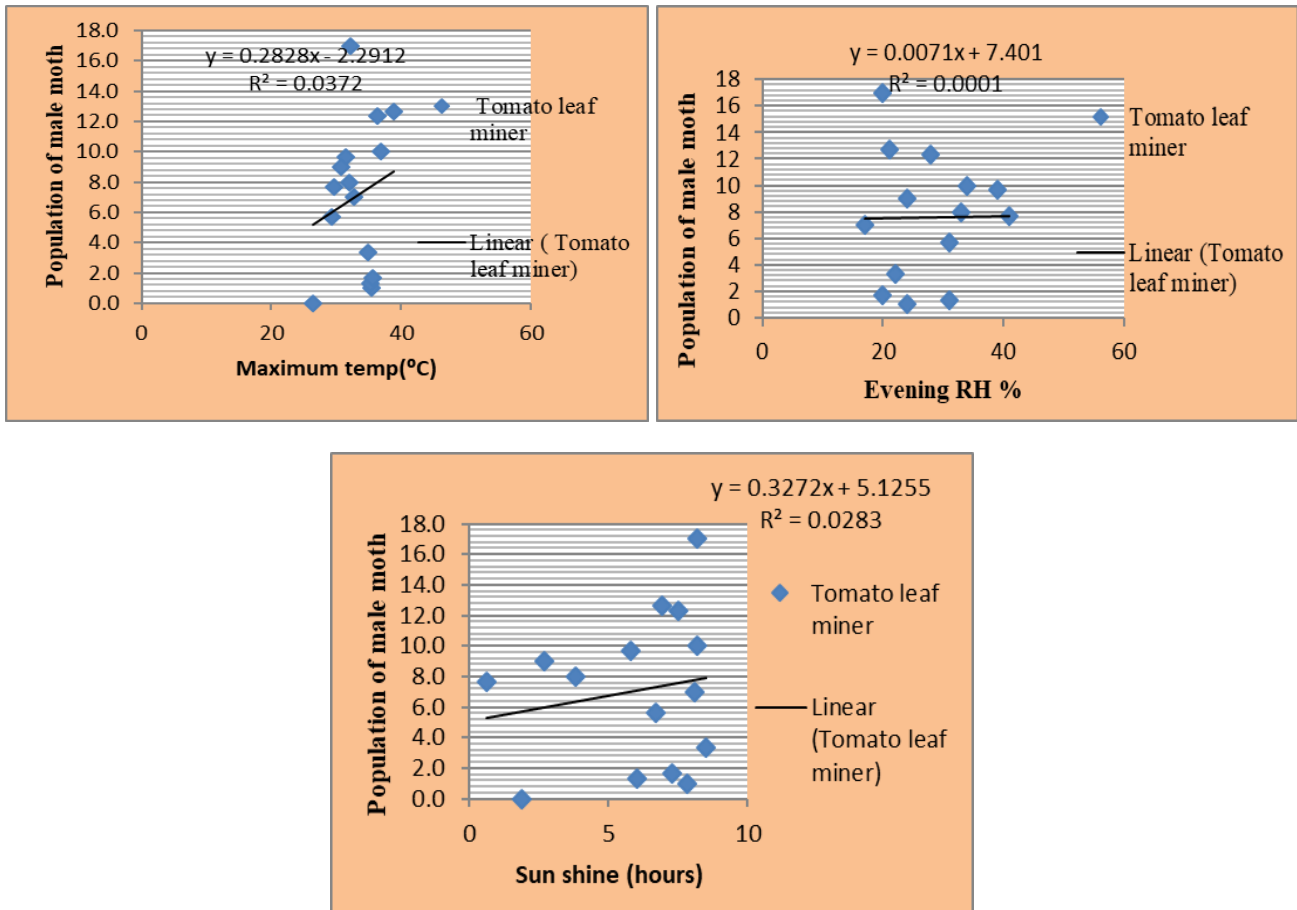


Fig 3: Regression graph on population of male moth *Tuta absoluta* with weather parameter



Fig 4: Installation of Wota T lure trap for trapping adult moths of *T. absoluta* on tomato crop var. Saaho



Fig 5: Damage caused by *Tuta absoluta* on leaves and fruit of tomato crop



Fig 6: Adults moths of *T. absoluta*

Conclusion

Monitoring of the South American tomato moth, *Tuta absoluta* on tomato crop by using Wota T trap indicated that the highest moth population was observed on tomato crop during the second week of February. Highest leaf infestation (1.60 broad mines /plant) was observed during 11th SMW, followed by (1.40 broad mines /plant) during 12th SMW. The average leaf infestation was 0.65 broad mines /plant followed by 1.22 broad mines with pin holes /fruits per plant was observed during 15th SMW. *T. absoluta* commenced from 1st meteorological week (0.7 adults/trap/week) and continued up to 15th meteorological week during the year and highest male moth population (17.0) trapped during the 10th SMW.

References

1. Kumari AD. *Tuta absoluta*, tomato leaf miner moth or South America tomato moth. Journal of Entomology. 2014;6(2):60-63.
2. Kumari AD, Anitha G, Anitha V, Lakshmi BKM, S VRao, NHP. New record of leaf miner, *Tuta absoluta* (Meyrick) in tomato in India Insect Environment. 2015;20(4):136-138.
3. Dandria D, Catania A. *Tuta absoluta* (Povolny, 1994). An important agricultural pest in Malta (Lepidoptera: Gelechiidae). Bulletin of the Entomological Society of Malta. 2009;2:57-60.
4. Ettaib R, Belkadhi MS, Belgacem AB, Aoun F,

- Verheggen F, Megido RC. Effectiveness of pheromone traps against *Tuta absoluta*. Journal of Entomology and Zoology Studies; c2016.
5. Saikia DK, Borkakati RN. Efficacy of Bio intensive Pest Management module against Major Insect Pests of Tomato, Assam Agriculture University, Jorhat, Assam, India. c2018. p. 989-9880.
 6. Taram SK. Population Dynamics, extent of damage and estimation of losses caused by the invasive South American Tomato moth, *Tuta absoluta* (Povolny), (Lepidoptera: Gelechiidae) on solanaceous crops with special reference to tomato (M.Sc dissertation, Thesis submitted to Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, c2016, 99).
 7. Ivo T, Jovic J, Mitrovic M, Cvrkovic T, Krstic O, Krnjajic S. *Tuta absoluta* (Meyrick, 1917) (Lepidoptera, Gelechiidae): A new pest of tomato in Serbia. Pestic. Phytomed. (Belgrade). 2011;26(3):197-204.
 8. Verma A, Jain BC, Sharma S, Sai YK. Cost of Cultivation of Tomato Crop in Durg District of Chhattisgarh, India. International Journal of Current Microbiology and Applied Sciences. 2020;6:3406-3403.