



MORPHOMETRICS OF TOMATO PIN WORM *TUTA ABSOLUTA* MEYRICK ON DIFFERENT HOST PLANTS

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ABSTRACT

The morphometrics of the *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) reared on tomato, potato and brinjal were analysed at the Insectary, Department of Entomology, S V Agricultural College, Tirupati. The results showed that the mean length and width of egg, I, II, III and IV instar larvae, pupa and adult was maximum when reared on tomato. The mean width head capsule of all instars was also more. These findings clearly indicated the preference of *T. absoluta* for tomato compared to potato and brinjal.

Key words: *Tuta absoluta*, morphometrics, tomato, potato, brinjal, egg, larval instars, pupa, adult, length, width, host effects, favourable host

The tomato leaf miner *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) is one of the most serious pests of tomato. It also attacks other cultivated solanaceous plants such as brinjal, potato, pepper, and tobacco (Campos et al., 2009; Pereyra and Sanchez, 2006), solanaceous weeds (Larrain, 1986) and garden bean (*Phaseolus vulgaris* L.). It is a native pest of South America but has spread to Africa, Asia and Central America. Since its introduction to Spain in 2006, it has invaded most of the countries in Europe, Mediterranean, Middle East, northern, western and eastern Africa and India in South Asia (Ghazwan et al., 2017). In these countries, it causes 80-100% crop loss. In India, the pest was first reported in Pune, Maharashtra in 2014. It attacks the crop from seedling to harvesting stage. It feeds on leaves, stems, buds, young fruits and reduces the quality of fruits by invading secondary pathogens. In severe cases, it inflicts 50-100% yield loss in both greenhouse and field conditions (Shashank et al., 2015). The pest can produce between 10 and 12 generations a year, and each female can lay 250-300 eggs in her lifetime. There are four larval instars; the first two instars mine the leaves by feeding on the mesophyll and leaving the epidermis intact, thus creating tunnels on the leaf commonly known as “mines”. These mines reduce the photosynthetic surface of the leaves and result in early drying and eventual death of the plant. Later the third and fourth instar larvae leave the mines and bore into stalks, apical buds and fruits. Pupation takes place in the mines, in dried leaves or in soil. Adults are nocturnal and hide between leaves during the day time. Their activity is concentrated in the early

hours of morning and late evening. Adults are silvery grey with black spots on the forewings and a wingspan reaching 10 mm. Adult longevity varies from 10-15 days in females and 6-7 days in males (Shiberu and Getu, 2017; Daniel and Srivastava, 2017). Since, it is a new introduced pest of tomato and other solanaceous crops, the information on morphometrics of this pest is lacking. Hence, in this study, the morphometrics of *T. absoluta* was studied under laboratory conditions rearing it on different hosts.

MATERIALS AND METHODS

Morphometrics of *T. absoluta* were studied on tomato, potato and brinjal using stereozoom microscope with Dewinter Calipers Pro Version 4.6 software under laboratory conditions (25± 2°C, 75± 2%RH) at the Department of Entomology, S V Agricultural College, Tirupati. The initial culture of *T. absoluta* was collected from infested fields of tomato and transferred to plastic jars containing tomato leaves as a food source. The fresh and healthy tomato leaves were provided to the developing larvae as and when required till the larvae moult into pupa. The pupae were collected and transferred to oviposition cages (30x 30x 30 cm) and the newly emerged adults were provided with 10% honey solution containing vitamin E as a food source. Equal number of males and females were confined to the oviposition cages provided with tomato seedlings as an oviposition substrate.

The eggs laid by adults on tomato seedlings were collected daily and kept for egg hatching. After hatching,

fresh tomato leaves were provided for newly emerged neonate larvae until pupation. Pupae were collected and transferred to adult rearing cages provided with adult food. This process was repeated continuously and the culture was maintained under laboratory conditions throughout the experiment for further studies. Similarly, the culture was also maintained in nethouse, on tomato, potato and brinjal seedlings in plastic pots. Seed potatoes with eyes were brought from local market at Tirupati, washed and placed in dark condition in wet gunny bags for four to five days to induce sprouting. Later, these sprouted potatoes were maintained in plastic pots and transferred to rearing cage for further studies. Tomato, potato and brinjal plants were grown singly in plastic pots. The host plants with four to five leaves stage were placed in rearing cages. In each cage, one pair (male and female) of *T. absoluta* were released for oviposition. The width of head capsule of larval instars; length and width of egg, larva, pupa and adult stages were recorded. On daily basis, cotton dipped in 10% honey solution was provided for adult moths. The experiments were repeated for three generations and morphometric observations made on tomato, potato and brinjal plants. The data were analysed adopting completely randomised design (CRD) and in OPSTAT software.

RESULTS AND DISCUSSION

The morphometrics of the *T. absoluta* on tomato,

potato and brinjal indicated that the mean egg length was 0.47, 0.46 and 0.42 mm with width of 0.26, 0.26 and 0.23 mm, respectively (Table 1). The result of present study are comparable with those of Desneux et al. (2010). Similarly, the mean length and width of I, II, III and IV instar larvae was 1.53, 1.34, 1.25 mm and 0.18, 0.17, 0.15 mm; 2.63, 2.51, 2.37 mm and 0.38, 0.35, 0.33 mm; 4.16, 3.83, 3.52 mm and 0.65, 0.56, 0.56 mm; 7.52, 6.82, 6.41 mm and 1.11, 1.01, 0.93 mm, respectively. The mean length and width of pupa was 4.51, 4.42, 4.22 mm and 1.27, 1.23, 1.21 mm, respectively (Table 1). These results agree with those of Nayana and Kalleshwaraswamy (2015) on pupal length and width on tomato. The mean length and width of adult was 10.15, 9.93, 9.05 mm and 1.79, 1.74, 1.71 mm on tomato, potato and brinjal. The mean width of head capsule of I, II, III and IV instar larvae on tomato, potato and brinjal was 0.17, 0.14 and 0.11 mm; 0.27, 0.25 and 0.22 mm; 0.41, 0.36 and 0.35 mm and 0.72, 0.65 and 0.64 mm, respectively (Table 1). These results corroborate with those of Erdogan and Babaroglu (2014) on the width of the head capsule of larval instars.

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Table 1. Morphometrics of larval stages of *T. absoluta* on tomato, potato and brinjal

| Host | Head capsule width (mm) | | | | | | |
|----------|-------------------------|-----------|------------|------------|-----------|-------|-------|
| | I instar | II instar | III instar | IV instar | | | |
| Tomato | 0.17 | 0.27 | 0.418 | 0.72 | | | |
| Potato | 0.14 | 0.25 | 0.36 | 0.65 | | | |
| Brinjal | 0.11 | 0.22 | 0.35 | 0.64 | | | |
| CD@0.01% | 0.013 | 0.015 | 0.035 | 0.035 | | | |
| SE(m) | 0.004 | 0.005 | 0.011 | 0.011 | | | |
| | Length (mm) | | | | | | |
| | Egg | I instar | II instar | III instar | IV instar | Pupa | Adult |
| Tomato | 0.47 | 1.53 | 2.63 | 4.16 | 7.52 | 4.518 | 10.15 |
| Potato | 0.46 | 1.34 | 2.51 | 3.83 | 6.82 | 4.428 | 9.93 |
| Brinjal | 0.42 | 1.25 | 2.37 | 3.52 | 6.41 | 4.22 | 9.05 |
| CD@0.01% | 0.014 | 0.024 | 0.017 | 0.02 | 0.101 | 0.019 | 0.026 |
| SE(m) | 0.005 | 0.008 | 0.005 | 0.006 | 0.032 | 0.006 | 0.008 |
| | Width (mm) | | | | | | |
| | Egg | I instar | II instar | III instar | IV instar | Pupa | Adult |
| Tomato | 0.26 | 0.18 | 0.38 | 0.65 | 1.11 | 1.27 | 1.79 |
| Potato | 0.26 | 0.17 | 0.35 | 0.56 | 1.01 | 1.23 | 1.74 |
| Brinjal | 0.23 | 0.15 | 0.33 | 0.56 | 0.93 | 1.21 | 1.71 |
| CD@0.01% | 0.018 | 0.012 | 0.013 | 0.015 | 0.012 | 0.014 | 0.017 |
| SE(m) | 0.006 | 0.004 | 0.004 | 0.005 | 0.004 | 0.004 | 0.005 |

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