Research Article

Morphological Aspects of a New Emerging Leaf Eating Caterpillar, *Trilocha varians* on *Ficus benjamina* in Pakistan

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Abstract | The morphological study of *Trilocha varians* was carried out under laboratory conditions at MNS-University of Agriculture, Multan on *Ficus benjamina*. All stages from eggs to adult were recorded and observed. The complete metamorphosis like egg, larva, pupa and adult was found in *T. varians*. The female laid eggs in 2 to 6 layers. The diameter of egg was 0.60 to 0.70mm. There are five larval instars of *T. varians*. The head length of 1st, 2nd, 3rd, 4th, and 5th instars was 0.30±0.05, 0.35±0.07, 0.93±0.08, 1.67±0.40, 2.09±0.09mm, respectively, while width of 1st to 5th larval instar was 0.28±0.02, 0.38±0.05, 0.89±0.06, 1.56±0.30, 2.00±0.07mm, respectively. The average body length of first, second, third, fourth, and fifth larval instar was 2.05±0.45, 4.01±0.50, 8.60±1.45, 14.17±3.01, and 23.01 ±4.99mm, respectively. A caudal horn is present on the dorsal side of the 8th abdominal part on each eruciform larva. The average length and width of male cocoon was 9.90 ± 1.00 and 4.74 ± 0.52 mm, respectively. The length of wingspan of male and female was 17.44 ± 1.56, 5.66 ± 0.49 mm, respectively, while body length of male and female was 8.84 ± 0.90mm, respectively.

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1. Introduction

Weeping fig (*Ficus benjamina*) is considered an important perennial plant with 10-20 meters height (Chuenban *et al.*, 2017). The *Ficus* spp. like *F. benjamina* has some medicinal value (Sirisha *et al.*, 2010; Lansky *et al.*, 2008), cultivated as ornamental plant and for landscaping purposes alongside the roads in several regions especially Pakistan (Ramzan *et al.*, 2019a). The plants can grow well at any either high or low temperature. To improve the aesthetic value, plants are trim and converted into the numerous

shapes in various regions especially in Pakistan. It has been reported that *Ficus* plants attacked by whitefly and mealybug (Walton and Pringle, 2004; Avery *et al*., 2011). Among them, *Trilocha varians* is the most dangerous pest of ornamental plants in several countries like the Philippines, Pakistan and India (Navasero *et al*., 2013; Kedar *et al*., 2014; Singh and Brar, 2016; Ramzan *et al*., 2023) and caused 100% defoliation (Kedar *et al*., 2014; Basari *et al*., 2019), has negative impact on the aesthetic value of the country (Zolotuhin and Witt, 2009; Daimon *et al*., 2012; Navasero *et al*., 2013).

During the current study has been observed that the *Ficus* spp. especially *F. benjamina* which planted alongside the roads as ornamental plants for increasing the aesthetic value of country infested by leaf eating larvae. Mostly plants have been dried due to severe attacked of a moth, have negative impact on the country, Pakistan which identified as *T. varians* (Ramzan *et al*., 2020). It is needed to check the morphological parameters of all stages of this pests on *F. benjamina,* so the current study conducted.

2. Materials and Methods

2.1 Study site

The experimental study was carried out at MNS-University of Agriculture, Multan Pakistan. The country located at Latitude 30.2°N, Longitude 71.4°E and 123-meter-high above sea level.

2.2 Collection and rearing

The eggs, larvae and pupae were collected from different sites of study area and reared them in growth chamber. The procedure of Ramzan *et al*. (2019a) was followed for the rearing. Each specimen like larvae, pupa and eggs were separately placed in different plastic jars. The new fleshy leaves of *F. Banjamina* were supplied to larvae. After emergence of new moths from pupae, a pair of both male and female was placed into new plastic jar to check the mating behavior and eggs collection. The time of mating period was recorded and after mating, presence of eggs also recorded in each jar. The eggs were collected and place into new boxes for hatching. After hatching each larva was transferred into petri dishes. For this purpose, about 30 petri dishes were used, one larva was placed in each Petri dish and after one day the diet change and new fleshy leaves were placed into Petri dishes until they reached into pupal stage. All morphological aspects were recorded in this study.

3. Results and Discussion

Leaf eating caterpillar, *T. varians* is new emerged insect pest in Pakistan. The pests mostly found on the *F. benjamina* from the month of May-December (Singh and Brar, 2016). The complete metamorphosis (egg, larva, pupa and adult) was recorded in *T. varians*. The yellow in colour, while round, flat and cake shape eggs laid by female on the dorsal and ventral surface of leaves into cluster or layers. A female in her whole life period laid about 215±33.85 eggs in 2 to 6 layers on the surface of boxes as well as dorsal side of the leaves. The incubation period was lasted for 4 to 8 days on *F. benjamina* which may take long time on other hosts. Before hatching, eggs converted into dark colour.

About 0.91±0.03 mm and 0.92±0.50 mm was the average width and thickness of egg, respectively. The similar statement about eggs was recorded by (Daimon *et al*., 2012). The egg and larva last for 4-8 days and 11-15 days, while pupa and adult stage lasts for 3-17 and 5-16 days. The similar findings were reported by (Jia and Jinxin, 1997).

There were five instars of this pest. The colour of head, thorax and abdomen of newly emerge larvae was dark brown, which is similar to the observation of (Singh and Brar, 2016). The average body length of

Table 1: Head capsule length and width, body length of different instar larva of *T. varians*.

Larval instar	n	Head capsule length (mm)		Head capsule width (mm)		Body length	
		Mean ± SE	Range	Mean ± SE	Range	Mean ± SE	Range
1	30	0.30±0.05	0.22-0.29	0.28±0.02	0.24-0.30	2.05±0.45	1.20-2.40
2	30	0.35±0.07	0.37-0.61	0.38±0.05	0.38-0.60	4.01±0.50	2.00-4.00
3	30	0.93±0.08	0.77-1.20	0.89±0.06	0.82-1.20	8.60±1.45	5.50-10.00
4	30	1.67±0.40	1.42-1.70	1.56±0.30	1.51-1.70	14.17±3.01	10.00-15.00
5	30	2.09±0.09	2.00-2.21	2.00±0.07	2.00-2.20	23.01±4.99	12.00-27.00

first, second, third, fourth, and fifth larval instar was 2.05±0.45, 4.01±0.50, 8.60±1.45, 14.17±3.01, and 23.01 ±4.99mm, respectively.

The head length of 1st, 2nd, 3th, 4th, and 5th instars was 0.30±0.05, 0.35±0.07, 0.93±0.08, 1.67±0.40, 2.09±0.09mm, respectively, while width of 1st to 5th larval instar was 0.28±0.02, 0.38±0.05, 0.89±0.06, 1.56±0.30, 2.00±0.07mm, respectively (Table 1).

The colour of first to fourth larval instars is brown and then after 24 hours change into greyish white, which is similar to the findings of another researcher (Daimon *et al.*, 2012). The long caudal horn was present on the dorsal side of each larva, which is similar to other researcher findings as mentioned above.

Table 2: Length, width of male and female cocoon of *T. varians*.

	Male cocoon		Female cocoon	
	Mean±SE	Range	Mean±SE	Range
Length	9.90±1.00	7.50-12.00	11.60±0.85	9.50-13.00
Width	4.74±0.52	3.50-5.50	5.56±0.63	4.50-6.50

Table 3: Description of male and female pupa and longevity of male and female adult.

	Male Pupa		Female Pupa	
	Mean±SE	Range	Mean±SE	Range
Length	7.91±0.65	6.50-9.00	9.90±1.00	8.00-11.00
Width	2.87±0.17	2.50-3.20	11.60±0.85	3.10-4.00
Longevity				
Male (days)	5.5±1.169	4-7 days		
Female (days)	10.3±1.692	6-12 days		

The length of male pupa is less than female pupal length. The average length and width of male and female cocoon is given Table 2, while description of pupa is given in Table 3. The colour of cocoon is whitish yellow and pupation occur in boat shaped silky cocoon. The larvae spun into leaves and make cocoon. Our findings are similar to (Rajavel and Shanthi, 2007). The sex difference between male and female was observed under pupation on the presence and absence of suture present on the lateral side of pupa. The suture was present in female pupa while absent in male and larval stages. Our findings are similar with (Navesro and Navasero, 2014; Daimon *et al.*, 2012; Ramzan *et al.*, 2019b).

The forewings and hind wings of adults were recorded pale reddish brown and greyish brown, respectively. The length of male and female wingspan was 17.44 ± 1.56, 5.66 ± 0.49 mm, respectively, while body length of male and female was 8.84 ± 0.90mm, respectively. The length of male and female forewing and hind wing is given in Table 4. During the current study has been observed that female life period is long as compared to male. The same results have been reported by (Singh and Brar, 2016; Ramzan *et al.*, 2021). It has been reported that climatic factors affect the morphology and biological aspects of insect pests, especially *T. varians* (Daimon *et al.*, 2012; Lu *et al.*, 2016; Sibly et al., 2016; Navasero and Navasero, 2014). It should be managed by using different strategies like monitoring and installing different traps (Murtaza *et al.*, 2019).

Conclusions

This is serious pest of fig. this pest has complete metamorphosis. The larval stage is most damaging stage of the pest.

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Table 4: Dimensions (mm) of adult males and female.

	Body length	Antennal length	Forewing		Hind wing	
			Length	Width	Length	Width
Male						
Mean±SE	8.84±0.90	3.17 ± 0.44	8.06 ± 0.77	17.44 ± 1.56	7.14 ± 0.59	4.80 ± 0.64
Range	7.50-10.50	2.50-3.56	8.00-11.0	13.0-20.0	6.50-8.00	3.20-5.59
Female						
Mean±SE	10.01±0.70	2.62 ± 0.33	10.48± 0.87	5.66 ± 0.49	8.57± 0.71	5.64± 0.57
Range	8.00-10.00	2.50-3.20	10.00-11.50	4.50-6.50	8.00-9.50	4.00- 6.40

Novelty Statement

This is the most dangerous pest of ornamental plants in the several countries of the globe. This is first morphological study which conducted on this pest. The current study results will be proved fruitful for further researchers and help in management of this pest.

Author's Contribution

MR conducted the study and write the manuscript. UNU and SS planned the study, while all other authors critically reviewed this manuscript.

Conflict of interest

The authors have declared no conflict of interest.

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