

## DEVELOPMENTAL PARAMETERS OF *TRILOCHAVARIANS* (LEPIDOPTERA: BOMBYCIDAE); A PEST OF WEEPING FIG, *FICUSBENJAMINA* IN PAKISTAN

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**ABSTRACT:** The developmental parameters of *Trilochavarians* were studied on weeping fig, *Ficusbenjamina* at  $26^{\circ}\text{C} \pm 1.0$  temperature and  $65\pm 5\%$  relative humidity. The study showed that female laid 160-270 eggs in 2-6 layers on the dorsal side of the leaves. Some unmated female also laid 15-183 eggs in groups which never developed into larvae. 24 hours prior to hatching, the eggs turned black. Egg incubation period was  $3.46\pm 1.22$  days on *F. benjamina*. The high fecundity increased the survival rate of *T. varians*. There were five larval instars which recorded in this study period. Last two instars caused more damage due to resemblance to hosts parts such as bark. There was a short, fleshy horn on the ninth abdominal segment. The developmental time of first, second, third, fourth and fifth larval instars was  $2.44\pm 0.82$ ,  $3.56\pm 0.53$ ,  $3.72\pm 0.26$ ,  $4.54\pm 0.79$  and  $6.20\pm 0.78$  days, respectively. Boat shaped and yellow silken pupation was usually observed. The male and female mean longevity was  $6.0 \pm 1.17$  and  $11.4 \pm 1.70$  days. The dorsal side of the female forewings had pale reddish brown lines. The thorax, head, and abdomen of the female had darker reddish brown coloring than those of the male. Adult hind wings had reddish brown outer edges and were grayish in color. The average lifespan for male and female was  $6.23\pm 2.09$  and  $10.01\pm 0.99$  days, respectively. The current paper will lead to proper management practices for this pest.

**Keywords:** *Trilochavarians*; Lepidoptera; Weeping fig; Fig; Emerging pests; Pakistan.

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## INTRODUCTION

The family Moraceae includes the genus *Ficus*, generally referred to as figs. It includes a significant group of trees with outstanding therapeutic properties, some of which are grown for landscaping. It is a perennial plant that grows to a height of 10 to 20 meters. It has solitary, alternately arranged leaves. There are different species of *Ficus* in the globe, some of which have been cultivated for trade. Weeping fig, or *Ficusbenjamina*, is an ornamental shrub of the Moraceae family.

Tropical and subtropical regions of the world are where it is grown. It is used medicinally to treat allergies and numerous other illnesses. Plants are said to have anti-fungal and anti-tumor effects. It is also used to clean up

pollution and harmful chemicals like formaldehyde and carbon monoxide. A significant pest that causes the defoliation of weeping, *Ficusbenjamina* is *Trilochavarians*. The spread of *T. varians* is widespread throughout South and Southeast Asia. There have been reports of it happening in several nations. The larvae are important pests on ornamental and roadside *Ficus* trees, including *F. benjamina* and *F. microcarpa* (Rosales: Moraceae). The plant's sensitive tips, twigs, and leaves are harmed by the early instar larvae, which also cause the leaves to become transparent. The trees are entirely stripped of their leaves by the late instars, and the gardens' aesthetic value is diminished.

There is need to control this pest on ornamental plants like *F. benjamina* in the country (Pakistan), but before management the biology and morphology of pest

should be determined. By keeping the importance of the study, the current research was conducted.

## MATERIALS AND METHODS

The current study was conducted under laboratory conditions to determine the biology and morphology of *T. varians*. To perform this study, eggs were collected from different plants of *F. benjamina* and brought to laboratory for further experiment. The eggs were collected along with *F. benjamina* leaves. The eggs were separated with the help of fine forceps and shifted into petri dishes through camel hair brush without damaging the eggs. Fifty newly emerged first instar larvae were collected from culture and shifted into new plastic containers. The new fresh leaves of *F. benjamina* were provided to the larvae on daily basis until larvae reached to pupation. The pupae were collected and placed into plastic container for adult emergence. The oviposition period of pest was recorded. The biological and morphological parameters of each stage of *T. varians* were recorded during the whole study period.

## RESULTS AND DISCUSSION

*T. varians* has multiple hosts, including the family Moraceae members such as *Ficus benjamina*, *F. annulata*, *F. altissima*, *F. microcarpa* and *F. carica*. The most preferred host for the growth and development of pest larvae was found to be the weeping fig, *F. benjamina* (Arya, 2020). This host is widely distributed and claimed to be affected by the current pest from numerous countries such as Pakistan, China, India, Taiwan, Nepal, Java, Japan, Thailand, Myanmar, the Philippines, and Sumatra (Zolotuhin and Witt, 2009; Ramzan *et al.*, 2019). Kedar *et al.* (2014) and Arya (2020) had reported another suitable host, jackfruit (*Artocarpus heterophyllus*) for pest growth and development. The onslaught of this pest ultimately lowers the aesthetic value by destroying the beauty of ornamental plants. As observed by other studies throughout the world (Kishida, 2002; Basari *et al.*, 2019), 100% of defoliation caused by later instars is consistent with the ocular observations made in the current study. Throughout the study period, many developmental data, including biological and morphological, were recorded.

*T. varians* eggs are spherical, cake-like in shape, and laid in a row contacting other eggs; the end that touches another egg is shorter and flattened. Single female can lay 160-270 eggs in 3-6 layers on the dorsal side of the leaves while on the wall of the plastic containers in controlled conditions. It has been reported that some unmated female also laid eggs in groups. 15-183 eggs per female laid by unmated females. These unfertilized eggs never developed into larvae. However, 24 hours prior to hatching, the eggs turned black. Rajavel

and Shanthi (2008) and Daimon *et al.* (2012) both reported observations about the form and color of eggs. Egg incubation period was  $3.46 \pm 1.22$  days on *F. benjamina* while it can vary with hosts as reported by Ramzan *et al.* (2019).

Brown colored larvae had just begun to emerge. There were five known larval instars, and two of them were later discovered to be more damaging. However, the color of the larvae altered after 24 hours to a greyish white up to the fourth instar larvae. The color of the larvae in their fifth instar altered to a dull brown with greyish streaks. On the second and fifth abdominal segments, there was a black crescent and a double, purple-brown dorsal hump. There was a short, fleshy horn on the ninth abdominal segment. The larvae of the last instar were challenging to find since they resembled immature *Ficus* spp. branches. The horns of early instars were longer than those of the final instar. Other workers have provided a description that is nearly identical (Navasero *et al.*, 2013). Due to their size and excellent feeding capacity, they consume a lot of leaves while feeding aggressively. Compared to the early three instars, the later instars may have higher feeding requirements (Zhang *et al.*, 2015; Ramzan *et al.*, 2020). The developmental time of first, second, third, fourth and fifth larval instars was  $2.44 \pm 0.82$ ,  $3.56 \pm 0.53$ ,  $3.72 \pm 0.26$ ,  $4.54 \pm 0.79$  and  $6.20 \pm 0.78$  days, respectively.

Boat shaped and yellow silken pupation was usually observed in the study period. It was recorded that fully developed larvae typically spun on the leaves and convert into pupation. Similar observations were made by many other researchers (Rajavel and Shanthi, 2008; Ramzan *et al.*, 2019). In the study  $8.57 \pm 1.00$  and  $9.13 \pm 0.54$  mm length of male and female cocoon was recorded, while width of male and female cocoon was  $4.65 \pm 0.12$  and  $5.34 \pm 0.43$  mm, respectively.

The dorsal side of the female forewings had pale reddish brown lines. The thorax, head, and abdomen of the female had darker reddish brown coloring than those of the male. Adult hind wings had reddish brown outer edges and were grayish in color. Based on wing venation, a distinct difference between the sexes was detected (Navasero and Navasero, 2013). The average lifespan for male and female was  $6.23 \pm 2.09$  and  $10.01 \pm 0.99$  days, respectively. According to the study, female adults had longer lifespans than male adults.

**Conclusion:** This is the basic research which conducted in this study period. The results of the current study will be helpful for future researchers and people to manage this pest on ornamental plants such as *Ficus benjamina* and others *Ficus* spp.

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