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Research Article

BIOLOGY OF *LASIOPTERA BRYONIAE* SCHINER (CECIDOMYIIDAE: DIPTERA) ON DIFFERENT TEMPERATURES

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Abstract: Bitter gall midge *Lasioptera bryoniae* was a pest of *Momordica charantia*. The objective of this work was to study the effect of different temperatures on *Lasioptera bryoniae* biology. Measurements included duration and viability of the egg, maggot and pupal stages, sex ratio, fecundity and longevity. The life cycle of *L. bryoniae* observed in three temperature regimes is completed in 17-26 days with 2-4 days for egg, 8-12 days for maggot and 4-6 days for pupa. At the temperature of 25ºC, the number of eggs laid by female of *bryoniae* was and 115.4 respectively. The fecundity decreased at higher temperature as compared to the optimum temperature of 25ºC.

Keywords: Biology, Temperature, Fecundity, Maggot and Days

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Introduction

In India, *Momordica charantia* is an important vegetable crop because of both nutritional as well as medicinal properties [1]. The bitter gourd gall midge *Lasioptera bryoniae* (Schiner) (Diptera: Cecidomyiidae) is a major pest of bitter gourd and causing significant yield loss [2]. The developing maggots inducing sophisticated gall by producing long, tubular galls at the distal end of young shoots affecting the growth of the plant [3]. The natural enemies have been reported by Muthukumar *et al*., [4]. The present study of this work aims to study the effect of different temperatures on *Lasioptera bryoniae* biology.

Materials and Methods

Egg period

Ten seedlings of thirty-day old plants raised in plastic pots were placed inside the wooden cage (60*60*60cm) and ten pairs of *Lasioptera bryoniae* adults released in cage. After egg laying, the stem was split open longitudinally and number of eggs laid in each egg mass was recorded. At room temperature, the egg masses inside the galled stems were placed in a petri dish lined with filter paper and watched periodically for the hatching of eggs.

Maggot period

The maggot present in tender gall shoot was longitudinally split with cut end of the shoot covered with moist cotton swab to prevent quick desiccation. The maggots were examined every twelve hours to ascertain the growth of maggot and to fix the period of growth. The observation was continued till the maggots metamorphosed to puparia.

Pupal period

The puparium was taken out and kept in petri dishes with filter paper in cage held at room temperature. Puparia were observed every six hours for the adult emergence.

Adult period

The puparia were kept in petri dishes lined with moist filter paper in cages and observed for adult emergence.

The newly emerged adult was provided with 30% honey solution and fresh bitter gourd flowers as adult food. At every eight hours, the adult food was changed. The freshly emerged adults were observed every six hours for their longevity.

Fecundity

Pots with one-month old seedlings were placed inside the cages (100*65*65cm) and in every cage, a pair of freshly emerged adults were released. The adult food described above in 3.3.2.4 was provided. After the mortality of the adults, the seedlings were dissected and examined for the number of eggs laid.

Results

Egg

The female lays the eggs by piercing the plant tissue and deposit the eggs inside the tender shoots or tender leaf petiole in patches of five to six. Freshly laid eggs are transparent, which becomes creamy white and later turn yellow after 36 hours. The egg period was two to three days at 25ºC and three to four days at 30ºC and 35ºC. The egg hatchability was in *Lasioptera bryoniae* noted at temperatures of 25, 30 and 35ºC was respectively 90, 87 and 82 percent. The egg of *L.* bryoniae the length and width are 1.38 mm and 0.61 mm respectively.

Maggot

The neonate maggots on eclosion were transparent measuring 1mm long.
The maggots have 11 body segments distinctly divided with a Y-shaped structure called the “Sternal spatula” present on the ventral surface of the second segment. The maggots become white within 3 days of eclosion which attain yellow colour when fully grown. At the early stage, the maggots start feeding the cortex tissues of shoots which in later stage form a separate tunnel reaching the periphery of the stem for pupation. The larval duration extends seven to eleven days at 25ºC. But in 30ºC, the larval period lasted nine to twelve days, at 35ºC, showed a duration of eight to twelve days. The size of the first instar larva measured a length and width 1.25 mm and 0.30 mm and the second instar larva a length of 1.75 mm and width of 0.32 mm whereas, the third instar measures a length of 1.55 mm and a width of 0.78 mm in *L. bryoniae*.

Pupa

Pupation takes place inside the larval cavity. The ventral side of the pupariam turn orange with black stripes at the distal abdominal segments. The adults leave the pupal case semi atrophied on the gall shoots after the emergence from the puparium. The pupal period was four to six days at all the temperatures tested. The puparia of *L. bryoniae* measures a length of 1.39mm and a width of 0.31 mm.

Adult longevity

Adult is a dark mosquito like fly which showed a longevity of three to four days at 25, 30 and 35ºC in both the species. During the adult period, feeding by adults was not noticed and the mating of adults was instantaneous without premating period.

Fecundity

At the temperature of 25ºC, the number of eggs laid by female of *L. bryoniae* was 115.4. The fecundity decreased at higher temperature as compared to the optimum temperature of 25ºC. The number of eggs laid by *L. bryoniae*, was, 104.2 and 95.2 at 30 and 35ºC respectively. The survival of offspring in *L. bryoniae* was 57.2, 51.0 and 41.2 at 25, 30 and 35ºC respectively.

Discussion

The egg period *Lasioptera bryoniae* lasted for 3-4 days depending upon the temperature range of 25-35 °C. Similar finding indicating the egg period of 1.4 days in lime gall midge was registered by Pena *et al*., [5]. The finding of Kim *et al*., [6] indicated the variation of egg stage 5-9 days in *Macrodiplosis selenis* depending on daily temperature also agree with the present observation. The larval development period of 9-12 day in *L. bryoniae* recorded in the present study could find the related support from the observations of Pena *et al*., (1989) on *Prodiplosis longifila* who reported a duration of 9 days for larval period with three developing instars. The puparium measured a length of 1.25-1.75 mm with pupal period of 4-6 days. This observation was comparable with the recording of *P. logifila* on lime by Pena *et al*., [5]. The longevity of adults which lasted for 3-4 days in *Lasioptera* was also in line with the longevity of 2-3 days noted in adult of *O. oryzivora* [7]. The fecundity ranged from 101.2 to 115.4 at 25°C and the number of eggs decreased at higher temperature of 30 and 35°C. This can be attributed to the influence of temperature on the oocyte maturation of eggs which might have reduced the number of eggs at higher temperature of 35°C [8].

Table-1 *Morphometric parameters of different stages of Lasioptera bryoniae*

Stages	Length (mm) (Mean ± SD)*	Width (mm) (Mean ± SD)*
Egg	1.38 ± 0.19	0.61 ± 0.35
I instar	1.25 ± 0.18	0.30 ± 0.31
II instar	1.75 ± 0.32	0.32 ± 0.18
III instar	1.55 ± 0.28	0.78 ± 0.27
Pupae	1.39 ± 0.43	0.31 ± 0.36
Male adult	1.44 ± 0.26	0.33 ± 0.24
Female adult	1.58 ± 0.31	0.32 ± 0.31

*SD: Standard Deviation, *Mean of twenty replications*

Table-2 *Developmental period (days) of Lasioptera bryoniae in varying temperatures*

Temperature (ºC)	Particulars	Developmental period (days)				Adult longevity (days)
		Egg	Maggot	Pupa	Total developmental period	
25	Mean ± SD	2.5 ± 0.19	8.2 ± 0.24	3.7 ± 0.32	19.1 ± 0.28	3.7 ± 0.42
	Range	2-3	7-10	4-6	13-19	3-4
30	Mean ± SD	2.8 ± 0.31	10.1±0.29	5.2 ± 0.34	22.7 ± 0.37	3.6 ± 0.20
	Range	2-4	9-12	4-6	15-22	3-4
35	Mean ± SD	2.7 ± 0.12	9.7 ± 0.32	5.0 ± 0.28	22.1 ± 0.55	3.1 ± 0.31
	Range	2-4	8-10	4-6	17-26	3-4

SD: Standard deviation

Table-3 *Effect of varying temperatures on fecundity, hatchability and survival of L. bryoniae*

Temperature (ºC)	No. of eggs per female*	Hatching**	Unhatched eggs** (%)	Successful offspring survival (%)
25	115.4	90.0	10.0	57.2
30	104.2	87.0	13.0	51.0
35	95.20	82.0	18.0	41.2

**Mean of ten replications, ** From the single female laid eggs*

Application of research: Can understand the biology of the insect easy to develop pest management practices.

Research Category: Entomology and Biology

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Study area / Sample Collection: Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu, India

Cultivar / Variety / Breed name: *Momordica charantia*

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

References

[1] Grover J.K. and Yadav S.P. (2004) *Journal of Ethnopharmacology*, 93(1),123-132.
[2] Muthukumar M., Sridharan S., Kennedy J.S., Jeyakumar P. and Arumugam T. (2017) *Journal of Entomology and Zoology Studies*, 5(3), 1635-1639.
[3] Muthukumar M., Sridharan S., Kennedy J.S., Jeyakumar P. and Arumugam T. (2019) *Ann. Pl. Protec. Sci*., 27 (1), 13-17.
[4] Muthukumar M., Sridharan S., Kennedy J.S., Jeyakumar P. and Arumugam T. (2018) *Journal of Entomological Res*., 42(4), 507-510.
[5] Pena J.E., Raymond Gagné J. and Duncan R. (1989) *The Florida Entomologist*, 72(3), 444-450.
[6] Kim W., Matsunaga K., Gyoutoku N., Matsuo K., Minami T. and Yukawa J. (2015) *Entomological Science*, 18, 470–478.
[7] Umeh E.D. and Joshi R.C. (1993) *Journal of Applied Entomology*, 116(1-5), 91-398.
[8] Jervis M.A. (2012) *Springer Science & Business Media, The Netherlands, p*750.