

BIOLOGY OF RICE BLUE BEETLE (*LEPTISPA PYGMAEA* BALY) UNDER CAGED CONDITION

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(Accepted 11 April 2013)

ABSTRACT – Biological studies on fecundity and developmental stages on rice blue beetle, *Leptispa pygmaea* Baly (Coleoptera: Chrysomelidae) were conducted at the Agriculture Research Station (Paddy), Sirsi, Uttara Kannada, Karnataka, India under caged condition on Abhilash rice variety (long duration) during August to October 2011. Adult female laid oval shaped eggs on both the sides of leaf surface either singly or in parallel rows with an average fecundity of 12.67 eggs having 0.36 mm length and 0.16 mm width. The incubation period was 4.5 days. The grub had five larval instars with mean developmental period of 10.9 days. Size of grub varied from 2.48 to 4.53 mm in length and 0.69 to 1.14 mm in width, whereas head size is 0.15 to 0.26 mm. The grub pupated on leaf surface by getting attached loosely with its posterior end. The pupal period was 4.40 days having 3.71 mm length and 1.17 mm width. Life cycle was completed in 19.80 days. The longevity of adult beetle varied with sex. Males lived longer than females. Adult male of *L. pygmaea* lived for 37 days with size of 6.81 mm length and 2.08 mm width and female lived for 19.96 days with size of 6.20 mm length and 1.80 mm width, whereas head size of both male and females measured 0.27 mm.

Key words : Rice blue beetle, biology, *Leptispa pygmaea*, development, *Oryza sativa*.

INTRODUCTION

Rice is one of the leading major cereal crops of the world and staple food crop for more than two third of the population of India and more than 65 per cent of the world's population (Mathur *et al*, 1999). Rice is probably the world's most genetically diverse crop, which thrives well under varying ecosystems starting from rainfed upland (dry systems) to rainfed lowland (wet system) and in deep water situations (Rajehja, 1995). More than 90 per cent of the world's rice is grown and consumed in Asia and this crop alone accounts for 35 to 60 per cent of the calories consumed by 2.7 billion Asians.

The rice blue beetle, *Leptispa pygmaea* Baly (Chrysomelidae: Coleoptera) hitherto reported as a minor pest (Trehan, 1946; Patel and Patel, 1970; David and Kumaraswami, 1975 Dale, 1994) has recently assumed a serious status as an emerging pest with much concern to the rice cultivation in Uttara Kannada district and it is said to occur mainly in coastal and heavy rainfall tracts of the Karnataka state (Malnad area). Rice cultivators, especially in rainfed rice ecosystem of Karnataka are facing problem of rice blue beetle, *L. pygmaea* which is causing greater loss. Since the blue beetle has been so far considered as a minor pest, no study on this pest has been carried out in Karnataka. A very little information on the biology of this pest is available from elsewhere also. Therefore, the present work was taken up during *Kharif* 2011.

MATERIALS AND METHODS

An experiment was conducted in the laboratory to study the biology of rice blue beetle during *Kharif* 2011 at the Agricultural Research Station (Paddy), Sirsi, Uttara Kannada, Karnataka, India. Materials used were earthen pots, muslin cloth, bamboo sticks, petridishes, filter paper, camel hair brush, hand lens, rice seedlings and rice blue beetle.

For studying the biology, rice seedlings of susceptible variety Abhilash were transplanted in the earthen pots and covered with muslin cloth supported by bamboo sticks on four sides of the pot. Several such cages were established in the green house. A group of 20 adults of either sex of *L. pygmaea* were collected from the rice fields and were released on rice plants covered with muslin cloth cages and maintained as stock culture. The eggs were collected from the rice plant under cages by clipping the leaf portion containing the eggs and placed in a petridishes containing moist filter paper and kept for hatching. Ten neonate larvae were released on rice seedling at vegetative stage and covered with muslin cloth cage. Ten such cages served as replications. The room temperature and relative humidity were also recorded and averaged; it was 19.7 to 30.1°C temperature and 76.9 to 90.6 per cent relative humidity. The observations were recorded on incubation period, grub period, changes in morphometric characters and colour of body and feeding behaviour of the grub at 12 h interval. With the help of

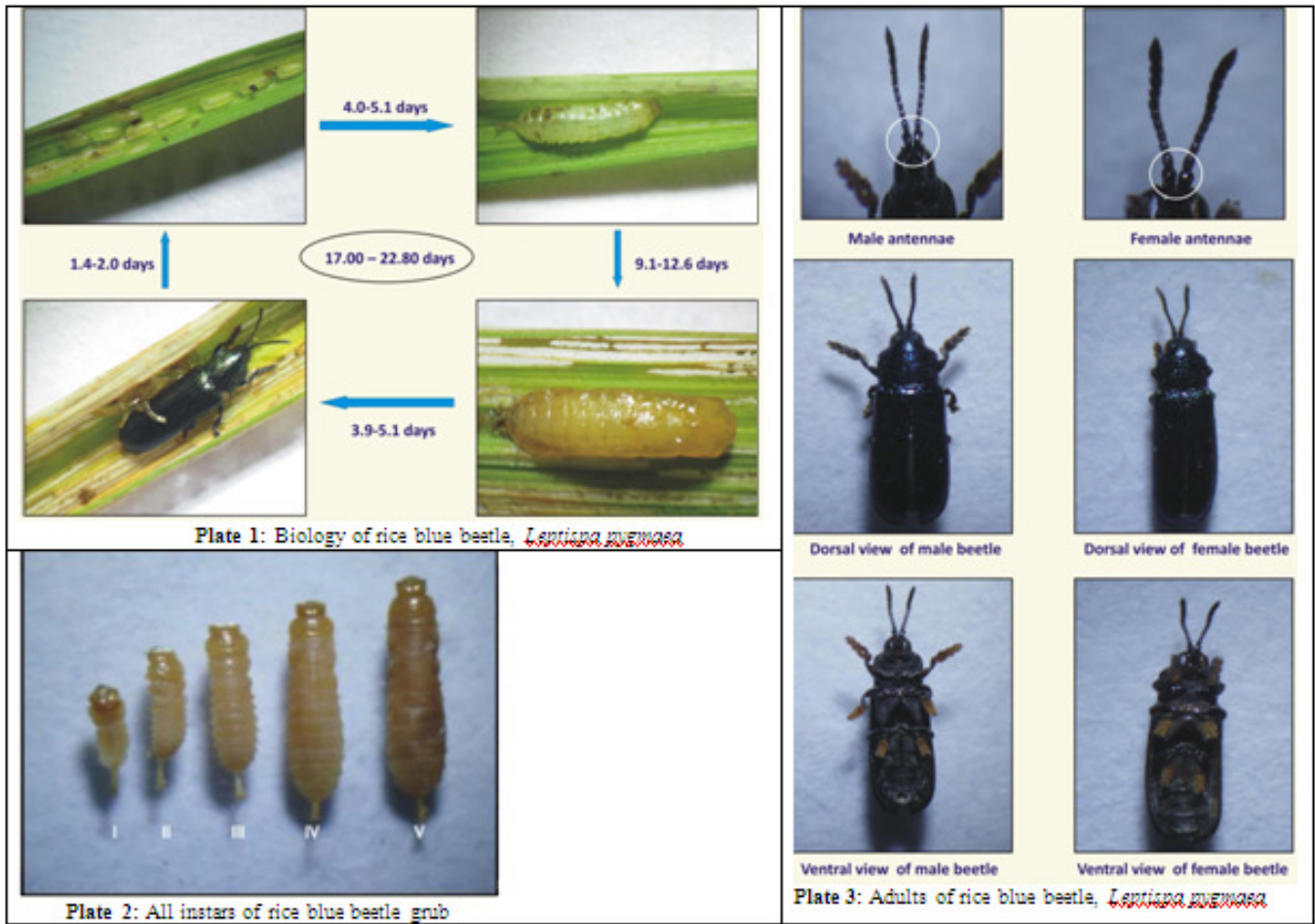


Table 1 : Duration of life stages of *Leptispa pygmaea* on paddy under caged pots

Sl. No.	Developmental stages	Duration of stage Range (days)	Mean ± S.D
1	Incubation period	4.00-5.10	4.50±0.30
2.	Grub		
	I instar	2.20-3.10	2.70±0.22
	II instar	1.80-2.70	2.20±0.26
	III instar	1.50-2.30	1.90±0.18
	IV instar	1.60-2.10	1.90±0.09
	V instar	2.00-2.40	2.20±0.13
3.	Total grub period	9.10-12.60	10.90±0.87
4.	Pupal period	3.90-5.10	4.40±0.31
4.	Total developmental period (egg to adult)	17.00-22.80	19.80±1.48

Note: Max temp: 31.6°C, Min temp: 18.9°C, RH1: 91.7%, RH2: 80.2%

Table 2 : Duration of adult longevity of *Leptispa pygmaea* on paddy under caged pots

Sl. No.	Parameter	Range	Mean ± S.D
1.	Pre-oviposition period (Days)	1.4-2.0	1.63±0.20
2.	Oviposition period (Days)	4.0-6.0	4.91±0.65
3.	Mating period (Minutes)	5.0-10.0	6.75±1.74
4.	Fecundity (number of eggs/female)	9.0-16.0	12.67±2.15
5.	Adult longevity (Days) Female	18.0-23.0	19.96±1.47
	Male	35.0-41.0	37.00±1.72

Note: Max temp: 31.6°C, Min temp: 19.9°C, RH1: 89.0%, RH2: 72.1%

Table 3 : Morphometric data of different stages of *Leptispa pygmaea*.

Sl. No.	Stages	Head (mm)		Length (mm)		Width (mm)	
		Range	Mean \pm S.D	Range	Mean \pm S.D	Range	Mean \pm S.D
1.	Egg	-	-	0.35-0.38	0.36 \pm 0.01	0.1-0.21	0.16 \pm 0.03
2.	Grub						
	I instar	0.13-0.17	0.15 \pm 0.01	2.40-2.55	2.48 \pm 0.04	0.58-0.8	0.69 \pm 0.07
	II instar	0.18-0.21	0.19 \pm 0.01	3.50-3.90	3.69 \pm 0.14	0.90-1.12	1.01 \pm 0.09
	III instar	0.21-0.24	0.22 \pm 0.01	3.90-4.10	3.96 \pm 0.05	1.10-1.21	1.14 \pm 0.03
	IV instar	0.24-0.27	0.25 \pm 0.01	4.10-4.40	4.29 \pm 0.10	1.00-1.15	1.13 \pm 0.04
	V instar	0.25-0.28	0.26 \pm 0.01	4.40-4.60	4.53 \pm 0.06	1.00-1.18	1.14 \pm 0.05
3.	Pupa	-	-	3.61-3.80	3.71 \pm 0.06	1.06-1.28	1.17 \pm 0.07
4.	Adult						
	Male	0.27-0.27	0.27 \pm 0.00	6.6-7.1	6.81 \pm 0.15	1.98-2.15	2.08 \pm 0.06
	Female	0.27-0.27	0.27 \pm 0.00	5.8-6.5	6.20 \pm 0.25	1.70-1.95	1.80 \pm 0.08

Note: Max temp: 31.6°C, Min temp: 18.9°C, RH1: 91.7%, RH2: 80.2%

micrometer scale the morphometric observations like length and width of eggs, grubs, pupa and adults were recorded. Observation was taken every day for the survival and moulting of the grub till they transformed into adults.

A pair of freshly emerged male and female beetles were enclosed in each cage covered by muslin cloth to study the biological characters like feeding behaviour, mating behaviour, pre-oviposition period, fecundity, oviposition period, adult longevity, nature of damage and habits of adults. Observations were made on the above mentioned parameters.

RESULTS AND DISCUSSION

Biological parameters:

The incubation period of *L. pygmaea* lasted for 4.0 to 5.1 with a mean of 4.5 days under laboratory conditions (Table 1) which is in agreement with the studies of Patel and Patel (1970), Dalvi *et al* (1985) and Patel and Shah (1985) who reported that mean incubation period of 3.79 to 7.16 days. The total grub period lasted for 9.10 to 12.60 with a mean of 10.90 days under potted cage condition (Table 1). The findings of Dalvi *et al.* (1985), Patel and Shah (1985) and Swamiappan *et al* (1990) revealed that total larval period of blue beetle was 13.77 days during *Kharif* season. The pupal period lasted for 3.90 to 5.10 with a mean of 4.40 days under potted cage condition (Table 1) which is in agreement with the findings of Dalvi *et al* (1985) who reported that the pupal of 4 to 5 days whereas Karthikeyan and Sosamma Jacob (2008) reported that the pupal period of 3.2 and 2.9 days in Jyothi and Aishwarya rice varieties, respectively. The longevity

of adult female was 18 to 23 with a mean of 19.96 days and 35 to 41 with a mean of 37 days in male beetle (Table 2). The present findings are in line with Dalvi *et al.* (1985) who reported the longevity of 18-35 days whereas, Karthikeyan and Sosamma Jacob (2008) reported the male longevity of 40.9 days on Jyothi and 36.7 days on Aishwarya rice varieties.

The biology of rice blue beetle is depicted in Plate 1. The total development period ranged from 17.00 to 22.8 with a mean of 19.8 days (Table 1). The present findings are in agreement with Dalvi *et al* (1985) who reported total life cycle of 22-24 days. The duration of coitus lasted for 5.0 to 10.0 with a mean of 6.75 minutes. The present findings are in close agreement with Patel and Shah (1985).

The pre-oviposition period was 1.40 to 2.00 with a mean of 1.63 days and oviposition period was 4.00 to 6.00 with a mean of 4.91 days (Table 2). The present findings are more or less in agreement with the findings of Patel and Shah (1985) who reported that pre-oviposition and oviposition periods of 4.91 and 13.81 days, respectively. The fecundity of blue beetle ranged from 09 to 16 with a mean of 12.67 eggs per female (Table 2). The results of present investigation are in close agreement with the findings of Karthikeyan and Sosamma Jacob (2008) who reported fecundity rate of 11 to 16 eggs per female.

Morphometrics:

Morphometric data of different stages of *L. pygmaea* are furnished in Table 3. Size of the egg measured 0.36

mm in length and 0.16 mm in width. The present findings are in agreement with Karthikeyan and Sosamma Jacob (2012) who reported that eggs of rice blue beetle measured 0.20 mm in length and 0.12 mm in width. Five instars of grub are depicted in Plate 2. The size of I, II, III, IV and V instar grubs were 2.48, 3.69, 3.96, 4.29 and 4.53 mm in length and the width measured 0.69, 1.01, 1.14, 1.13 and 1.14 mm, whereas the head measured 0.15, 0.19, 0.22, 0.25 and 0.26 mm, respectively. The pupal size measured 3.71 mm in length and 1.17 mm in width. The present investigations are in close agreement with Karthikeyan and Sosamma Jacob (2012).

The adult male and female beetles are depicted in Plate 3. The adult male beetle measured 6.81 mm in length and 2.08 mm in width and female beetle measured 6.20 mm in length and 1.80 mm in width whereas the head measured 0.27 mm in both male and female beetles (Table 3). The present findings are in agreement with Patel and Shah (1985).

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