



Morphometrics and morphology of rice blue beetle (*Leptispa pygmaea* Baly) (Coleoptera : Chrysomelidae)

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ABSTRACT

The Rice blue beetle, *Leptispa pygmaea* Baly, reported earlier as a minor pest, is recently attaining the status of a major pest by causing much concern in several rice growing tracts of Palakkad, Kannur and Kasaragod districts in Kerala, India. Attempts have been made for the first time in Kerala to study the morphometrics and morphology of the beetle for its correct identification and management. The beetle was found to lay oval shaped eggs on the rice leaves and the egg measured 0.20 mm length and 0.12 mm width. The eggs hatched into creamy white grubs with two spiny projections on the head and two tubular projections on the posterior end of the body. The grubs had five larval instars and the head capsule of 1st, 2nd, 3rd, 4th and 5th instars measured a width of 0.17, 0.20, 0.23, 0.26 and 0.26 mm respectively. The grub pupated on the leaf and was seen attached loosely by its posterior end. The brown coloured pupa measured 3.89 mm (length) and 1.32 mm (width). The adult beetle was metallic greenish yellow in colour with longer antennae, narrow thorax and a long body. The female rice blue beetle could be differentiated by its shorter antennae, broader thorax and stouter body. The antennal scape was broader in the female compared to that of the male. The male reproductive system consists of aedeagus with two parts of tegmen and siphon. The aedeagus showed an average length of 1.36 mm and width 0.07 mm (anterior) and 0.10 mm (posterior). The female reproductive system showed spermatheca and two lateral coxites with an average length of 1.60 mm and a width of 0.52 mm.

Key words: Morphometrics, reproductive system, rice blue beetle

INTRODUCTION

The rice blue beetle, *Leptispa pygmaea* Baly hitherto reported as a minor pest (Trehan, 1946; Patel and Patel, 1970; David and Kumaraswami, 1975; Dale, 1994) has recently assumed a serious pest status in the northern districts of Palakkad, Kannur and Kasaragod in Kerala, India. Not much work on this species has been reported as it is an emerging pest. Basic studies on the biology and morphology are of great importance for the correct identification and management of the pest.

MATERIALS AND METHODS

The study was carried out under net house conditions during 2005 at a temperature $30.1 \pm 1.40^\circ\text{C}$ (maximum) and $23.1 \pm 0.69^\circ\text{C}$ (minimum) and relative humidity ($94.33 \pm 2.11\%$) at the Regional Agricultural Research Station, Pattambi, Kerala Agricultural University. *L. pygmaea* was reared on 15-day old potted rice seedlings covered with a mylar cage of size 49 cm x 18 cm closed by muslin cloth at one end. Different stages of the beetle were collected from the potted rice seedlings to study their morphology. Measurements were made using an image analyzer (Model 2 EISS STEMI 2000-C). All

observations were replicated ten times. The anatomy of the reproductive systems of both sexes of the beetle was also studied.

RESULTS AND DISCUSSION

Egg

L. pygmaea laid light green, smooth, oval shaped eggs on rice leaves. They turned yellowish towards hatching. The measurements of different stages of *L. pygmaea*. Egg measured 0.20 mm in length and 0.12 mm in width. Dalvi *et al.* (1985) and Patel and Shah (1985) reported a bigger size of egg with 1.00 mm length and 0.38 mm width.

Larva

The grub of *L. pygmaea* was light green with a brown head. A spiny projection was present on either side of the head. It had a small head capsule, three pairs of thoracic legs, and an elongated body with a tail like projection (urogomphi) at the posterior end. This is in conformity with the finding of Patel and Shah (1985) who observed such a sclerotized tubular process at the tip of the abdomen of *L. pygmaea*. The grub completed its development with five instars.

First instar

Newly emerged first instar grub was light green coloured with a brown head measuring an average length of 0.65 mm and a width of 0.26 mm. Patel and Shah (1985) observed a width of 0.36 mm for the head capsule of first instar grub of *L. pygmaea*. The average length and width of the body of first instar grub was found to be 2.53 and 0.74 mm, respectively while Patel and Shah (1985) observed a small size first instar grub of *L. pygmaea*.

Second instar

The second instar grub was also light green colored with a brown head. The body length and width were increased to 3.9 mm and 1.09 mm respectively. The head capsule measured an average length and width of 0.67 and 0.26 mm respectively. The tail showed a very slight increase in length and width. Patel and Shah (1985) observed a lower value for the body length and a higher value of 3.92 mm for the width of the body of second instar grub of *L. pygmaea*. They also observed a higher width of 0.57 mm for the head capsule of the second instar grub.

Third instar

No change in colour was observed in third instar grub. The body length was slightly increased from 3.9 to 4.00 mm but there was no change in width of the body. Head capsule width was increased from 0.2 to 0.23 mm. The tail width was slightly increased from 0.12 to 0.14 mm without any change in the length of the tail. A higher head capsule width for third instar grub of *L. pygmaea* was observed by Patel and Shah (1985). The other morphometrics observations made by them were in agreement with the present finding.

Fourth instar

Fourth instar grub also showed no colour change. The length of the body of the fourth instar grub increased to 4.36 mm while the body width was reduced in the fourth instar. The width of the head capsule was slightly increased to 0.26 mm. The tail length was slightly increased while its width remained the same as in the third instar.

Fifth instar

The colour of fifth instar grub was changed to dirty white and the body length was increased to 4.56 mm and the width was further slightly reduced to 0.90 mm. There was no change in the width of the head capsule. The tail showed a very slight increase in length and width. The present finding of the fourth and fifth instar stages in the grub of *L. pygmaea* is contrary to the earlier report of Patel and Shah (1985) who observed only three larval instars. But Dalvi *et al.* (1985) did not mention the number of larval instars in *L. pygmaea*. They

observed that the full grown grub was 4.65 mm long and 1.00 mm broad which developed in 12-14 days. They found a pre-pupal stage of 4.75 mm length and 1.1 mm breadth with a head width of 0.81 mm, which lasted one day.

The overall results of the morphometrics of the different instars of the grubs of rice blue beetle indicated that the width of the head capsule of the grub increased from 0.17 mm in 1st instar to 0.26 mm in fourth instar. But there was no increase in capsule width in the last fifth instar grub. The head capsule width in fourth and fifth instars remained the same. The fifth instar stage observed in the present study might have been the pre pupal stage of *L. pygmaea* reported by Patel and Shah (1985). The body length of the grub was found to increase from 2.53 mm in the first instar to 4.47 mm in the fifth instar and the body width increased from 0.74 mm in the first instar to 0.90 mm in the last instar. The tail length increased from 0.50 mm in first instar to 0.56 mm in the fifth instar.

Pupa

Freshly formed pupa was white in colour, later changed to brown and was seen loosely attached to the leaf by its distal end. It measured an average length and width of 3.81 and 1.22 mm respectively. Patel and Shah (1985) observed a slightly bigger sized blue beetle pupa with 4.45 mm length and 1.39 mm width. Dalvi *et al.* (1985) reported that the pupa of *L. pygmaea* was oblong brown and measured 4.35 mm in length and 1.06 mm in breadth. The anterior end of the pupa turned dark blue colour before the emergence of the adult.

Adult

Newly emerged adult blue beetle was metallic bluish green in colour dorsally and white on the ventral side of the body. The male and the female beetles were distinguished based on their body size. Male beetles were bigger in size than the females. The body length and width in males were 7.05 and 2.10 mm respectively while the females measured a length of 6.1 mm and width of 1.9 mm. There was no difference in measurements of the head and thorax in both the sexes. Besides the body size, the sex differentiation in *L. pygmaea* could be done by the antennal character also. The two basal segments of the antennae were larger than the rest in both the sexes. This is in confirmation with Dalvi *et al.* (1985) who observed that the basal segments of the antenna were larger than the rest in *L. pygmaea*. Male and female blue beetles differed in the size of the scape of the antenna. The antennal scape was larger measuring 0.15 mm in female beetle while in male it was smaller in size of 0.12 mm. The male had a longer antenna of 1.1 mm length whereas in the female it was shorter with 0.08 mm length. In both sexes, the 3rd, 4th, 5th and 6th antennal segments were small and uniform while the 7th to 11th segments were larger

than the middle four segments. The present finding of the large sized antennal scape in female blue beetle corroborates with the report of Patel and Shah (1985). However, the larger size of male blue beetle observed in the present study is not in conformity with the finding of Patel and Shah (1985) who observed a slightly bigger size for the female of *L. pygmaea*.

Anatomy of the reproductive system

The male reproductive system of *L. pygmaea* comprised aedeagus with tegmen and siphon. The aedeagus showed an average length of 1.36 mm and a width of 0.07 mm and 0.10 mm at the anterior and posterior ends respectively.

The female reproductive system showed spermatheca and two lateral coxites measuring an average length of 1.60 mm and a width of 0.52 mm. No earlier work on the reproductive system of *L. pygmaea* has been reported. Deka and Hazarika (1995) described the anatomy of reproductive system of another chrysomelid rice pest, *Dicladispa armigera* wherein no measurements of the reproductive organs were reported.

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