

Short Communication

Biology of pod fly, *Melanagromyza obtusa* Malloch on *Cajanus cajan* (L.) Millsp. in Manipur, India

S. Subharani* and T. K. Singh

¹Distributed Information Sub Centre (DISC), Institute of Bioresources and Sustainable Development¹ Takyelpat, Imphal – 79500, India.

²Entomology Research Laboratory, Manipur University, Canchipur-795003, India.

Accepted 11 February, 2019

The biology of Pod fly, *Melanagromyza obtusa* Malloch (Diptera: Agromyzidae) was studied during 2004 - 2005 in the laboratory of Department of Life Sciences, Manipur University, Imphal (Altitude: 790 msl and Latitude: 23.83°N - 25.68° N) at a temperature of $17.39 \pm 0.23^{\circ}\text{C}$ and $59.16 \pm 0.39\%$ relative humidity. The mean longevity of the adult pod fly was 6.59 ± 0.38 days. The incubation period varies from 2.5 to 3.5 days, the average being 2.99 ± 0.16 days. There were three larval instars which took 7.75 ± 0.53 days to enter into pupal stage. The pupal period lasted for about 9 to 13 days with an average of 11.38 ± 0.74 days. The life cycle of *M. obtusa* was completed in 41.74 ± 0.81 days.

Key words: Pigeon pea, pod borer, Manipur, metamorphosis, instar, life cycle.

INTRODUCTION

Pigeon pea (*Cajanus cajan*) is one of the major pulse crops grown in India. As many as 250 insect species have been recorded to attack pigeon pea (*C. cajan*) (Upadhyay et al., 1998). However, the most damaging pests of this crop are pod-borers which attack the reproductive parts of the plant. Amongst the pod borers, the pod fly, *Melanagromyza* which is a serious pest of pigeon pea is responsible for some of the major damage to the pods experienced during winter and spring (Akhauri et al., 1994; Shanower et al., 1998). This pest is widely distributed throughout India (Bihar, Punjab, Madras, Assam, Nagpur, Delhi etc.) inhabiting different climatic regions (Ahmad, 1938). The pod fly oviposits in the tender pods and both the larval and pupal stages pass inside the pods. After hatching the larvae mine in the pods and feed on the soft seeds thus making the yield unfit for human consumption (Lal and Yadav, 1994). Unfortunately, the literature available on its biology provides only the fragmentary information on average duration of the life stages of the insect. Such study has not been conducted in Manipur so far. Hence, the study on the biology of *M. obtusa* on pigeon pea.

MATERIALS AND METHODS

For studying the biology of *M. obtusa*, pigeon pea crop (cv. T-21) was grown in 35 pots. At the time of flowering, the plant in each pot was isolated in nylon cloth cages of 0.5 m × 0.2 m. Pupae were collected from the pigeon pea field and after emergence males and females were sorted out by examining the genitalia. Thereafter 5 pairs of male and female flies were released in 5 cages. After the release of male and female, oviposition was ascertained after 24, 36, 48, 60, 72 and 84 h by harvesting and dissecting the pods. Observations were made at 12 h intervals to record the incubation period of the eggs. For studying the total larval, pre-pupal and pupal period, newly eclosed larvae were transferred to the seed of tender and green developing pods of the crop and kept inside numbered Petri plates in the laboratory at $17.39 \pm 0.23^{\circ}\text{C}$ and $59.16 \pm 0.39\%$ relative humidity. The total number of larval instars and duration of each instar were determined by examining the cast off skin (exuviae). Measurements of various stages were taken with the help of Binocular Research Microscope fitted with an ocular micrometer.

RESULTS AND

DISCUSSION Egg

Freshly laid eggs were glistening white in colour, smooth tapering posteriorly and projecting into the pod cavity, the pointed process was filled with a transparent fluid. Eggs were laid singly, often in partly matured pods

*Corresponding author. E-mail: subharani_devi@yahoo.co.in.

Table 1. Duration of various stages (in days) of *Melanagromyza obtusa* at 19.58 °C and 70.15% R.H in the laboratory.

Biological events	Mean
Incubation period	2.99 ± 0.16
Total larval period	7.75 ± 0.53
Prepupa	0.68 ± 0.09
Pupa	11.38 ± 0.74
Adult longevity	5.72 ± 0.28
Total life span	28.52 ± 1.85

Each value is a mean of 5 replications with ± S.E.

rather than in very young or fully matured pods. Eggs measured about 0.97 mm in length and 0.15 mm in breadth. The incubation period varied from 2.5 to 3.5 days, the average being 2.99 ± 0.16 days (Table 1). Ipe (1974) observed the average incubation period of the eggs to be 2.35 days whereas Nair (1975) and Singh and Rai (1984) stated that incubation period lasted for about 3 and 2.95 days, respectively, which is about the same as observed in the present findings. However, Upadhyay et al. (1998) reported a longer range for the egg stage (3 to 10 days).

Larva

The freshly eclosed maggots were transparent, glistening white in colour and later turned to creamy white. The body was divided into 12 segments, which had very faint segmental boundaries. For the first few hours following eclosion, the larvae did not bore into the seed but rather fed on the surface and then feed under the epidermis of the seeds. The moult from first instar to second instar took place usually within the seeds. The second instar larvae were sub-cylindrical, segmentation distinct, segmental boundaries with bands of minute papillae. The second and third instar larvae drill deep into the seed consuming the starchy food as well as the embryo. The full grown maggot was cylindrical in shape and creamy white in colour with a greenish tinge which later changed to yellowish before pupation. The inter-segmental grooves and cuticular papillae also became more prominent. Three larval instars were observed for this insect in the present study which was similar as reported by Singh and Rai (1984), Lal and Katti (1997) and Upadhyay et al. (1998). The average total larval period of *M. obtusa* was about 7.75 ± 0.53 days (Table 1). Our results for the duration of the total larval period were in agreement with that of Singh and Rai (1984). Full grown larvae measured about 2.45 to 2.84 mm in

length and 1.15 to 1.25 mm in breadth with an average of 2.63 ± 0.06 mm and 1.20 ± 0.02 mm, respectively (Table 2). The finding is in conformity with the findings of Bindra and Singh (1972) who also reported that full grown larvae measured about 3.5 to 4.00 mm in length and 1.25 to 1.50 mm in width.

Prepupa and pupa

The mature larvae after passing through the prepupal stage of about 0.68 ± 0.09 days, transformed into pupa inside the last instar integument in the soil. Similar observations were made by Singh and Rai (1984). Freshly formed pupae were yellowish brown in colour but later turned into brown or brownish black. The pupae were cylindrical and broadly rounded at the two ends. The pupal period lasted for 9 to 13 days with an average of 11.38 ± 0.74 days. It measured 2.25 to 3.50 mm in length and 1.25 to 1.40 mm in width, with an average of 2.96 ± 0.22 and 1.32 ± 0.03 mm, respectively (Table 2). Singh and Beri (1971) also found the pupal period of *M. obtusa* to range between 7 to 12 days depending on the climatic condition and the size was 2.36 mm × 1.07 mm. Similar observations were also made by Senapati et al. (2000) who reported the pupal period to be about 4 - 13 days. Interestingly there are wide variations in pupal period as reported by different workers. The response of the pupal stage of *M. obtusa* to various environmental conditions is different from that of the egg and the larval stages in certain respects. The pupae are more resistant to desiccation and can therefore stand reasonable exposures to partially saturated atmosphere. Again the pupal stage is comparatively long or in other words, the rate of pupal development is slower than that of the egg or the larval stage. Lal and Katti (1997) and Upadhyay et al. (1998) reported pupal period to range from 8 to 31 days

Adult

The adult fly was a small, shining and metallic blue or black in colour. Emergence from the pupal stage took place in the morning hours. Similar observations were also made by Lal and Katti (1997). The antennae were aristate, the palpi black and the proboscis was brown at apex. In many adults, the abdomen was glossy black with a metallic surface while in some others the abdomen had a violet colour or a greenish blue colour. Though similar colouration was observed both in male and females, the eyes were indistinctly pubescent and the orbits had more distinct short hairs in female than in the male. Mating occurred during daytime. Adult longevity on average was 5.72 ± 0.28 days. Upadhyay et al. (1998) reported the life span of the adult at the range of 3 to 5 days. The average length of the male and female fly was $2.77 \pm 0.12 \times 1.16 \pm 0.04$ and $3.08 \pm 0.08 \times 1.49 \pm 0.07$, respectively (Table 2).

Table 2. Egg, larvae, pupae and adult measurements of *Melanagromyza obtusa* reared on pigeonpea.

<i>M. obtusa</i>	Morphometric dimension of developmental stages							
	(Mean ± S.E.)							
	Egg	1 st	2 nd	3 rd	Pre-pupa	Pupa	Adult (wing expanse)	
							Male	Female
Length (mm)	0.97 ± 0.02	0.73 ± 0.02	2.06 ± 0.07	2.63 ± 0.06	3.01 ± 0.05	2.96 ± 0.22	2.77 ± 0.12	3.08 ± 0.08
Breadth (mm)	0.15 ± 0.06	0.17 ± 0.01	0.93 ± 0.03	1.20 ± 0.02	1.37 ± 0.07	1.32 ± 0.03	1.16 ± 0.04	1.49 ± 0.07

Each value is a mean of 5 replications with ± S.E.

ACKNOWLEDGEMENTS

The authors thank the Head of Department, Department of Life Sciences, Manipur University and Co-ordinator, Distributed Information Sub Centre, IBSD, Imphal for providing necessary facilities to carry out the work.

REFERENCES

- Ahmad T (1938). The tur pod fly *Agromyza obtusa* Malloch a pest of *Cajanus cajan*, Indian J. Agric. Sci. 8: 63-67.
- Akhauri RK, Sinha MM, Yadav RP (1994). Population build – up and relative abundance of pod borer complex in main season pigeonpea, *Cajanus cajan* (L.) Millsp. J. Ent. Res. 18: 217 – 222.
- Bindra OS, Singh H (1972). Tur pod fly *Melanagromyza obtusa* Malloch. (Diptera: Agromyzidae). Pesticides. 6: 11 – 12.
- Ipe M (1974). Morphological, behavioural and biological studies of *Melanagromyza obtusa* on *Cajanus cajan* Zeitschrift fur Angewandte Entomologie.75: 89 – 98.
- Lal SS, Katti G (1997). Podfly, *Melanagromyza obtusa* Malloch. A key pest of pigeonpea. Indian Institute of Pulses Research. IARI. pp. 26.
- Lal SS, Yadav CP (1997). Ovipositional response of pod fly (*Melanagromyza obtusa*) on resistant pigeonpea (*Cajanus cajan*) selections. Indian J. Agric. Sci. 64: 658-660.
- Nair MRGK (1975). Insects and Mites of crop in India. Indian Council. Agric. Res. New Delhi 464p.
- Senapati B, Sahoo BK, Kulat SS, Bodhade SN (2000). Insect pests of pigeonpea and their management. Insect pests of pulses & oilseeds and their management. Appl. Entomol. 2: 28 – 53.
- Shanower TG, Lal SS, Bhagwat VR (1998). Biology and management of *Melanagromyza obtusa* (Malloch) (Diptera: Agromyzidae). 17: 249-263.
- Singh NN, Rai L (1984). Biological studies of *Melanagromyza obtusa* (Malloch) on *Cajanus cajan* (L.) Millsp. Bull. Ent. 5: 156 – 161.
- Singh S, Beri SK (1971). Studies on the immature stage of Agromyzidae (Diptera) from India. Part I Notes on biology and description of immature stage of four species of *Melanagromyza* Hendel. J. Nat. Hist. 5: 241 – 250.
- Upadhyay RK, Mukerji KG, Rajak RL (1998). IPM system in Agriculture, 4 pulses, New Delhi 99p.