

Original Research Article

Biology of Stem Fly *Ophiomyia phaseoli* (Tryon) and Leaf Webber *Grapholita critica* (Meyr) on Pigeonpea

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ABSTRACT

The biological study of leaf webber (*G. critica*) on BDN-711 conducted at the experimental laboratory Department of Agriculture Entomology, VNMKV, Parbhani during Kharif-2017. The result revealed that incubation and larval period ranged from 2.24 to 4.46 with a mean of 3.10 ± 0.40 and 16.52 to 20.45 with a mean of 17.50 ± 1.50 days. Average larval period of first, second, third and fourth instars varied from 1.52 to 3.16, 2.23 to 4.13, 2.12 to 4.95 and 6.18 to 11.63 with a mean of 2.80 ± 0.52 , 3.60 ± 0.58 , 3.20 ± 0.80 , 8.26 ± 1.90 days, respectively. The pre-pupal and pupal period varied from 0.83 to 2.23 with a mean of 1.50 ± 0.48 and 4.56 to 7.21 with a mean of 6.20 ± 0.75 days. The longevity of male and female was 7.12 to 11.56 with a mean 8.12 ± 1.50 and 8.53 to 12.79 with a mean 9.56 ± 1.60 days. Whereas total life period of male and female ranged from 33.76 to 38.25 with a mean 34.80 ± 1.620 and 35.08 to 39.76 with a mean 36.38 ± 1.80 days. Whereas the biological study of stem fly, *O. phaseoli* resulted that incubation period and larval period ranged from 3.00 to 5.00 with an average 4.0 ± 1.05 and 6.00 to 12.00 with an average 10.2 ± 1.46 days. Pupal period ranged from 7.00 to 10.00 with average 8.9 ± 1.70 days. Longevity of the male and female fly varied from 5.00 to 13.00 with average 10.1 ± 2.51 and 8.00 to 16.00 with average 12.2 ± 3.45 days, when 50 per cent honey solution was provided. Pre-oviposition period and oviposition ranged from 3.00 to 6.00 with average 4.6 ± 1.00 and 2.00 to 4.00 with an average of 2.9 ± 0.80 days. Fecundity and total life cycle of stem fly ranged from 65.00 to 90.00 with an average of 80.5 ± 5.45 eggs per female and 21-37 with an average of 30.6 ± 3.22 days.

Keywords

Biological study, *G. critica*, *O. phaseoli*, Pigeon pea

Introduction

Pigeonpea, *Cajanus cajan* (Linnaeus) is an important legume crop grown in Asia, Africa, and Latin America but India is probably the primary center of origin of pigeonpea and occupies second position in area and production next to chickpea. *Grapholita critica* (Meyr) is becomes important insect pest in the recent past in all pigeonpea growing areas of our country. This pest is a major factor responsible for heavy loss in early and medium late maturing pigeonpea genotypes (Sahoo and

Senapati, 2000). Its incidence is common throughout the pigeonpea growing area. It is a minor pest (Narendra *et al.*, 1998) in some pigeonpea growing areas but the chances of becoming a major pest (Akhilesh and Nath, 2003; Sinam and Singh, 2004) are more due to its nature of damage. With the similar point of view *Ophiomyia phaseoli* (Tryon) is the most dangerous agromyzid flies in the world its damage varies from crop to crop and season to season, being especially severe to seedlings. The adult stem fly

deposits eggs in punctures of the leaf tissue, the first pair of leaves of bean seedlings being favourite sites for oviposition and cause extensive tunneling to young plants. The stem fly incidence was observed on blackgram and soybean from July to November and on cowpea from July to October (Agarwal and Pandey, 1996). Overall plant growth is stunted and it may die; yield losses in some east-Asian countries can come to 30-50% and even to 100%.

Since information on the nature of damage and biology of leaf webber and stem fly is lacking on pigeonpea with that view present studies were conducted on this aspect.

Materials and Methods

Studies on biology of pigeonpea leaf webber, *G. critica* were carried out in the experimental laboratory at Department of Agril. Entomology, Vasantrya Naik Marathwada Krishi Vidyapeeth, Parbhani during *Kharif*-2017.

Maintenance of stock culture

Larval culture of leaf webber with the webbed leaves and stem fly with infested plant were collected from pigeonpea variety BDN-711 and brought to the laboratory.

Leaf webber (*G. critica*)

Since larvae preferred to live inside fresh leaves and feed, live plants of one month old were maintained and provided to *G. critica* in the laboratory. Twenty larvae were placed in small petri plates individually replicated thrice and were provided with fresh leaves swabbed with cotton at the base of the petiole. These leaves were changed at regular intervals till pupation and adult emergence. Ten pairs of newly emerged

male and female adults were released into insect rearing cages containing cotton swabs with 50 per cent honey solution and a twig of pigeonpea. Fresh pigeonpea twigs were provided daily. Adult moths were reared for one generation to obtain pure culture. Further stages were utilized for biological studies and for observations were made on the duration *viz.*, egg, larval instars, pupa and adult, pre-mating, mating, pre-oviposition, oviposition periods and longevity of both the sexes.

Stem fly (*Ophiomyia phaseoli*)

Culture of stem fly was initiated by collecting the larvae and pupae from the field infested plants and maintained in rearing cages on 10-15 days old seedlings. The newly emerged adults obtained from the rearing cages were allowed for mating.

A cotton swab with 50 per cent honey solution was provided as source of food for the adult flies. The freshly laid twenty eggs on lower surface of leaves were transferred individually replicated thrice to small glass vials for incubation along with the leaf spot for observation as it is difficult to separate the eggs from substratum.

On hatching, maggots were transferred to seedling and kept individually in rearing cage for observation. The pupal period was studied by observing the twenty pre-pupae kept individually in the petri plate till adult emergence. Freshly emerged male and female flies were collected in a plastic jars (7.5 x 2.5 cm) provided with 50 per cent honey as a food. After mating, ten females were enclosed individually in jars containing pigeonpea seedlings for recording the oviposition and pre-oviposition periods however fecundity studied by counting the number of eggs laid by individual per female in a separate jar and the period from

the adult emergence to death was taken as adult longevity.

Observations were made continuously from egg laying to egg hatching and this duration was taken as incubation period. The period from egg hatching to pupation was observed and taken as larval period. The period between pre pupae till the adult emergence was noted as pre pupal period. The entire biological studies of leaf webber and stem fly were conducted in laboratory condition at room temperature of 25°C and 75.00 ± 5.0 per cent relative humidity.

Results and Discussion

Leaf webber (*G. critica*)

The observations on biology of leaf webber (*G. critica*) are presented in table 1.

Freshly laid eggs were flattened, oval, transparent, dull white and round at both ends. The incubation period ranged from 2.24 to 4.46 days with a mean of 3.10 ± 0.40 days. Larval period varied from 16.52 to 20.45 days with a mean of 17.50 ± 1.50 days. The average larval period of first, second, third and fourth instars varied from 1.52 to 3.16, 2.23 to 4.13, 2.12 to 4.95 and 6.18 to 11.63 with a mean of 2.80 ± 0.52, 3.60 ± 0.58, 3.20 ± 0.80, 8.26 ± 1.90 days, respectively.

The pre-pupal period varied from 0.83 to 2.23 days with a mean of 1.50 ± 0.48 days. Pupal period varied from 4.56 to 7.21 days with a mean of 6.20 ± 0.75 days. Longevity of male was 7.12 to 11.56 with a mean 8.12 ± 1.50 days whereas in female it was 8.53 to 12.79 with a mean 9.56 ± 1.60 days. Total life period male ranged from 33.76 to 38.25 with a mean 34.80 ± 1.620 days whereas in female it was 35.08 to 39.76 with a mean 36.38 ± 1.80 days. These observations are

similar and in close agreement with the studies made by Khandwe *et al.*, (1994) and Kumar *et al.*, (2013).

Stem fly (*O. phaseoli*)

The observations on biology of Stem fly (*O. phaseoli*) are presented in Table 2.

Eggs were always laid on the undersurface of the young leaves of pigeon pea and were also laid near the midrib or primary vein or in between the veins into the mesophyll tissue of the leaf by penetrating the ovipositor into the leaf tissue under the epidermal layer. The freshly laid eggs are oval shaped with smooth round ends. The incubation period ranged from 3.00 to 5.00 days with an average of 4.0 ± 1.05 days. The larval duration ranged from 6.00 to 12.00 days with an average of 10.2±1.46 days.

The fully grown larva pupated in stem, but first mined a hole to the epidermis to assist in the emergence of the adult. The pupal period varied from 7.00 to 10.00 days with an average of 8.9 ± 1.70 days. The longevity of the male fly varied from 5.00 to 13.00 days with an average of 10.1 ± 2.51 days.

Whereas female ranged from 8.00 to 16.00 days with an average of 12.2 ± 3.45 days, when 50 per cent honey solution was provided. Pre-oviposition period ranged from 3.00 to 6.00 days with an average of 4.6 ± 1.00 days and oviposition period lasted for 2.00 to 4.00 days with an average of 2.9 ± 0.80. The fly laid 65.00 to 90.00 eggs with an average of 80.5 ± 5.45 eggs per female throughout its life span when food was provided whereas the total life cycle of stem fly ranged from 21-37 days with an average of 30.6 ± 3.22 days. These observations are similar and in close agreement with the studies made by Singh *et al.*, (1991) and Taleka *et al.*, (1988).

Table.1 Biology of leaf webber, *G. critica* under laboratory condition on pigeon pea (Kharif-2017)

Developmental stages	Range	Average
Incubation period	2.24 - 4.46	3.10 ± 0.40
Larval duration (days)	16.52 - 20.45	17.50 ± 1.50
1 st instar	1.52 - 3.16	2.80 ± 0.52
2 nd instar	2.23 - 4.13	3.60 ± 0.58
3 rd instar	2.12 - 4.95	3.20 ± 0.80
4 th instar	6.81 - 11.63	8.26 ± 1.90
Pre-Pupal period (days)	0.83 - 2.23	1.50 ± 0.48
Pupal period (days)	4.56 - 7.21	6.20 ± 0.75
Pre- mating period (hrs)	2.83 - 3.56	3.10 ± 0.20
Mating period (hrs)	1.26 - 2.35	2.10 ± 0.40
Pre-oviposition period (days)	2.26 - 4.3	3.10 ± 0.60
Oviposition period (days)	3.91 - 7.26	5.22 ± 0.60
Post oviposition period(days)	5.28 - 7.56	6.33 ± 0.60
Adult longevity (days)		
50per cent honey solution 1. Male	7.12 - 11.56	8.12 ± 1.50
2. Female	8.53 -12.79	9.56 ± 1.60
Fecundity (Number)	22 – 85	60.80 ± 15.30
Total life period (Days)		
1. Male	33.76 - 38.25	34.80 ± 1.62
2. Female	35.08 - 39.76	36.38 ± 1.80

Table.2 Biology of stem fly, *O. phaseoli* under laboratory condition on pigeon pea variety BDN-711 (Kharif-2017)

Developmental stage (Days)	Range	Average
Pre oviposition period	3 – 6	4.6 ± 1.00
Oviposition period	2 – 4	2.9 ± 0.80
Incubation period	3 – 5	4.0 ± 1.05
Larval period	6 – 12	10.2 ± 1.46
Pupal period	7 – 10	8.9 ± 1.70
Adult Longevity		
With 50 per cent honey solution		
1. Male	5 – 13	10.1 ± 2.51
2. Female	8- 16	12.2 ± 3.45
Fecundity	65 - 90	80.5 ± 5.45
Total Life Cycle	21 – 37	30.6 ± 3.22

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