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Research Paper

Bionomics of Western Flower Thrips, *Frankliniella Occidentalis* Pergande on Rose

Entomology

KEYWORDS : Bionomics, Western flower thrips, Rose and *Frankliniella occidentalis*

*** H.G. KANARA**	Dept. of Entomology, College of Agriculture, Junagadh Agricultural University, Junagadh 362 001(Gujarat) * Corresponding Author
M.F. ACHARYA	Dept. of Entomology, College of Agriculture, Junagadh Agricultural University, Junagadh 362 001(Gujarat)

ABSTRACT

A lab trial was conducted during 2012-13 at Department of Entomology, College of Agriculture, JAU, Junagadh to study the bionomics of rose thrips, Frankliniella occidentalis Pergande. Laboratory studies revealed that the female laid their eggs in the leaf tissues by sharp ovipositor. The average incubation period was found 5.28 day. The larva passed through two distinct instar and average duration of each instar was 1.72 and 4.76 day, respectively. The total larval period was on an average of 6.48 day with the total pupal period of 3.96 day.

The average pre-oviposition, oviposition and post-oviposition period were 3.12, 32.68 and 4.20 day, respectively. The number of progenies produced by a single female varied from 28 to 69 with an average of 58.8. The average longevity of male and female was 21.60 and 42.36 day with entire life span of 25.52 and 48.40 day, respectively. The sex ratio of male to female was worked out as 1:1.73 at a constant temperature of 25 ± 1°C.

Introduction

Western flower thrips, *Frankliniella occidentalis* (Pergande) [Thripidae: Thysanoptera] is a serious problem on rose grown under protected cultivation. Rose (Rosa sp.) is one of the nature's beautiful creations and is universally called as 'queen of flower'. Cultivation of rose under protected conditions has gained importance in recent years due to its export potential. Rose is used for worship, in making garlands and bouquets (Bose and Yadav, 1989). The pest feeding results in mottling, severe curling, browning and drying of tender leaves, sepals, tender stalks, outer petals of green and half opened buds, which turn to brown colour and appear as if they are burnt. Damaged flowers get discoloured and distorted in shape and reduced in size (Jhansi Rani and Jagan Mohan, 1997). This pest can cause 28-95 percent damage with a population density of 11-33 thrips/flower (Gahukar, 2003). At present the information on bionomics of this pest is scare. Hence, the study was conducted under laboratory conditions and the findings of the present study would help in managing this pest.

Materials and Methods

The present investigation on bionomics of thrips, *F. occidentalis* on rose was carried out at Department of Entomology, College of Agriculture, Junagadh Agricultural University, Junagadh during 2012-13. The study was carried out at a constant temperature of 25 ± 1°C by using B.O.D. incubator. In order to develop the initial culture of thrips, *F. occidentalis,* large number of adults were collected with the help of aspirator from the rose plants, five females and two males were picked up individually by means of moistened camel hair brush and released gently into a glass vial (3 cm × 1 cm) held in an inverted position. A young leaflet of rose was then introduced into glass vial and the vial was closed with bark cork. Thus, field collected adults were distributed in 25 vials to obtain large number of progenies. The vials were kept in an incubator adjusted to 25 ± 1°C temperature for oviposition. As soon as the larvae emerged out from the leaflets, they were reared separately into the glass vials. The leaflets of rose were changed once every 2 days until the larvae pupated.

The rearing was continued till the emergence of adults and they were used for further investigations. The sexes of adults were determined on the basis of their body colour, size and abdominal tip. The males were smaller in size, pale in colour with rounded abdominal tip, where as the females were dark brown to black with pointed abdominal tip. The adults, thus, obtained were paired for the further study. Each stage of the thrips were observed and measured in Leica microscope at Biocontrol laboratory of Entomology.

Egg:

A pair of male and female was enclosed in a glass vial (3 cm × 1 cm) containing a rose leaflet for oviposition. The leaflet was collected after 24 hours from the vial and kept individually in a separate vial for hatching of eggs. The procedure was continued till the death of female. The incubation period and number of larvae emerged out was recorded.

Larva:

With a view to study the larval instars and their duration, the newly emerged young larva was transferred with a help of a wet camel hair brush and kept individually in a glass vial containing rose leaflet, which was changed daily in the morning. The individual leaflet was examined critically under binocular microscope to confirm the moulting. The observations on number of instars, instar duration and total larval duration were recorded.

Pupa:

for ease of pupation, a thin layer of fine soil was kept at bottom of the glass vial as the pupation take place in the soil. The pupa when formed was collected and kept individually into glass vial for emergence of adults. The prepupal and pupal periods were recorded.

Adult:

The adults emerged from the pupae were paired on the same day. Each pair was introduced into glass vial to study the fecundity and longevity. Fresh rose leaflets were provided into glass vials for food and oviposition. The leaflet was changed at an interval of 24 hours. The old leaflets were collected and kept into another glass vials for emergence of progenies. Observations on pre-oviposition, oviposition and post-oviposition and longevity of adults were recorded.

Results and Discussion

Present studies revealed that the female of *F. occidentalis* inserted their eggs, partially or completely, into parenchyma tissue of leaves or flower by making incision with the help of saw like ovipositor. Since, the eggs were embedded into leaf tissues, they could not be studied. However, the number of eggs laid by a female, incubation period, pre and post ovipositional periods were derived on the basis of number of larvae emerged out from the eggs.

Incubation period of *F. occidentalis* varied from 4 to 7 day with an average of 5.28 ± 0.73 day. This finding partially supports the results of Ronald and Jayma (1993), who observed the incubation period as 6.37 day on rose at a constant temperature of 20°C. The larva passed through two distinct instar before attaining the pupal stage. The newly emerged first instar larva was white or nearly transparent which later on turned to yellow, orange, crimson or purple in colour. Its body consisted of a head; 3 thoracic segments and 11 abdominal segments with 3 pair of similarly structured legs and no wing buds. When the first instars larvae become doubled in size, they searched for a niche to molt. Similar observations were also reported by Lewis (1973), when the pest was reared on rose in London.

In the present study, the body length of first and second larval instar (Table 2) varied from 0.54 to 0.57 mm and 0.85 to 0.88 mm with an average of 0.56 ± 0.01 mm and 0.86 ± 0.01 mm, respectively. The duration of first and second larval instars varied from 1 to 2 day and 3 to 6 day with an average of 1.72 ± 0.45 and 4.76 ± 0.72 day, respectively. The total larval period varied from 4 to 8 day with an average of 6.48 ± 1.17 day. Almost similar result was obtained by Ronald and Jayma (1993) on rose. Two pupal stages were recorded in the present study. Both stages had functional legs. Before pupation, the larva entered into prepupal stage which was somewhat darker than the second instar larva. Prepupal stage had wing buds, rudimentary antennae and did not excrete. The pupa had developed antennae that curve back over the head, elongated wing pads and legs. Similar observations were recorded by Lewis (1973).

Studies on body length of pre pupa revealed that it ranged from 0.76 to 0.78 mm with an average of 0.77 ± 0.02 mm, while the length of pupa ranged from 0.79 to 0.82 mm with an average of 0.81 ± 0.01 mm. They were presented in Table 2. Present studies on pupal period indicated that the pre pupal and pupa period varied from 1 to 3 day and 2 to 3 day with an average of 1.76 ± 0.52 and 2.20 ± 0.57 day, respectively. The total period varied from 3 to 6 day with an average of 3.96 ± 1.09 day. The duration of different developmental stages of F. occidentalis were presented in Table 1. Total 25 number of individual were observed for the study of each duration of developmental stages. "Table 1 placed about here".

Adult was thin, elongated and dorso ventrally flattened with light yellow in colour. Female was larger than the male with light brown patches on abdomen. Adult possessed two pair of long and slender membraneous wings usually with only a few longitudinal setae bearing veins which were covered with minute microtrichia. The forewings covered hindwings and abdomen. It is evident from the result that body length of the male thrips ranged from 0.96 to 1.11 mm (Average 1.01 ± 0.08 mm) in length and 1.49 to 1.54 mm (Average 1.53 ± 0.03 mm) in breadth, where as the female thrips measured from 1.20 to 1.50 mm with an average of 1.40 ± 0.10 mm in length and 1.89 to 1.94 mm with an average of 1.92 ± 0.04 mm in breadth. Kirk and Terry (2003) reported that the adult male was about 1 mm long and female was slightly larger, about 1.4 mm in length. "Table 2 placed about here".

Present study indicated that male and female thrips lived for 19 to 23 day (Average 21.60 ± 0.86 day) and from 41 to 44 day (Average 42.36 ± 0.75 day), respectively.

The results revealed the pre-oviposition, oviposition and post-oviposition periods varied from 2 to 4, 28 to 34 and 3 to 5 day with an average of 3.12 ± 0.49, 32.68 ± 1.18 and 4.20 ± 0.64 day, respectively. A single female produced 28 to 69 progenies with an average of 58.8 ± 6.78. Kirk and Terry (2003) observed that each female may lay 40 to over 100 eggs in the tissue of the plant, often in the flower.

The sex ratio of male and female of *F. occidentalis* was 1:1.73 presented in Table 3. The entire life span of male varied from 19 to 31 day with an average of 25.52 ± 1.98 day and that of female, 39 to 52 day with an average of 48.40 ± 2.18 day. The slightly variations observed in the present investigation with earlier findings in the bionomics of F. occidentalis may be due to the changes in the environmental factors. "Table 3 placed about here".

Table 1: Duration of different developmental stages of *F. occidentalis* on rose

Sr. No.	Different periods (Days)	No. of observations	Minimum	Maximum	Av. ± S.D.
1	Incubation period	25	4	7	5.28 ± 0.73
2	First larval instar	25	1	2	1.72 ± 0.45
3	Second larval instar	25	3	6	4.76 ± 0.72
4	Total larval period	25	4	8	6.48 ± 1.17
5	Pre pupa period	25	1	3	1.76 ± 0.52
6	Pupa period	25	2	3	2.20 ± 0.57
7	Total pupal period	25	3	6	3.96 ± 1.09
8	Pre-oviposition period	25	2	4	3.12 ± 0.49
9	Oviposition period	25	28	34	32.68 ± 1.18
10	Post-oviposition period	25	3	5	4.20 ± 0.64
11	Longevity of male	25	19	23	21.60 ± 0.86
12	Longevity of female	25	41	44	42.36 ± 0.75
13	Entire life span of male	25	19	31	25.52 ± 1.98
14	Entire life span of female	25	39	52	48.40 ± 2.18

Table 2: Measurements of different stages of *F. occidentalis*

Sr. No.	Different stages	No. of observation	Length (mm)		Av. ± S.D.
			Minimum	Maximum	
1	First larval instar	25	0.54	0.57	0.56 ± 0.01
2	Second larval instar	25	0.85	0.88	0.86 ± 0.01
3	Pre pupa	25	0.76	0.78	0.77 ± 0.02
4	Pupa	25	0.79	0.82	0.81 ± 0.01
5	Male	25	0.96	1.11	1.01 ± 0.08
6	Female	25	1.20	1.50	1.40 ± 0.10
		Breadth with wing expansion (mm)			
7	Male	25	1.49	1.54	1.53 ± 0.03
8	Female	25	1.89	1.94	1.92 ± 0.04

Table 3: Sex ratio of *F. occidentalis*

No. of adults observed	Sex		Sex-ratio (Male : Female)
	No. of male	No. of female	
200	73	127	1 : 1.73

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