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Bio-ecology of Mango Leaf Twisting Weevil (*Apoderus transquebaricus*)

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ABSTRACT

A study on Bio ecology of mango leaf weevil was studied at S.V. Agricultural College, Tirupathi, A. P. Eggs were laid singly,oval shiny yellow coloured and 2.1 mm in length and 0.2 mm in width and the egg period completed 2.5 to 4.0 days. Early grubs were small , sluggish and pale yellow in colour and the average length and width ranged from 1.95 mm and 1.0 mm respectively and the matured grub stage an average of 8.5mm in length and 3.1mm in width and the grub stage lasted on an average 12.3 days. The pupa was pale yellow in colour the average length and width 3.4 mm and 2.8mm respectively and in active stage that lasted on an average of 6.2 days. adults of the leaf twisting weevils were shiny reddish brown weevils with typical shape. adult females were bigger in size than the males. adult average longevity is of 17 days. The length of adult female an average of 12.0 mm and the width an average of 5.6 mm respectively. For seasonal influence highest (20.3%) level of leaf twisting weevil population was recorded during third week of September and lowest (1.4%) during second week of January 2004. leaf twisting weevil population was positively correlated with rainfall and morning relative humidity and evening relative humidity. It was negatively correlated with maximum and minimum temperature.

Key words: *Mango leaf twisting weevil (Apoderus transquebaricus), Biology and Seasonal incidence*

INTRODUCTION

In the recent years, insect pests of mango have been taken seriously under intesive cropping systems of Andhra Pradesh. Mango leaf twisting weevil, (*Apoderus transquebaricus) is* considered as one of the important pests of mango, both on nursery and main field. Earlier, attempts were made to describe the biology of this weevil by Fletcher[3], Khanna, and Butani[2]. However, the information is realized to be insufficient to identify and understand the pest *viz*., leaf twisting weevil. Hence attempts were made to observe and narrate the biology including seasonal incidence of this important pest of mango in South-zone of Andhra Pradesh. In the process, the works of Mann and Singh[6], and Pajini and Sindu[7] who have documented information on

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different Coleopterans including Curculionid weevils were taken into consideration to project salient features of this weevil through appropriate means.

MATERIAL AND METHODS

A study on biology of mango leaf twisting weevil (*A. transquebaricus*) was initiated during August 2003 to July 2004 under laboratory conditions laboratory conditions at insectary S.V Agricultural College, Tirupathi

Male and female weevils were collected by sexual dimorphism characters and released into insect rearing cage of size (5 x 5 x 5m) having mango twigs that were maintained under caged conditions. Fecundity was documented by continuous observations. Freshly rolled leaves along with eggs were placed on the twisters for observation. Before these twisters were kept in Petri plates on which 0.2 per cent Nacl solution was added to prevent growth of moulds. The Petri plates were kept in incubators to maintain constant temperature inside the twisters i.e.30-35°C during day time and 25-30°C during night time. These leaf twisters were observed continuously to document the development of grub and pupae and their duration in days through destructive samples. To reduce experimental error, the observations on biology of the pest were replicated 10 times with uniform pest infested leaves. The data (duration of life stages) thus obtained were subjected to statistical analysis as per the procedure outlined by Panse and Sukhatme[8].

Studies on seasonal incidence and behavioral aspect of mango leaf twisting weevil, commonly attacking mango were taken up in the orchards of Department of Horticulture, S.V.Agricultural College, Tirupati, Chittoor (District) and Farmers fields at Narashingapuram (Village), Chandragiri (Mandal), Chittoor (District) during August 2003 to July 2004.

To study the abundance of mango weevils on the mango, trees of different age groups 0-5, 5-15 and above 20 years old were selected. Five trees in each age group were selected (replication) and observations were made at weekly intervals during August 2003 to July 2004. From each selected plant four main branches i.e. one from each direction were selected for recording observations. Again within each selective branch, three twigs (total 12 twigs) were located and fixed with tags for observations.

Weather parameters *viz.*, maximum and minimum temperatures; relative humidity and rainfall were recorded from meteorological wing, Department of Agronomy, S.V. Agricultural College, Tirupati.

RESULTS AND DISCUSSIONS

Biology of *A. transquebaricus* consists of egg, five larval instars in grub stage, pupa and adult. Grub stage feeds within the twisted leaf of mango and all life stages were completed within the leaf lamina and pupate inside the leaf roll. (Table 1 to 2).

1. Egg

The eggs were laid singly in the peripheral region within the twisted leaf. In the initial period of egg laying, the eggs were surrounded by mucilaginous substances secreted by the adult female to stick on to the leaf surface. The eggs were shiny yellow colour. The egg period completed within the period ranging from 2.5 to 4.0 days and an average of 2.9 days. The measurements of eggs *viz.*, length and width were 2.1 and 0.2 mm (Plate-1).

2. Grub

Grub stage of the leaf twisting weevil consists of early and late grub stages. During the early stage, the grubs were small, sluggish in movement and were pale yellow in colour without legs. In the matured stage, the grubs were yellowish colour, 'C' shaped with black small sting like structure and actively feeding on the twisted region of the leaf. The grub stage lasted on an average of 12.3 days with the range of 10.7 – 15.7 days (Plate-2). The length of the early grub stage was ranged from 1.5 t0 2.4 mm with an average of 1.95 mm and width ranging from 0.9 mm to 1.3 mm with an average of 1.0 mm. The length of the matured

grub stage ranged from 4.6 to 8.8 mm with an average of 8.5 mm and width ranging from 2.6 to 3.2 mm with an average of 3.1 mm (Plate-3).

3. Pupa

The pupal stage occurred in the in side the leaf roll. It is the inactive stage that lasted on an average of 6.2 days; ranging from 5-8 days. The pupa was pale yellow in colour. The length of pupa ranged from 2.9 to 3.9 mm with an average of 3.4 mm. The width ranged from 2.6 to 3.3 with an average of 2.8 mm (Plate-4).

4. Adult

Adults Leaf twisting weevils were medium in size reddish shiny reddish brown in colour with long neck and snout. The snout region was narrow and abdomen was broader and the adult weevil had triangular shaped body

Head possessed long neck and head was broader than neck; proximal part of head showed rostrum (or) snout which was reddish brown in colour. Length and width of neck varied from male and female. Neck was recorded as shorter in male and larger in female (Plate-5).

The matured adult females were bigger in size than the male ones. The adult longevity ranged from 12-20 days with on an average of 17 days. The preoviposition period lasted 5-6 days, oviposition period lasted 4-5 days and post oviposition period varied from 6-10 days. The length of adult female varied from 11.0 to 14.2 mm, with an average of 12.0 mm and the width varied from 4.9 to 6.5 mm with an average of 5.6 mm. The fecundity of females ranged from 30 to 59 eggs with an average of 43.

Seasonal influence

The highest (20.3%) level of leaf twisting weevil population was recorded during third week of September and lowest (1.4%) during second week of January 2004. There was no weevil population from fourth week of January to July 2004. A steady level of increase in population increased from August to September 2003. A gradual reduction of population was observed from fourth week of September to third week of January 2004 (Table .3) and (Fig -1).

The increase in leaf twisting weevil population was positively correlated with rainfall (r=0.4929) and morning relative humidity (r=0.6498) and evening relative humidity (r= 0.2978). It was negatively correlated with maximum and minimum temperature (r=-05015 and r=-0.3979) (Table-4).

One per cent increase in relative humidity increased the twisting weevil population by 0.64 per cent in the morning and 0.2978 per cent in the evening. One mm increase in rainfall increases the weevil population by 0.49 per cent.

The biology of leaf twisting weevil results are supported by Fletcher[3] who stated that the eggs were oval, yellowish and requires 4 days for its development. The grubs were yellowish and are 3 mm in length. It was also supported by Singh and Thangavel[9] who stated that the egg lasted 3 days, grub stage lasted 5-6 days and the pupal stage lasted 5-8 days.

The seasonal incidence of leaf twisting weevil, *A. transquebaricus* was noticed during fourth week of August to January. The peak incidence was recorded during fourth week of September. This observation supports the record of Bharat Babu[1] Kannan[4] who stated that incidence was observed during second part of September and continued upto second part of October, and negligible there after upto March. It correlated negatively with maximum and minimum temperatures, and positively with rainfall and relative humidity. This observation was nearer to the observations made by Bharath Babu[1] and Kannan[4]. The variation realized may be due to alteration of environmental factors.

Table 1: Developmental periods of leaf twisting weevil *Apoderus tranquebaricus*

Stages		Duration (Days)		SEm ±
		Range	Mean	
Egg		2.5 – 4.6	2.90	0.170
Grub	Ist instar	0.2 – 0.6	0.3	0.062
	IInd instar	1.1 – 2.3	1.6	0.125
	IIIrd instar	1.9 – 2. 5	2.1	0.125
	IVth instar	2.1 – 2.8	2.43	0.097
	Vth instar	2.9 – 3.4	3.00	0.82
Pupa		5.0 – 8. 0	6. 20	0.94
Adults longevity				
	Female	12.0 – 20. 0	17.0	1.247
	Male	11.5 – 17. 0	15.2	0.573
(i) Fecundity		30.0 – 59.0	43.0	2.160
(ii) Preovipositional period		5.0 – 6.0	5.3	0.125
(iii) Ovipositional period		4.0 – 5.0	4.8	0.082
(iv) Postovipositional period		6.0 – 10.0	7.3	0.216

Table 2: Morphometrics of different stages of leaf twisting weevil, *(Apoderus tranquebaricus)*

Stage	Measurement					
	Length (mm)			Width (mm)		
	Range	Mean	SEm ±	Range	Mean	SEm±
Egg	1.6 – 2.4	2.1	0.047	0.11- 0.23	0.2	0.017
Grub						
Ist instar	1.5 – 2.4	2.0	0.125	0.9 – 1.3	1.0	0.047
IInd instar	2.5 – 2.45	2.8	0.047	1.0-1.6	1.3	0.094
IIIrd instar	4.9 – 5.3	4.9	0.170	1.9 – 2.6	2.0	0.047
IVth instar	3.8 – 7.5	7.1	0.170	2.1 – 3.0	2.6	0.125
Vth instar	4.6 – 8.8	8.5	0.125	2.6 – 3.2	3.1	0.047
Pupa	2.9 – 3.9	3.4	0.125	2.6-3.3	2.8	0.125
Adult						
Female	11.0 -14.2	12	0.236	4.9 – 6.5	5.6	0.287
Male	8.0 - 12.0	9	0.624	3.1 – 5.9	4.0	0.287

Table 3: Data on seasonal incidence of mango leaf twisting weevil

Standaerd weeks	Leaf twisting weevil	Min. temp	Max. temp.	Morning RH	Evening RH	Rainfall
31	8.4	25.1	36.8	67	41	67.3
32	10.6	24.2	33.3	72	48	55.6
33	12.4	24.7	34.1	69	45	14.6
34	16.3	24.6	31.3	69	53	33.6
35	17.9	26	34.5	59	38	1.4
36	19.1	25	35.3	62	35	9.4
37	20.3	25.1	36.2	59	44	0
38	18.4	24	33.9	79	58	98.4
49	16.6	24.4	33.5	80	50	54
40	14.8	22.8	31.9	85	61	122.5
41	12.1	23.8	32.1	78	62	48
42	10.6	24.3	31.6	74	55	1.2
43	10.1	19.3	35	68	36	13.8
44	9.8	20	33.2	69	47	5.6
45	7.6	20.6	32.3	81	43	12.2
46	7.2	20.4	31.2	63	46	0
47	5.6	21.4	30.9	80	53	18.8
48	4.3	20.1	29.3	80	59	16.2
49	3.2	18.7	28.6	86	56	23.7
50	2.9	15.22	29.4	87	43	0
51	2.4	15.9	29.1	75	47	0
52	2.2	20	28.2	83	45	0
1	1	19.6	29.5	83	53	0
2	1	17.9	30	82	45	0
3	1.4	16.3	30	79	44	0
4	0	16.4	29.9	79	36	0
5	0	18.2	30.7	72	37	0
6	0	17.2	32.3	76	29	0
7	0	18.2	35	69	33	0
8	0	21.5	33.5	70	19	0
9	0	20.7	37.5	69	25	0
10	0	21.9	36	70	27	0
11	0	21.3	37.2	59	20	0
12	0	25.3	38.6	66	29	0
13	0	26.4	39.8	65	24	0
14	0	23.8	38.4	60	23	0
15	0	25	35.3	68	41	26.2
16	0	24.8	36.9	70	37	79.6
17	0	24.9	38.7	63	24	0
18	0	27	40.6	58	25	0
19	0	29	42.7	48	22	0
20	0	27.9	41.2	47	20	0
21	0	28	40.4	53	25	0
22	0	28	38.4	56	51	2.6

23	0	27.2	37.1	57	24	6.9
24	0	26.8	37.1	56	32	5
25	38.4	28.1	38.4	53	16	0
26	33.8	26.2	33.8	56	37	1.6
27	31.1	24.8	31.1	64	49	13.3
28	35.4	26.2	35.4	59	36	0
29	36.9	26.2	36.9	58	29	0
30	32	26	32	51	23	0

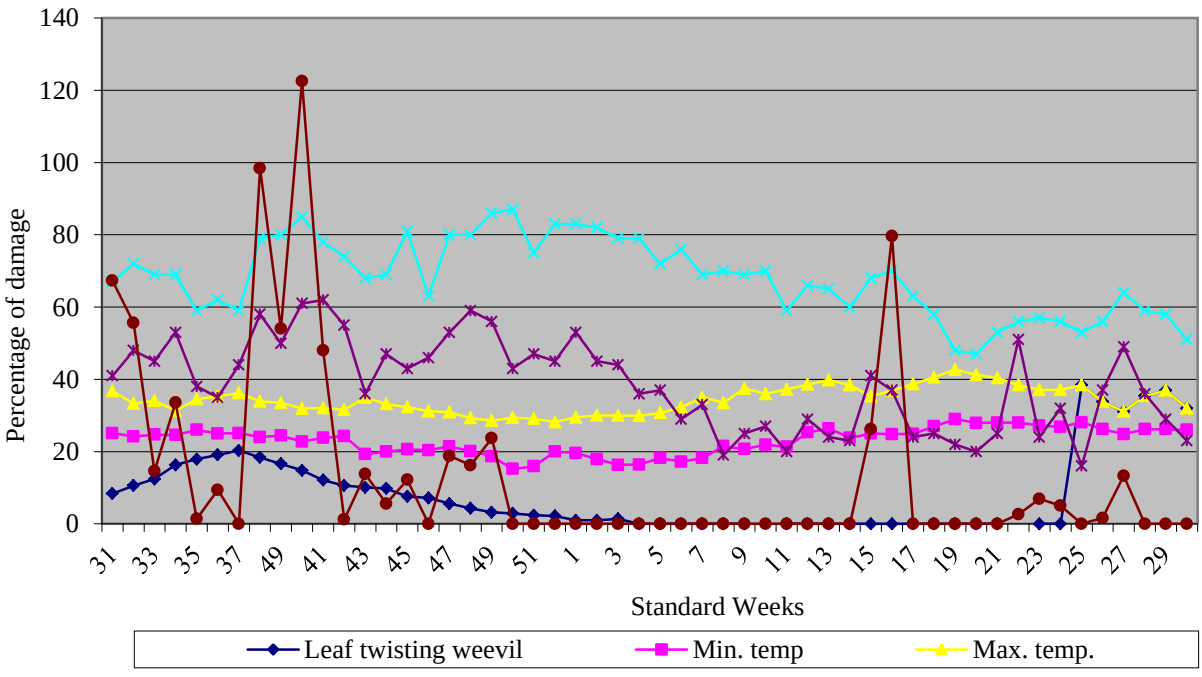
** Leaf twisting weevil: *Apoderus trunquebaricus* percentage of damaged leaves per 12 twigs i.e.

Table 4: Correlation of weather parameters in relation to mango leaf twisting weevil

Insect pest	Temperature		RH		RF
	Minimum	Maximum	Morning	Evening	
Mango Leaf Twisting weevil	-0.3979*	-0.5015**	0.4929**	0.6498**	0.2978*

* Significant at 5 per cent
** Significant at 1 per cent
NS: Non-significant
3 twigs in each direction

Fig. 1: Seasonal occurrence of mango leaf twisting weevil - pests with respect to abiotic factors



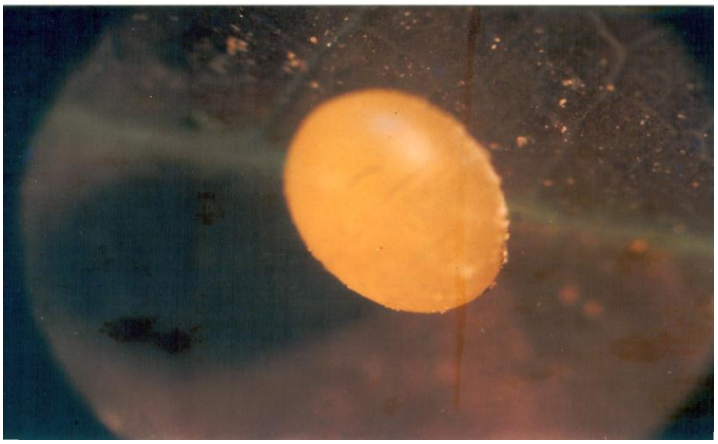


Plate 1: Egg of mango leaf twisting weevil,
A. transquebaricus

Plate 2: Grub stages of mango leaf twisting weevil,
A. transquebaricus

Plate 3: Matured grub of mango leaf twisting weevil,
A. transquebaricus

Plate 4: Pupa of mango leaf twisting weevil,
A. transquebaricus

Plate 4: Adult of mango leaf twisting weevil,
A. transquebaricus

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