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Studies on Pest Succession of Insect Pests in *Jatropha curcas* in Chhattisgarh Plain, India

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A B S T R A C T

In the present studies three insect pests *viz.*, blue bug, *Chrysocoris purpureus* (Westw), leaf webber cum fruit borer, *Pempelia morosalis* (Saalm Uller) and broad mites, *Euseius sp* were recorded as major pests. Along with this spider, *Oxyopes lineatipes* was recorded as predator. The pest succession studies revealed that mean maximum and minimum population of *C. purpureus* was recorded in 1st fortnight of September (34.24) and 2nd fortnight of October (19.36), nymph and adult / plant, respectively. Mean maximum population of webber was recorded in the month of June 1st fortnight (39.90) and minimum in the month of April 1st fortnight (4.34) in season (II).

Introduction

Jatropha curcas commonly called as Ratanjyot, Chandrajyot, Jamalghota, Jangli arandi and Kala aranda in Hindi. In Chhattisgarh, rural people call by different names i.e., in Bastar plateau zone it is known as Ranizada, in northern hill zone as Ramredi and in Chhattisgarh plain region as Bagranda (Puri *et al.*, 2005). It is multipurpose tree of significant economic importance. It is native of Mexico and tropical South America. The genus Jatropha belonging to family Euphorbiaceae is one of the prospective biodiesel yielding tree crops. The seeds contain Jatropha oil which has a great potential to be used as biofuel in future. Like any other crop, Jatropha is also attacked by a number of insect pests which deteriorates the plant growth, vigour and also affects the quality and quantity of oil yield. The use of *J. curcas* is varied and has ranged from serving as medicine to providing slow drying non edible oil known as 'curcas oil'. The wood and fruit of Jatropha can be used for numerous purposes including fuel.

The important and common insect pests found on Jatropha are leaf webber, semi looper, *Pempelia morasalis* (Saalm Uller.) shield

backed bug, *Scutellera nobilis Fab.* blotch miner, *Stomphosistis thraustic*a termite (*Odento termes sp.* aphid, jassid and thrips, *Retithrips syriacus* Among these, shield-backed bugs are the key pest of Jatropha in Gujarat. The nymphs and adults suck the cell sap from leaves, tender parts of the plant, flowers and capsules (Shanker and Dhyani, 2006).

A number of insects have been reported on Jatropha from Chhattisgarh, among which scutellerid bugs, namely *Chrysocoris purpureus, Scutellera nobilis* are observed along with leaf webber cum fruit borer, *Pempelia morosalis* which causes damage to almost all parts i.e. leaves, stems, inflorescence and fruits. The damage is due to dark green active larvae which cause webbing on leaves, apical stems, and inflorescence and even bore into fruits in later stages (Soman *et al.,* (2006) and Tamrakar *et al.,* (2007).

A couple of year back, Broad mites were observed as a major pest in the Chhattisgarh (Ganguli *et al.,* 2010). Feeding by the mite cause leaves to bronze and thicken, become brittle, corky or cupped downward and narrower than normal. Young stem growth may be distorted and stunted with terminal buds to die and drop off. Severely damaged plants could die.

Materials and Methods

To study the pest succession in various provenances of *Jatropha curcas,* observations were recorded at fortnightly interval on two plants selected randomly from each provenance on the number of grass hopper/plant, number of nymphs and adults of the scutellerid bug, *C. purpureus* /plant, and number of larvae of leaf webber cum fruit borer, *P. morosalis/plants.* The various types and number of natural enemies occurring were also recorded.

Experiment details

The experiment was conducted in Randomized Block Design with 47 provenances each replicated three times.

Results and Discussion

In the present investigation three insect pests were found damaging Jatropha namely blue bug, *Chrysocoris purpureus* (Westw), broad mites, *Euseius sp.* and leaf webber cum fruit borer, *Pempelia morosalis* (Saalm Uller) a longwith natural enemies spider, *Oxyopes lineatipes*.

Blue bug, *Chrysocoris purpureus* (Westw)

The blue bug, *C. purpureus* attacked mainly the tender shoots and fruits of Jatropha. It was found sucking the sap from fruits, due to which the color of fruits changed from green to yellow. In case of severe infestation the fruits turned brown. The infestation adversely affected the quality of seed and oil and ultimately reduced the fruit and oil yield.

The mean maximum population of bugs were observed in the month of September (I fortnight) *i.e.* 34.24 bugs/plant and the minimum during the month of October (II fortnight) 19.36 bugs/plant in season I (pre-pruning) while mean maximum population of bugs were observed in the month of May (I fortnight) *i.e.* 11.17 bugs/plant and the minimum during the month of May (II fortnight) 4.38 bugs/plant in season II (post-pruning) (Table 1).

In the correlation analysis blue bug was found to have a non-significant but positive correlation of (0.729), (0.865) with minimum temperature and relative humidity (morning) respectively while non-significant and negative correlation (-0.707) with maximum temperature was observed. Significant positive

correlation of (0.976) and (0.968) of blue bug populations with rainfall and relative humidity (evening) respectively was observed during season I (Table 2).

In season II, the blue bug showed non-significant but positive correlation of (0.493) and (0.358) with minimum relative humidity (morning) and relative humidity (evening) respectively while with maximum temperature, minimum temperature and rainfall it was negative and non-significant with (-0.520) and (-0330), (-0.311) respectively.

Soman *et al.,* (2006) Tamrakar *et al.,* (2007) and Baraiha *et al.,* (2010) have also reported blue bug (*C. purpureus*) on Jatropha from Chhattisgarh, causing damage to fruits of Jatropha.

List of provenances of *Jatropha curcas* are as follows

S. No.	Name of provenances	S. No.	Name of provenances
1.	Sagar-1	25.	J&K Set 2
2.	RJ 117 (A)	26.	Jagdalpur
3.	Dehradoon	27.	Kalyanpur
4.	Barbuspur	28.	APOS-2001
5.	Pant J&K Set 2	29.	RJ 117 (B)
6.	J&K Set 1	30.	TNMC-7
7.	Jabalpur	31.	ANOS-201
8.	J&K Set 1	32.	PKVJ-SJ-1
9.	NRCAF-13	33.	Pendra Road
10.	Baikunthpur	34.	PKVJ-DHW-1
11.	TNMC-5	35.	NRCAF-14
12.	Mandeshwar	36.	Balodabazar
13.	Pant J&K Set 1	37.	Kot
14.	PKVJ-MKV-1	38.	Tukupoms
15.	AMOS-201	39.	Taraipur
16.	Bawal	40.	Kilkila
17.	NRCAF-15	41.	Chandrapur
18.	PKVJ-AKT-1	42.	Mahanrpur
19.	Indore-I	43.	Surajpur
20.	Korba	44.	Sonhat
21.	Chandka	45.	Saheltarai
22.	TFRI-1	46.	Churmundra
23.	Barmunda	47.	Keshipur
24.	NRCAF-18		

Experiment details

Design	**RBD**
Replications	Three
Number of provenance	47
Plot size	90 x 40 m^2
Age of plant	6 years
Treatments	8
Date of planting	27.02.2005

For recording observations, the whole experimental field was divided into 35 blocks, each block having nine plants.

Table.1 Fortnightly mean population of Blue bug (*C. purpureus*), leaf webber (*p. morosalis*) and spider (*Oxyopes lineatipes*)

Months	Fortnightly mean population		
	Blue bug (*Chrysocoris purpureus*)	**Webber (*Pempelia morosalis*)**	**Spider *(Oxyopes lineatipes)***
Season-I (Pre- Pruning)			
Sept. 1st FN	34.24	0.00	14.12
Sept. 2nd FN	26.34	0.00	12.13
Oct. 1st FN	21.12	0.00	10.52
Oct. 2nd FN	19.36	0.00	7.08
Nov. 1st FN	19.65	0.00	6.31
Nov. 2nd FN	19.75	0.00	13.24
Season-II (Post- Pruning)			
March 1st FN	10.08	0.00	5.62
March 2nd FN	7.99	0.00	3.71
April 1st FN	6.09	4.34	7.52
April 2nd FN	8.22	17.09	6.12
May 1st FN	11.17	39.90	4.14
May 2nd FN	4.38	6.16	5.34

Table.2 Correlation of fortnightly means population of various insects and long with the weather parameters

Weather parameters	Fortnightly mean population	
Season I	**Blue bug**	**Webber**
Maximum Temperature (°C)	0.9762*	--
Minimum Temperature (°C)	0.8655	--
Rainfall (mm)	0.9681*	--
Relative humidity (Morning)		
Relative humidity (Evening)	-0.5207	0.4274
Season II	-0.3303	0.6252
Maximum Temperature (°C)	-0.3118	-0.0842
Minimum Temperature (°C)	0.4930	-0.4461
Rainfall (mm)	0.3587	-0.1626
Relative humidity (Morning)	0.9762*	--
Relative humidity (Evening)	0.8655	--

Leaf webber cum fruit borer, *Pempelia morosalis* (Saalm Uller)

Leaf webber cum fruit borer, *Pempelia morosalis* (Saalm Uller) caused damage to the leaves, inflorescence, fruits and apical stem of the Jatropha plant by making webs along with excreta, which causes economic damage. It also feeds on inflorescence and in later stages borer into capsules, which leads to poor and stunted growth of Jatropha plants. The maximum population of larvae of webber was observed in season (II), in the month of May (I fortnight) 39.90 larvae/ plant and the minimum populations were observed during the month of April (I fortnight) 4.34 larvae/plant. No population of webber larvae was observed in season (I) (Table 1).

Soman *et al.*, (2006) and Tamrakar *et al.*, (2007) have also mentioned about webber, *P. morosalis* as a pest of Jatropha in Chhattisgarh.

A pest from this Baraiha *et al.*, (2010) reported leaf webber cum fruit borer, *P. morosalis* as one of the major threats in bio-diesel production of Jatropha.

In the correlation analysis Webber was found to have a non-significant positive correlation of (0.427), (0.625) with maximum temperature, minimum temperature, and non-significant negative correlation of (-0.084), (-0.446), (-0.162) with rainfall, relative humidity (morning) and relative humidity (evening) respectively in season II.

Spider, *Oxyopes lineatipes*

Spider, *Oxyopes lineatipes* was seen preying mostly on moths, within striking distance. They play an important role by killing 2-3 moths daily thus preventing new generation of pest built up. The maximum population of this spider was recorded during the month of September 1st fortnight (14.12spider/plant) and minimum the month of November 1st fortnight (6.31 spider/plant) in (season I). In Season II, the maximum populations of spiders were observed in the month of April (I fortnight) *i.e.*7.52 spiders plant and the minimum during the month of March (II fortnight) 3.71 spiders/plant (Table 1).

In the correlation analysis spider was found to have a non-significant positive correlation of

(0.484) and (1.00) with bug, *C. purpureus*, respectively season I (Table 2) in season II, the spider showed positive correlation (1.00) and (0.787) negative correlation with host population (-0.493) and (-0.272). Vanita (2000) has also reported *Oxyopes sp*. as one of the predatory spiders recorded on Jatropha.

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