The Bioscan 8(1): 91-93, 2013
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

IMPACT OF ABIOTIC FACTORS ON POPULATION DYNAMICS OF INSECT PEST OF JATROPHA IN SOUTH GUJARAT

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KEY WORDS
Jatropha
Insect pest
Population dynamics
Abiotic factors

Received on :
02.05.2012

Accepted on :
22.12.2012

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ABSTRACT

Study was carried out to investigate population dynamics and impact of abiotic factor on population of insect pest complex of Jatropha (*Jatropha curcas* L.) under unprotected condition. The results of the field study revealed that the incidence of thrips (*Retithrips syriacus* Mayet) started from February with a peak during November (1.87 thrips/leaves) whereas it was nil during the month of July. The incidence of leaf miner (*Acrocerops conflua* Mayrick) was started from January with two peaks during months of May and November (0.65 and 0.55 leaf miner/leaf miner, respectively). The incidence of leaf webber (*Salebria morosalis* saalm Uller) was nil during the months of July with a peak during May (1.65 larvae/plant). The bugs (*Scutellera nobilis* Fabricious) were more active during the months of October to January with a peak of 0.14 bug/plant. Among various weather parameters, morning humidity and evening humidity were exhibited non-significant negatively relationship, while maximum temperature and sunshine hours showed positively non- significant influence on the population of the insect.

INTRODUCTION

Jatropha curcas L. known, as Ratanjot belong to the family Euphorbiaceae and is thus closely related to other important cultivated plant like rubber, castor etc. The Jatropha has been grown as a medicinal plant and hedge crop. It found in almost all the states and is generally grown as a live fence for a source of bio-fuel, plant nutrient and plantation can be used for biofencing. India has 146m ha of wasteland, of which 33m ha can be reclaimed for Jatropha plantation, in addition to arable land that is being used for plantation (Shanker and Dhyani, 2006). It would bring environmental benefits, protection of crops and pasture lands or as a hedge for soil erosion control or as a wind brake and to improve the fertility of soil for agricultural crops. It would also act as a source of bio-mass or organic manure because oil-cake is rich in nitrogen, phosphorous and potassium. Another benefit of planting Jatropha is that it increases the ground water level of the existing land, solving the problem of shortage of drinking water and adequate water for irrigation of agricultural land. The pests are limiting factors in the successful cultivation of the crop. Detailed work on the pests of this crop has not been attempted so far. Due to recent global fuel demands, this crop has attracted the attention of several developing countries. Though several new plantations have come up, the critical information on the identification and the management of various insect pests is limited. Hence an attempt was made to investigate status and their seasonal incidence. According to Manoharan *et al*. (2006), the survey was conducted to explore the pests of Jatropha and seasonal incidence revealed the presence of 13 insects and 2 acarine pests. Of which, five were defoliator, while other were sucking pests. Among these pests, leaf Webber, thrips and yellow mite were predominant. Except leaf Webber, all other pests are polyphagous in nature. Rani and Sridhar (2003) reported that *Rhipiphorothrips cruentatus*, *Stomphasistis thraustica* and *Phycita* sp. were found damaging Jatropha. Very little information is available on impact of meteorological factor on the population dynamics of insect pest of Jatropha under Gujarat condition. The investigations made were, therefore envisaged to study the impact of weather parameter on the population of insect pests of Jatropha.

MATERIALS AND METHODS

Study was carried out during February 2006 to January 2007 at college farm, N. M. college of Agriculture, N.A.U., Navsari, Gujarat. All the post sowing agronomical practices were followed. However, experimental area was kept free from insecticide application throughout the experimental period in order to record the incidence of insect pests.

To find out the incidence of major insect pests on Jatropha (Table 1), 50 plants were randomly selected from entire field. The populations of major insect were recorded at monthly interval. Three leaves each from top, middle and lower part of each plant were observed for recording the thrips (nymphs and adults), jassid (adults), white fly (nymphs and adults), aphid (nymphs and adults) and leaf miner damage at weekly interval. For leaf webber, number of larvae of leaf webber was recorded by observing entire plant. Whole of the plant was observed to record the population of bug. Mean pest population was worked out and the data were statistically analyzed for proper

Table 1: Different insects pest of *Jatropha curcas* L. in South Gujarat

Sr. No.	Name of insects	Taxonomic status	Order/Family	Damaging stage
1	Thrips	*Retithrips syriacus* (Mayet)	Thripidae:Thysenoptera	Nymphs and adults
2	Leaf miner	*Acrocerops conflua* (Mayrick)	Gracillaridae/ Lepidoptera	Larva
3	Leaf Webber	*Salebria morosalis* (saalm Uller)	Pyralidae/ Lepidoptera	Larva
4	Scutellerid bug	*Scutellera nobilis* (Fabricious)	Scutelleridae/Hemiptera	Nymphs and adults

Table 2: Population dynamics of insect pest complex of Jatropha

Month	Thrips per leaf	Leaf miner per leaf	Leaf webber per plant	Bugs per plant
February-2006	1.06	0.22	0.16	0.00
March-2006	1.24	0.21	0.70	0.00
April-2006	1.49	0.38	1.53	0.00
May-2006	1.83	0.65	1.65	0.00
June-2006	1.14	0.30	0.93	0.00
July-2006	0.00	0.00	0.00	0.00
August-2006	0.46	0.07	0.05	0.00
September-2006	1.22	0.29	0.83	0.00
October-2006	1.55	0.43	1.32	0.14
November-2006	1.87	0.55	1.45	0.14
December-2006	1.27	0.24	0.62	0.14
January-2007	0.83	0.00	0.00	0.12
Mean ±SD	1.16 ± 0.54	0.28 ± 0.20	0.77 ± 0.62	0.04 ± 0.07

Table 3: Correlation matrix of insect pest and abiotic factors

Sr. No.	Pest	Correlation matrix with Maximum temperature (ºC)	Minimum temperature (ºC)	Relative humidity %(Morning)	Relative humidity %(Evening)	Rainfall (mm/month)	Sunshine h/month
1	Thrips	0.19938	- 0.25012	- 0.25983	- 0.40741	- 0.66449*	0.47450
2	Leaf miner	0.23017	- 0.3384	- 0.34499	- 0.10560	- 0.13584	0.28951
3	Leaf webber	0.13206	- 0.04073	- 0.30842	- 0.10302	- 0.14340	0.24710
4	Bugs	- 0.28934	- 0.71105*	- 0.25227	- 0.47023	- 0.54342	- 0.02491

R= ± 0.57400, N = 12

interpretation. Data on maximum and minimum temperatures, morning and evening relative humidity, sunshine hours and rain fall (mm) were recorded at the Meteorological observatory, Navsari Agricultural University, Navsari which were used to study the effect of weather parameters on population dynamics of various insect pests. The simple correlation coefficients were worked out between pest population and various weather parameters.

RESULTS AND DISCUSSION

Population dynamics of insect pest of Jatropha and their correlation with abiotic factors were studied in different season of the year as well as their correlation with weather parameters were presented in Table 2 and 3.

Thrips (*Retithrips syriacus* M.)

The data revealed that the thrips was occurred during February to June 2006 and August 2006 to January 2007. In November, its population was at highest level (1.87 thrips/leaf), whereas it was nil during the month of July. The average population of thrips per month was recorded as 1.16 ± 0.54 per leaf throughout the year. Lal (1982) studied the influence of maximum and minimum temperature, humidity and rainfall on the population of the thrips, *R. syriacus* on Cassav. Which they found that the thrips populations were practically very lower and absent between June. Lal and Pillai (1981) found the population of thrips, *R. syriacus* L. infestation was more in dry period on Cassava crop.

The thrips population exhibited significant negative correlation was recorded with rainfall (r = - 0.66449). Correlation between thrips and maximum temperature (r = 0.19938) and sunshine hours (r = 0.47450) were positive non significant, while minimum temperature (r = -0.05255), morning relative humidity (r = - 0.25983), evening relative humidity (r = 0.40741) were negative non-significant. According to Lal (1982), increase in population of the thrips was found to be non-significantly correlated with humidity.

During course of investigation the incidence of other sucking pest *viz*., aphid, jassid, whitefly and mite were not found on Jatropha crop.

Leaf miner (*Acrocerops conflua* M.)

The larval population remained nil on Jatropha crop during the months of July and January. There were two pick period of leaf miner larvae observed during May and November with its population as 0.65 and 0.55 larvae/leaves, respectively. The average population of leaf miner per month was recorded as 0.28 ± 0.20 larvae/leaves. According to Gour *et al*. (1994), Castor leaf miner, *Acrocerops conflua* (Meyrick) was recorded throughout the year on *J. curcas* L. with its peak in November. The correlation of leaf miner population with maximum temperature (r = 0.23017) and with sunshine h (r = 0.28951)

were positively non-significant, while it was negatively non-significant with minimum temperature (r = - 03384), rainfall (r = -0.34499), morning (r = -0.10506) and evening (r = - 0.13548).

Leaf webber (*Salebria morosalis* S.)

The mean larval populations of leaf webber per plant during the year indicate that the highest level of larval population was recorded as 1.65 larvae/plant in May followed by 1.53 larvae per plant in April. The population was not observed during the months of July, August and January. The average population per month was calculated as 0.77 ± 0.62 larvae per plant. Manoharan *et al*. (2006) found that the incidence of leaf webber, *Salebria morosalis* (saalm Uller) was registered from August to November months and subsequent peak during March.

The correlation matrix indicated that correlation between population of leaf webber and minimum temperature (r = - 0.04070), rainfall (r = - 0.30842), morning (r = -0.10302) and evening (r = - 0.14340) were negatively non-significant, while correlation between leaf webber and maximum temperature (r = 0.13206) and with sunshine hours (r = 0.24710) were positively non-significant during the period of investigation.

Bugs (*Scutellera nobilis* F.)

The bugs remained more active during the months of October to January with its peak (0.14 bugs/plant). In general the population of bugs was remaining as negligible throughout the year with on an average of 0.04 ± 0.07 bugs per plant. The bugs population exhibited significant negative correlation with minimum temperature (r = -0.31061), while correlation between maximum temperature (r = - 0.28934), rainfall (r = - 0.25227), sunshine hours (r = - 0.024710), morning relative humidity (r = - 0.47023) and evening relative humidity (r = - 0.54342).

The present study revealed that the thrips population was highest in the November months, while the leaf miner and leaf webber population were increase in the month of May. The bug remaining active during the month of October to December. Among various weather parameters, morning humidity, evening humidity and were exhibited non-significant negatively relationship, while maximum temperature and sunshine h showed positively non- significant influence on the population of the insect.

ACKNOWLEDGMENTS

The authors are highly thankful to Principal, N. M. College of Agriculture and Director of Research, Navsari Agricultural University, Navsari, Gujarat, India for providing necessary facilities for conducting the present research work.

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