Population Dynamics of Major Insect Pests Associated with Karanja (*Pongomia pinnata* L.) Pierre Based Agroforestry System

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Short Research Article

ABSTRACT

A study was carried out at Jabalpur (M.P.), India on the population dynamics of the major inspect pests in Karanja (*Pongomia pinnata L.*) Pierre in 40 provenances intercropped with soybean. Three

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major insect pests namely leafminer (*Liriomyza trifolii*), white fly (*Bemissia tabaci)* and and stemfly (*Melanagromyza sojae (Zehntner)*)) were found infesting the karanja trees well as soybean crop A girdle beetle (*Obereopsis bravis*) and cow bug were also observed. Incidence of cow bug started in the first week of July and continued up to last of September. The population of cow bug attained its peak. by the middle of August at minimum and maximum temperature of 23.5℃ and 31.5℃ respectively, minimum and maximum relative humidity of 75% and 88% respectively and rainfall of 122 mm. The incidence of stem fly appeared from second week of august and continued up to last week of October and its highest population synchronized with adequate number of leaves of tree. The correlation studies a significant and positive correlation and did not differ significant between the insect population of white fly, girdle beetle and bark cater pillar between The population dynamics of Jassid. stem fly girdle, and bark eating caterpillar was not affected by average relative humidity.

1. INTRODUCTION

Pongamia pinnata (L.) Pierre is most commonly grown in humid and sub tropic environment, most commonly in coastal areas with its roots in freshwater or salt water but best growth is found in deep well drained sandy loam soil with assured moisture content and can also grow on sandy soils but do not grow well on dry sands [1]. It is also used in herbal medicine which is known as botanical medicine or as phytotherapy or phytomedicine which means a plant or plant part is used to make medicine to assist in the healing process during illness and disease. The roots of *Pongamia pinnata* (L.) Pierre is good for cleaning foul ulcers, cleaning teeth, strengthening gums and gonorrhea. Among various constraints causing losses in large trees, insects are the major one, which deteriorates the quality and the quantity of trees, shrubs, herbs as well as their produce There are about 30 species of insect pests recorded to cause damage to *Pongamia pinnata* (L.) Pierre rose usually as avenue and strip plantations on marginal lands. They include leaf miner defoliator, shoot borer, sap suckers, flower feeder etc. [1,2] reported a checklist of insects infesting *Pongamia pinnata* (L.) Pierre in India.

Management of insect pests in agroforestry systems is crucial to sustained production and even farmers have recognized this as a priority issue for agroforestry research. Insect pest issues of karanja in agroforestry system are likely to arise from two sources: the importation of wild plants into intensively managed ecosystems and certain peculiar features of agroforestry. Problems. Complications due to insect pests become more prominent if the imported woody plants are taxonomically related to the food or commercial crops of a recipient country. or if the pests of those plant species are similar to the insect pest complex native crops. In order to develop insect pest management programmed for specific agro forestry system it is necessary to have the basic information on the seasonal incidence of the insect pests in relation to weather parameters for determining appropriate time of action and suitable effective method of control. Therefore, the present investigation was carried out with a view of study the effect of different parameters on the incidence of important insect pests in Karanja.

2. MATERIALS AND METHODS

The field experiment was conducted at New Dusty Acre Area Research Farm, Department of Forestry, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.). Forty provenances were planted from different location of 5 x 5 m spacing with having 9 plants in block total number of 120 in randomized block design in between Karanja provenances. Soybean variety was sown for pest association and population dynamics and succession studies. The study was conducted in Randomized Complete Block Design. Observations for seasonal incidence of pests were taken once in a week whereas the observations on the population dynamics were recorded twice in a week. To assess the succession and incidence of insect pests and their natural enemies on Karanja under the field conditions, the weekly observations were recorded on five randomly selected plants at different stages of plant/crop growth starting from the first week of August to 4th week of November. The nature of damage of major pests was also studied. The meteorological data of corresponding period of observation was collected. The correlation of pest occurrence with weather parameters, were assessed by using the formula:

$$rxy = \frac{\sum xy - (\sum x)(\sum y)/n}{\sqrt{\left(\sum x^2 - \frac{(\sum x)^2}{n}\right)\left(\sum y^2 - \frac{(\sum y)^2}{n}\right)}}$$

Where,

n = Number of respondents
x = Independent variables
y = Dependent variables
r = Correlation coefficient
$\sum xy$ = sum of the product of score of two variables
$\sum x$ = sum of x scores
$\sum y$ = sum of y scores
$\sum x^2$ = sum of the square of x scores
$\sum y^2$ = sum of the square of y scores
$(\sum x)^2$ = square of the summation of the independent variables
$(\sum y)^2$ = square of the summation of the dependent variables

To evaluate the distribution and infestation level of various insect pests in Jabalpur (Dusty acre farm under Department of Forestry, JNKVV, Jabalpur, M.P.), 10 provenances of Karanja were surveyed at fortnightly intervals and the observation were noted on the incidence of major insect pests on 4 randomly selected plants per locality. The provinces were named as T1-T40. Five randomly selected branches in each plant were observed for the life stages of (moth/caterpillar) major pests to calculate per cent infestation. The population levels of insect pests such as leaf miner, girdle beetle, white fly, ant, stem fly, and aphid as well as natural enemies was also assessed [3,4].

3. RESULTS AND DISCUSSION

Forty provenances of Karanja were tested during the study. The All India coordinated project categorized the provenances in to different insect pest groupbased on their susceptibility reactions to pests on karanja and soybean. In the present studies on the basis of insect pest load and level of infestation, leaf miner (*Liriomyza trifoli* (Bugess)), Whitefly (*Bemisia tabaci* (Genn)) and stemfly (*Melanagromyza sojae* (Zehntner)) were found to be major pests of karanja, *P. pinnata* during 2010. Leaf miner *L.trifoli* appeared on the trees on 27th July. Its maggots mined the leaves through whitish zig-zag tunnels between the upper and lower epidermal layers of leaf. The pest continued till second week of September. The maximum and minimum populations of insect were recorded in treatment No. T17

(8.85%), T26 (3.32%) and maximum (52.83%) with minimum (41.64) infestation percentage were recorded in the middle of Octobers when the maximum and minimum temperature was 33.2 and 24.8℃ respectively coupled with maximum and minimum relative humidly of 86% and 71% respectively and zero rainfall. Among the 40 provenance, T17 was the most susceptible and T26 was the least susceptible to leaf miner.

White fly *B.tabaci* was observed to suck sap from the under surface of leaves and spread leaf curl disease virus. It appeared during the third week of August and remained active until the crop was harvested. The maximum and minimum population was recorded in T9 (217.27/tree) and T40 (77.67/tree). Among the forty provenances highest susceptible was T9 and lowest was T40 whereas remaining provenance was found to be moderate susceptible to white fly. The most favorable conditions for whitefly proliferation were the maximum and minimum temperature of 33.3 and 23.3℃ respectively, maximum and minimum relative humidity of 85% and 64% respectively with zero rainfall.

Stem fly *M. sojae* was observed outer layer of tree branches and spread from lower branches to higher branches. The damage spread to leaves. and other parts of the tree. The pest appeared during the fourth week of September and remained active at last of November. The differences in population among the provenances were not statistically significant. The lowest population was observed invT40 (1.01/tree) and highest population was recorded in T2 (1.71). The favourable conditions for M. sojae build up were the maximum and minimum temperature of 30.40℃ and 22.5℃ respectively and maximum and minimum relative humidity of 93% and 69% respectively with 118.5 mm of rainfall.

The No correlation was found between the weather parameters with fluctuation of leaf miner or stem fly population. Dashed et. al (1999) reported the peak population of stem fly in the first fortnight of august synchronized with ripening of the fruit. whereas in the present studies of insect population was recorded in the first of August. However, insect population was synchronized with repining ripening of the fruits.

On the basis of average 10 observation recorded at weekly interval all type of insect pest were differ significantly with regard cow bug population. There were variations in the leaf

Table 1. Seasonal incidence and population dynamic of insect pest in karanja during 2010

S.No.	Common Name	Scientific Name	Order	Family
1	Leaf miner	*Liriomyza trifoli Bugess*	Diptera	Agromyzicdae
2	Whit fly	*Bemissia tabaci Genn*	Hemiptera	Aleurodae
3	Stem fly	*Melanagromyza sojae Zehntner*	Lepidoptera	Noctiudae

miner populations on different varieties of Karanja. This indicates that stem fly white fly was less preferred fallow by minor leaf and leaf defoliator, whereas the number of insect pest per tree of karanja in July months under Agrisilviculture system of agro forestry.

On the basis of percentage infestation of leaf damage and twigs was found less preferred, whereas number of insect pest attacked on different was highly preferred by some insect months was highly preferred by some insect miner leaf, girdle beetle blue beetle. Arora and co-workers (2001) and Vashishtha (2002) have also reported high infestation of stem fly [5-7].

4. CONCLUSION

Weekly observation was recorded on the population dynamic and infestation level of insect on different provenances of karanja. the leaf miner (*Liriomyza trifolii*) and white fly (*Bemissia tabaci*) to be major pests. And a girdle beetle (*Obereopsis bravis*.) were was found infesting the karanja trees well as soybean crop in Madhya Pradesh. Incidence of cow bug started from first week of July and continued up to last of September with it peak population in middle of august at temperature minimum maximum relative humidity and rainfall were 23.5 c, 31.5,C and 75%, 88% 122mm respectively .

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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