

Short Research Article

Population dynamics of major insect pests associated with karanja (*Pongomiapinnata* L.) Pierre based agroforestry system.

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ABSTRACT

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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 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. A study was carried out at Jabalpur (M.P.), India on the population dynamics of the major insect pests in Karanja (*Pongomiapinnata* L.) Pierre in 40 provenances intercropped with s-Soybean variety was sown for pest association and population dynamics and succession studies. Study found that. There were two-Three major insect pests namely ~~miner~~ leaf miner (*Liriomyza trifolii*) and white fly (*Bemisia tabaci*) and stem fly (*Melanagromyza sojiae* (Zehntner)) girdle beetle (*Obereopsis bravis*) were found infesting the karanja trees well as soybean crop in Madhya Pradesh. A girdle beetle (*Obereopsis bravis*) and cow bug were also observed. Incidence of cow bug was started from in the first week of July and continued up to last of September with it. The peak population of cow bug attained its peak in by the middle of August at minimum and maximum temperature of 23.5°C and 31.5°C respectively, minimum and maximum relative humidity of 75% and 88% respectively and rainfall of were 23.5 e, 31.5, e and 75%, 88% -122mm respectively. The incidence of stem fly was started appeared from the second week of August and continued up to the last week of October and its higher highest population was synchronized with adequate number of leaf leaves of tree. The correlation studies reveals-revealed a significant and positive correlation and did not differ significant between the insect population of white fly, girdle beetle and bark caterpillar. Whereas correlation was not found non significant between The population dynamics of Jassid .stem fly girdle, and bark eating caterpillar with was not affected by average relative humidity.

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Comment [GN3]: The data on cow bug could not be seen in results and discussion. Hence delete from here.

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Keywords- Population dynamics, karanja, soybean, insect pest, Leaf miner, White fly and Stem fly

INTRODUCTION

Karanja (*Pongomiapinnata*L.)Pierre belongs to family Fabaceae (Papilionaceae). It is a nitrogen- fixing tree, producing seeds containing 30-40% oil and has originated from India . It is a medium size evergreen tree with a spreading crown and a short bole. The tree is planted for shade growing as ornamental tree. It is one of the few nitrogen fixing trees producing seeds containing 30-40% oil. The natural distribution is along coasts and river bank. It can be planted on degraded land, farmer's field boundaries, wasteland, fallow land. In recent times bio-diesel as alternative source of energy has gained more acceptance and government support. India's 30 million hectares of wasteland if deployed for bio-diesel production has the potential to generate 15 million jobs. This is apart from the employment created in seed collection, marketing and processing. ,

~~Insect pests are the most important group of organisms causing injury to plants in agroforestry systems. Therefore, the management of insect pests in these agroforestry systems is crucial to sustained production and even farmers have recognized this as a priority issue for agroforestry research. Insect pest problems-issues of karanja in agroforestry system are likely to arise from two sources: Those problems associated with the importation of wild plants into intensively managed ecosystems and those related to some certain peculiar features of agroforestry. These 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 of the leguminous genus is~~*Acacia*, with emphasis on *Acacia mollissima mearnsii* native crop. ~~Before developing~~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 ~~which infor~~ 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. ~~is briefly reviewed to illustrate the potential insect pest problems to the exotic plants themselves and how, as companion crops, the exotic plants may compound the pest problems of~~

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food legume crops. There is presently a contention that agricultural insect pest management strategies of karanja are deflectable in agroforestry systems.

Karanja (*Pongamia pinnata L.*) belongs to family Fabaceae (Papilionaceae). It is originated from India in naturalized in various humid and sub-tropical region of Asia. It is a medium size evergreen tree with a spreading crown and a short bole. The tree is planted for shade growing as ornamental tree. It is one of the few nitrogen fixing trees producing seeds containing 30-40% oil. The natural distribution is along costs and river bank. It can be planted on degraded land, farmer's field boundaries, wasteland, fallow land. Pongamia thrives in area having an annual rainfall ranging from 500 to 2500 mm. It can grow on most soil type ranging from stony sandy to clayey. It does not do well on dry sands. It is highly tolerant of salinity. Highest growth rates are observed on well drained soil with assured moisture.

Bio-fuels are relevant to India especially in view of energy, being an important element in poverty alleviation and improvement in quality of life for rural people. Besides it can greatly mitigate the country's staggering oil import bill of Rs.90, 000 crore and provide decentralized energy supply for agriculture, industry and household sectors in rural areas. In recent time's bio diesel as alternative source of energy is getting more acceptance and government support. Production of bio diesel sector would also create huge employment. India's 30 million hectares of wasteland development for bio diesel production in estimated to generate 15 million jobs. This is part from the jobs created in collection of seeds, marketing and processing. Production of bio diesel will also create jobs for highly trained manpower in chemical, agricultural and industrial sectors.

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-incidence of pests were was taken once in a week whereas the observations on the

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population dynamics ~~observation was were~~ recorded twice in a week. ~~Randomized Complete Block Design was used for study.~~ To ~~note 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 weekly interval in the field conditions starting from the first week of August~~ at different stages of plant/crop growth ~~starting from the first week of August up to~~ 4th week of November ~~on the five randomly selected plants. On the incidence of various insect pest and their natural enemies.~~ The nature of damage of major pests was also studied. The meteorological data of corresponding period of observation was ~~also noted collected.~~ ~~The The studies on~~ correlation ~~coefficient of pest occurrence~~ with weather parameters, were ~~also conducted assessed~~ by using the formula:

~~Where,~~

rx_y = simple correlation coefficient

x = meteorological parameter

y = incidence of insect pest and

n = number of ~~observation~~ observations

~~Distribution of insect pest.~~

To ~~know 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 i.e. moth/caterpillar to calculate. Both healthy as well as infested branches were counted and~~ per cent infestation ~~was worked out.~~ The population levels of insect pests ~~miner such leaf as~~ leafminer, girdle beetle, white fly, ant, stem fly, ~~and aphid as well as natural enemies~~ was also ~~noted assessed.~~

RESULTS AND DISCUSSION

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Forty provenances of Karanja were tested during the study. The All India coordinated project categorized the provenances in to different insect pest group based on their susceptibility reactions to pest 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 sojiae* (Zehntner)) were found to be major pests of karanja. *P. pinnata* during 2010. Firstly, the provenances were tested for significance of variance on the basis of critical difference (CD) at 5 percent Level significance and then categorized in to insect pest resistant or susceptible group.

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Table No. 1 Seasonal incidence and population dynamic of insect pest in karanja during 2010

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S.No.	Common Name	Scientific Name	Order	Family
1	Leaf miner	<i>Liriomyza trifoli</i> Bugess	Diptera	Agromyzidae
2	Whit fly	<i>Bemisia tabaci</i> Genn	Hemiptera	Aleurodidae
3	Stem fly	<i>Melanagromyza sojiae</i> Zehntner	Lepidoptera	Noctuidae

Leaf Miner (*Liriomyza trifolii* Bugers)

Leaf miner *L. trifoli* appeared on the trees on 27th July. Its maggots was mined the leaves through found damaging the tree by making whitish zig-zag tunnels between the upper and lower epidermal layers of leaf which could be seen by holding the leaf against bright light. The pest appeared in the last week of July and continued till second week of September. The maximum and minimum populations of insect were recorded in treatment No. T17 (17) (8.85) and 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°C respectively coupled with the maximum 86% and minimum (71%) relative humidity of 86% and 71% respectively and zero rainfall. Among the 40 provenance, T17 was the most susceptible was T17 and T26 was the least susceptible to leaf miner. lowest susceptible was T26.

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White fly (*Bemisia tabaci* Genn.)

White fly *B. tabaci* was recorded to seek the cell observed to suck sapsap from the lower under surface of leaves and spread leaf curl disease virus. It appeared during the third week

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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 have be moderate susceptible against to white fly. ~~When The most favourable conditions for whitefly proliferation were~~ the maximum and minimum ~~temperature~~ ~~temperature of was~~ 33.3 and 23.3°C ~~respectively~~ and, maximum and minimum relative humidity of 85% and 64% ~~respectively~~ with zero rainfall.

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Stem fly (*Melanagromyza sojae* zehner)

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Stem fly *M. sojae* was observed ~~to such of in the~~ outer layer of ~~branch or stem of tree~~ ~~branches~~ and spread from lower ~~surface branches~~ to higher branches, ~~and spread of The~~ damage spread to ~~leaf leaves~~ and other parts of the tree. ~~It The pest~~ appeared during the fourth week of September and remained active at last of November. The differences in population among the ~~provinance~~ ~~provenances~~ were not statistically significant. The ~~provenance recorded the~~ lowest population was observed in T40 (1.01/tree) ~~but its performance did not differ significant with remaining treatment. The~~ and highest population was recorded in T2 (1.71). ~~When The favourable conditions for M. sojae build up were~~ the maximum and minimum temperature was of 30.40°C and 22.50°C ~~respectively~~ and ~~the relative humidity~~, maximum and minimum ~~relative humidity of~~ 93% and 69% ~~respectively~~ with 118.5 mm of rainfall.

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DISCUSSION

~~Before developing insect pest management programmed for specific agro forestry system it is necessary to have the basic information on the seasonal incidence of the insect pest in relation to weather parameter which in 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 parameter on the incidence of insect pest. In the present studies on the basis of insect pest load and level of infestation of three insect pests i.e. miner leaf (*Liriomyza trifolii*) stem fly (*Melanagromyza sojae*), and white fly (*Bemissia tabaci* Genn.) were found to be major pest of karanja (*Pongamia pinnata* L.) The activity of leaf miner was started from 2nd august and continued up to October with insect population insect pest in fourth fort night intervals when the minimum temperature maximum temperature and relative humidity 4.10 25.0 Celsius and 87% respectively. The No~~

correlation ~~studies of~~ was found between the ~~meteorological weather~~ parameters with fluctuation of leaf miner or stem fly population ~~indicate that there is no effect of a biotic factor on the fluctuation of the leaf miner population.~~

~~The activity of stem fly started from second standard week and continue up to October 27 last date harvesting of crop with the insect population in 6 slandered week when the minimum maximum temperature and relative humidity were 7.3 calicoes and 26.1 Celsius and 56% respectively. There was no significane relationship between meteorological parameter with stem fly / leaf defoliator infestation.~~ Dashed *et. al* (1999) reported the peak population of stem fly in the first fortnight of august synchronized with ~~repining ripening~~ of the fruit. whereas in the present studies of insect population was recorded in the first of ~~august~~ August. ~~However~~ 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 ~~cowbug population~~. ~~There were variations in the leaf miner miner leaf insect~~ populations on different varieties ~~ranged from of karanja~~ 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. ~~No works have been reported by earlier workers with regards to varietals against miner leaf infestation.~~

~~On the basis of 6 observation recorded on the percent leaf damage and number of twigs found in karanja tree showed significant and some are non significant against stem fly The percentage of damage of leaf ranged 45.62% to 56.82%.~~ 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 ~~sigh~~ Vashishtha (2002) ~~have~~ also reported ~~to be more preferred by~~ high infestation of stem fly.

CONCLUSION

Weekly observation were recorded on the population dynamic and infestation level of insect on different provenances of karanja. ~~five randomly selected branches in each were observed for counting the population of the insect in whole plant .Both healthy and infested branches~~

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Comment [GN31]: Were these pests observed? If so, what were the species of blue beetle , please? Or is it the same girdle beetle *O.bravis*? What were their population levels?

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and twigs of the plant were counted and then the percentage infestation was work out .There were 3 replication and each plant present a replication in a randomized block design. showed There were two insect pest namely miner leaf the leafminer (*Liriomyza trifolii*) and white fly (*Bemisia tabaci*) to be major pests. And a girdle beetle (*Oberea sp.*) were was found infesting the karanja trees well as soybean crop in Madhya Pradesh. Incidence of cowbug was 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 .

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