Special Issue on Status of Information and Communication Technology in the Successful Implementation of IPM
Volume 4, Issue 2 - 2021, Pg. No. 8-12

Research Article

Peer Reviewed Journal

Insect Pest associated to Tree Bean (Parkia Roxburghii) Declined in Mizoram

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How to cite this article:
Vanlalhmuliana H, Rachael C, Lalthasangi et al. Insect Pest associated to Tree Bean (Parkia Roxburghii) Declined in Mizoram. *J Adv Res Agri Sci Tech* 2021; 4(2): 8-12.

Date of Submission: 2021-11-05
Date of Acceptance: 2021-11-28

A B S T R A C T

Tree bean (Parkia roxburghii) is an important leguminous cash crop in Mizoram and other North Eastern Region of India. However, its production is threatened by several abiotic and biotic factors, especially insects and diseases. Declined of tree bean was frequently observed and reported in all the districts of Mizoram since 90's which caused serious setback for tree bean growers. However, there were no systematic studies or research conducted to assess the role of insect pests on declining tree bean in Mizoram. The present investigation was carried out in Thiltlang, Darzo, Tuipui D, Rotlang East and Hnahthial of the then Lunglei district, Sangau of Lawngtlai district and Siaha of Siaha district and on road side plantation of NH-54 from Aizawl to Tipa and World Bank road from Aizawl to Lunglei, Mizoram, India during October 2017 to October 2020. The present works was aimed at studying the insect species associated with this crop in the states and also constitute an important baseline data for the design and implementation of IPM strategies for Tree bean protection in Mizoram. The frequently associated insect with partial or complete declined of tree bean was identified as Ambrosia and bark beetles, Blepephaeus succinctor and Xystrocera globosa. In addition, Ambrosia beetles (Curculionidae, Scolytinae) and Blepephaeus succinctor (Coleoptera: Cerambycidae: Lamiinae) was reported for the first time attacking and causing Tree bean decline in Mizoram.

Keywords: Ambrosia and Bark Beetles, Blepephaeus Succinctor, Xystrocera Globosa, Partial or Complete Decline, Integrated Pest Management, Mizoram

Introduction

Tree bean (Parkia roxburghii) is economically important multipurpose fast growing deciduous leguminous tree vegetable of Mizoram and other north eastern states of India. It is distributed in India, Bangladesh, Myanmar, Java, Thailand, Egypt and the Malaysian region. In North Eastern India, tree bean is found growing wild throughout the region. It is known as Zawngtah in Mizo language and the trees are mostly grown in jhumland, roadside, orchard, and backyard garden. Almost every part of the plants an i.e flower, tender leaves, tender pods and mature seeds are eaten as vegetables and provide a good source of nutrients. The mature seeds are useful against food allergy, diarrhea and dysentery. Traditionally, the bark and fruits are prescribed to check excessive bleeding during menstruation and the juice of the green rind of the pod is applied to fresh cuts, scabies and itching. In addition, the seeds are eaten by various wild animals and birds. The matured pod is one of the delicacies of the tribal people of the region and fetching

high market price. Tree bean decline have been frequently observed in Mizoram since 90's but since the sudden death have been confined in few locations, no proper studies on the decline have been carried out. Thangjam 2006 reported that the problems of die-back symptoms in P. timoriana have also been found to be associated with the infestation of Anoplophora glabripennis (Motchulsky) commonly known as Asian longhorned beetle and Recently, sudden decline of tree bean was reported from various parts of Manipur, Nagaland, Mizoram and Meghalaya, which seriously affected the socio-economic situation of the growers (Thangjam and Sahoo 2012). Preliminary investigation on the reasons behind the decline of tree bean was carried out during 2012-2013 in all the Krishi Vigyan Kendra of Mizoram under the direction of Director of Agriculture (Research and Education), Government of Mizoram but no proper conclusion was made. Recently, it was found that the sudden death or decline of tree bean in Mizoram was frequently associated with pathogen identified as Botrydiplodia theobromae and also some small unidentified bark borers infesting the tree (Ratankumar Singh et al 2018). In Manipur, tree bean decline was linked to insect stem borer, Bactocera sp. (Surendranath, 2007). Rajesh et al 2012 reported Verticilium dahlae causing seedling wilt of tree bean. Thangjam et al 2003 reported that C. cautella infested tree bean plant in both field and on storage conditions and the larvae was found to feed voraciously on the green kernels. All the stages in the life cycle of the insect were observed on P. timoriana. Sinha et al 2017 reported Lasiodiplodia theobromae causing dieback in tree bean decline in Northeast India.

Roy et al., 2016 reported a large number of insect pests like; Asian long horned beetle (Anoplophora glabripennis); bark eating caterpillar (Indarbela spp); jassid (Empoasca kerri); aphid (Aphis craccivora); thrips (Scirtothrips dorsalis); green stink bug (Nezara virudula); Coreid bug/ tur pod bug (Clavigralla gibbosa); spotted pod borer (Cadra cautella) to be associated with the tree bean. Out of these, Asian long horned beetle, bark eating caterpillar and spotted pod borer are most commonly found associated with declining trees. Moreover, Verticillium wilt and collar rot have also been observed in declining tree bean plantation. There were reports on large scale spread of Verticillium wilt from Chandel district of Manipur. Collar rot (Phytophthora sp.) has been found in valley areas, especially in Imphal West and Bishnupur district of Manipur. (Roy et al.,2016). Diseases and pests Parkia species have a number of pests in common with other leguminous trees and shrubs. The stem and bark borers Xystrocera festiva and Cossus subfuscus can cause severe damage in Parkia speciosa, especially at lower elevations in Java. Other pests are the pod borers Cryptophlebia ombrodelta and Mussidia pectinicornella, and the caterpillars of the leaf feeders Polyura hebe, Eurema blanda and Eurema hecabe. The seeds are relished by a great number of arboreal mammals (Yusuf et al., 2001).

Materials and Methods

Tree bean is found associated to numerous insect pest right from nursery stage to full grown stage. However, research on insect pest of this multipurpose tree is very scanty. Thus, the present study examined the insect pest associated to tree bean and its involvement in the sudden decline of this particular tree in Mizoram.

Study Area: The present investigation was carried out in Thiltlang, Darzo, Tuipui D, Rotlang East and Hnahthial of the then Lunglei district, Sangau of Lawngtlai district and Siahatlah-III of Siaha district, Mizoram, India during October 2017 to October 2020 covering 430 numbers of trees of different ages. In addition, incidences of different insects on tree bean were surveyed and observed randomly on road side plantation of NH-54 from Aizawl to Tipa and World Bank road from Aizawl to Lunglei covering 180 numbers of trees of different ages ranging from 3 to 15 years.

Pest Incidence/ Percentage of Infestation: The total no of healthy trees, partially dead and completely dead trees were recorded from the randomly selected trees to work out the percentage of death tree/ declined tree. Besides, the basal portions of the selected tree were inspected carefully up to 5ft. to identify borer infestation and holes of different size were counted and recorded. The activity and role of these insect were also studied in field condition.

Collection and Preservation of Insects: The emerging adult insects were collected in situ with the help of fine cloth bags covering the cutted logs and also by splitting open the cutted log with axe. The photographs of all the associated insects were taken with a Digital Camera.

The adults were conserved in 70% ethanol or dry (card mounted and pinned) and the immature stages were also preserved in 70% ethanol. The insects collected were sent to the Zoological Survey of India, Kolkata for Identification.

Results and Discussion

Pest incidence/ percentage of infestation: The results of the survey conducted in the villages of Thiltlang, Darzo, Tuipui D, Rotlang East Hnahthial, Sangau and Siaha and road side plantation of NH-54 from Aizawl to Tipa and World Bank road from Aizawl to Lunglei reveals that 29.73% (183 numbers) and 38.57% (233 numbers) were completely and partially death respectively. Among the selected villages/ town area, Rotlang east village has the highest percentage of completely declined tree (40%) followed by Sangau (34.44%) and Thiltlang (34.16%) whereas Tuipui D village has the lowest percentage of completely declined tree (20%). Besides, Thiltlang village has the highest percentage

of semi-declined tree (42.35%) followed by Hnahthial (42%) and Sangau (41.11%) which are at par to each other. In addition, the percentage of semi/partially declined tree was lowest in roadside plantation of NH-54 from Aizawl to Tipa (29%). The overall percentages of completely declined and partially declined tree were 29.73% and 38.57% respectively (Table 1).

Ambrosia beetle and other borer infestation were observed by counting the numbers of holes present from the ground level up to 5 ft. 10 numbers of trees were randomly selected from 9 locations thereby 90 numbers of trees were covered under the processed. The averaged numbers of Ambrosia beetle and other bark beetle holes was highest in Thiltlang (131.25) followed by Rotlang East (128.25) and Sangau (124.70). The averaged numbers of other beetle (larger holes) was also highest in Thiltlang (5.50) followed by Hnahthial (4.15) and Rotlang East (3.50). The overall average numbers of Ambrosia beetle and other bark beetle holes was 102.65 whereas that of other beetle (larger holes) was only 2.35 (Table 2).

Table 1.Survey Area and General Conditions of the Tree

S. No.	Villages/ town/Area	Total Nos. of tree survey	Total Nos. of Completely death tree (Complete declined)	Total Nos. of Partially death tree (Semi-declined)	Total Nos. of Healthy tree	% of Completely declined tree	% of Semi-declined tree
1.	Thiltlang	85	29	36	20	34.16	42.35
2.	Darzo	75	17	27	31	22.67	36.00
3.	Tuipui D	30	6	11	13	20.00	36.67
4.	Rotlang East	35	14	14	7	40.00	40.00
5.	Hnahthial	50	15	21	14	30.00	42.00
6.	Sangau	90	31	37	22	34.44	41.11
7.	Siaha	65	20	26	19	30.77	40.00
8.	NH-54 (Aizawl to Tipa)	100	33	29	38	33.00	29.00
9.	World Bank road (Aizawl to Lunglei)	80	18	32	30	22.50	40.00
Total		610	183	233	194	29.73	38.57

Table 2.Ambrosia Beetle and other Borer Infestation in Different Location of Mizoram

S. No.	Villages/town/Area	Total Nos. of tree inspected	Average Nos. of Ambrosia beetle and other bark beetle holes (small/pin hole size) per tree	Average Nos. of other beetles holes (Larger holes) per tree
1.	Thiltlang	10	131.25*	5.50
2.	Darzo	10	61.70	3.25
3.	Tuipui D	10	99.10	-
4.	Rotlang East	10	128.25	3.50
5.	Hnahthial	10	119.75	4.15
6.	Sangau	10	124.70	1.75
7.	Siaha	10	98.80	2.00
8.	NH-54(Aizawl to Tipa)	10	78.50	-
9.	World Bank road (Aizawl to Lunglei)	10	81.80	1.00
Total		90	102.65	2.35

The holes were counted from ground level up to 5 ft

Collection and Preservation of Insects: During the study period 18 species of beetles ranging from few millimeters (Ambrosia beetle and other bark beetles) to few centimeter (long horned beetles), mostly unidentified (Figure 3) were collected from different locations. Besides, large numbers of different lepidopteran larva (immature stages) were also collected for identifications. Among the insects collected, Blepephaeus succinctor was reported for the first time from tree bean and found to be associated to tree bean declined (Figure 1). This particular insect was mostly found to attacked tree bean age ranging from 2-10 years and caused extensive damaged especially in Thiltlang and Hnahthial areas. Xystrocera globosa was also active in Thiltlang, Darzo, Rotlang East and Hnahthial areas (Figure 2a). Some unidentified borer larvae were also found causing extensive damage to tree bean especially on older trees (Figure 2b, c and d).

Figure 1.a)Entry Point of Blepephaeus Succinctor bLarval Stage of B. Succinctor and c)Aadult of B. Succinctor (Coleoptera: Cerambycidae: Lamiinae)

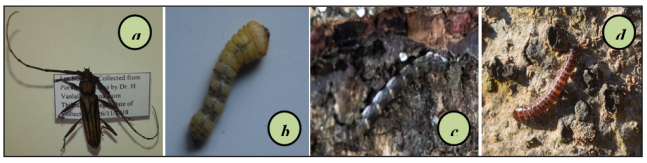

Figure 2.a)Adult Xystrocera Globosa (Coleoptera: Cerambycidae), b, c & d) Larva of Unidentified Borer

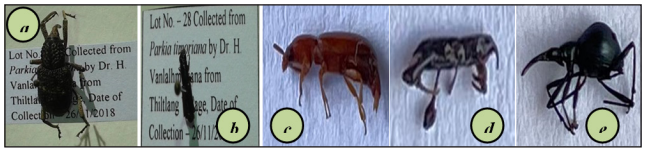

Figure 3.Some of the Unidentified Borer Collected from the Study Sites (a, b, c, d & e)

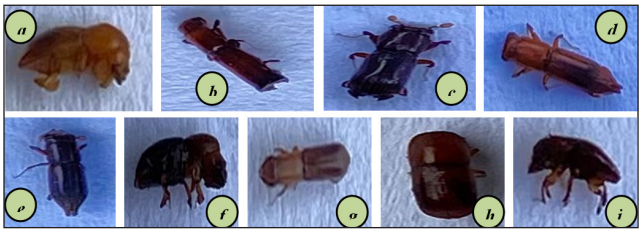

Figure 4.Unidentified Ambrosia and Bark Beetle Collected from the Study Sites (a-i)

Main Reasons for Declined of Tree Bean in Mizoram: During the study period, large numbers of insect's species were encountered but identification of the insects was the main problem. Most of the insects species collected was few in numbers and does not play significant role in the declining of tree bean in the region. However, Ambrosia beetles and other bark beetles pose a serious threat and play significant roles in the declining of tree bean in Mizoram. Moreover, B. succinctor and X. globosa was also found to be very destructive especially to young trees. In some cases, partially declined tree was found regenerated (Figure 5g) after spraying of systemic insecticides and cutting the wilted top portion of the trees. In general, tree bean plants are not well managed like other fruit crops in Mizoram. The seedlings were directly planted without digging pit or maintaining proper spacing and two to three weeding was done per year only without watering nor fertilizer applications. The plant was mostly left unattended till the plant shows sign of declined and when the farmers realized that the trees need due care it was always too late.

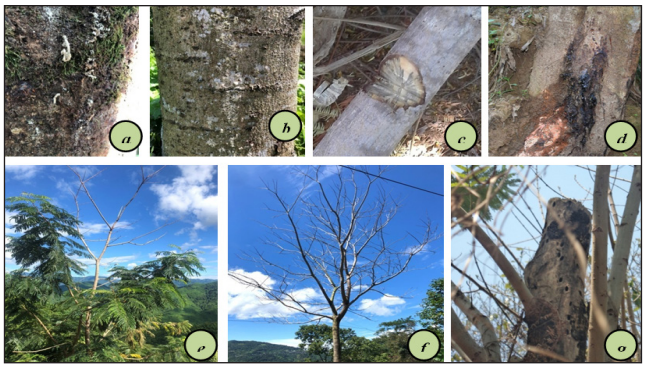

Figure 5.Nature of Damaged of Ambrosia and Bark Beetles: a,b) Production of Trash Like Saw-dust on the Entry Point; c) Wood Staining by Fungus; d) Gum Exudation; e) Partial Declined; f) Complete Declined; g) Regeneration from Partially Declined Tree

Figure 6.Collection of Insects; a) in Situ Collection; b, c) Ex-situ Collection by Bagging the Cutted Logs

Figure 7.Bored Holes and Sign of Different Insects; a) Bore Holes of Ambrosia Beetles; b) Bore Holes of Ambrosia Beetles and other Unidentified Borer; c) Long Horn Beetles; d) Bark Borer

The infested trees start shedding yellowing leaves and mostly drying up from the top downwards with prominent die back symptoms. Majority of the plant will completely dries up and dies within a few months, but in some cases it takes more than a year. The plant that dies slowly after having wilting symptoms was mostly attacked by insects only but the plants that die faster when cut opens usually shows sign of diseases infections also (Figure 5c). It can be concluded that the vast numbers of Ambrosia and bark beetles act as vector and transmitted pathogens among tree bean which accelerates the dying process of tree bean.

Conclusion

It is imperative that large scale management of Ambrosia and bark beetles was urgently needed to stop tree bean decline in Mizoram. Since weakened, dying or physiologically stressed trees are the preferred hosts of Ambrosia beetles and bark borer. Thus, maintaining tree health and vigour is an important step for reducing the risk of ambrosia beetle infestations and reducing tree density and maintaining proper spacing can strengthen the fitness of individual trees. Proper weeding, frequent watering and fertilization, pruning of infested trunk needs to be done. Stem injection and soil application of systemic insecticides will be useful to some extend and timing of foliar applications of insecticides needs to be properly worked out to increase the effectiveness as they were very difficult to control. Insecticides treated net may also be employed if applicable. Parasitoids and predators of these destructive pests need to be found out. Lastly, all the available management practices should be incorporated within the overall framework of integrated pest management to combat these notorious pests.

References

1. Sinha B, Lalhruaitluangi C, Devi PS et al. First report of Lasiodiplodia theobromae causing dieback in tree bean (Perkia roxburghii) in Manipur. *Plant Disease Research* 2018; 33(2): 222-224.
2. Rajesh K, Ashwani T, Borah RK. Identification and controlling of verticillium wilt infecting Parkia roxburghii seedling in Manipur India. *Res J Forest* 2012. doi:10.3923/rjf.2012.
3. Kumar RS, Dutta A, Singh SK et al. Occurrence, severity and association of fungal pathogen, Botrydiplodia theobromae with sudden death or decline of tree bean (Parkia timoriana, (DC.) Merr) in North Eastern India. *Current Science* 2018; 115 (6): 1133-1142.
4. Roy SS, Kumar S, Sharma SK et al. Tree bean (Parkia roxburghii): A potential multipurpose tree legume of north east India. In: National Symposium on Vegetable Legumes for Soil and Human Health. 2016.
5. Surendranath ST. Identification of Strategy for Mapping of Science and Technology Needs in a State: A Project Compilation Report, Manipur Science and Technology Council (MSTC), Central Jail Road, Imphal 795001, Manipur. 2007; 137.
6. Thangjam R, Damayanti M, Sharma GJ et al. Cautella Walker (Lepidoptera: Crambidae: Phycitinae) - a pest on Parkia timoriana (DC.) Merr. in Manipur. *Curr Sci* 2003; 85(6): 725-726.
7. Thangjam R. DBT-PDF Annual Progress Report, Institute of Bioresources and Sustainable Development (IBSD) Imphal, India (Department of Biotechnology Government of India. 2006.
8. Thangjam R, Sahoo L. vitro regeneration and Agrobacterium tumefaciens-mediated genetic transformation of Parkia timoriana (DC.) Merr.: a multipurpose tree legume. *Acta Physiol Plant* 2012; 34: 1207-1215.