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Studies on Insect Diversity Associated with Important Tree Species at Bhubaneswar, Odisha, India

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A B S T R A C T

A field experiment was conducted in nearby areas of Bhubaneswar to document the insect pests associated with some important tree species used for avenue plantations. The species taken for study are Gambhar (*Gmelina arborea*, Verbenaceae), Kadam (*Neolamarkia cadamba*), Mahogany, (*Swetnia macrophylla*) Kangada (*Xylia xylocarpa* Fabaceae)and Spanish cherry(*Mimosups elengi*, Sapotaceae). A total of 50 numbers of insect pests have been recorded. While categorizing the recorded insects based upon their mode of damage, foliage feeders are found as the dominant groups comprising more than 50% of total recorded insect pests followed by sap feeders (22%). The bark feeders like termite and *Inderbela* comprises the third largest group (16.0%) in the studied location. While categorizing the available insects on taxonomic aspects. Lepidepterous insects are found as pioneer among all comprising of 34% of the total followed by the sap feeders belonging to hemiptera. (22%). Coleopterous insects occupies the third positioned with 12% share of the total recorded species Among plant species Kadam recorded highest Lepidepterous diversity (66.6%) followed by Gambhar (30.00%). Orthopteran population including grasshoppers and crickets were more recorded in Mahogany (57.14%) followed by *Mimusops.*

Introduction

Out of the total forest area of 32% in the state, most part is under potential threat to anthropogenic activities causing reduction in species diversity (Hussain & Tripathy, 2016). Besides several biotic and abiotic factors are also poses serious threat to both afforested and natural plantations causing great loss to the freshly transplanted stand of several important timber yielding species. Continuous and severe outbreaks of several pests are found to be associated with loss of precious species in both natural forests and avenue plantations.

The report on insect-pest incidence, beneficial arthropods association in most of the important tree species in the country is quite meager. In spite of lot of scope for using biocontrol agents in such permanent ecosystems, the work done in these regard is

quite inadequate because of lacking appropriate sampling techniques to monitor pest and bio control activities.

Hence, in the present investigation an attempt is being taken to produce a systematic documentation regarding the list of insects associated with few important afforested and avenue plantation species popularly used throughout the state. The species teken for study are Gambhar (*Gmelina arborea*, Verbenaceae), Kadam (*Neolamarkia cadamba*), Mahogany, (*Swetnia macrophylla*) Kangada (*Xylia xylocarpa* Fabaceae) and Spanish cherry (*Mimosups elengi*, Sapotaceae). Such attempt may be helpful in future in formulating IPM strategy as per feasibility and warranty of situation.

Materials and Methods

Abundance of insects were recorded from 3 different locations of Bhubaneswar during first fortnight July, 2017 to Aug 2018.Bhubaneswar is situated at an elevation of 25.9 m above mean sea level at 20^0 15'N latitude and 85^0 52' E longitude. It is situated in the East & South East Coastal Plain zone of Odisha, which falls under Tropical wet-dry or Tropical Savanna forest type. Flying and slow moving insects were collected by means of a swift net and preserved appropriately.

Immature stages of Lepidopterous and Coleopterous insects were reared in the post graduate laboratory of college of Forestry up to the adult stage in natural food medium in plastic cups of 4 inch diameter and 4 inch depth after following all the sanitation practices. Identification was established either by personnel experience or from Entomology museum or by consulting professors of Entomology department or from Internet sources or by using standard keys lay by established workers. (Patil *et al*., 2016, Tripathy *et al*., 2018) Specimens were preserved by following appropriate technique in case of delay in identification. At different locations, trees showing uniform growth pattern and age were selected, plants were divided into 3 categories such as (i) Seedlings (ii) Plants- 1-3 year old (Saplings)(iii) Plants- more than 3 years old.(Pandey *et al.,* 2010, Tripathy *et al.,* 2018) For saplings, ten number of saplings and ten terminal twigs/sapling were randomly selected and from more than three years plants five plants were selected and 10 no of twigs were selected from lower, middle and upper canopy, from which all leaves were sampled for observing the presence of grubs or adults of defoliator/standard branch.

Results and Discussion

A total of 50 number of insect pests have been recorded to infest these species during the experimental period at different growth stages viz. seedlings, saplings and full grown stages at Bhubaneswar situation which has been summarized in Table1. Gambhar is a multipurpose and fast growing timber species and has a problem of multiple insect pest attack in India. Several workers has observed 101 insect pests infesting to *Gmelina arborea* from India (Nair, 2007) Mathur and Singh (1959) recorded 21 defoliators and 13 shoot borers infesting to this plant species but *Calopepla leayana* and *Tingis beesoni* was found as most destructive. This fact was agreed by several workers like, Aung Zeya 1981, 1983, Nair and Mathew 1988, Meshram *et al.,* 2001; Mathur 1979; Ahmad and Sen-Sharma. 1990, Burman 2014 etc. Meshram *et al.,* 2001 from India also viewed *Calypepla leyana* as the most damaging one. The present study also corroborate the same fact that *Calopepla leayana* is the major defoliator of this species recorded here during the period of experimentation with defoliation recorded from seedlings to saplings and also in full grown plants.

Table.1 Succession of different insect pests associated with important tree species during the observation period at Bhubaneswar (2017-2018)

Gambhar - *Gmelina arboria* ,Roxb: Verbenaceae						
Sl. No.	Pest Common name	Scientific name	Order	Family	category	Status
1	Gambhar defoliator	*Calypepla leyana((*Latreille)	Coleoptera	Chrysometidae	Foliage feeder	Major in seedling and pole sized plants.
2	Gambhar shoot weevil	*Alcidodes ludificator*	Coleoptera	Curculionidae	Shoot borer	Major in tree
3	Brown winged Grasshopper	*Arphia conspersa*	Orthoptera	Acrididae	Foliage feeder	Major in seedlings
4	Mealy bug	*Pseudococcus filamentosus*	Hemiptera	Pseudococcidae	Sap sucker	Attacks leaves and young shoots
5	Mealy bug	*Nipaecoccus viridis*	Hemiptera	Pseudococcidae	Sap sucker	Attack young leaves and shoots
6	Mealy bug	*Planococcus citri*	Hemiptera	Pseudococcidae	Sap sucker	Attack young leaves and shoots
7	Gambhar leaf miner	*Phyllocnistis amydropa*	Lepidoptera	Gracillaridae	Eat leaves	tissues Attack leaves
8	Semilooper	*Ectropis bhurmitra*	Lepidoptera	Geometridae	Miner	Attack leaves
9	Termite	*Odentotermus obesus*	Isoptera	Termitidae	Rood feeder and bark feeder	Major in trees.
10	Termite	*Microtermus obesi*	Isoptera	Termitidae	Root and bark feeder	Major in trees
11	Bark borer	*Inderbela quadrnotata*	Lepidoptera	Arbellidae	Bark borer	Major in trees
12	Tortoise beetle	*Aspidomorpha miliaris*	Coleoptera	Chrysomelidae	Miner	Major in trees but seasonal appearance
13	Leaf folder	*Belippa laleana*	Lepidoptera	Limacodidae	Foliage feeder	Major but seasonal
14	Spittle bug	*Poophilus costalis*	Hemiptera	Aphrophoridae	Sapfeeder	Minor
15	Aphids	*Aphis gossypi*	Hemiptera	Aphididae	Sap feeder	Minor and occasional
16	White flies	*Aleuropapillatus gmelinae*	Hemiptera	Alyrodidae	Sap feeder	Minor and occasional
17	Jassids	Unidentified	Hemiptera	Cicadellidae	Sap feeders	Minor and occasional
18	Defoliating	*Eupterote geminate*	Lepidoptera	Eupterotidae	Foliage	Major in rainy

	caterpillar				feeders	season
19	Bark eating caterpillar	*Inderbella quadrinotata*	Lepidoptera	Arbellidae	Bark feeder	Major in problematic areas
20	Defoliating beetle	Unidentified	Coleoptera	----	Foliage feeder	Minor ,during rainy seasons
Kadamba - *Neolamarkia cadamba* Roxb, family : Rubiaceae						
1	Leaf defoliater	*Arthroschista hilalaris*	Lepidoptera	Pyralidae	Foliage feeder	Pole size and larger plants
2	Semi looper	*Ectropis bhurmitra*	Lepidoptera	Geometridae	Foliage feeder	Attack leaves
3	Bark borer	*Inderbela quadrinotata*	Lepidoptera	Arbillidae	Bark feeder	Major in tree
4	Brown grass hopper	*Arphia conspersa*	Orthoptera	Acrididae	Leaf feeder	Major in seedlings
5	Bag worm	*Pteroma plagiophleps*	Lepidoptera	Psychidae	Leaf feede	Minor in plants
6	Beetle	Unidentified	Coleoptera		Available in bark	Visitor and dead wood feeder
7	Frog hopper	Unidentified	Homoptera	Fulgoridae	Sap suckers from leaves	Appeared in rainy season
8	Caterpillar -	Unidentified	Lepidoptera	-----	Foliage feeder	Appeared during rainy season
9	Leaf minor	Unidentified	Lepidoptera -	------	Foliage feeder	Minor during rainy season
Mehagani- *Swetenia macrophyla* King: Meliaceae						
1	Brown grasshopper	*Arphia conspersa*	Orthoptera	Acrididae	Leaf feeder	Major in Seedling
2	Semi looper	*Ectropis bhurmitra*	Lepidoptera	Geometridae	Foliage feeder	Seedling
3	Shoot borer	*Hypsipyla robusta*	Lepidoptera	Pyralidae	Top shoot borring	Major during post rainy and winter season in seedlings and pole sized plants
4	Brown grass hopper (sp.2)	*Diabolocatantops pinguis*	Orthoptera	Acrididae	Leaf feeder	Major in seedlings
5	Cricket	*Brachytrupus portentosus*	Orthoptera	Gryllidae	Leaf feeder	Major in seedling
6	Leaf footed bug	Unidentified	Hemiptera	Coreidae	Leaf feeder	Minor
7	Grasshopper	Unidentified	Orthoptera	Acrididae	Foliage feeder	Major in seedling
Spanish Cherry- *Mimusops elengi* Linn: Sopotaceae						
1	Webber	*Nephopterix eugraphila*	Lepidoptera	Phycitidae	foliage feeder	Appeared mainly during rainy season Major in all groups of plants

2	Termites	*Odontotermus obesus Microtermus obesi*	Isoptera	Termitidae	Bark feeder	Major in big trees and transplants
3	Grass hoppers	*Arphia conspersa*	Orthoptera	Acrididae	Leaf feeder	Major in seedlings
4	Thrips	*Arrenothrips ramkrishnae Hood*	Thysanoptera	Thripidae	foliage feeder	Appeared throughout the year .Major in all plant groups
5	Grasshoppers	*Diabolocatantops pinguis*	Orthoptera	Acrididae	Foliage feeder	Appears throughout the year
6	Mealybug	Unidentified	Hemiptera	Pseudococcidae	Sap feeder	Appears in winter
7	Tent hairy catterpillar	*Metanastia hyrtica*	Lepidoptera	Lesiocampidae	Defoliator	Appears during rainy and winter
Kangada- *Xylia xylocarpaRoxb* : Fabaceae						
1	Bark feeder	*Inderbella quadrinotata*	Lepidoptera	Arbelidae	Bark feeder	Major pest in trees
2	Grasshopper	*Arphia conspersa*	Orthoptera	Acrididae	Leaf feeder	Major in seedlings
3	Termite	*Odontotermus obesus*	Isoptera	Termidae	Bark feeder	Major in large plants
4	Termite	*Microtermus obesi*	Isoptera	Termidae	Bark feeder	Major in large plants
5	Stink bug	*Podisus brevispinus*	Hemiptera	Pentatomidae	Sap feeder	Major in large plants
6	Leaf footed bug	Unidentified	Hemiptera	Coreidae	Sap feeder	Major in seedlings

Table.2 Classification of insect pests into different categories of the observed species reported during study period at Bhubaneswar (2017-2018)

	Mahogany	**Xylia**	**Gambhar**	**Kadam**	**Mimusops**	**Total**
Foliage feeders	5 (71.42)	1(16.6)	9(42.8)	6(66.6)	5(71.42)	26(52.00)
Bark feeders	1(14.28)	2(33.3)	2(9.52)	2(22.2)	1(14.28)	8(16.00)
Shoot borers	1(14.28)	0.00	1(4.76)	0.00	0.00	2(4.00)
Sap feeders	0.00	2(33.3)	7(33.3)	1(11.1)	1(14.28)	11(22.00)
Root feeders	0.00	0.00	2(9.52)	0.00	0.00	2(4.00)
Wood feeder	0.00	1(16.6)	0.00	0.00	0.00	1(2.00)
Total	7(14.00)	6(12.00)	21(42.00)	9(18.00)	7(14.00)	50(0.00)

Figures in parenthesis are percentage values

Table.3 Classification of insect pest as per their taxonomic groups in the observed species during the study period at Bhubaneswar (2017-18)

Insect orders	Gambhar	Kadam	Mahogany	Kangada	Baula	Total
Coleoptera	4(20)	1(11.1)	0.00	1(14.28)	0.00	6(12)
Lepidoptera	6(30)	6(66.6)	2(28.57)	1(14.28)	2(28.57)	17(34)
Orthoptera	1(5)	1(11.1)	4(57.14)	1(14.28)	2(28.57)	9(18)
Isoptera	2(10)	0.00	0.00	2(28.57)	1(14.28)	5(10)
Hemiptera	7(35)	0.00	1(14.28)	2(28.57)	1(14.28)	11(22)
Others	0.00	1(11.1)	0.00	0.00	1(14.28)	2(4)
Total	20(40)	9(18)	7(14)	7(14)	7(14)	50(0.00)

Figures in parenthesis are percentage values

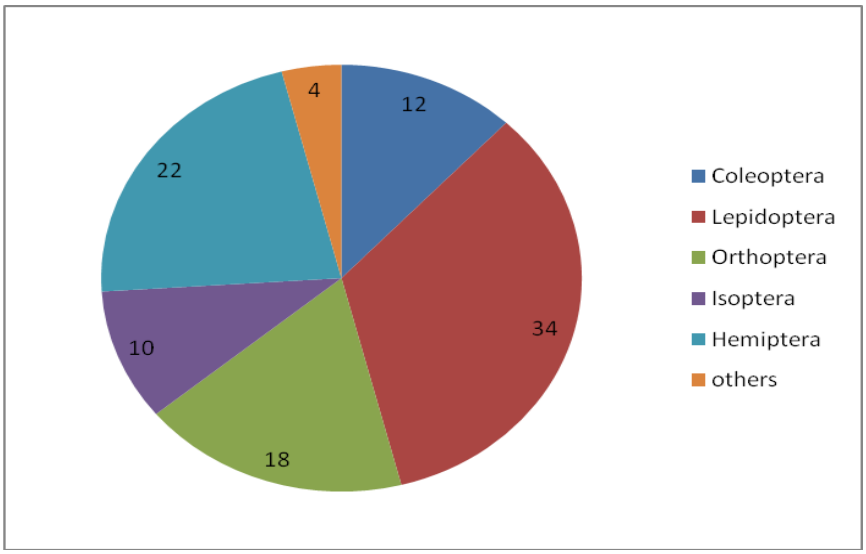

Fig.1 Order wise distribution of insect pests in the observed trees during the study period at Bhubaneswar (2017-18)

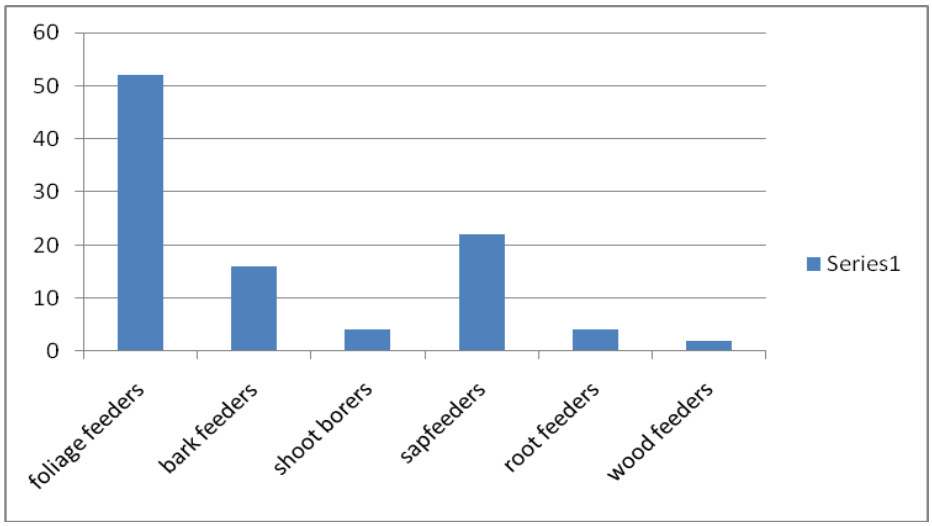

Fig.2 Classification of insect pests on the basis of damage in the observed species reported during period of experimentation at Bhubaneswar (2017-18)



Mimosups webber infested twig

Kadam defoliator larvae

Kadam defoliator pupae

Bagworm larvae

Inderbela infestation in kadam


Leaf minor damage and stink bug in kadm

Pentatomid from xylia

Female and male of kadam defoliator

Brown grass hopper from xylia

Unidentified caterpillar from kadam

grubof calopepla

Pupae of calopepla

Adult of calopepla

Folder in gambhar

Grasshopper from xylia

Grasshopper in mimosups

Damage of gambhar shoot weevil

Coreid in xylia

Another important pest recorded here is *Alcidodes ludificator* which bores the shoot and kill the young plants and branches and the infestation was recorded throughout the year. In forest plants and trees suitable for plantation in agro forestry, because of height sampling becomes a great problem for which detection of distribution of insect pests at the uppermost canopy of large sized plants is not possible in a country like ours.

But in developed countries some other techniques like fogging and use of other sophisticated machineries has solved this problem. However, substantial loss of early transplants in the site and making the seedlings unsuitable for planting is the common outcome. Nair (2007) and Senthil Kumar and Murugasan (2012) from India viewed this shoot weevil as one of the minorpests attacking Gambhar. Reports from other countries regarding pest diversity of Gambhar is also available i.e. 20 in Thailand (Hutacharen, 1990). In a study on three year old plantation in Kerala, India, Nair and Mathew (1988) found the major damage was caused by 2 species of Insects i.e. Gambhar defoliator and *Tingis beesoni* and they reported a total of 34 species of insects to be associated with this tree. In Kadam the defoliator *Arthorschista hilalaris* is found as the major one appearing during the rainy and post rainy months. In the present study a total of 9 species were recorded from this species. Chey,2001 reported more than half a dozen species of defoliators in this species from Malaysia. *Euteryste fabea* (Lepidoptera: Eupterotidae) has been reported to cause

substantial damage in this species from Phillipines (Quinones and Zamore. 1987). White grub damage in 1-2 year old seedlings in Indonesia is also reported (Intari and Natawaria. 1973) and the hepialid caterpillars (*Sahyadrasus malabaricus*) infesting the stems of saplings has been reported from Kerala, India (Nair, 1987).

Mahogany, the most preferred afforested species after teak in the state is observed to be infested by a total number of 7 species here at Bhubaneswar. The shoot borer *Hypsipyla robusta* attack is found as major one. Nair, 2007 also opined that less other insects are associated with the tree in exotic plantations of Mahogany, the dominant pest is one of the two species of *Hypsipyla* sp. Additional pests in native plantations include the mahogany web worm *Macalla thyrsalis* (Lepidoptera, Pyralidae) which webs the newly flushed leaves and feeds on them and *Phyllocnistis meliacella* (Lepidoptera, Gracillaridae) whose larvae mines in the leaves (Howard and Solis 1989). Termites are also considered important in this plant species as viewed by workers from India (Nair, 2007) and abroad (Mathew and Newton, 1998).

Mimusops elengi is a medicinal plant with typical leaf margin, lusture and dense foliage for which it is preferred at present for avenue plantations, plantation in public places including parks and backyards. At Bhubaneswar situation we have recorded 7 species of insects out of which the Phycitid borer *Nephopteryx eugraphilla* was the dominant one followed by thrips *Arrenothrips ramkrishnae* causing leaf galls. The literature in this regard is quite meager. Senthilkumar and Murugassan (2012) from Coimbatore reported its damaging status and host range in detail. However, the first species is a major concern during rainy season and the second one is available throughout the year in Bhubaneswar situation. *Xylia xylocarpa* was found to be resistant to any of the principal pests except bark feeder *Inderbella quadrinotata* (Arbellidae, Lepidoptera). But in seedlings, few insects are reported here and the total species infesting this plant at various growth stages are six in numbers. Workers like Mathew (1995) from Kerala also reported the same fact. As depicted in table 2and fig.2 while categorizing the recorded insects based upon their mode of damage, foliage feeders are the dominant groups comprising more than 50% of total recorded insect pests followed by sap feeders(22%). The bark feeders like termite and *Inderbella* comprises the third largest group (16.0%) in the studied location. While categorizing the available insects on taxonomic aspects (Table 3 and fig. 1 . Lepidepterous insects are found as pioneer among all comprising of 34% of all followed by the sap feeders belonging to hemipteran. (22%). Coleopterous insects occupies the third positioned with 12% share of the total recorded species Among plant species Kadam recorded highest Lepidepterous diversity (66.6%) followed by Gambhar (30.00%). Orthopteran population including grasshoppers and crickets were more recorded in Mahogany (57.14%) followed by *Mimusops.*

References

Ahmad SI and Sen-Sharma PK. 1990. Bionomics of *Calopepla leayana* latr. (Coleoptera: Chrysomelidae), a serious defoliator of *Gmelina arborea* Roxb. Plantations in India.
Indian forester, 116, 71-82.

Aung-Zeya. Two insect species doing derious damage to planted Yamane (*Gmelina arborea*) in Yazinand Moswe areas. Burma Forest Research Institute. Yazin Leaflet. 1981; 7: 80-81

Aung-Zeya. Further observation on *Tingis beesoni* (Hemiptera: Tingidae) incidence on Yamane(*Gmelina*

arborea). Burma Forest Research Institute. Yazin Leaflet. 1983; 7: 82-83

Barman A. 2014. A brief perspective on Gmelina tree insect pest *Craspedonta leayana*. *Journal of Entomology and Zoology Studies*, **2**(4): 276-278

Chery, V.K.(2001).The laran tree and its defoliators. The Planter, 77. 587-592

Howard, F.W. and Solis, M.A. 1989. Distribution, life history and host relationships of mahogany webworm, *Macalla thyrsisalis* (Lepidoptera: Pyralidae). Florida Entomologist, 72: 469-79

Hussain ,M .M. and Tripathy ,M.K. 2016. Prospects of IPM in forestry. Lead paper presented by Dr. M. K. Tripathy in national symposium on new horizons in pest management for sustainable developmental goals on 23-24 Dec at OUAT, BBSR 2016.pp 9-17(souvenir)

Hutacharen C. 1990. Forest insect pests in Thailand. In pest and diseases of forest plantations, ed. C. Hutacharern , K.G. MacDicken , M.H. Ivory and K.S.S. Nair. Bangkok: FAO regional Office for Asia and the Pacific, 75-79.

Intari ,S.E. and Natawaria, D. 1973. White grubs in forest tree nurseries and young plantations. Laporan lembaga penelitian Hutan, 167, 1-22.

Mathew ,J.E. and Newton, A.C. 1998. The Silviculture of Mahogany. Wallingford, Oxon: CAB International.

Mathew,G.(1995). Field performance of some indigenous tree species with respect to pest incidence in Kerala(India).*Indian journal of Forestry*, 18,133-40

Meshram ,P.B., Pande, P.K. and Banerjee, S.K. (2001). Impact of pest problems in *Gmelina arborea* Linn. Plantations in Western Maharastra, Indian forester, 127 (12), 1377-86.

Nair, K,S,S, and Mathew, G. 1988. Biology and control of fast growing hardwood species: *Albezia falcataria* and *Gmelina arborea*. KFRI Research Report No. 51. Kerala Forest Research Institute, Peechi, India.

Nair, K.S.S. 2007 Tropical forest insect pests: ecology, impact and management. Cambridge University Press, Cambridge. 404.

Patil, S. S., Sutar, M.V .and Sathe ,T.V. 2016. Diversity, Biology and Control of insect pests of teak *Tectona grandis* from western Maharastra, Biolife, 4(1):141-146

Quiniones, S.S. and Zamora, R.A 1987. Forest Pests and Diseases in the Phillipines. In forest pests and diseases in Southeast Asia, BIOTROP Special publication No. 26, ed.E.D.de Guzman and ST Nuhamara. Bogor, Indonesia: Southeast Asian regional centre for tropical biology, 43-65.

Sethilkumar, and Murugesan. 2012. Insect pests of important trees species is south india and their management information. Technical bulletin by IFGTB , Coimbatore PP 1-12617

Tripathy ,M.K,Rout M and Tripathy 2018Population dynamics aof teak defoliator, *Hyblaea puera* Cramer at Coastal Odisha ,,India .Journal of Entomology and Zoology studies 6(5) 2378-2387.

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