



AN ASSESSMENT OF INSECT PESTS OF TEAK (*TECTONA GRANDIS* LINN.F) WITH SPECIAL REFERENCE TO BIOECOLOGY OF *HYBLAEA PUERA* (CRAMER) IN AIZAWL DISTRICT MIZORAM

Agricultural Science

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ABSTRACT

A Survey studies and assessment on the Bioecology of insect pest of teak (*Tectona grandis*) and their natural interrelationship of plant and insect life in their common environment how it interacts with the environment and with other species. A research survey revealed that an assessment of Insect pest teak (*Tectona grandis* Linn.f.) conducted during May, 2016 and February, 2020 total of 15 insect were associated with this plant and were recorded as natural enemies associated with this plant. Investigation on seasonal incidence, biology and management of *Hyblaea puera* Cramer was carried out in Aizawl district of Mizoram during 2016-2020. The *Hyblaea puera* is a well-known pest causing significant economic losses on timber production from teak plantations during their seasonal outbreaks. Pest population was at peak during June to August in the teak plantation of Eastern and western aspects of Aizawl District and recorded lowest pest incidence and also showed maximum pest population. The study revealed that the *Hyblaea puera* (Cramer, 1777) completed its life cycle in 21–25 days in both laboratory and field conditions.

KEYWORDS

Bioecology, Insect Pests, Lepidoptera, *Tectona Grandis* Linn.f,

OBJECTIVES

1. To study the activity of *Hyblaea puera* Cramer on teak (*Tectona grandis*)
2. To study the phenology of *Tectona grandis* Linn.F

The objectives of the study were to assess the bioecology of teak defoliator characterization of teak (*Tectona grandis* L.) plants against these pests was carried under field condition at different aspects Eastern and western aspects of Aizawl district, Mizoram.

Literature review

The first teak plantation in India was established in 1846 at Nilambur, Kerala. It is widely distributed in India and grows in the dry and moist deciduous forests below 240 N latitude in the states of Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Gujarat, Chattisgarh, Madhya Pradesh, Rajasthan, Uttar Pradesh, Manipur and Orissa. There are nearly 8.9 million ha. of teak bearing forests in India (Tewari, 1992) within precipitation range of 800 to 2500 mm. Presently 1.5 million hectares of teak plantation exist in India and around 50,000 ha of teak plantations. In Mizoram teak, plantation has been introduced in large scale in last three decades and covers 12,624 hectares. (Vinod, Lalnundanga and Lalremkimi 2008) Teak plantation is expected to become one of the major sources of wood in the near future in Mizoram.

It belongs to the family of Verbenaceae. It occurs in natural forests between 90 to 260 N latitude and 730 to 1040 E longitudes, which includes Southern and Central India, Myanmar, Laos people's Democratic Republic and Northern Thailand (White, 1991). Teak has been introduced in South East Asia, Indonesia, Sri Lanka, Vietnam, Malaysia and the Solomon Islands as well as in Africa and Latin America.

About 187 insect species have been found feeding on the living teak tree in India (Mathur and Singh, 1961; Hutachareon and Tubtim, 1995). The majority of these insects are leaf feeders, with a smaller number of sap feeders, stem borers, inflorescence and fruit feeders and root feeders. Among these, the teak defoliator, *Hyblaea puera* Cramer is the most widespread and serious pest. Outbreaks occur almost every year in India over extensive areas. During these outbreaks in the early flushing period of teak, trees usually suffer a total defoliation, sometimes there is partial defoliation later in the growth season (Beeson, 1941; Nair, 1988). Studies in young teak plantations at Nilambur in Southern India showed that defoliation by *H. puera* caused loss of 44.1 per cent of the potential wood volume increment (Nair et al., 1996).

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H. puera has also become an economic pest in non-native teak countries such as Costa Rica and Brazil, where outbreaks appeared all of a sudden during 1995 and 1996, respectively. Nair (1988) opined that outbreaks of *H. puera* appear imminent in Latin America and Africa in the near future. Hence, a regular outbreak of *H. puera* is set to become a global problem in all these countries where teak is being cultivated. Hence, the present study was conducted to know the seasonal incidence of teak defoliator *H. puera* through monitoring and surveillance in different teak plantations of Eastern aspects and western aspects of Aizawl district in Mizoram. In fact, the total number of insect pests infesting this plant might be more because of report of additional species by several workers around the country during subsequent years after the base line report. Instead of substantial damage, no such established management practice is available in this country because of lack of systematic study in many aspects of the pests including biology, ecological studies like population density fluctuation, factors governing host preference of individual pests etc. Moreover, for economic, technical and social reasons chemical control strategies in spite of their availabilities are not preferred by the growers. In some advance states like Kerala some private growers are coming forward for taking control operations against the major pests. Hence in the present investigation an attempt is being made for bringing out a systematic documentation regarding the damage caused by different insect pests attacking teak seedlings in the state as well as to find out the relationship of different climatic factors with their incidence

MATERIAL AND METHOD

STUDY AREA

Mizoram is situated in the north eastern part of India. The state lies between 21°56' and 24° 31' N latitudes and 92° 16' and 93° 26' E longitudes. (Anon. 2011) Aizawl district of Mizoram having maximum teak plantation in the state and teak plantation are from lower to higher altitudes in northern and southern aspects.

25 sampling sites were identified on the surveyed area during the period of November, 2016 to April, 2018 and The meteorological data such as Relative Humidity, Maximum and Minimum Temperature, Geographical Bearing (E & W), Wind Velocity, Cloud Cover, Rainfall, Chainage, were recorded.

Insects pest of teak *Tectona grandis* have been studied from Tuirial, Seling and Tuirini Riparian and from non Riparian Sairang, and Sihhmui Teak Plantation by visiting various study spots and noting pest

insects at monthly interval. Nature of damage of insects towards teak crop have been studied in field condition by spot observation. Similarly, their

METHODOLOGY

A sampling will be carried out for two annual cycles. Different Teak plantation in Aizawl District will be selected which include - Tuirial, Seling, Tuirini, Sihhmui, and Sairang Teak Plantation of each, division a Quadrat of 10m X 10m will be randomly laid out at regular intervals.

Observations were recorded at fortnightly interval along with major weather parameter viz., temperature, relative humidity and rainfall at each location. Based on these data simple correlation was worked out.

Observed that Monthly sampling Insect pest associated with *Tectona grandis* Linn.F were collected by adopting standard sampling techniques :- Sweep Netting, Light trap and visual observations. Direct catching of insect using hand net employed during day time 8 am to 1pm when Major pests are most active in search of food. Insect populations respond rapidly to a wide variety of disturbances and environmental changes, due jhuming forest fire, etc) and outbreaks are one common response to such changes utilized meta analysis to quantify increases in temperature, nutrient inputs, and decreases in diversity all create favourable conditions for herbivores, particularly for generalist insects, which can be important for outbreaks.

RESULT:

During the transect line sampling, 43 insect species recorded from southern aspect and 32 species were collected from Northern aspects. Visual search revealed some species outside transect line areas. Total number of 65 species were recorded from this area during 2016-2017.

Bioecology of *Hyblaea Puera Cramer*

The species was first described by Cramer in 1777 as *Phalaena puera* and was originally included under the family Noctuidae. *H. puera* was first recognized as a pest of teak plantations in Kerala, India over 150 years ago. Since then, vast literature has accumulated on its biology and ecology. During the study period, the change in infestation pattern was observed. *Hyblaea puera* infestation was not found during the month January to May.

The adult moths are comparatively small, with a wingspan of 3–4 cm, and have a characteristic resting posture that conceals the black and orange-yellow hindwings under the greyish-brown forewings. Males and females emerge more or less simultaneously and mating takes place within a couple of days. Eggs are laid on tender new leaves, placed singly near the veins, and usually on the undersurface. They are oval, flat, and white and measure about 1 mm in length. About 500 eggs are laid per female with a recorded maximum of 1000. Larvae hatch in about two days. There are five larval instars. The first and second instars mainly feed on the leaf surface. Starting with the third instar, the larva cuts out a leaf flap, usually at the edge of the leaf, folds it over, fastens it with silk, and feeds from within. The entire leaf, excluding the major veins of tender leaves, is eaten, but more veins are left in older leaves. Under the optimal conditions, the larval period lasts 10–12 days. The full-grown larva measures about 3.5–4.5 cm, and there is considerable colour variation in the fourth and fifth instars; the body may be either wholly black or dark greyish to black, with longitudinal coloured bands may include a dorsal orange or ochreous band and lateral white lines.

It appears that there are diverse ecological impacts on to the system during this pest outbreak. The outbreak usually result in complete defoliation of Teak trees, and cause a break in the growth and development of the Teak trees, however this is not fatal for the trees.

H. puera indicated female oriented egg laying singly on ventral side of leaf lamina. The freshly laid eggs were oblong and pale white in colour. The length and breadth of eggs ranged from 0.92 to 1.0 mm and 0.40 to 0.51 mm respectively. The incubation period ranged from 2 to 3 days whereas, egg hatchability varied from 45 to 65 per cent The neonate larvae were greenish yellow with a black coloured head, which later turned to blackish brown. The length of first, second, third, fourth and fifth instars varied from 1.90 to 2.0, 1.0 to 4.50, 11.90 to 15.0, 17.90 to 20.0 and 28.0 to 32.0 mm, respectively while, breadth varied from 0.22 to 0.26, 0.53 to 0.65, 1.50 to 1.70, 1.80 to 2.50 and 3.0 to 3.50 mm,

respectively.



Fig. Life Cycle of *Hyblaea puera* Cramer

The duration of first, second, third, fourth and fifth instar larvae varied from 2 to 4, 2 to 3, 2 to 3, 2 to 3 and 3 to 5 days, respectively. The total larval period was completed in 12 to 16 days. The pupation took place in the silken cocoon underneath the leaves. The length and breadth of pre-pupa ranged from 18.0 to 26.0 and 16.0 to 24.0 mm respectively. The pre-pupal period varied from 1.10 to 3.0 days. The length of male and female pupae varied from 14.50 to 16.0 and 17.0 to 19.0 mm while, its breadth ranged from 3.50 to 4.50 and 4.50 to 5.50 mm, respectively. The male and female pupal period ranged from 3.0 to 5.0 and 6.0 to 8.0 days, respectively. Length of adult male and female moths was 16.0 to 19.0 and 20 to 22.0 mm, respectively. The wing expansion of adult male and female moth ranged from 24.0 to 28.0 and 32.0

Hence, it can be concluded from the present experiment knowing the that the occurrence of Insect pest associated with *Tectona grandis* Linn.F and the main insect pest of teak and it is required to take appropriate management strategies at proper time for these pests. It appears that there are diverse ecological impacts on to the system during this pest outbreak. The outbreak usually result in complete defoliation of Teak trees, and cause a break in the increment growth rate and development of the Teak trees, however this is not fatal for the trees.

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