RELATIVE PREFERENCE OF DIFFERENT HOST PLANTS TO TEAK DEFOLIATOR, *HYBLAEA PUERA* CRAM. (HYBLAEIDAE : LEPIDOPTERA) IN BANGLADESH

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ABSTRACT

Seven plant species have been recorded as hosts of teak defoliator, *Hyblaea puera* Cram. (Hyblaeidae : Lepidoptera) in Bangladesh. Of them *Avicennia officinalis* Linn., a mangrove species, is a new host record of *H. puera*. The food preference of the pest larvae was evaluated for all the host plant species. *Tectona grandis* Linn. was found to be the most preferred food followed by *Avicennia officinalis* Linn., *Callicarpa arborea* Roxb., *Vitex peduncularis* Wall., *V. pubescens* Vahl., *V. negundo* Linn. and *Oroxylum indicum* Vent.

সারসংক্ষেপ

বাংলাদেশে সেগুনের পাতাভোজী পোকা, *Hyblaea puera* Cram.-এর সাতটি পোষক গাছ নির্ণয় করা হয়েছে। তন্মধ্যে *Avicennia officinalis* Linn. (কাল বাইন) নামক একটি ম্যানগ্রুভ প্রজাতি এ পোকার একটি নতুন পোষক গাছ হিসাবে তালিকাভুক্ত করা হয়েছে। এ পোকার শুককীটের খাদ্য হিসাবে প্রতিটি পোষক প্রজাতির গ্রহণযোগ্যতা নিরূপণ করা হয়েছে। দেখা গেছে, সেগুন সবচেয়ে পছন্দনীয় পোষক গাছ এবং এর পরে নিম্নক্রমানুসারে *Avicennia officinalis* Linn. (কাল বাইন), *Callicarpa arborea* Roxb. (বরমালা), *Vitex peduncularis* Wall. (হরিনা), *V. pubescens* Vahl. (আরসল), *V. negundo* Linn. (নিশিন্দা) ও *Oroxylum indicum* Vent. (মনখনা) প্রজাতি রয়েছে।

Key words : Bangladesh, food preference, host plants, *Hyblaea puera*, teak defoliator.

INTRODUCTION

The primary driving force of all animals is the necessity of finding the right kind of food and enough of it. The kind of food supply is one of the most important factors in determining the existence and abundance of a species in an area (Andrewartha and Birch 1954, Beeson 1941). All herbivores show some degree of selectivity between plant species and between different tissues within the plant (Crawley 1983). Phytophagus insect species are distinguished by their feeding preferences for different plant hosts (Craighead 1923, Walsh 1864, 1865).

Teak (*Tectona grandis* Linn.), a valuable timber species, is attacked by a number of insect pests of which the teak defoliator, *Hyblaea puera* Cramer (Hyblaeidae : Lepidoptera) causes major defoliation in Bangladesh (Baksha 1990, 1993). However, in addition to teak, many plants provide important source of food for *H. puera* in India and elsewhere (Beeson 1941, Mohonadas 1986).

The existence of alternative sources of food is important in determining the extent to which the alternative food plants can absorb a part of the insect population and divert it from teak, and

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provide breeding material at a time when teak is leafless due to its deciduous nature. The occurrence of two or more alternative host plants in the same locality may affect the abundance and population density of a species and thus could play a part in determining whether or not it becomes a pest. It was, therefore, necessary to enlist the host plants of *H. puera* in Bangladesh and to determine their relative preference as food for its larvae.

MATERIALS AND METHODS

The study was started in June, 1990 when an epidemic attack of *H. puera* was observed in teak growing areas of Chittagong, Cox's Bazar and Chittagong Hill Tracts (South) Forest Divisions. Surveys were made in these forests to explore the alternative food plants of *H. puera* during the epidemic infestation periods and during the time when teak remained leafless due to its deciduous nature. Defoliated plant samples and the larvae of the pest were collected and brought to the laboratory for identification and rearing up to the adults.

To assess the relative preference of various host plants of *H. puera* larvae, laboratory experiments were set up in June, 1990 in the Bangladesh Forest Research Institute, Chittagong with detached leaves of approximately 3-years old saplings of each host plant.

In a multiple choice test, detached leaves of approximately same age (2nd terminal pair) from each host plant were offered to a batch (30 larvae) of 3rd instar larvae arising from the same stock culture. The larvae were placed in the centre of a circle drawn on a sheet of art paper. The leaves of each species were placed equidistantly from the centre of the circle and from each other. The paper was covered with wire net in order to prevent the larvae from fleeing and being eaten by lizards, rats, etc. After 24 hours the number of larvae aggregated on leaves of each host plant was counted. The experiment was replicated four times.

In another experiment, leaf samples of each host plant were placed in separate petridishes. Five 3rd instar larvae were released in each petridish containing the host leaves. The leaves were kept fresh by wrapping their petioles with cotton pad soaked with water. After 24 hours, the leaf area consumed by the larvae was measured by tracing the eaten area on graph sheets. There were three replications for the experiment.

RESULTS

Table 1 gives the list of host plants of *H. puera* recorded in Bangladesh. *Avicennia officinalis* Linn. was recorded for the first time as a host plant of *H. puera* in Bangladesh. It is a halophytic species growing in the swampy mangrove forests along the coastal belt of Bangladesh. Excepting *A. officinallis* all other species grow in association with teak in the hilly areas.

Table 1. Host plants of *H. puera* recorded in Bangladesh.

Sl. No.	Local name	Botanical Name	Family
1.	Teak, Shegun	*Tectona grandis* Linn.	Verbenaceae
2.	Barmala	*Callicarpa arborea* Roxb.	do
3.	Nishinda	*Vitex negundo* Linn.	do
4.	Harina, Goda	*V. peduncularis* Wall.	do
5.	Arsol	*V. pubescens* Vahl.	do
6.	Kala Baen	*Avicennia officinalis* Linn.	do
7.	Khona, Monkhona	*Oroxylum indicum* Vent.	Bignoniaceae

The analysis of deviance for the number of larvae aggregating on various host leaves is given in Table 2 which shows that the difference for the relative preference of the larvae to various host leaves is highly significant ($P < 0.01$). Table 3 gives the analysis of variance for the data on the leaf area consumed by five 3rd instar larvae. From this Table it reveals that the difference between the host plants for their palatability was also highly significant ($P < 0.01$).

The relative preference of *H. puera* larvae for the seven host plants recorded from Bangladesh is shown in Table 4. The Table reveals that *T. grandis* was the most preferred food followed by *Avicennia officinalis, Callicarpa arborea, Vitex peduncularis, V. pubescens, V. negundo* and *Oroxylum indicum*. This suggests that when teak leaves are not available or unsuitable, the pest could switch over to other available alternative food plants for their subsistence.

Table 2. Analysis of deviance for the number of larvae aggregating on various host plants in a multiple choice test (out of 30 larvae) in 4 repeats with one arena containing 7 host plants.

Source	df	Deviance	X^2-value	Significance
Replication	3	0.31	7.81	NS
Host plant	6	68.75	12.59	$P < 0.01$
Error	18	9.82	28.87	

Table 3. Analysis of variance for the data on the leaf area consumed by five 3rd instar larvae of *H. puera*.

Source	df	SS	MS	F-ratio	Significance
Replication	2	0.26	0.13	0.13	NS
Host plant	6	341.62	56.94	55.82	$P < 0.01$
Error	12	12.24	1.02		

Table 4. Relative preference of seven host plants recorded from Bangladesh to *H. puera* larvae.

Host plants	Mean *	
	Number of larvae aggregated on detached leaf (out of 30 larvae)	Leaf area consumed (cm^2) by five 3rd instar larvae
Tectona grandis	9.5 (3.1) a	15.4 a
Avicennia officinalis	7.5 (2.8) ab	8.7 b
Callicarpa arborea	5.0 (2.3) bc	5.8 c
Vitex peduncularis	2.5 (1.7) cd	5.6 c
V. pubescens	2.0 (1.6) d	5.0 cd
V. negundo	1.0 (1.2) d	3.3 cd
Oroxylum indicum	0.8 (1.1) d	2.4 d
$LSD_{0.01}$	(0.6)	2.5
CV (%)	(15.0)	15.3

* Figures in parentheses are based on $\sqrt{X + 0.5}$ transformation. Figures followed by same letter (s) in a column do not differ significantly at 1% level.

DISCUSSION

In the forests, *C. arborea* provides an important source of food when teak leaves were aged or the trees were leafless. As *C. arborea* is an evergreen tree it can support residual population of *H. puera* during the leafless period of teak. Beeson (1941) reported that the moth oviposits on *V. negundo* and rejects teak entirely when its foliage is unpalatable. The present study suggests that given the choice and equal facilities teak is the most preferred species at a time when the experiment was conducted. However, more conclusive result could have been obtained if the experiments were conducted by using leaves of each species collected from different seasons of the year specially during the leafless period of teak.

It is well known that the quality of food is more important than the species specially for the young larvae. The young larvae must have soft young leaf-tissue, and cannot survive on a diet of old leaf. The growth and survival of young larvae of pine beauty moth (*Panolis flammea*) on both Scots pine and lodgepole pine rise sharply when the leaves are young (Watt 1990). Presumably for this reason *H. puera* oviposits preferably on unexpanded teak leaves which have not entirely lost their reddish tinge. Older larvae normally thrive on fully expanded mature leaves.

The species of food plants affect the rate of development and survival of insects. The amount of food consumed by *Lymantria obfuscata* larvae is dependent upon the host plant which in turn determines the duration of larval period (Masoodi 1992). Mohonadas (1986) compared the development of *H. puera* on *V. altissima* and teak and found shorter larval and pupal periods, greater pupal weight and high survival percentage of *H. puera* on teak suggesting that teak is a better host plant than *V. altissima*. The larval period was reported to be longer on teak than on *Premna latifolia* and shorter on *V. negundo* than on either; the difference between the two extremes was about 12% (Beeson 1941). Thus the rate of development and survival percentage of *H. puera* on the seven host plants need to be explored to get more conclusive results. Further, the existence of strains of *H. puera* exclusively associated with each host plant may also be explored.

The distribution of *H. puera* on the alternative host plants in the field specially during the leafless period of teak is an important area for research on population dynamics of *H. puera*, which has not been assessed in the present study. Likewise the ovipositional preference of adult females should also be studied in order to determine the extent to which the alternative food plants can absorb and divert part of the *H. puera* population or provide breeding materials for the population.

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