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Shoot Borer, *Hypsipyla robusta* Moore (Lepidoptera: Pyralidae) Infestation on *Chukrasia velutina* Wight *et* Arn. in Hilly Areas of Bangladesh

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Abstract: The nature and extent of damage of shoot borer, *Hypsipyla robusta* (Moore) Lepidoptera: Pyralidae was studied in 2-8 years old *Chukrasia velutina* Wight *et* Arn. plantations in hilly areas of Chittagong, Bangladesh. A single tree could have attacked several times in the season. About 47% *C. velutina* trees were found to have attacked at least once in their lifetime. The infestation rate was more pronounced on the hill slopes (56%) than on the valleys (37%). A good number of trees (60%) were found to exhibit recovery trend after the infestation while other trees were with the formation of fork, cork, knot, curve, twist, whorled branching from the point of infestation (Mostly at a height of 2-3 m). It was estimated that about 42% potential biomass production was lost due to the infestation. Apart from that, some trees were found to show an encouraging 'resistance' character keeping intact themselves against the infestation that referred an ample scope of propagation and plantation in future for a better inheritance.

Key words: *Chukrasia velutina, Hypsipyla robusta,* infestation, topography, deformation

INTRODUCTION

Chukrasia velutina Wight *et* Arn. locally known as Chickrasi is a very tall, handsome, deciduous to semi-evergreen tree under the Family Meliaceae. It grows well in tropical semi-evergreen and moist deciduous forest up to an elevation of 1000 m[1] and widely distributed throughout India, Srilanka, Myanmar, Malaysia, Borneo and South-China[2]. In Bangladesh it is probably the chief timber species abundant in Chittagong[3] and that is why the species is internationally known as Chittagong wood[4]. The species also widely planted in Bangladesh due to the high yielding and quality timber. The wood is very close grained, light reddish- brown coloured[5] with moderately fine and uniform texture, excellent timber for ornamental veneers, locally used in house construction as scantlings, posts, and planks, carving, canoes, dug-outs, cooperage etc.[1]. Unfortunately, this tree species is facing a hazardous biotic attack caused by a shoot borer, *Hypsipyla robusta* (Moore) at the early growing stages[6-8]. Sometimes this borer terms the plantation to be futile. Quality and yield of timber are being degrading due to the malicious infestation.

In Bangladesh shoot borer (*H. robusta*) infestation was first reported in *Toona ciliata* (Toon) in 1980[9,10]. Later on, the pest was found to cause serious damage to *Swietenia macrophylla* (Mahagoni) plantations in different part of the country[11]. Though Bakhsha and Islam[11] described the nature and extent of damage on *S. macrophylla* by shoot borer, the information regarding infestation on *C. velutina* is scanty. In the present circumstances it becomes essential to assess, investigate and diagnose the nature and extent of damage by the insect. The present study aims at exploring the nature and extent of damage caused by the shoot borer on *C. velutina* planted in tropical moist semi evergreen ecology of hilly areas in Chittagong.

MATERIALS AND METHODS

Study area: The study was conducted in hilly areas of Chittagong, lies on 91°51′ E longitude and 22°30′ N latitude covered with numerous tropical plants[12]. Brown hill soil of the selected area is well-drained, generally sandy loam to sandy clay loam, moderate to strongly acid and poorly fertile[13]. The average annual rainfall is about 2500-3000 mm occurring mostly between June and September. The climate is tropical monsoon with mean monthly maximum temperature of 29.75°C and minimum of 21.14°C. The highest temperature is 32.6°C in May as and the lowest is 14.1°C in January[14]. The area is homogeneous in nature and a well representative of south-eastern hilly region of Bangladesh.

Sampling methods: Infestations caused by *H. robusta* on *C. velutina* trees were studied by direct observation in the

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plantations following stratified random sampling method. The plantations established with a spacing of 2x2 m within the perimeter of the University of Chittagong were the primary sampling units while hill slopes and valleys were the ultimate sampling units. Twenty plots of 100 m^2 (10x10 m) each were selected randomly for the investigation. Ten plots were from hilly topography and another ten from valleys. All the trees in each plot were measured for the total height with Haga altimeter and diameter at breast height (dbh) with diameter tape. The height of infestation was measured for infested trees only. The losses of potential biomass production of the infested trees were also calculated by comparing the total volume of the infested trees with non-infested ones. During the study the age of the plantations were 2-8 years and the height and dbh. ranged from 1.5 to 10.5 m and 2.5 to 15.5 cm, respectively.

Data collection and statistical analysis: The information and data recorded from the field investigation were analyzed by using computer software and documented along with necessary graphs wherever suited. Possible treatment differences were explored by analysis of variance by using SPSS and MS Excel in Windows based IBM PC. The results were compared with previous findings reported in various literatures.

RESULTS AND DISCUSSION

Nature of Damage: Juvenile shoots of the *C. velutina* saplings were usually found to get infested by the larvae of *H. robusta* in the first week of June and continue to the last week of August. In advent to the monsoon when precipitation started, new shoots were emerged and the borer started their infestation. Penetration of soft apical tissue and epidermis were started by the first instar larvae of *H. robusta* just after they had been hatched out from the eggs. After penetration, tunnel usually 23.5 cm in length and 0.5-1.0 cm in diameter was made by the downward movement of insects. A gummy mass of frass was exerted out at the point of entry of hole. The attacked shoots were found to dry up rapidly. The leading shoots were usually damaged due to the malicious infestation and become forked, curved or even twisted finally. Besides forking, development of lateral branches was also found. Similar observation was reported by Baksha and Islam[11] for the shoot borer infestation on *S. macrophylla.*

Intensity of infestation: Almost half (47%) of the *C. velutina* trees in the plantations of the study area were infested by the shoot bore *H. robusta* at least once during their life time. There was no report found to compare the present result of shoot borer infestation on *C. velutina* but up to 91% trees of Meliaceae were damaged by the shoot borer *H. robusta* in Ghana[15]. The trees growing in the hill slopes were more susceptible to the borer infestation than that in the valleys (Fig. 1). This might be due to the distribution of less light intensity to the plantation in the valley than that of hill slope. The trees growing under shade cover during the early years of the plantations, make the plants less attractive to the borer for oviposition[16]. However, some trees were found to infest for second, third or even fourth time.

Infestation height: Trees of *C. velutina* were found to attacked for the first time at a height of 0.5 m which ultimately reached up to 4.5 m, but the trees were severely infested at an average height of 2-3 m in the 2-3 years old plantation (Fig. 2 and 4). The result of the present study was slightly higher than that of Bauer[17] findings (1.5 m) but supported by Thakur[16] who mentioned that trees of 3 years age or 2.5 m height is the most soft targets to

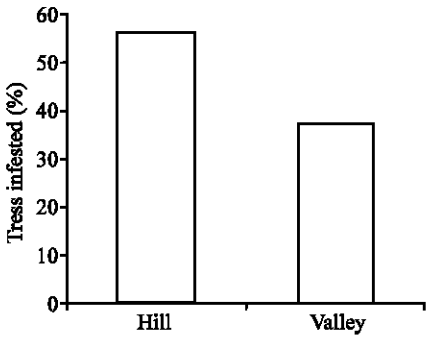

Fig. 1: Susceptibility of shoot borer infestation on *C. velutina* in plantations at different topography

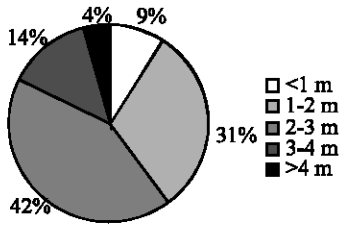

Fig. 2: Percentage of trees infested at different height classes

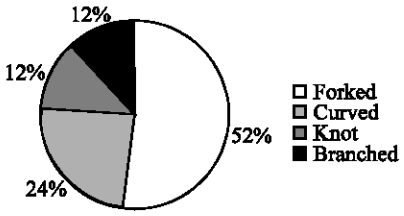

Fig. 3: Different form of distortion caused by the borer

Fig. 4: Shoot borer intensity with forking at the infestation height (L) as compared to a healthy tree (R) in the plantation

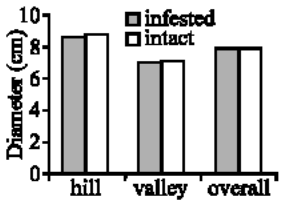

Fig. 5: Diameter at breast height of *C. velutina*

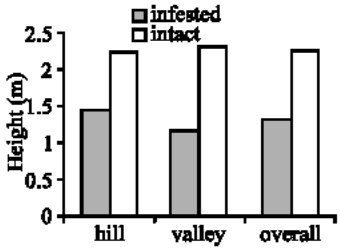

Fig. 6: Bole height of *C. velutina* in the stand

H. robusta for infestation. There was no significant difference in infestation height between the topographies (*i.e.* hill slopes and valleys).

Recovery and deformation: The trees were rarely killed due the shoot borer infestation. About 60% of the infested trees were successfully recovered themselves after the infestations. There was no significant difference in recovery capacity of the trees grown in hill slopes and valleys. Apart from these self-recovered trees remaining were distorted in various ways from their desired quality. A similar observation was made by Bakhsha and Islam[11] in shoot borer infestation on *S. macrophylla*. As a result of distortion, the stems in most cases forked, curved or even twisted finally (Fig. 3 and 4). All the forms of damage caused by the shoot borer were ultimately resulted inevitable huge loss in timber production both in context of yield and timber quality.

Loss of biomass production: Though lateral growth of *C. velutina* was not significantly hampered (Fig. 5) due to the injury caused by the borer in the plantation, retardation to apical growth (*i.e.* primary growth) were observed (Fig. 6) during the study. Estimated trees volume of the infested trees were 42% less than that of the non-infested trees in the plantations which indicated a considerable loss of potential biomass production (42%) in the infested trees compared to that of the intact trees.

C. velutina is one of the most important tree species of Family Meliaceae isbeing planted in every where in Bangladesh due to the fast growing nature and excellent timber quality. All the attempts of plantations may be futile due to the infestation caused by the larvae of shoot borer *H. robusta*. In the nursery systemic insecticide (Furadan 5G @ 5-10 g/plant) application might be affordable[11]. However, the chemical application is not feasible in the plantations. It is also very tough to device a remedial measure in the plantation when large-scale infestation appears on. Genetic improvement of the species by planting borer resistant planting materials may be one of the important options. During the study, it was found that a good number of trees were not infested at all though their surrounding trees were heavily infested. There might be some resistance properties in the trees that were not infested. Provenance trial through the selection and clonal propagation of these resistant trees may be one of the important options for improving the desired future genotype since the species exhibits excellent properties in the favour of colonal propagation[19-22]. This could be an important area of future study.

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