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Further Observation on a Root-Borer of Young Plantation Teak in Prome Forest Division with a View to Its Control and Prevention in Pure Teak Plantations

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ပြည်သစ်တောနယ်ရှိ သက်နုရွယ်ကျွန်းစိုက်ခင်းများတွင် ကျရောက်ဖျက်ဆီးသော ကျွန်းမြစ်ဖောက်ပိုးနှင့် ပတ်သက်၍ ဆက်လက်လေ့လာတွေ့ရှိချက်နှင့် ကာကွယ်ရန်နည်းလမ်းများကို တင်ပြခြင်း

ဦးအောင်ဇေယျ၊B.Sc (Rgn.), Dip. (For.) (Oxon.), M.Sc. (Oxon.)၊ ဌာနမှူး
သစ်တောသုတေသနဌာန၊ရေဆင်း

စာတမ်းအကျဉ်းချုပ်

ပြည်သစ်တောနယ်တွင် သက်နုရွယ်စိုက်ခင်းကျွန်းပင်များကို ဖျက်ဆီးသော ကျွန်းအမြစ်ဖောက်ပိုးကို ၁၉၇၆-ခုနှစ်မှ စတင်တွေ့ရှိလေ့လာခဲ့ရာ၊ ၁၉၈၂ ခုနှစ်အထိတိုင်အောင် စိုက်ခင်းကျွန်းပင်များကို နှစ်စဉ်မပြတ် ဖျက်ဆီးလျှက်ရှိကြောင်း တွေ့ရပါသည်။ ၁၉၈၄ ခုနှစ်အတွင်း လေ့လာမှုများမှ တွေ့ရှိချက်မှာ ၁၉၇၄ ခုနှစ်မှ ၁၉၈၂-ခုနှစ်အတွင်း နှစ်စဉ်စိုက်ပျိုးခဲ့သော ကျွန်းစိုက်ခင်းများတွင် ၄င်းပိုးဖျက်ဆီးမှု ၁.၇၃% မှ ၃၂.၇၀% အထိရှိခဲ့ပြီး ပျမ်းမျှ ၇.၅၀%ရှိကြောင်း တွေ့ရပါသည်။ ၁၉၇၆ ခုနှစ်က ပြည်သစ်တောနယ်ရှိ (၂)နှစ်သားအရွယ် ကျွန်းစိုက်ခင်းတစ်ခုတွင် တွေ့ရှိခဲ့ရသော ပိုးဖျက်ဆီးမှုနှုန်းမှာ ၃%ခန့်ဖြစ်ပါသည်။ ဤပိုးဖျက်ဆီးမှုကို ကျွန်းပင်စည်ဖောက်ပိုးဖျက်ဆီးမှုနှင့် နှိုင်းယှဉ်ဆွေးနွေးထားပြီး ပိုးနှိမ်နှင်းရန်နှင့်ကျွန်းစိုက်ခင်းသစ်များကို ၄င်းပိုး၏ဘေးအန္တရာယ်မှကာကွယ်နိုင်ရန် နည်းလမ်းများကိုလည်း ဆွေးနွေးတင်ပြထားပါသည်။

Further Observations of a Root Borer in Young Teak (*Tectona grandis* Linn.F.) Plantation - Prome Division, Possible Control and Prevention

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Abstract

A root-borer was first observed attacking young teak trees in the Prome Forest Division pure teak plantations in 1976 and has been observed in young teak trees ever since. Observations made in 1984 of plantations established between 1974 and 1982 showed a damage incidence rate average of 8.1 (1.5-30.8) percent. The incidence rate in 1976 was estimated at three percent in a two-years-old plantation in the same Division.

The potential for damage by this insect of teak is compared to the losses due to the beehole borer (*Xyleutes ceramica*) and for protection of new plantations against its attack are recommended.

Contents

1. Introduction and Objectives

In June, 1976, a Lepidopterous insect (moth) belonging to the family Hepialidae (swift moths) (Hampson) (Imms) was found attacking two years old teak trees in the pure teak plantations of the South Nawin Forest Reserve, Prome Forest Division. The larva of this insect attacked the young trees by girdling the bark and sapwood of the main stem almost totally at about two inches above ground before boring its way into the heartwood then down along the center of the taproot. No deaths were detected among affected trees when the insect was first observed (Zeya). Examinations made in 1983 showed trees severely affected several years earlier, breaking at the girdle, probably due to excessive crown movement in strong winds, or due to vines restraining growth of the trees during the growing season.

This paper describes the results of investigations made by sampling to determine the distribution and abundance of the root borer in young plantations in this area. This study is apart of a research objective to identify and evaluate control alternatives for insects damaging economically important tree species.

2. Background

The Plantations

The plantations involved were developed as monocultures under the system of Taungya cultivation. Land preparation operations following teak extraction included clear felling of all remaining trees, extraction of high-value species, followed by burning and site clearing. The direct sowing method was employed various spacings in different years, or even in different parts of the same compartment (6' x 6', 8.5' x 8.5', 4' x 9', 12' x 12', 9' x 18'). Weeding was originally carried out annually for four years after planting. The rate of weeding was three times each for the first and second years, twice during the third, and once during the fourth (3,3,2,1) 1[*]. The frequency of weeding was changed in 1977 to twice each year for two years, (2,2) 2[*]. In 1978, the frequency was changed again to three times during the first, twice during the second, and once during the third year (3,2,1)3[*]. The current practice which began in 1979 is three times during the first year, twice per year during the second and third, and once during the fourth year (3,2,2,1)4[*]

Kyathaung wa (*Bamboosa polymorpha*) of poor growth and Myin wa (*Dendrocalamus strictus*) was present in these forest reserves together with the dominant tree species of Kyun (*Tectona grandis*), Pyinkado (*Xylia dolabriformis*), Thinwin (*Milletia pendula*), Padauk (*Pterocarpus macrocarpus*) and other tree species of lesser commercial value such as Zaungbale (*Lagerstroemia villosa*), Kyaungsha (*Oroxyllum indicum*), Thitpyu (*Wendlandia glabrata*) and Myaukchaw (*Homalium tomentosum*).

1[*] Forest Dept. Head Office Letter No. 10817 – 10867/Bha (Ga) 41, Dt. 30-6-76
2[*] Forest Dept. Head Office Letter No. 10921 – 10986/Gagyi (Kha) 61, Dt. 25-10-77
3[*] Forest Dept. Head Office Letter No. 11316 – 11371/Gagyi (Kha) 61, Dt. 3-11-78
4[*] Forest Dept. Head Office Letter No. 13723 – 13783/Gagyi (Kha) 61, Dt. 2-10-79

The Area

The study was conducted in the pure teak plantations established between 1974 and 1982 in South and Middle Nawin Forest Reserves of Prome Forest Division (Fig.1) about 43 miles East of Prome at latitude 18°54' N and longitude 95°48'E. The elevation is estimated at 1000-1200 ft. (300-350 m) above sea level. The area may be termed as having rough, steep, hilly terrain and a sandy loam soil and the forests are classified as Dry Upper Mixed Deciduous (Anon).

The average rainfall during 1961-75 period was 95.59 in. (1295 mm) with the heaviest monthly rainfall of 9.99 in. (252.64 mm) occurring in July. The average temperature during the same period ranged from a minimum of 71.4°F (21.9°C) to a maximum of 91.2°F (33.2 °C) with peak average monthly temperatures reaching 102.5°F (39.16 °C) during April (Zeya).

The Insect

Accounts of attack by stem borers have been given by various authors (Troup) (Atkinson, 1931& 1935) (Beeson, 1921 & 1941), (Moore) (Kaufman), but no detailed studies have apparently been made of these insects. The descriptions given by these authors have certain similarities in the methods of attack and the injuries caused but differed insect under study.

Information as to the original host tree of this insect was unavailable, but Kyaungsha (*Oroxyllum indicum*), Thitpyu (*Wendlandia glabrata*) and Zaungbale (*Lagerstroemia villosa*) were observed to be hosts to the insect as well as teak in the area. The larva of this insect was reported by the local residents to have served as bait for fishing.

3. Materials and Methods

Three replicates of 100 trees each were taken randomly in each compartment, and each replicate was examined for root-borer injuries. This was done by sweeps along ten adjacent rows of ten trees each. For example, if the rows were planted in an East-West direction, the sweeps were from North to South. This system was followed throughout the study.

The plantation weeding program, by reducing competing vegetation, also increased the opportunities for the insect to find suitable hosts. Comparison of the incidence of attack among plantations with varying spacing between trees is biased by these spatial differences. The spacing of 9 ft. by 9 ft. is most commonly used and served as a basis for comparison. Data from plantations with different spacing were weighted by the ratio of acreage per tree with the acreage per tree in a 9 ft. by 9 ft. plantation.

Figure I.

Pure Teak Plantations

South and Middle Nawin Forest Reserves

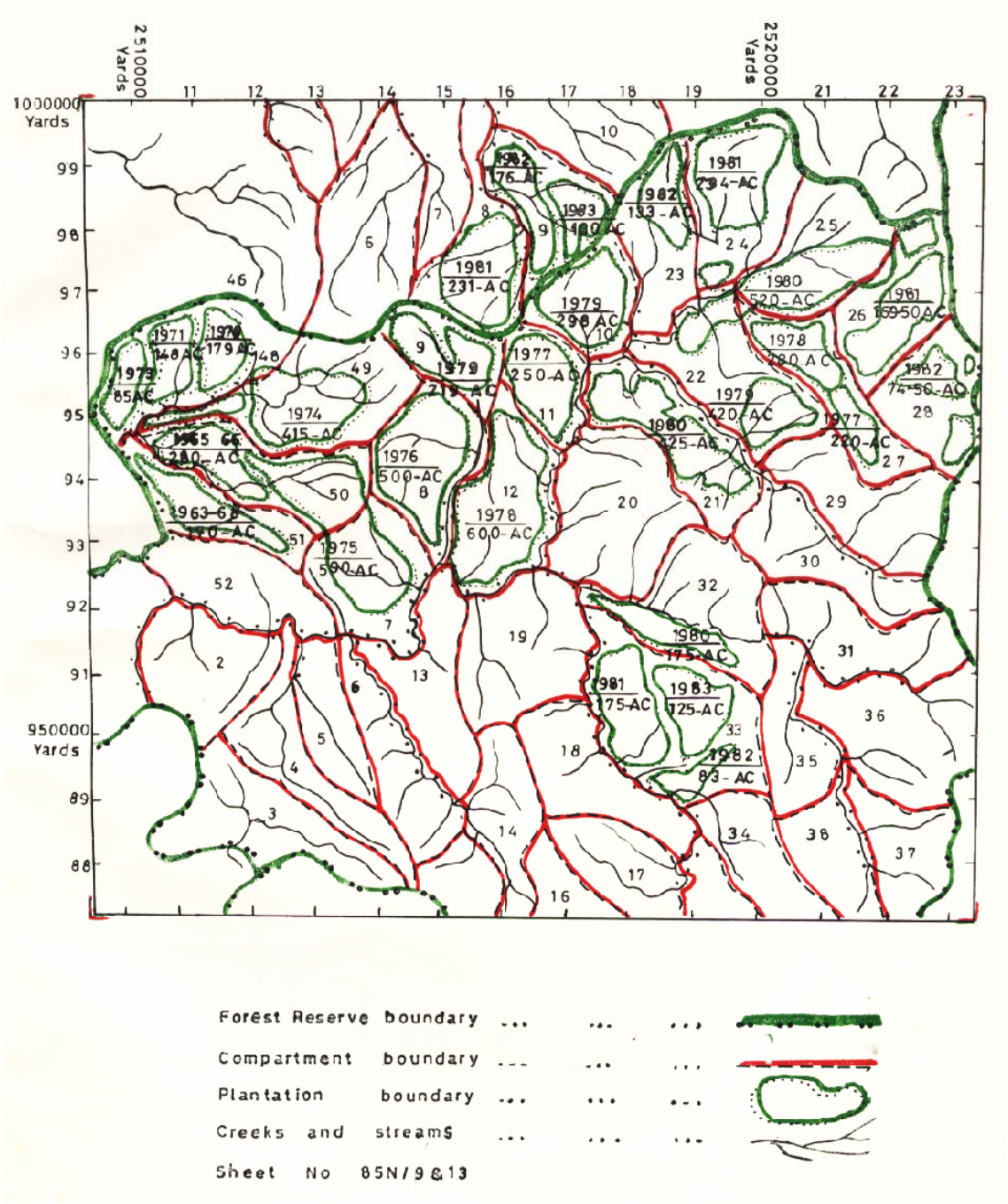

Table 1 Incidence of Root-Borer of Teak in Prome Forest Division Pure Teak Plantations Established Between 1974 and 1982.

Year planted	Compartment number	Acres planted	Spacing (ft.)	Number of trees examined	Percent Incidence	Average percent incidence standardised to 9 ft. spacing
1974	S. Nawin 49	402	6 x 6	100	14	
-"-	-"-	-"-	-"-	-"-	14	30.8
-"-	-"-	-"-	-"-	-"-	13	
1975	S. Nawin 50	267	9 x 9	100	7	9.0
-"-	-"-	-"-	-"-	-"-	11	
-"-	S. Nawin 49	57	-"-	-"-	8	6.0
1976	S. Nawin 8	464	9 x 9	100	7	
-"-	-"-	-"-	-"-	-"-	9	6.3
-"-	-"-	-"-	-"-	-"-	3	
1977	S. Nawin 9	66	9 x 9	100	Nil	0.0
-"-	S. Nawin 11	439	9 x 18	-"-	3	1.5
-"-	-"-	-"-	9 x 9	-"-	4	4.0
1978	S. Nawin 27	282	12 x 12	100	9	
-"-	-"-	-"-	-"-	-"-	7	4.1
-"-	-"-	-"-	-"-	-"-	6	
1979	S. Nawin 22	420	12 x 12	100	7	2.6
-"-	S. Nawin 10	298	-"-	-"-	28	9.9
-"-	-"-	-"-	-"-	-"-	25	
1980	S. Nawin 21	425	9 x 9	100	13	
-"-	-"-	-"-	-"-	-"-	14	12.3
-"-	-"-	-"-	-"-	-"-	10	
1981	M. Nawin 8	231	12 x 12	100	14	
-"-	-"-	-"-	-"-	-"-	9	7.1
-"-	-"-	-"-	-"-	-"-	15	
1982	S. Nawin 9	176	9 x 9	100	7	
-"-	-"-	-"-	-"-	-"-	9	8.7
-"-	-"-	-"-	-"-	-"-	10	

Table 2 Comparison of incidence of attack in plantations having different spacing standardised to 9 ft. by 9 ft. spacing.

Spacing	18 x 9 (ft.)	12x12 (ft.)	9 x 9 (ft.)	6 x 6 (ft.)
Incidence	1.5	4.1	9.0	30.8
rates		2.6	6.0	
standardised		9.9	6.3	
to		7.1	0.0	
9 ft x 9 ft			4.0	
spacing			12.3	
			8.7	
Mean	1.5*	5.92	6.61	30.8*

Overall weighted mean - 8.1 %

* - Significant difference from overall mean.

4. Results

The results of observations made are given in Table 1. Differences among age classes were not significant and damage occurred as early as one year after planting and regularly with mild epidemics in 1975, 1979 and 1980. 1* Table 2 summarizes the rates of incidence adjusted to a uniform basis of 9ft x 9ft spacing. It is to be noted that the plantations with 6ft by 6ft and 9ft by 18ft spacings had significantly different percentage of damaged trees.

The rate of attack of 3 percent reported in 1980 (Zeya) is now shown to range from 1.5-30.8 percent with an overall average of 8.1 percent in 1983.

5. Discussion and Conclusion

The repeated attacks in the plantations surveyed indicate the insect is a persistent pest. While it seems to develop in Kyaungsha, Thitpyu and Zaungbale, it has become firmly established in young teak plantations in the area. It follows that teak plantations established in other are as might be subject to attack if there other species are present in adjacent forest areas.

The incidence of attack in the extreme spacing which were significantly different from the maen may be explained simply on the basis that in plantations with spacing as wide as 18ft x 9ft, the method of egg-laying may cause a large majority of eggs to be deposited in the spaces between trees giving the larvae hatching from these eggs less chance for survival. Plantations with spacing, closer than 9 ft by 9 ft give the larvae greater chance for survival thus providing the typical results.

It seems appropriate to mention that the insect which has done the most damage to teak in Burma for nearly 150 years causing annual losses estimated to approach US$ 18,000,000 is the beehole borer which is also a Lepidopterous insect. This insect is known to live on a wide range of hosts including daung-sat-pya (*Callicarpa arborea*), Petka (*Clerodendron infortunatum),* Yemane (*Gmelina arborea* Roxb.) in Burma and *Vitex parviflora* in the Philippines.

The beehole borer has been able to adapt itself so perfectly to teak that more than 25 years of research on the insect conducted prior to the Second World War has not enabled foresters to contain it (Beeson, 1941).

With the extent of the teak plantations in Burma and the value of the wood products in foreign exchange, it is logical to consider methods of prevention of this damage and control, if not eradication, for the insect. Chemcial control methods may cradicate the insect when present and can kill the emergent larvae. Mechanical control can be done by removal and destruction of damaged trees but all trees must be examined yearly. Silvicultural control measures can reduce the opportunities for young teak seedlings to be attacked by eliminating host trees which serve to provide the initial insect population.

To provide appropriate control measures for this insect, a set of recommendations have been developed and are suggested for use as appropriate. Further study should continue to determine the age of teak plantations when the incidence of attack is reduced or ceases.

1* Comparisons in this study courtesy of U Htun Lynn, Biometrician, Forest Research Institute, Yezin.

6. Recommendations

Silvicultural and Mechanical Control

1. The forests in South Nawin Forest Reserve are made up of tree species which are many and varied. All of these species were felled in areas marked for plantation development. But small areas that were considered unsuitable for plantation development were left unworked and unattended. These small unworked areas with their wide variety of flora can harbour insects and serve as potential reservoirs. These insects have the capability of adapting themselves to teak under favourable conditions. Therefore, it appears logical that areas should not be left unworked or unattended within the plantation perimeter.
2. Kyaungsha, Thitpyu, Zaungbale and other fast growing softwood tree species, within the perimeter of the plantations should be cut off about one foot above the ground line and the stumps removed and burnt. The stumps and the felled trees should not be left for other purposes since they may stay moist and sprout permitting further infestation.
3. Careful examination of all standing trees should be made beginning with the first weeding operation. Since the appearance and location of the injuries are easily seen, no special skill is needed to detect affected trees. These trees including teak must be removed with the stumps and burned or destroyed. The areas vacated by the damaged teak trees can be replanted with new trees.

   The most appropriate time to carry out all these control operations appears to be during each weeding. While the present weeding schedule appears to be an effective silvicultural practice, a critical reappraisal of it should be made in the light of very large teak monocultures.

Chemical Control

1. The use of a non-residual contact-stomach-volatile insecticide solution in water, such as Malathion or Nogos at one percent concentration, will add efficacy to control measures. It will ensure the destruction of the larvae inside the stems which otherwise may pupate and escape from affected trees or stumps that may accidentally be left unburnt. To obtain this concentration of the insecticide, either 4.5 ces. of 100 EC Malathion or Nogos, or 9 ccs of 50 EC formulation, in one gallon of water is sufficient.

   When affected trees are detected in plantations, they can be treated with insecticide before removal to ensure destruction of the insects which live concealed in their boreholes.
2. Complete spraying of the basal parts of all plantation teak trees with an insecticide having a residual half-life of about 50 days may be suggested. The insect emergence period of about 30 days in May must be covered. Contamination of forest creeks and rivers, on which the rural residents depend for water, would result if applied in later months when continuous heavy showers fall.

   Extreme care is required in the use of insecticides.

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