KFRI Research Report No.261

MAINTENANCE OF PERMANENT PLOTS TO DEMONSTRATE THE EFFECT OF PROTECTING TEAK PLANTATIONS FROM THE TEAK DEFOLIATOR

(Report of the project KFRI 287/98, sponsored by Kerala Forest Department, January 1998- December 2002)

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ABSTRACT OF THE PROJECT PROPOSAL

1. Project No. : KFRI/287/98

2. Tilte: Maintenance of permanent plots to demonstrate the effect of protecting teak plantations from the teak defoliator.

3. Objectives: To demonstrate the effect of protecting teak trees from the defoliator

To integrate teak defoliator control operations with teak plantation management practices.

4. Date of commencement: January 1998

5. Scheduled date of completion: December 2002

6. Funding Agency : Kerala Forest Department

7. Investigators

Principal Investigator: T.V.Sajeev
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8. Study area : Nilambur teak plantation

ABSTRACT

Two plots, half a hectare each, were established at Nilambur in 1993 to demonstrate the impact caused by the teak defoliator on the growth of teak. While routine management practices were adopted in both the plots, teak leaves in one of the plots were protected from the teak defoliator through pesticide spray while those in the other plot were left unprotected. In the current project, both the above plots were maintained during the period 1998 - 2002. At the end of the experiment period, there was 39.39 per cent additional height increment and 21.88 per cent additional GBH increment in the protected plot as compared to the unprotected plot.

1. INTRODUCTION

The teak defoliator, *Hyblaea puera* Cramer (Lepidoptera: Hyblaeidae) is recognized as the most important pest of teak (*Tectona grandis* Linn.). Due to the high intensity of defoliator outbreaks which leads to total defoliation more than once in a year in many teak plantations, there had been many estimates regarding the impact of defoliator incidence on growth of teak (Nair et al., 1985). The best estimate available is based on continuous observation for a period of 5 years starting with 4-year-old trees. It was estimated that *H. puera* outbreaks cause a loss of 44 per cent of the potential increment in volume during the experimental period (Nair et al., 1985).

Apart from the impact on volume increment, the incidence of teak defoliator also causes forking when the insect feed and damage the terminal shoot. It was observed that permanent forking resulted in nearly 10 per cent of the trees which had terminal shoot damage.

In the year 1993, two permanent demonstration plots were established in a teak plantation (planted in 1993) raised by the Forest Department at Panayamgode in Nilambur North Forest Division. During the 5-year period, one of the plots was protected from teak defoliator attack while the other was left unprotected. At the end of the five years, in the protected plot, there was 45 per cent increase in mean height and 19 per cent increase in GBH over the control (Varma et al., 1998). In the current project, the protection afforded to one of the plots was continued for a further period of five years staring from the year 1998.

2. MATERIALS AND METHODS

2.1. Study area

The plots established for the study is in the Panayamgode teak plantation of Nilambur Forest Range, Nilambur North Forest Division. One plot was left to natural defoliation and in the other plot appropriate control measures were taken to control the teak defoliator as and when required. During the start of the project, there were 1053 trees in the protected plot and 849 trees in the unprotected plot. There was a buffer area of 10 rows (trees at 2m x 2m spacing) between the protected and unprotected plot.

2.2. Maintenance of plots

Both the plots were periodically weeded and protected from fire by taking fire line around the plots.

2.3. Monitoring of pest incidence

The monitoring of pest incidence in the plot was made during February to October - the period during which teak defoliator outbreaks are prevalent in Nilambur. Routine observations were made at fortnightly intervals, but when outbreaks were reported any where from Nilambur, daily observations were made. This was necessitated because of the fact that any incidence of teak defoliator had to be detected as early as possible so that immediate control measures could be adopted to prevent damage to the foliage in the protected plot.

2.4. Tree Measurements

The tree height and GBH of all the trees were measured every year during the month of January or February. Since the measurements were continuous with those made during the preceding project, the combined data is presented in this report to evaluate the growth during the first ten-year period. The height measurements were started in 1994 and the GBH measurements in 1996. Only

trees with the sufficient height so as to measure the girth at breast height (i.e. 1.37 m) were considered for girth measurements.

2.5. Control of teak defoliator

Pesticide application was undertaken whenever pest incidence was observed in the protected plot. The pesticides used were either Ekalux 25 EC or a commercially available *Bacillus thuringiensis* formulation (Biobit). Effort was made to use Biobit wherever possible since it had a relatively narrow host spectrum and is safe compared to chemical insecticide. However, Ekalux had to be used while Biobit was not available in the local market. Both the above pesticides have knockdown effect at all stages of the defoliator larva thus preventing damage to the foliage through spraying.

The pesticide was applied using a mist blower (Stihl SR400 with AU 8000 spray head) during the first and second years, while a motorised high volume sprayer (Birla Yamaha make) was used in the subsequent years. Even though the former, being a ultra low volume sprayer, was highly efficient is giving good coverage, could not be used in tall trees.

3. RESULTS AND DISCUSSION

3.1. Pest incidence

The sequence of outbreaks, which occurred during the project period, is given in Table 1. A total of 13 outbreaks occurred during the period. There were three outbreaks each during the years 1998, 2000 and 2001 and two outbreaks each during the years 1999 and 2002.

Table 1. *H.puera* incidence in the protected plot during the period 1998-2002

Year	Sl. no. Of outbreak	Month	Larval stage noticed	Treatment given
1998	1	March	1st & 2nd instar	Ekalux 25 EC
	2	June	1st & 2nd instar	Ekalux 25 EC
	3	July	Egg, 1st & 2nd instar	Ekalux 25 EC
1999	1	June	2nd & 3rd instar	Biobit
	2	July	1st & 2nd instar	Ekalux 25 EC
2000	1	April	1st & 2nd instar	Biobit
	2	June	Egg, 1st & 2nd instar	Biobit
	3	July	Egg, 1st & 2nd instar	Biobit
2001	1	April	1st & 2nd instar	Biobit
	2	June	1st & 2nd instar	Biobit
	3	August	1st & 2nd instar	Biobit
2002	1	June	2nd & 3rd instar	Ekalux 25 EC
	2	August	2nd & 3rd instar	Ekalux 25 EC

Majority of the outbreaks occurred during the months of June and July. Late outbreaks during the month of August occurred during the years 2001 and 2002. All outbreaks were caused by the early stages of the insect. The control measures adopted were successful since no further foliar damage was noticed after the pest control operation.

3.2. Growth of trees

The height and GBH measurements of trees in the two plots over the period 1994-2002 are given in Tables 2 and 3.

Table 2. Mean height of trees during 1994 - 2002 in the protected and unprotected plots

Category	Mean height (m)								
	1994	1995	1996	1997	1998	1999	2000	2001	2002
Protected	0.37 (1147)	2.67 (1130)	3.99 (1129)	5.47 (1119)	8.80 (1053)	9.76 (1046)	10.68 (1007)	10.99 (961)	11.57 (997)
Unprotected	0.32 (1141)	2.35 (950)	3.06 (944)	3.75 (944)	5.62 (849)	6.96 (844)	7.18 (782)	7.42 (779)	8.30 (793)

Figures in parenthesis indicate the number of trees in the plot

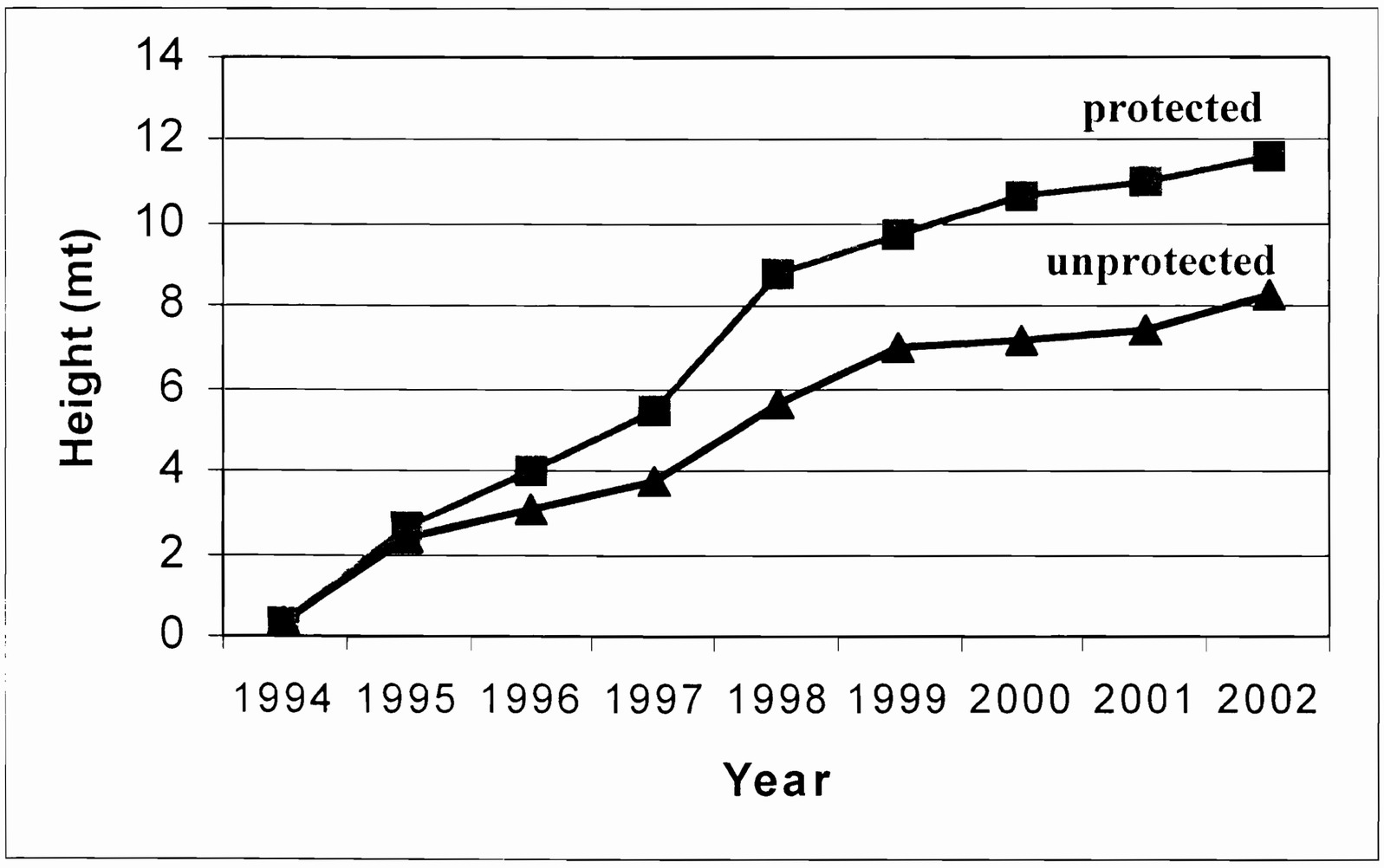

Fig.1. Graph showing mean height of trees in protected and unprotected plots.

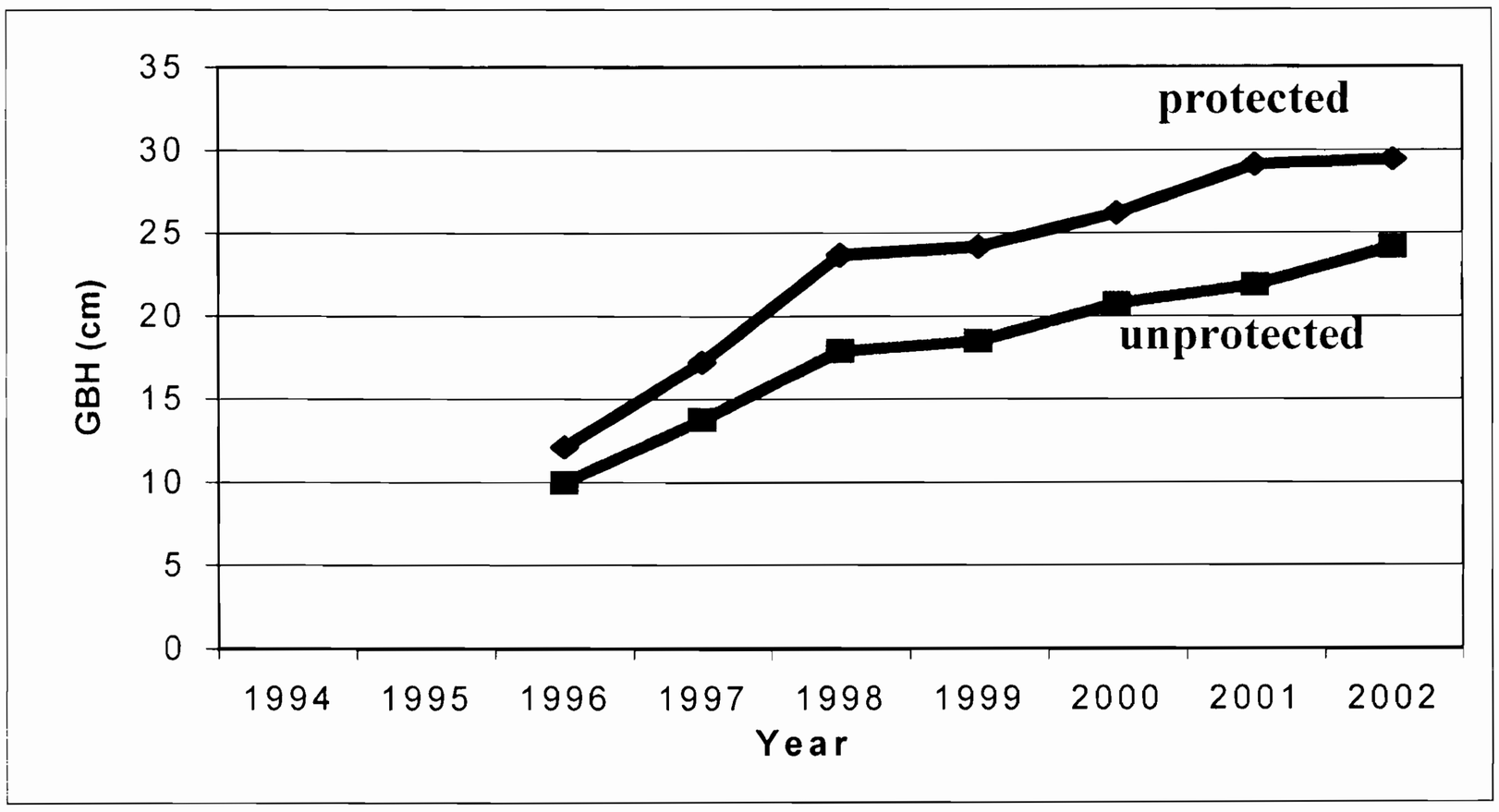

Fig.2. Graph showing mean GBH of trees in the protected and unprotected plots.

Table 3. Mean GBH of trees during 1996 - 2002 in the protected and unprotected plot

Category	Mean GBH (cm)						
	1996	1997	1998	1999	2000	2001	2002
Protected	12.12 (987)	17.21 (1028)	23.65 (1045)	24.14 (1036)	26.18 (1007)	29.11 (961)	29.41 (997)
Unprotected	10.00 (685)	13.75 (792)	17.91 (805)	18.50 (807)	20.75 (782)	21.88 (779)	24.13 (793)

Figures in parenthesis indicate the number of trees in the plot

Growth measurements show that at the end of the experimental period, the trees in the protected plot had a mean height of 11.57 m as against 8.3 m for trees in the unprotected plot. This is 39.39 per cent additional increment in height for the protected trees. After the same period, the mean GBH of protected trees was 29.41 cm as against 24.13 cm for the unprotected trees. This is 21.88 per cent additional increment in GBH for the trees in the protected plot.

At the end of the observation period, it was observed that 31 per cent of

trees in the unprotected plot have been forked, while incidence of forking was only 4 per cent in protected plot.

The volume of wood produced was high in the protected plot. The volume of wood per tree in the protected plot was 0.14791 m^3 compared to 0.1360 m^3 in the unprotected plot

4. CONCLUSIONS

The current project was primarily intended to maintain the demonstration plots to observe the impact of teak defoliator on growth increment. Since the plots were not replicated the growth data is not amenable for statistical comparison. However it could be observed that there was 39.39 per cent additional height increment and 21.88 per cent additional GBH increment in the protected plot as compared to the unprotected plot.

The project has also demonstrated that protecting teak plantations from teak defoliator is worthwhile if sufficient monitoring program is adopted. All outbreaks, which occurred during the experimental period, were detected and controlled.

5. REFERENCES

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