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RELATIONSHIP BETWEEN ACTIVITY OF MAJOR DEFOLIATORS OF TEAK AND WEATHER PARAMETERS UNDER KONKAN CONDITIONS OF MAHARASHTRA STATE, INDIA

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Abstract

The survey of defoliators infesting teak plantation was carried out during January, 2012 to December, 2012 to study the defoliators activity. The peak incidence of *Eutoctona machaeralis* Walker was in the forty-second meteorological week. The various weather parameters *viz*., temperature (maximum and minimum), relative humidity (morning and evening) and rainfall were found affecting the pest population ($R^2 = 0.243$) during the study. The peak incidence of *Hyblaea puera* Cramer was highest in the thirty-eighth meteorological week. The various weather parameters were found affecting pest population ($R^2 = 0.438$).

Key words : Defoliators, *Eutoctona machaeralis* Walker, *Hyblaea puera* Cramer, peak incidence.

Introduction

Forest provides number of valuable products, but due to heavy deforestation during last few decades, the availability and supply of timber wood and other products is very less compared to present demand. In order to meet present demand of timber wood, the efforts are being made at government as well as farmers level to increase the plantation of forest trees. Similarly the forest nurseries are also maintained to produce healthy and quality planting material. However, the success of forest tree plantation as well as nursery is suffered a lot due to several problems. The major problem of forest nurseries and plantation is damage caused by insect pests. Among important timber plants of India, teak (*Tectona grandis* Linn.) is the most valuable commercial timber tree. Besides the utilities of teak, plantation trees of teak are very vulnerable to damage by insect pests. As many as 300 insect pests have been recorded on teak by Tewari (1992).

Among teak plantation, teak defoliator *Hyblaea puera* Cramer (Lepidoptera : Hyblaeidae), teak skeletonizer, *Eutoctona machaeralis* Walker (Lepidoptera : Pyralidae) are the major insect pests which have been reported to cause significant losses in nursery as well as plantation. Both *H. puera* and *E. machaeralis* are the major pests in intensively managed plantation of teak (Varma *et al*., 2007). In teak plantation, teak skeletonizer *E. machaeralis* was found to be very serious in Konkan region of Maharashtra (Ghorpade and Patil, 1991).

The teak defoliator and teak leaf skeletonizer reduce the vigour of the plants by affecting the foliage (Singh *et al*., 1978 and Raut, 1998). Teak leaf skeletonizer, *Eutoctona machaeralis* Walker causes about 80-90 per cent damage to teak trees (Khan *et al*., 1988). Katagall *et al.* (2000 b) found that the *E. machaeralis* caused 20.03 per cent damage to teak plantation. Teak skeletonizer feed on teak leaves of various maturity levels (Roychaudhary and Joshi, 1997).

If the forests are not protected from the ravages of insects, there will be little opportunity to practice forestry. Hence, more attention has to be given to identify the relation between climatic factors and population of defoliators as well as their management. So far, no systematic studies have been conducted in the State of Maharashtra in general and Konkan region, in particular on these aspects. In view of this the present studies were conducted during the year 2012.

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Materials and Methods

A survey was carried out to record the major defoliators associated with teak plantation at Biodiversity Park of the College of Forestry, Dapoli during January 2012 to December 2012. Ten trees were selected randomly and marked permanently to record infestation at weekly interval according to Meteorological week. Larvae and adults on trees were counted by the quadrate method. The area of 50 cm^2 was randomly selected and marked at 4 sides of tree canopy for further observations. Total number of larvae and adults present per quadrate was counted and the average pest wise population per tree was calculated. The average pest population was then correlated with major weather parameters such as temperature (maximum and minimum), humidity (morning and evening) and rainfall etc.

Results and Discussion

Incidence of leaf skeletonizer, *E. machaeralis*

The results presented in table 1 revealed that there was no pest infestation of pest upto the eighth meteorological week. The incidence noticed in the ninth meteorological week (0.5 larvae per tree), which gradually increased upto the fourteenth meteorological week (1.0 larva per tree). The incidence declined from the fifteenth meteorological week (0.75 larvae per tree). There was no incidence of pest during the seventeenth meteorological week upto the twenty-seventh meteorological week. The incidence reappeared in the twenty-eighth week (0.25 larvae per tree), which gradually increased and reached its peak in the forty-second meteorological week (5.75 larvae per tree). The pest declined from the forty-third meteorological week (4.25 larvae per tree) and completely disappeared from the forty-eighth meteorological week (fig. 1). Average pest incidence during infestation period ranged from 0.25 to 5.75 larvae per tree with a mean of 1.78 larvae per tree (table 1). Similar observations were recorded by Raut (1998). He reported the peak population of pest in first week of October. Katagall *et al*. (2000 a) also reported that the pest population was higher during July to October months. Khan *et al*. (1988), Gawade (1992), Alam *et al.* (2004) and Pandey *et al*. (2010) also reported that the teak leaf skeletonizer, *E. machaeralis* was found very active during August to October with highest population and infestation during September, while low pest population during rest of the year.

The data presented in table 2 revealed that the minimum temperature correlated positively and significantly (0.319) with pest population, which indicated

Table 1: Intensity of defoliators on teak trees during January, 2012 to December, 2012.

Meterological week	Major defoliators	
	E. machaeralis	*H. puera*
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	-	-
9	0.5	-
10	0.5	-
11	0.75	-
12	1.0	-
13	1.0	-
14	1.0	-
15	0.75	-
16	0.5	-
17	-	-
18	-	-
19	-	-
20	-	-
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	0.25	1.00
29	0.75	1.50
30	0.50	1.75
31	1.0	2.50
32	1.5	2.00
33	1.75	3.25
34	1.75	3.00
35	2.0	3.00
36	2.25	3.25
37	2.0	3.75
38	2.50	4.25
39	3.00	4.00
40	3.25	4.00
41	4.50	3.75
42	5.75	3.50
43	4.25	1.75
44	3.50	1.00
45	2.25	-
46	1.00	-
47	0.25	-
48	-	-
49	-	-
50	-	-
51	-	-
52	-	-
Range	0.25 to 5.75	1.00 to 4.25
Average	1.78	2.77

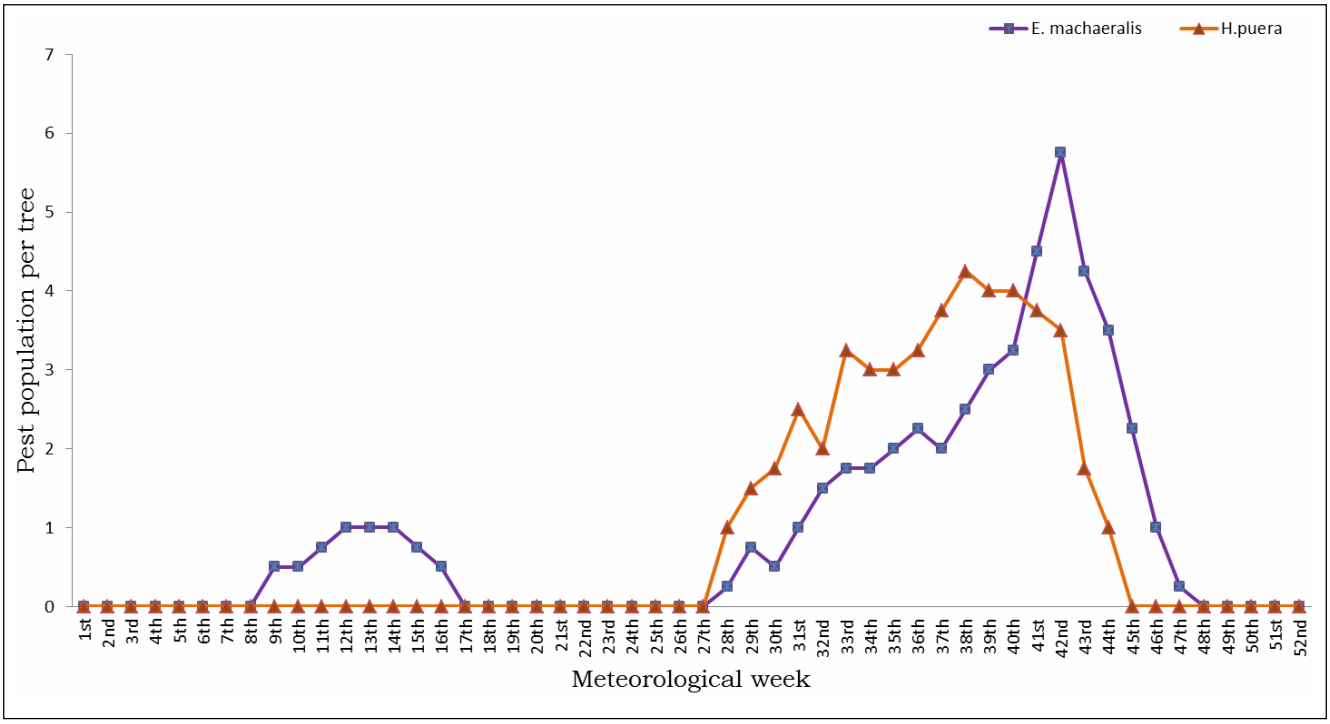

Fig. 1 : Relationship of defoliators on teak plantation.

Table 2 : Correlation between teak defoliators and weather parameters.

Scientific name of the pest	Temp. Max. (°C)	Temp. Min. (°C)	R.H. Mor. (%)	R.H. Evn. (%)	Rainfall (mm)	R^2 values
E. machaeralis	-0.087	0.319*	-0.051	0.142	0.041	0.243
H. puera	-0.498*	0.506*	0.252	0.549*	0.306*	0.438

*- Significant at 5%.

that when temperature decreases, the pest population increases. Whereas, the maximum temperature correlated negatively and non-significantly (-0.087). The morning relative humidity showed negative and non-significant correlation (-0.051), while evening relative humidity and rainfall showed positive and non-significant (0.142 and 0.041, respectively) correlation. The various weather parameters like maximum and minimum temperature, morning and evening relative humidity and rainfall affect the pest population ($R^2 = 0.243$) during the study.

Incidence of teak defoliator, *Hyblaea puera* Cramer

During the study, it was found that there was no incidence of pest during the first meteorological week to the twenty-seventh meteorological week. The incidence of pest noticed in the twenty-eighth meteorological week (1.00 larvae per tree), which gradually increased and reached its peak in the thirty-eighth meteorological week (4.25 larvae per tree). The incidence declined from the thirty-ninth meteorological week (4.00 larvae per tree) and completely disappeared from the forty-fifth meteorological week (fig. 1). The average pest incidence during infestation period ranged from 1.00 to 4.25 larvae per tree with a mean population of 2.77 larvae per tree (table 1). Similar observations were also made by Pawar and Bhatnagar (1989), who reported that the pest population was higher during August – September months whereas pest population was absent during January to June. Katagall *et al*. (2000 a) also reported that the pest population was at its peak in second fortnight of September.

During observation period, it was found that the maximum temperature (-0.498) correlated negatively and significantly with pest population, which indicated that when maximum temperature increases, population of the pest decreases. The minimum temperature (0.506) correlated positively and significantly with population of the pest, which indicated that when minimum temperature decreases, the pest population increases. The evening relative humidity (0.549) and rainfall (0.306) correlated positively and significantly with the population of pest which indicated that when evening relative humidity and rainfall increases, the population of pest increases. The

Appendix 1 : Weekly weather data during the period of study at Dapoli station (January, 2012 to December, 2012).

Period	MW	Temp. max. (°C)	Temp. min. (°C)	RH (Mor.) (%)	RH (Evn.) (%)	Rainfall (mm)
01.01 - 07.01	1	31.8	14.8	91	58	0.0
08.01 - 14.01	2	30.0	9.6	91	57	0.0
15.01 - 21.01	3	28.8	10.4	93	59	0.0
22.01 - 28.01	4	29.0	12.6	93	58	0.0
29.01 - 04.02	5	31.3	13.1	93	49	0.0
05.02 - 11.02	6	30.7	10.4	86	44	0.0
12.02 - 18.02	7	30.1	10.4	91	54	0.0
19.02 - 25.02	8	35.6	14.2	91	48	0.0
26.02 - 04.03	9	32.6	11.0	91	52	0.0
05.03 - 11.03	10	30.8	11.9	90	54	0.0
12.03 - 18.03	11	34.2	14.1	89	42	0.0
19.03 - 25.03	12	33.6	15.6	92	47	0.0
26.03 - 01.04	13	31.8	19.7	92	64	0.0
02.04 -08.04	14	32.5	20.5	93	67	0.0
09.04 - 15.04	15	32.4	20.4	94	64	0.0
16.04 - 22.04	16	34.1	22.4	91	65	0.0
23.04 - 29.04	17	34.4	20.4	86	75	0.0
30.04 - 06.05	18	31.8	20.5	92	71	0.0
07.05 - 13.05	19	32.7	22.6	85	68	0.0
14.05 - 20.05	20	32.9	22.4	81	78	0.0
21.05 - 27.05	21	32.7	22.7	82	70	0.0
28.05 - 03.06	22	33.0	22.9	83	79	0.0
04.06 - 10.06	23	32.0	23.8	91	85	100.
11.06 - 17.06	24	29.8	23.7	96	87	116.6
18.06 - 24.06	25	29.4	23.8	95	77	490.2
25.06 - 01.07	26	29.4	23.4	96	80	243.9
02.07 - 08.07	27	28.2	24.0	96	89	355.0
09.07 - 15.07	28	29.2	24.1	96	86	145.8
16.07 - 22.07	29	27.9	23.9	96	92	313.9
23.07 - 29.07	30	28.9	24.1	94	92	140.6
30.07 - 05.08	31	27.9	23.9	95	89	212.6
06.08 - 12.08	32	28.0	24.0	95	93	224.5
13.08 - 19.08	33	28.8	24.4	94	86	57.0
20.08 - 26.08	34	29.1	24.1	95	88	48.2
27.08 - 02.09	35	26.9	23.2	97	93	505.2
03.09 - 09.09	36	27.3	23.8	97	93	274.4
10.09 - 16.09	37	28.1	23.9	93	89	155.0
17.09 - 23.09	38	28.7	22.7	93	89	12.4
24.09 - 30.09	39	30.1	22.0	94	78	5.0
01.10 - 07.10	40	29.7	23.4	91	94	253.0
08.10 - 14.10	41	31.3	22.2	89	69	0.0
15.10 - 21.10	42	33.4	19.5	86	50	0.0
22.10 – 28.10	43	33.0	22.1	87	53	0.0
29.10 – 04.11	44	32.0	19.3	85	54	0.0
05.11 – 11.11	45	32.2	18.1	89	55	0.0
12.11 – 18.11	46	31.9	15.8	95	49	0.0
19.11 – 25.11	47	32.2	15.0	89	40	0.0
26.11 – 02.12	48	31.9	15.6	90	50	0.0
03.12 – 09.12	49	33.7	18.1	89	48	0.0
10.12 – 16.12	50	30.8	14.0	90	49	0.0
17.12 – 23.12	51	32.5	13.9	91	43	0.0
24.12 – 31.12	52	31.7	13.8	92	39	0.0

maximum temperature, minimum temperature, relative humidity (morning and evening) and rainfall were found affecting the pest population (R^2 = 0.438) during the observation period (table 2).

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