

## A study of preference of wood by termites in Ambala region of Haryana state

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### ABSTRACT

Termites constitute a group of social insect of great economical importance. They cause serious damages to tree crops, timber and furniture etc. which are made up of cellulose. The present study deals with the preference of wood by the termites. Experiment was conducted by collecting different woods. The wood which was preferred by termites is *Mangifera* and *Azadirachta* and placed in category IV. Outer sap wood was more preferred by termites as compared to heart wood.

**Key words** Preference of wood, Termites, Damage.

### INTRODUCTION

Termites are usually called "white ants" because the majority of them are white and small and live in large colonies much like the ants. The great economical importance of the termites can be judged from the estimates of losses caused by them to crops and forests made from time to time by different workers (Bignell and Eggleton, 2000). Termites prefer to feed on soft spring growth wood rather than hard woods and woods rich in natural chemical protectants. Some woods (e.g. red woods, cypress, and juniper) are less preferred by termites, but no wood is completely immune to attack. In general, termites prefer cellulose that is easy to obtain. E.g., in laboratory studies they prefer in this order: loose cellulose fibers > paper > cardboard > softwood blocks > hard wood blocks.

### Methodology

The field experiment was set up within the limits of subdivision Naraingarh of district Ambala from Nov 2006 to Oct 2007. Ambala lies on north eastern edge of Haryana between 27- 39"-45' North latitude and 74- 33" 53' to 76-36"- 52' East longitude. It is bounded by district Yamuna nagar to south east.

To its south lies Kurukshetra district while in its west are situated Patiala and Ropar district of Punjab and the Union Territory of Chandigarh. The Shivalik range of Solan and Sirmaur district of H.P. bounds the Ambala district in North and North-East. The height from the sea level is 900 feet.

For the present study different areas having termite infestation were observed and four sites were selected to set up different experiments during Nov. 2006 to Oct. 2007 in the Naraingarh subdivision of Ambala District. Preference of wood was observed in the above mentioned experiment by calculating species wise mean per cent loss of all the 3 experiments. All the species were compared on the basis of mean per cent loss and were categorized in different categories depending upon preference.

Experiment was conducted to observe the preference of wood. Four different plant species viz. Safeda (*Eucalyptus* sp.), Dhrek (*Melia* sp.), Shisham (*Dalbergia sisoo*) and Kikar (*Acacia indica*) were used. Small logs having both sap wood and heart wood were weighed and placed at the termite infested sites for six months. Final weight was

calculated and per cent weight loss was compared to the earlier experiment of same duration i.e. six months.

## RESULTS AND DISCUSSIONS

Minimum three samples of all the eight wood species were studied by grave yard method. Only heart wood was placed without any seasoning or treatment. In another experiment four wood species were studied by same method in which sap and heart wood both were present.

On the basis of per cent loss of wood by termites during the test period, the resistance of tested wood or preference of wood by termites was graded into following various classes.

Mean per cent Loss	Termite resistance Category	Preference of wood By termites
0-9.0	Very resistant I	Least Preferred
9.1-15.0	Resistant II	Less preference
15.1-20.0	poorly resistant III	Preferred
Above 20.0	Perishable IV	Most preferred

Eight species were investigated against the attack of termites with regard to their natural termite resistance quality and wood preferred by termites. Out of these, three species proved to be very resistant to termite viz. Shisham, Sal and Safeda which shows that these are least preferred by termites. These were placed in Category I, Table-11, where the mean per cent loss was below 10.0 i.e. very resistant. Weight loss vary for *Eucalyptus* 5.26 to 12.24 (mean per cent wt. loss 8.21) for *Dalbergia* 5.61 to 12.00 (mean per cent wt. loss 8.27) and for *Shorea* 5.93 to 12.50 (mean per cent wt. loss 8.66), Table 4, 6 & 8. It was revealed that these were not eaten by termites and if eaten, to very less extent. It may be due to the presence of other preferred wood species present near by. Other reason for natural resistance of these species may be due to presence of volalite substance in heart wood.

*Acacia* and *Prunus* is placed in category II, Table-11 and damaged caused to these woods is very less. Per cent weight loss vary from 10.42 to 21.10 (Mean per cent wt. loss 14.64) for *Acacia*. Per cent weight loss vary from 6.06 to 14.71 (Mean per cent wt. loss 9.76) for *Prunus*. Hence these woods are not preferred by termites, Table-4 & 5.

**Table 1: Per cent weight loss of wood safeda (*Eucalyptus sp.*) due to attack by termites**

S. No.	Period of Attack	Initial Weight (g)	Final Weight (g)	Total Weight loss	Per cent wt. loss
1	2 months	190.00	180.00	10.00	5.26
2	3 months	174.00	162.00	12.00	6.90
3	6 months	196.00	172.00	24.00	12.24
	Total	560.00	514.00	46.00	8.21*

**Table 2: Per cent weight loss of wood shisham (*Dalbergia sisoo*) due to attack by termites**

S. No.	Period of Attack	Initial Weight (g)	Final Weight (g)	Total Weight loss	Per cent wt. loss
1	2 months	196.00	185.00	11.00	5.61
2	3 months	255.00	238.00	17.00	6.67
3	6 months	250.00	220.00	30.00	12.00
	Total	701.00	643.00	58.00	8.27*

Damage caused to *Melia* sp. wood is also considerable i.e. between 16 – 20 (Mean per cent wt. loss) hence placed in category III, Table-11, In *Melia* sp. per cent loss vary from 12.67 to 22.58 and the mean per cent wt. loss was 17.36, so it is poorly resistant to termites, Table-6.

The species (wood) which were most preferred by termites are *Mangifera* and *Azadirachta*. These were placed in Category IV, Table-11, where the mean per cent loss was above 20 i.e. perishable. It was found that these woods were eaten at very fast rate by termites and weight loss vary for *Mangifera* 26.19 to 38.30 (Mean per

**Table 3: Per cent weight loss of wood sal (*Shorea robusta*) due to attack by termites**

S. No.	Period of Attack	Initial Weight (g)	Final Weight (g)	Total Weight loss	Per cent wt. loss
1	2 months	270.00	254.00	16.00	5.93
2	3 months	270.00	250.00	20.00	7.41
3	6 months	280.00	245.00	35.00	12.50
	Total	820.00	749.00	71.00	8.66*

**Table 4: Per cent weight loss of wood kikar (*Acacia indica*) due to attack by termites**

S. No.	Period of Attack	Initial Weight (g)	Final Weight (g)	Total Weight loss	Per cent wt. loss
1	2 months	240.00	215.00	25.00	10.42
2	3 months	240.00	210.00	30.00	12.50
3	6 months	237.00	187.00	50.00	21.10
	Total	717.00	612.00	105.00	14.64*

**Table 5: Per cent weight loss of wood jamoya (*Prunus padus*) due to attack by termites**

S. No.	Period of Attack	Initial Weight (g)	Final Weight (g)	Total Weight loss	Per cent wt. loss
1	2 months	165.00	155.00	10.00	6.06
2	3 months	167.00	153.00	14.00	8.38
3	6 months	170.00	145.00	25.00	14.71
	Total	502.00	453.00	49.00	9.76*

**Table 6: Per cent weight loss of wood dherk (*Melia azadarach*) due to attack by termites**

S. No.	Period of Attack	Initial Weight (g)	Final Weight (g)	Total Weight loss	Per cent wt. loss
1	2 months	150.00	131.00	19.00	12.67
2	3 months	150.00	125.00	25.00	16.67
3	6 months	155.00	120.00	35.00	22.58
	Total	455.00	376.00	79.00	17.36*

cent wt. loss 31.91) and for *Azadirachta* 22.73 to 32.74 (Mean per cent wt. loss 27.33) which is too high (Table-7 & 8).

It was further observed that outer sap wood is more preferred by termites as compared to heart wood. It is very clear from the observation of wood samples as presented in photographs of *Dalbergia sisoo* and *Eucalyptus* spp. This is also evident from the table 12, where the per cent weight loss in *Eucalyptus* is 19.11, *Melia* 31.25, *Dalbergia* 35.44 and *Acacia* 41.65. When this loss is compared with the loss caused to only heart wood in Table-10, it is very much clear that the preference of termite is sap wood instead of Heart wood. This

might be due to the presence of volatile substances in the heart wood.

Similar experiment was conducted by Sen-Sarma in 1974 on 29 different wood species. He categorized these woods in five categories depending upon their termite infestation. We in our experiment also categorized the 8 species depending upon their termite resistance but only two species (*Dalbergia* and *Melia*) are common in our and Sen-Sarma experiment. In his experiment he compared outer heart wood region and inner heart wood region although, we compared the sap wood and heart wood in four wood species in our experiment.

**Table 7: Per cent weight loss of wood mango (*Mangifera indica*) due to attack by termites**

S. No.	Period of Attack	Initial Weight (g)	Final Weight (g)	Total Weight loss	Per cent wt. loss
1	2 months	210.00	155.00	55.00	26.19
2	3 months	210.00	146.00	64.00	30.48
3	6 months	235.00	145.00	90.00	38.30
	Total	655.00	446.00	209.00	31.91*

**Table 8: Per cent weight loss of wood neem (*Azadirachta indica*) due to attack by termites**

S. No.	Period of Attack	Initial Weight (g)	Final Weight (g)	Total Weight loss	Per cent wt. loss
1	2 months	220.00	170.00	50.00	22.73
2	3 months	220.00	162.00	58.00	26.36
3	6 months	226.00	152.00	74.00	32.74
	Total	666.00	484.00	182.00	27.33*

**Table 9: Per cent Weight loss of different woods (including sap and heart wood) due to attack by termites (after 6 months)**

S. No.	Wood Species	Initial Weight (g)	Final Weight (g)	Total Weight loss	Per cent wt. loss
1	Safeda ( <i>Eucalyptus</i> sp.)	1570.00	1270.00	300.00	19.11
2	Dhrek ( <i>Melia azadarach</i> )	1600.00	1100.00	500.00	31.25
3	Shisham ( <i>Dalbergia sisoo</i> )	790.00	510.00	280.00	35.44
4	Kikar ( <i>Acacia indica</i> )	2485.00	1450.00	1035.00	41.65

In the field, preference for a particular cellulose resource is likely determined by its availability, size, textures and nutritional demand of the termite colony. There is some evidence that termites prefer wood that has been attacked by certain wood destroying fungi. Other fungi may deter termite feeding.

According to Juan A. Morales-Ramos and M. Guadalupe Rojas 2000; the feeding preferences of the Formosan subterranean termite, *Coptotermes formosanus* Shiraki were tested in three separate experiments on 28 different wood species. Preference was determined by consumption rates. Birch (*Betula alleghaniensis* Britton) red gum (*Liquidambar styraciflua* L.) Parana pine (*Araucaria angustifolia* (Bert), sugar maple

(*Acer saccharum*. Marsh) Pecan (*Carya illinoensis* Wangenh) and northern red oak (*Quercus rubra* L.) were most preferred species by *C. formosanus* in order of consumption rate. All of these species are significantly more preferred than southern yellow pine (*Pinus taeda* L.) widely used for monitoring. Sinker cypress [=old growth bald cypress, *Taxodium distichum* (L.)] western red cedar (*Thuja plicata* Donn), Alaskan yellow cedar (*Chamaecyparis mootkatensis* D. Don), Eastern red cedar (*Juniperus virginiana* L.), sassafras [*Sassafras albidum* (Nutt)] Spanish cedar (*Cedrella odorata* L.), Honduras mahogany (*Swietenia macrophylla* King), Indian rosewood (*Dalbergia latifolia* Roxb.), Honduras rosewood (*D. stevensonii* Standl.) and morado (*Machaerium* sp.) Induced significant feeding deterrence and mortality to *C. formosanus*.

**Table 10: Per cent weight loss of different woods due to attack by termites (after 6 months)**

S. No.	Wood Species	Initial Weight (g)	Final Weight (g)	Total Weight loss	Per cent wt. loss	Per cent loss/month
1	Safeda ( <i>Eucalyptus</i> sp.)	196.00	172.00	24.00	12.24	2.04
2	Dhrek ( <i>Melia azadarach</i> )	155.00	120.00	35.00	22.58	3.76
3	Shisham ( <i>Dalbergia sisoo</i> )	250.00	220.00	30.00	12.00	2.00
4	Kikar ( <i>Acacia indica</i> )	237.00	187.00	50.00	21.10	3.52
5	Sal ( <i>Shorea robusta</i> )	280.00	245.00	35.00	12.50	2.08
6	Mango ( <i>Mangifera indica</i> )	235.00	145.00	90.00	38.30	6.38
7	Neem ( <i>Azadirachta indica</i> )	226.00	152.00	74.00	32.74	5.46
8	Jamoya ( <i>Prunus padus</i> )	170.00	145.00	25.00	14.71	2.45
	Total	1749.00	1386.00	363.00	20.75	3.46

**Table 11: Comparative statement of termite resistance class of different wood species**

S. No.	Name of Wood Species Tested	Per cent weight loss		Termite Resistance Class
		Range	Mean	
1	Safeda ( <i>Eucalyptus</i> sp.)	5.26-12.24	8.21	I
2	Dhrek ( <i>Melia azadarach</i> )	12.67-22.58	17.36	III
3	Shisham ( <i>Dalbergia sisoo</i> )	5.61-12.00	8.27	I
4	Kikar ( <i>Acacia indica</i> )	10.42-21.10	14.64	II
5	Sal ( <i>Shorea robusta</i> )	5.93-12.50	8.66	I
6	Mango ( <i>Mangifera indica</i> )	26.19-38.30	31.91	IV
7	Neem ( <i>Azadirachta indica</i> )	22.73-32.74	27.33	IV
8	Jamoya ( <i>Prunus padus</i> )	6.06-14.71	9.76	II

Laboratory tests to determine natural resistance of several Indian timbers have been carried out by Sen-Sarma (1963a,b,c, 1972; Sen-Sarma and Chatterjee 1965b, 1968) and Sen-Sarma *et al.* (1975). Natural termite resistance of eighty four Indian timber species has been tested so far by Sen-Sarma *et al.* (1975). Sen-Sarma (1970) has given an exhaustive account of various methods of laboratory evaluation of termite resistance of wood and wood products. Gupta and Sen-Sarma (1981) have investigated the anti-termite properties of some anthraquinone derivatives of teak. Heartwood of teak shows wide variation in termite resistance. Sen-Sarma and Thakur (1979b) are of the opinion that the termite resistance in teak is perhaps genetically controlled.

Various reports dealing with the status of termites on crops and trees in India have been reported and published by Sen-Sarma and Thakur (1983,1985,1986), Khan and Singh (1985), Nair and Varma (1985), Verma (1986), Sen-Sarma (1987), Das (1988), Verma (1989,1993), Cowie *et al.* (1989), Varma (1990), Bhanot *et al.* (1991) and Girdhar (1995).

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