

## Field Evaluation of Natural Resistance of Timber and Fuel Wood Against Termite Attack

D.R. Parihar

Central Arid Zone Research Institute, Jodhpur 342 003, India

**Abstract :** Wood of fourteen timber and fuel wood tree/shrub species was found to be non-resistant to termite attack. Maximum damage was observed in *Leucaena leucocephala* ( $74.6 \pm 2.6\%$  wt. loss) and minimum in *Dalbergia sissoo* ( $15.0 \pm 7.8\%$  wt. loss). Resistant class of tested materials was also worked out.

**Key words :** Termite damage, natural resistance, evaluation, timber wood, fuel wood.

Termite causes severe losses to timber and fuel wood both in urban as well as in rural areas. The major damage occurs from subterranean termites. Natural resistance of wood has been evaluated in India (Purushotham *et al.*, 1953; Sen-Sarma *et al.*, 1975; Sammaiah and Reddy, 1991; Mishra and Rana, 1992). Field evaluation of wood against termite attack has not been carried out in the Rajasthan desert, which has more than 39 species of termites, and most of them are subterranean. With this in view, the wood of fourteen tree/shrub species was tested against termite attack.

### Materials and Methods

#### Study area

This study was carried out in an area of 50 x 50 m at CR Farm, CAZRI, Jodhpur, which was identified as heavily infested with termites. The experimental site was cleaned of the dead vegetation of other organic debris and was divided into two halves of each measuring 24 x 24 m

each. One half was used for timber wood and the other, for fuel wood experiments. A 2 m wide buffer zone was left in between.

#### Testing procedure

Smooth wooden blocks of 15 x 10 x 2 cm of available commercial timber and debarked (mostly of heart-wood) stakes of 20 x 2.5 x 2.5 cm of fuel wood, were tested against termite attack. Before testing, both timber and fuel wood samples were oven dried at 85°C for 24 hours. The testing material was weighed and inserted vertically to a depth of 10 cm in a row distance of one metre, and between two rows, one metre distance was kept as buffer zone. The surrounding soil was pressed to ensure natural compactness. Number of samples of each wood were tested for termite resistance. The wooden samples with knots and other deformities were rejected.

After 46 days of test period, the blocks and fuel wood stakes were taken out, thor-

oughly cleaned, oven dried and then the weight loss due to wood consumed by termites was calculated. On the basis of percentage wood eaten by termite, the following categorization of wood into various resistance classes, as suggested by Sen-Sarma *et al.* (1975), was done.

Percentage wt. loss	Resistance class
0-6	Very resistant (Class I)
7-16	Resistant (Class II)
17-30	Moderately resistant (Class III)
31-50	Poorly resistant (Class IV+)
51 and above	Perishable (Class IV-)

## Results and Discussion

### Termite damage to wood

Various groups of termites were noticed to damage wood and it was possible to identify the group from the pattern of damage. About 20 species of termites were recorded damaging fuel wood and timber used in buildings and other wooden ma-

terials. During foraging by termites, large parts of the wood are consumed, exhibiting irregular cavities which were filled with mud and wooden dust; a thin ring of the outer wood was left intact.

### Timber wood test

Among the timber blocks tested (Table 1 and 2), maximum damage was observed in *Pinus longifolia* ( $73.3 \pm 5.7\%$  wt. loss), closely followed by that in *Acacia nilotica* ( $72.7 \pm 6.2\%$ ) and minimum was in *Dalbergia sissoo* ( $15.84 \pm 4.8\%$ ). Per cent weight loss in other blocks was : *Tectona grandis* ( $35 \pm 4.3\%$ ), *Shorea robusta* ( $23.5 \pm 3.7\%$ ), *Mangifera indica* ( $50.2 \pm 7.5\%$ ), and *Tecomella undulata* ( $37.5 \pm 2.3\%$ ). On the basis of the findings of Sen-Sarma *et al.* (1975), the poorly resistant test wood blocks were *Tectona grandis*, *Tecomella undulata* and *Mangifera indica*, while *Acacia nilotica* and *Pinus longifolia* may be grouped as perishable and *Shorea robusta* as moderately resistant. Sen-Sharma *et al.*

Table 1. Termite-consumed timber wood and their resistant class

Timber wood tested	Wood consumed (%)			Resistant class	Termite species present
	Replicates	Mean (%)	Standard Error (S.E.)		
<i>Tectona grandis</i> (teak)	20	35.0	4.3	Poorly resistant (IV +)	<i>Microtermes mycophagus</i>
<i>Dalbergia sissoo</i> (shisham)	19	15.8	4.8	Resistant (II)	<i>M. mycophagus</i>
<i>Acacia nilotica</i> (babul)	11	72.7	6.2	Perishable (IV -)	<i>M. mycophagiuis</i>
<i>Shorea robusta</i> (sal)	21	23.5	3.7	Moderately resistant (III)	<i>M. mycophagiuis</i>
<i>Mangifera indica</i> (mango)	18	50.2	7.5	Poorly resistant (IV +)	<i>M. mycophagiuis</i>
<i>Pinus longifolia</i> (pine)	15	73.3	5.7	Perishable (IV -)	<i>Eremotermes</i> sp.
<i>Tecomella undulata</i> (rohida)	10	37.5	2.3	Poorly resistant (IV -)	<i>M. unicolor</i> <i>Eremotermes</i> sp.

(1975) reported weight loss of 56.6% as resistant class IV for *Acacia nilotica*, 51.5% as resistant class IV- for *Mangifera indica* and 19.3% as resistant class III for *Shorea robusta*. These values are comparatively lower than those of present study. The wood consumption by termites was linked to the nutritional requirement of the species, test conditions and chemical properties of the tested material.

#### Fuelwood test

The maximum wood consumed by termites was in *Leucaena leucocephala* (74.6  $\pm$  2.6%) and minimum was in *Acacia senegal* (33.8  $\pm$  4.5%) (Table 2). None of the fuel wood tested was resistant to termite attack. Out of seven test wood species, *Acacia senegal*, *Prosopis cineraria* and *Albizia lebbek* exhibited poor resistance, while the

remaining four : *Acacia tortilis*, *Prosopis juliflora*, *Leucaena leucocephala* and *Eucalyptus camaldulensis* were found to be perishable. Sen-Sarma and Chatterjee (1968) reported that wood of *Albizia* sp., *Prosopis spicigera* (Syn. *cineraria*), *P. juliflora* and *Tectona grandis* suffered very little termite damage resulting in almost immunity to termite attack in the laboratory. They further observed that natural resistance of *P. spicigera* was likely to be affected by high temperature which diminishes the effectiveness of chemical substances. Interestingly, the samples of juvenile trees proved to be highly susceptible to termite attack (Sen-Sarma and Chatterjee, 1968). Sometimes, resistance of wood may be due to the wood being nutritionally unsatisfactory or deterrent to the test termite and not due to presence of toxic substances (Sen-Sarma and Chatterjee, 1968). Higher quantity of

Table 2. Consumption of fuelwood by termites

Fuel wood tested	Replicates	Wood consumed (%)		Termite species present	Resistant class
		Mean	Standard Error		
<i>Acacia tortilis</i> (Israeli babul)	14	52.4	6.2	<i>Microtermes mycophagus</i> <i>M. obesi</i>	Perishable (IV -)
<i>Acacia senegal</i> (Kumat)	15	33.8	4.5	<i>Microtermes mycophagus</i> , <i>Odontotermes redemanni</i>	Poorly resistant (IV +)
<i>Prosopis cineraria</i> (Khejri)	12	36.3	3.6	<i>Odontotermes obesus</i>	Poorly resistant (IV +)
<i>Prosopis juliflora</i> (Vilayati babool)	12	56.1	2.8	<i>Microtermes obesi</i>	Perishable (IV -)
<i>Leucaena leucocephala</i> (Subabul)	12	74.6	2.6	<i>Microtermes unicolor</i>	Perishable (IV -)
<i>Eucalyptus camaldulensis</i> (Eucalypt)	12	61.5	6.7	<i>Odontotermes guptai</i>	Perishable (IV -)
<i>Albizia lebbek</i> (Siris)	12	47.5	3.3	<i>Microtermes mycophagus</i>	Poorly resistant (IV +)

starch content makes the wood relatively more susceptible to insect attack (Beeson 1941; Roonwal and Thapa, 1960). Lignin and phenolic compounds are thought to contribute some resistance to both termites and fungi (Abushama and Abdel-Nur, 1978). The effect on various parameters which are likely to influence termite resistance of wood, such as age, diameter, height, felling season, seasoning methods, should also be considered to establish proper correlations (Mishra and Rana, 1992).

### Acknowledgement

The author is thankful to Dr. N.S. Rathore, Zoologist, Desert Regional Station, Zoological Survey of India, Jodhpur, for the identification of termite species.

### Reference

- Abushama, F.T. and Abdel-Nur, H.O. 1978. Natural resistance of sudanese timber against the sand termite, *Pseudotermes hybostoma*. *Entomological Experiment Application* 24:204-211.
- Beeson, C.F.C. 1941. *Ecology and Control of Forest Insects of India and Neighboring Countries*. Vasant Press, Dehradun (Revised 1961).
- Mishra, S.C. and Rana, S.S. 1992. Laboratory evaluation of natural resistance of bamboos to termite *Microcertermes beesoni* Snyder (Isoptera:Termitidae). *Journal of Entomological Research* 16(4) 311- 318.
- Purushotam, A., Pande, J.N. and Yadav, Y.G. 1953. Wood preservation in India. *Indian Forest Bulletin* No. 168, p. 73.
- Roonwal, N.L. 1979a. *Termite life and termite control in Tropical South Asia*. Jodhpur (Scientific Publishers) p. 17.
- Roonwal, M.L. 1979b. Termite damage to Railway coaches in India. *Indian Journal of Forestry* 2(4): 307-310.
- Roonwal, M.L. and Thapa, R.S. 1960. Experiments on fresh water seasoning of three species of Indian timbers to provide anti-insect protection. *Indian Forest Record* 19(1): 41.
- Sammaiah, C.H. and Reddy, M.V. 1991. Ecotoxicity of different concentrations of BHC and Aldrin to termites attacking wooden stakes and Eucalyptus trees. *Journal of Ecotoxicology and Environment Monitoring* 1(4): 291-303.
- Sen-Sarma, P.K. 1977. Insect pests and their control in rural housing. *Indian Journal of Entomology* 39(3): 284-288.
- Sen-Sarma, P.K. and Chatterjee, P.N. 1968. Studies on the natural resistance of timbers to termite attack V. Laboratory evaluation of resistance of three species of Indian wood to *Microtermes baesoni* Snyder (Termitidae). *Indian Forester* 93: 694-704.
- Sen-Sarma, P.K., Thakur, M.L., Mishra, S.C. and Gupta, B.K. 1975. *Wood destroying termites of India in relation to natural resistance of timber*. Final Technical report PL-480, FRI, Dehra Dun, 187 p.
- Thakur, N.L. 1977. Pest status and control of termite in rural areas. *Indian Forests* 106(3) 425-435.
- Thakur, R.K. 1985. Pest status of termites in Gujarat, India. *Indian Journal of Forestry* 8(1): 37-40.