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Anti termite activity of *Jatropha curcas* Linn. biochemicals

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ABSTRACT: *Jatropha curcas* oil and its toxic fraction were evaluated at different dilutions i.e., 1%,5%,10%,20% against *Microcerotermes beesoni*, the test termite. The maximum wood protection against termites of both the treatments were obtained at their highest concentration i.e. 20%. The weight loss ranged from 18.77% to 48.80% at concentrations of 20% to 1% of *Jatropha curcas* oil formulation. The protection afforded by toxic fraction was enhanced, with the % weight loss ranging from 10.48 to 35.19. However, all the treatments proved to be effective over the control (50.84%). @ JASEM

Termites are known to cause tremendous losses to finished and unfinished wooden structures in buildings, besides loss in agriculture and forestry crops (Sen-Sarma *et al.* (1975). For controlling termites, synthetic termiticides have been used for a long time. At the advent of termite control, persistency of the chemical was regarded to be a boon, as it provided protection for longer periods. But soon it was realised that, chlorinated, persistent type of insecticides posed a great hazard to environment, due to their residual effects. Therefore, some of the termiticides like DDT, aldrin, dieldrin, heptachlor and BHC were banned and a search for other less persistent insecticides was started. Now a days chloropyriphos has been successfully employed as soil treatments against subterranean termite. Continuous use of synthetic termiticides for soil as well as crop treatment , has been allowed for the present time because of the lack of any effective substitute. World over, research is going on for an effective formulation, which can reduce the damage by termites, at the same time being environmentally acceptable. In the present investigation, the properties of *Jatropha* oil and its components against the termites using different additives, have been evaluated against the test termite, *Microcerotermes beesoni*.

MATERIAL AND METHODS

Seeds of *J. curcas* were obtained from Nivas , Jabalpur. Dried seeds were decorticated and powdered. Powdered seeds were extracted in a large Soxhlet apparatus, in petroleum ether (40-60 °C), for 20 hours, The solvent was removed from the extract under reduced pressure at 40^0C. The oil obtained was further subjected to fractionation with O'Keeffe solvent system containing petroleum ether: methanol: water in the ratio 10:9:1 to separate toxic fraction. Both polar and non-polar fractions were separated with the help of separating funnel. The process was repeated three times and collected aqueous methanol fractions were combined. Preliminary trials were made in the laboratory to test the efficacy of *J. curcas* against *Microcerotermes beesoni*, a test termite commonly used for laboratory testing. The experiment was carried out to observe the feeding of termites on the treated wood pieces of perishable wood of mango (*Mangifera indica*). Test blocks of mango wood measuring 2 cm^3 were prepared, oven dried at 80^0C for 48 hours and weighed. *Jatropha curcas* oil and its toxic fraction of oil, in combination with additives and emulsifier, were evaluated against *Microcerotermes beesoni*, the test termite. Soil was collected from the mound of *Odontotermes obesus*. It was ground, moistened and sterilised in an autoclave. 500 g of sterilised soil was filled in glass jars of 1 litre capacity. The test species were dipped overnight in different concentrations of curcas seed fractions, dried at room temperature and placed over the soil in the glass jars. A feeding strip of 1x2x20 mm of soft wood i.e semul (*Bombax ceiba*) was also placed into the jar together with a small piece of the nest of *Microcerotermes beesoni*. The temperature of the laboratory was maintained at 27^0C $\pm 2^0$C and relative humidity 85% $\pm$ 5 %. Preparation of cages and testing was done following the methods evolved by Sen-Sarma and Chatterjee (1970) and Sen-Sarma *et al,* (1975). After 60 days of exposure, the test pieces were removed from the cages, cleaned and oven dried at 80^0C for 48 hours and weighed. There were four treatments and 4 replications. The weight loss (% weight loss) in different treatments and replications was calculated and subjected to statistical analysis.

RESULTS AND DISCUSSION

The oil and its toxic fraction have shown encouraging results against the test termite, *Microcerotermes beesoni* (Table-1). The maximum efficacy i.e minimum weight loss due to termites of both the treatments were obtained at their highest concentration i.e. 20%. The weight loss ranged from 18.77% to 48.80% at concentrations of 20% to 1% of JA (Jatropha oil formulation). The protection afforded by JM (Jatropha oil toxic fraction formulation), with the % weight loss ranging from

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10.48 to 35.19. However, all the treatments proved to more effective over the control (50.84%). The difference in the weight of the wood pieces before treatment was non significant. The weight of the test pieces, after the various treatments (T1-T9), as well as their weight loss, was highly significant at P≤0.01. Minimum loss was observed in T5 (10.48%), which was highly significant (P=0.01) in comparison to control, while maximum weight loss in blocks was recorded in treatment T4 (48.80%) which was at par with control (T9). The mean weight loss was 4.48g in control, which indicates that control wooden blocks were more damaged by termites as compare to 1.79, 2.69, 3.37, 4.32, 0.86, 1.55, 2.45 and 3.0 g post treatment weight of T1 to T8, respectively.

Table-1 Efficacy of *Jatropha curcas* seed components against test termite *Microcerotermes beesoni*

Treatment	Treatment concentration (%)	Pretreatment weight of test pieces (g)	Post treatment weight of test pieces (g)	Weight loss in test pieces after exposure (g)	Weight loss (%)
T1	20	9.53	7.75^{a}	1.79^{e}	18.77 (25.66)^{d}
T2	10	9.39	6.69^{bc}	2.69^{cd}	29.45 (32.86)^{c}
T3	5	8.67	5.29^{de}	3.37^{b}	38.54 (38.37)^{b}
T4	1	8.82	4.56^{ef}	4.32^{a}	48.80 (44.31)^{a}
T5	20	8.32	7.45^{ab}	0.86^{f}	10.48 (18.85)^{e}
T6	10	8.88	7.33^{ab}	1.55^{e}	17.34 (24.60)^{d}
T7	5	8.57	6.11^{cd}	2.45^{d}	28.70 (32.39)^{c}
T8	1	8.52	5.52^{d}	3.00^{bc}	35.19 (36.37)^{b}
T9 Control		8.81	4.34^{f}	4.48^{a}	50.84 (45.48)^{a}
C.D.		NS	0.852**	0.4648**	2.197

Values are mean of 4 replications.
NS- Non-significant
Values in parenthesis are arc sine transformed values.
Values followed by the same alphabet are not significantly different at P≤0.01.

The results revealed that oil and its fraction, significantly reduce the weight losses (18.77%, 10.48%) due to exposure of wood of mango (*Mangifera indica*) to termite attack, in comparison to control (Fig.1)

Reports of the efficacy of plant products against termite and furniture beetle are available in literature. Sharma *et al.* (1980) studied the role of neem extractives in wood protection. They tested neem seed ester extract against test termite *Microcerotermes beesoni* on highly perishable timber of mango (*Mangifera indica)*, at very low dilution i.e. 0.025% concentration. They reported four fold protection of wood. On the contrary, Verma *et al.* (1995) reported that neem cakes when mixed with soil did not protect eucalyptus seedling from subterranean termites attracting roots. Giridhar *et. al.* (1988) reported the termiticidal activities of

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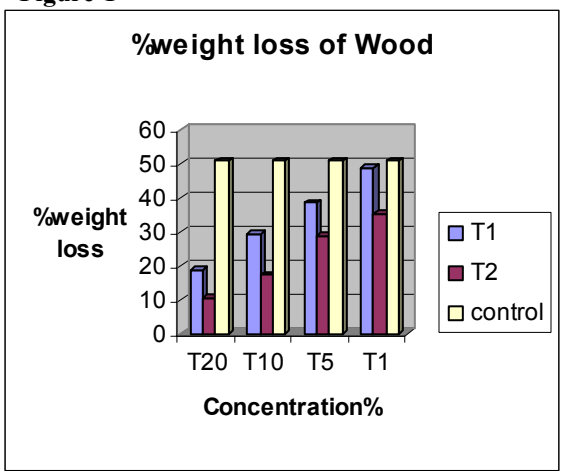
Calotropis latex. Impregnation of the wood with latex significantly reduced termite attack (10.6-11.9% loss in weight), especially in susceptible wood species like *Cedrus deodara* and *Mangifera indica.*

Figure-1



The results of our findings against termite has further been strengthened that formulations containing crude oil of *J. curcas* and its toxic fraction were found to be significantly effective even after 60 days of exposure to termites. The persistency of the formulation was reflected by the fact that treated wooden blocks were subjected to termite exposure after 3 months of its treatments with the formulation. After treatment, the wooden blocks were kept at room temperature.

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