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Development of Physical Barrier for Termite Management in Buildings (OLP-0331)

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Termite is a well known structural pest throughout the world. Once the pathway of termite into buildings is established, it starts attacking all types of cellulosic and some non-cellulosic materials also such as paper, books, wood works, plastic, synthetic fibre, polyurethane foam, thermocole and even thin sheet of soft metal of lead or copper, asphalt, rubber, creosote and mortars etc. There are four types of termites found, out of them subterranean termites are most destructive to buildings. More than 95% damage is caused by this termite alone. They infest structures by tunneling through the soil. It enters into buildings at ground level from the foundations. Protection of buildings from termites is conventionally achieved by creating chemical barriers inside as well as outside of buildings. A typical "anti-termite treatment" may involve application of thousands of litres of toxic pesticidal solution. This technique is quite effective. However, the pesticides used for the purpose are toxic and are sources of environmental pollution. Pesticides approved by Govt. of India (in IS:6313, Part-3, 2001) are already banned in foreign countries. The new pesticides, which are coming up as alternative are considered comparatively safe but relatively short-lived and require multiple re-applications. Therefore, there is an urgent need to develop long-lasting and environment friendly alternative of toxic pesticides.

In the present project, extensive studies and experimental work was carried out on various types of inert-materials to develop "Physical Barrier" for termite management in buildings. Different types of waste materials like- granite waste, glass waste, fly ash, ceramic waste and available sand (Badarpur and Solani) were identified for the purpose. Ceramic waste was in the form of de-shaped, damaged and broken sanitary ware etc. Except fly ash, all the materials were washed, dried and crushed with machine. Particle size ranging from 0.5mm to 3.0 mm were prepared and sieved with standard test sieves (IS:460,BSS,ASTM)

Experimentation:

A laboratory level experiment was carried out using various particle sizes of different material to determine penetration behaviour of termites. *Microcerotermes beesoni* (Snyder) species of termite was used for the study. Major active workers were sorted out. Soil of *Odontotermes obesus* species was collected from the upper parts of mounds with uniform texture and pH ranging from 6.7 to 7.0. The soil was air dried, moistened with distilled water up to 15-20% moisture content. Round bottom transparent glass jars (capacity 2500 ml) with plastic lids were used for the study. Lower portion of experimental jar is filled with the material and upper part was filled with termite culture medium. A wooden test block (*Mangifera indica*) was kept in the bottom with material. Three replica of each material and control were prepared. The experiments were maintained in the laboratory at 28 ± 5 degree Celsius and 80 % RH (Fig.1). Laboratory trial of material is completed and field trial is in progress.

Results obtained so far are encouraging. It was observed that test termites were unable to penetrate through the specific particle sizes/combinations of some material. The wooden test blocks kept in effective material remained intact till the end of experimental period. However, termite can easily penetrate through the particle size less than 0.5mm and above 3.0 mm of all the material including sand

and fly-ash. The activities of termites started within two weeks in all the experimental jars and the test blocks kept in controlled experimental jars were observed to be affected totally (Fig.1).

Fig.1: Laboratory level experiment with various grades of material

Laboratory experiments have shown excellent results. However, yield from the waste is 30% to 40%. Field trial of finally prepared material has been started using Barrier Testing Stations (B.T.S.). Each B.T.S. is prepared in the laboratory using 20-24 kg of material (Fig.2) and basic principles are shown in Fig. 3.

Fig.2: Barrier Testing Stations (B.T.S.) ready for field trial

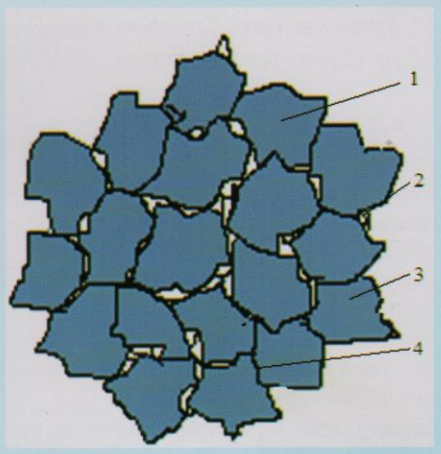

Fig.3: The basic principles on which developed material works. 1. Termite cannot chew the hard material, 2. Termite cannot cross through the narrow spaces, 3. Termite cannot take away large and heavy particles, 4. Sharp edges of particles prevents movement of termites

Salient features of developed material:

- Completely eco-friendly. No environmental pollution and ground water contamination.
- Completely pesticide free.
- Effective life is much more than the conventional anti-termite treatment.
- One time application.
- Neither degrades nor decomposes.
- Applicable during pre-constructional stages of buildings.