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STUDIES ON THE EVALUATION OF DDT AND BHC IN GELATINE SOLUTION AS WOOD PRESERVATIVES AGAINST TERMITES IN COMPARISON WITH DIELDRIN

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Studies on the evaluation of DDT and BHC in gelatine solution were undertaken as wood preservatives against termite attack by grave-yard testing methods. Wooden stakes treated separately with DDT 3.5% and BHC 2.5% in gelatine solution were found to be safe against termites in soil for four and half and five years respectively. Whereas control stakes were severely damaged within six months. Stakes treated with dieldrin 0.5% in gelatine solution used as standard termiticide for comparison remained unattacked for five years.

Key words: DDT, BHC, Termite control.

INTRODUCTION

Termites or white-ants are widely distributed throughout the world. Roonwal [1] reported 270 species of termites from South Asian countries. In Pakistan 104 species of termites have been reported by Chaudhry and Ahmed [2]. The most destructive and notorious species are Microtermes obesi, Heterotermes indicola, Coptotermes heimi and Odentotermes obesus. They are commonly found in our country and damage wooden fixtures in the buildings and the major agricultural crops such as cotton, wheat, coconut and sugar-cane, as reported by Chaudhry and Ashiq [3]. Termite damage timber in buildings may be detected by the presence of mud plastering along joints and cracks on the surface. When lightly tapped, damaged wood often has a 'papery' sound. As early as 1945 inorganic compounds such as sodium flousilicate, copper sulphate, lime and lead arsenate had been used for termite control. They were replaced by chlorinated hydrocarbons like DDT, BHC, dieldrin, heptachlor, chlordane and chloropyriphos gradually. DDT and BHC are being manufactured in our country and are in practice for termite control for the last so many decades. According to Alam [4] DDT decomposes at higher temperature and at higher relative humidity in tropical and subtropical countries. Anwarullah et. al. [5] reported that in our environmental conditions an emulsion of 0.7% DDT is effective for the control of termites for one year.

Gelatine or animal glue is obtained from the waste products of hides, muscles and bones of different animals. It contains 15% of water and 1 to 4% of inorganic salts [6]. In our case it is used as an adhesive for the fixation of termiticides on wooden cellulose.

The present investigations deal with the fixation of DDT and BHC on wooden surface by using gelatine solution as an adhesive against termites.

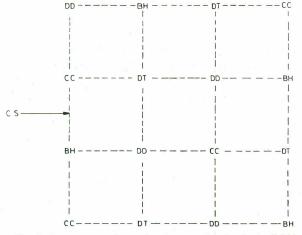
MATERIAL AND METHODS

Chir Wood (Pinus roxiburghii) was selected for graveyard testing. Sixty four stakes (24" x 3" x 2") were numbered, weighed and dried in oven at 90°. In order to find out the loss of weight of each stake they were weighed again. Different concentrations of DDT, BHC and dieldrin (0.5, 1.5, 2.5 and 3.5%) were made in gelatine solution. These solutions were painted separately on each stake with brush. The stakes were weighed again in order to determine the exact amount of pesticide absorbed in each case. Afterwards the stakes were placed for drying for 24 hours at 27°. The field techniques as described by Coaton [7], Roonwal [1] and Gay et. al. [8] were followed with slight modifications. Sixteen control and sixteen treated stakes were embedded vertically 20" below the soil surface at a distance of 2 feet in termite-infested soil near PCSIR Campus, Karachi. As the effect of pesticides depend upon the weather conditions and type of soil, another set of stakes of the same numbers were installed in the termite mounds at Kathor. The stakes were connected together by the strips of the same wood at a depth of 3" below soil level as shown in Plan No. 1.

Preparation of gelatine solution. Fifty grams of gelatine extracted from animal hides was soaked in 50 ml of water for two hours. Afterwards 50 ml of water was slowly added. The soaked gelatine solution was dissolved in water by stirring at 60° . As gelatine solution gels a mass on cooling, 3.5% phenol and 2.5% zinc chloride were mixed in order to avoid this drawback.

RESULTS AND DISCUSSION

Regular inspections of the treated and control stakes were made at intervals of three months, six months, one year, two years, three years, four years and five years and their conditions with reference to termite attack was deter-



Plan 1. Arrangement of treated and untreated stakes in the field key: DD = Dieldrin, DT = DDT, BH = BHC, CC = Control and <math>CS = Connecting Strip.

mined according to the following rating system:

- (a) Safe stakes not showing any contact by termites (S).
- (b) Slightly damaged stakes exhibiting pronounced surface attack at a depth not greater than 1/4" (SD).
- (c) Damaged stakes attacked to such an extent that requires replacement in service (D).

It was observed that control stakes were severely damaged by termites within six months (Fig. 1 and 2). Damaged control stakes were replaced by new untreated stakes and they were embedded in the same termite infested area. It was further noticed that replaced control stakes were again damaged after six months (Fig. 3). Stakes treated with 2.5% DDT and 1.5% BHC were slightly damaged after two and half years (Figs. 4 and 5). On the contrary stakes treated with 3.5% DDT and 2.5% BHC were not attacked by termites even after four and half and five years respectively (Fig. 6 and 7, Table 1). Stakes treated with 0.5% dieldrin in gelatine solution used as a standard termiticide for comparison remained unattacked for five years (Fig. 8).

Fig. 1. Control.
Fig. 2. Control.
Fig. 3. Control.
Fig. 4. Treated with 1.5% BHC.
Fig. 5. Treated with 2.5% DDT.
Fig. 6. Treated with 2.5% BHC.
Fig. 7. Treated with 3.5% DDT.
Fig. 8. Treated with 0.5% Dieldrin.

Table 1. Efficacy of BHC, DDT and dieldrin in gelatine solution as wood preservatives against termites.

	Concentration of termiticides in gelatine solution (%)	Condition of stakes in soil						
		6 months	1 year	2 years	2-1/2 years	3 years	4 years	5 years
4	0.5 DDT	S	D	. —		_	, <u> </u>	_
4	1.5 DDT	S	D	-	-	—	-	
4	2.5 DDT	. S	S	S	SD		_	_
4	3.5 DDT	S	S	S	S	S	S	-
4	0.5 BHC	S	D	—	-	-	-	
4	1.5 BHC	S	S	S	SD	_	_	
4	2.5 BHC	S	S	S	S	S	S	S
4	0.5 Dieldrin	S	S	S	S	S	S	S
32	Control	D	D	D	D	D	D	D

S = Safe, D = Demaged and SD = Slightly damaged.

Roonwal [1] recommended the use of 5% DDT in water emulsion and BHC 5% in fuel oil for the prevention of termite attack for one year. In our experimentation the thin film of gelatine based solution containing DDT 3.5% and BHC 2.5% coated separately on wooden samples prevented the attack of termites for many years in adverse weathering conditions.

Treated and untreated wooden samples were taken out from PCSIR campus, Karachi, from the comparative point of view, where the soil is usually damp and muddy; and from Kathor where the field is mostly dry. However, no difference was noted in either case.

In the light of our experimentations with the promising results, it is, however, recommended that formulatins containing DDT 3.5% and BHC 2.5% could be used very effectively for the treatment of any kind of wood without involving any risk in order to prevent termite attack for a period of four and half and five years respectively.

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ig. 1. Laboratory set up of a biogass digestor,

amount of gas collected each day was recorded. The maximum and minimum temperature of each day during each experiment was also recorded. The average temperature calculated for each experiment is also shown in Table 2.

The analysis of the biogas was performed by gas analyzer using orsai technique [10]. The percentage of methane gas was obtained by difference and confirmed by flamability test [11]. It may be mentioned here that no incenlum was needed for any of the experiments to generate biogas from banara peelings. This is in contrast to generation of biogas from erop residues where generally an inoculum is needed to start the biodegradation process.

The FT-IR spectra were recorded on Perkin Elner Model 1800 Spectrometer in a KBr disc. The proximate and elemental analysis were determined by a LECO MAC and CHM-600, instruments respectively.

ESULTS AND DISCUSSION

The results of proximate and elemental analysis of dried banana peelings powder are given in Table I. The proximate analysis of dried banana peelings powder showed a higher percentage (63%) ef volatile matter and

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been published, utilizing animal manure as a substrate for biogas production [1-7]. The cow dung and bird dropping, have been traditionally used for the generation of the biogas on a large scale in various countries filts India. China and Pakiatan. It is of interest to note that several thousand biogas planus have been installed in these Asian countries. It is reported that approximately half of the 4000 plants started in Pakiatan several years ago are still in operation. The use of agricultural wastes for generation of biogas is however still in experimental stage. Conversion of biogas is rice and wheat straws to biogas has been reported by R. Katib et al. [8]. A mixture of rice straw and cow dung has also been reported to result in the improvement of biogas ducing the environmental pollution and garbage disposal production [9]. The use of these agricultural wastes for enproduction [9]. The use of these agricultural wastes for enbrochems of the country. To our knowledge there has been no report on the use of fruit wastes such as began a pechage for the generation will have the additional advantage of reproblems of the country. To our knowledge there has been for the generation of the biogas. Since banana is produced to report the targe scale, it is desirable to examine the in Pakitatan on a large scale, it is desirable to examine the oras. In this paper the results of experiments for the genation of biogas from dried banana peclings are reported.

Fresh banana poelings were collected and dried under sun for 15 days. They were crushed into powder of 60 mesh. A shurry of 240 g banana peeling powder in 3 litrs of water was prepared. The slurry which was prepared in a 5.0 litre beaker was mixed thoroughly and left open in air for 48 hours to allow the shurry to undergo aerobic fermentation. The pH of the slurry was adjusted to 1.0 by addition of