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Studies on the Control of Powder-Post Beetles (*Lyctus* spp) by Indigenous Pesticide in Comparison to DDT and BHC

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Studies were conducted with a view to promoting indigenous pesticides for the control of *Lyctus* spp (powder-post beetles). Tenekil (A multichlorinated hydrocarbon, developed and formulated at PCSIR Laboratories Complex, Karachi) at the doses of 0.5%, 1% & 1.5% gave 58%, 71.6% & 94% mortality of *Lyctus* powder-post beetle in different infested wooden samples under laboratory conditions after 24 h. DDT at the same concentrations gave 40%, 43.3% and 58.3% mortality, whereas BHC gave slightly higher mortality i e 45.6%, 51.6% and 60.3%.

Key words: Tenekil, Furniture-pest control. DDT, *Lyctus* beetles.

Introduction

Beetles of family Lyctidae are commonly called powder-post beetles due to the manner by which their larvae reduce the attacked timber to a fine flour-like powder by making net-work of galleries in it. They live in the timber for many years and complete their whole life cycle inside it (Borer and Delong 1964). Twenty species of *Lyctus* beetles occur in tropical and temperate countries of the world. At least six have been recorded in United Kingdom. Powder-post beetles (*Lyctus brunneus* steph) is the most common cosmopolitan species severly damaging wooden furniture and fixture, beams and tool handles in buildings. The initial infestation by *Lyctus brunneus* to sapwood is not normally detectable. When boring starts, the small thread like larval tunnels running parallel to grain are just visible. The final stages of attack may result almost complete disintegration of the sapwood, although a thin surface layer of wood is usually left intact. The infestation may not be detected until the appearance of exit holes and beetles. Activity by the larvae within the wood causes the fine flour-like bore dust to be pushed out from the surface, where it may accumulate in small piles but this is more apparent when beetles have cut their exit holes (Anon 1960). Some other powder-post beetles of families *Anobbiidae* and *Bostrichidae* also attack the seasonal timber and the damage caused is similar to that of Lyctidae (Robinson 1983).

Tenekil (a multichlorinated hydrocarbon) developed and formulated at PCSIR Laboratories Complex, Karachi (Siddiqui *et al* 1964) from indigenous materials showed toxic potentiality towards the plant parasitic nematodes and subterranean termites (Anwarullah *et al* 1983; Roomi *et al* 1991; Seema *et al* 1991; Shah *et al* 1994; Akhtar and Ahmed 1997). However, no data is available on the toxicity of Tenekil to the powder-post beetles. A study was conducted to evaluate the toxicity of Tenekil against the beetles (*Lyctus brunneus*) in comparison to the standard DDT and BHC.

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Materials and Methods

A survey was conducted in the months of April and May 1998 in the timber markets of Karachi region and its adjoining areas, to study the pest infestations in wooden furniture. The result showed that 35% wooden materials used for making furniture were heavily infested with powder-post beetles (*Lyctus* spp). Two hundred samples of different infested timber were first collected and following preliminary investigations 48 samples of Shisham (*Dalbergia sissoo*) Deodar (*Cedrus deodara*) and Fir (*Abies pindro*) wood were selected. The solutions of Tenekil, DDT (Dichloro-diphenyltrichloroethane) and BHC (Benzenehexachloride) (Alam 1964) were prepared in mineral oil ranging in concentrations of 0.5%, 1% and 1.5% vv^{-1}. Thirty ml of each concentration was injected to every tiny hole made by *Lyctus* beetles for 10 second, using the specially designed wood injector fitted with five inches needle. Twelve samples of each infested wood were used as control. Both the treated and control samples were kept at room temperature of 27 ± 1°C for 24 h. Each wooden sample was then exposed thoroughly to examine the whole network of galleries and the larval mortality was recorded. For comparison another set of experiments were also conducted at Kathore. The results are presented in Table 1.

The filter paper technique was conducted to test the efficacy against the adult of *Lyctus* beetles. The adults were obtained from an infested wood of Deodar (*Cedrus deodara*). The filter papers (Watman) 9.5 cm were placed in petridishes and treated

Table 1
Efficacy of Tenekil against larval *Lyctus* beetles in comparison with DDT and BHC

Pesticides	Treatments	Replicates	% Larval mortality after 24 h in wood			Mean mortality %
			Deodar *(Cedrus deodara)*	Shisham *(Dalbergia sisso)*	Fir *(Abies pindrow)*	
Tenekil	0.5%	3	60±2.5	58±3.3	56±0.26	58±2.02
	1%	3	74±1.8	70±2.6	71±1.7	71.6±1.48
	1.5	3	92±0.3	94±1.75	96±3.2	94±1.75
BHC	0.5%	3	38±1.9	43±1.8	39±2.6	40±2.1
	1%	3	44±4.4	46±1.9	42±1.37	43±2.55
	1.5%	3	53±2.5	61±2.7	62±2.7	58±1.83
DDT	0.5%	3	44±2.0	47±1.2	48±1.84	45±1.68
	1%	3	51±2.5	54±1.8	50±3.5	51±2.6
	1.5%	3	60±1.8	62±3.5	59±2.7	60±2.61
Control	--	9	--	1	2	1

L.S.D. P=0.05 - 2.701
L.S.D. P=0.01 - 2.011

with each concentration of aforesaid pesticides and allowed to dry for 5 min. Ten adult *Lyctus* beetles were introduced in every petridish. They were kept at room temperture of 27±1°C and humidity of 80%. Each concentration was replicated three times and nine replicates were used as control. The beetles were examined after every 1/2 h upto 8 h. The number of insects, moribund or dead, were recorded accordingly. When 29 *Lyctus* beetles out of 30 (97%) for a given concentration of the test chemical were found dead or moribund in 24h the test was concluded (Smith 1976). The results are shown in Table 2.

The field trials were also conducted with the same pesticides for the control of powder-post beetle infesting the wooden furniture (chairs, tables and beds) of nearby different localities with the same effective concentrations (1.5%) and methodology. The results are summarised in Table 3.

Results and Discussion

Tenekil at the dose of 1.5% gave 94% mean larval mortality of *Lyctus* powder post beetles in the infested samples. The same dose was observed to cause 100% mortality in the adult beetles under laboratory conditions (P=0.1). Although the types differ, yet the larval mortality of *Lyctus* beetles was found to be more or less equal. This clearly indicates that insecticidal effect does not depend upon the types of the wood. On the other hand DDT and BHC at the doses of 1.5% induced 58% and 60.0% larval mortality and 70.3% and 80.3% mortality of adult beetles respectively under laboratory conditions at the level of 1% (Table 2).

Domestic trials with Tenekil, DDT and BHC at the concentration of 1.5% against *Lyctus* powder post beetles attacking furniture (beds, chairs and tables) showed no further infestation upto one year (Table 3). This could be due to the use of especially designed wood injector, that aid the toxicant to reach the dwelling larvae in the galleries. As Tenekil has been

Table 2
Potentiality of Tenekil against adult *Lyctus* spp in comparison with DDT and BHC

Pesticides	Treatments	Replicates	Adult insects used	%Mortality after 8 h	%Mortality after 24 h	SD
Tenekil	0.5%	3	10	40.0±0.9	60.6±2.71	
	1%	3	10	60.3±2.7	70.0±1.48	
	1.5%	3	10	96.6±1.75	100.0±1.7	
DDT	0.5%	3	10	30.0±2	50.3±1.2	
	1%	3	10	50.6±1.4	60.0±7.7	
	1.5%	3	10	60.6±2.7	70.3±1.4	
BHC	0.5%	3	10	40.3±1.1	60.6±2.71	
	1%	3	10	50.6±2.1	60.6±2.71	
	1.5%	3	10	70.0±1.2	80.3±1.8	
Control	--	12	10	--	--	

L.S.D. P = 0.05 - 1.76
L.S.D. P = 0.01 - 2.62

Table 3

Domestic trials of tenekil against *Lyctus* spp attacking different furnitures in comparison with DDT and BHC

Pesticides	Concentrations	No. of infested beds treated	No. of infested chairs & tables treated	Conditions of furniture after		
				3 Months	6 Months	1 Year
Tenekil	1.5%	50	50	NP	NP	NP
DDT	1.5%	50	50	NP	NP	NP
BHC	1.5%	50	50	NP	NP	NP
Control	–	50	50	SP	HP	HP

NP = No further infestation, SP = Infested and HP = Heavily infested

reported for low mammalian and avian toxicity (Siddique *et al* 1964), it can play a prominent role in domestic application. It can also be effective at the concentration of 1.0% for the control of *Lyctus* beetles in comparison with DDT and BHC. Even at lower doses of Tenekil, the larval mortality was observed to be higher as compared to DDT and BHC (Table 1). Laboratory and field studies showed similar efficacy of Tenekil indicating that environment has little effect.

In the light of our studies, the use of Tenekil is recommended which has proved to be significantly effective, for the control of powder-post beetles (*Lyctus* spp.).

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