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SHORT COMMUNICATION

Laboratory Evaluation of Dibenz (b,f)-1,4-Oxazepine for the Protection of Nylon Tapes against Rodents Attack

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ABSTRACT

The efficacy of dibenz (b,f)-1,4-oxazepine (CR), a potent sensory irritant and deltamethrin a well-known insecticide, in providing protection to the multi-element nylon tapes, used as aircraft arresters at airports have been evaluated. The results obtained indicate that 5 per cent CR-admixed UV resistant nylon tapes got adequate protection against attacks from wild type laboratory bred *Rattus rattus* for up to 160 days. CR treatment was found to be water wash resistant against 7, 30 and 60 days protection offered by 3, 4 and 5 per cent deltamethrin, respectively.

1 INTRODUCTION

Rodents are not only carriers of diseases but also cause enormous damage to agricultural crops and stores[1-6]. Of late, rodents have been reported to inflict severe damage to the multi-element nylon tapes used as aircraft arresters in airfields. Though, several methods have been used for the control of rodents, depending upon the situation[7-9], no information is available on the way these multi-element nets can be protected against rodents attack. These multi-element nets are used to stop an aircraft from overshooting the runway in emergency.

Dibenz (b,f)-1,4-oxazepine (CR) has been reported as a potent non-toxic sensory irritant and a riot control agent[10-12]. Earlier studies at this Establishment using 1-10 per cent CR had shown that CR exhibits irritant property at 5 per cent concentration[12]. Keeping its high irritancy in view, the present study was undertaken to evaluate its potential to provide protection to CR-impregnated nylon tapes against rodents attack. The efficiency of CR was compared with that of deltamethrin, a potent non-toxic insecticide with high irritant property.

2. MATERIALS & METHODS

2.1 Test Chemicals

CR was synthesised in the laboratory from o-chlorobenzaldehyde and orthoaminophenol by condensation followed by ring closure. CR is a yellow crystalline solid; m.p. 74 °C, and purity 99.5 per cent. The compound is very stable. Deltamethrin (technical grade) was obtained from M/s AgrEvo Schering Hoechst, Mumbai. Deltamethrin is a white solid; m.p. 101°C, and purity 98 per cent[13].

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2.2 Test Animals

Laboratory bred wild type commensal rats (*Rattus rattus*) were drawn from the colony maintained in the Establishment. Rats in weight range 150-200 g were used in the study. Animal feed obtained from M/s Amrut Feeds, Pune, was provided *ad libitum*, water was also provided *ad libitum*.

2.3 UV Treatment of Nylon Tapes

A method has been developed for UV treatment of nylon tapes using the following ingredients:

Rectified spirit	100	parts
Synpol B-30 (butyral resin)	10	parts
Carbon black (ISAF/N220)	5	parts
Butyl resinoleate	10	parts
Dynasylon (memo)	0.05	part

Synpol B-30 (butyral resin) (10 parts) was added to 50 parts of rectified spirit. The mixture was stirred gradually to get a homogeneus solution. To the solution thus obtained, 5 parts of carbon black and 10 parts of butyl resinoleate were added. After allowing the suspension to stand for 48 hr, the rest of the rectified spirit (50 parts) was added.

CR (5 per cent) and deltamethrin at concentrations of 3,4 and 5 per cent were added to the solution separately. Dynasylon (0.05 part) was added to the solution before treatment. Strips (8 cm × 3 cm) were cut from nylon tapes and treated with the UV treatment solution. The strips were passed through rollers to squeeze out the surplus solution. Curing was done at 140 °C for 6 min.

To ascertain the waterwash resistance of the nylon strips, they were washed under accelerated conditions for 6 hr under tap water and allowed to remain overnight in a water filled container. After washing, the strips were dried at room temperature. Control strips were treated in the same manner without CR or deltamethrin.

2.4 Evaluation of UV Resistant Nylon Tapes against Rodents Attack

Nylon strips (4 Nos. one at each corner), treated with CR (5 per cent) and deltamethrin (3, 4 and 5 per cent concentration) were tied vertically in separate wire mesh rodent cages. Control nylon strips were also tied simultaneously. Six wild type rats (*Rattus rattus*) were released in these cages and the extent of protection attained by the strips was observed visually everyday to assess their rodent proofness. The experiment was terminated when visual damage was observed and the data were analysed.

3. RESULTS & DISCUSSION

Rodenticides have been effectively used for the control of rodents. However, the application of rodenticides or other conventional methods of rodent control may neither be economical nor feasible for the protection of nylon tapes.

A multi-element net made of UV resistant treated nylon tapes has been developed. The net is 58 m in length and 4.5 m in width. It has got multiple element comprising 90 horizontal and 570 vertical strips made of nylon tapes used as aircraft arresters. However, these tapes are vulnerable to rodent attack, although various sensory irritants, such as o-chlorobenzylidine malanonitrile (CS) and 1-chloroacetophenone (CN), have been reported in literature[12-14]. The authors have developed the sensory irritant CR as a potent riot control agent[10-12]. This agent with low toxicity and high irritant property is being used by various police and paramilitary organisations. CR creates a highly unpleasant taste and burning sensation in the mouth accompanied by profuse salivation, but no toxicological hazards are associated with it. Data on protection attained by UV resistant nylon strips treated with deltamethrin (concentration range 3-5 per cent) and CR (5 per cent) are given in Table 1. It is seen that the percentage loss in weight of UV resistant strips is directly related to the protection from rodent damage achieved. The concentration-dependent loss in weight of UV resistant strips vis-a-vis protection in respect of deltamethrin was observed. Deltamethrin-treated UV resistant strips offered protection for 7, 30 and 60 days following treatment with 3, 4 and 5 per cent concentration of deltamethrin, respectively (Table 1).

CR-treated nylon strips showed the minimum weight loss of 6 per cent up to 160 days of exposure.

Table **Protection against damage by commensal rat (*Rattus rattus*) attained by UV resistant-treated nylon strips on treatment with irritants**

	Control strips	Deltamethrin-treated 3%	Deltamethrin-treated 4%	Deltamethrin-treated 5%	CR-treated 5%
Wt. of strips before UV treatment (g)	6.115 ± 0.060	6.062 ± 0.020	6.080 ± 0.010	6.069 ± 0.040	6.084 ± 0.040
Wt. of treated strip after UV and irritant treatment (g)	6.786 ± 0.050	6.810 ± 0.050	6.812 ± 0.010	6.857 ± 0.060	6.921 ± 0.020
Total quantity laid upon the strip (mg/cm^2)	27.90	31.10	30.50	32.80	34.80
Wt. of treated strips after exposure (g)	4.07 ± 0.52	5.25 ± 0.76	5.44 ± 0.64	5.83 ± 0.42	6.52 ± 0.17
Per cent Wt. loss	40.00	23.00	20.00	16.00	6.00
Protection against rodent damage (days)	0.00	7.00	30.00	60.00	160.00

Values are mean ± SE, n (number of rats) = 4

Thus protection from damage lasted up to that period.

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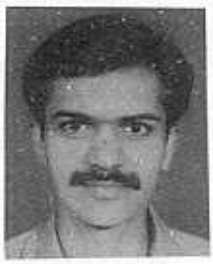

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