

### Short Communications

## Deltamethrin spray as a long-term protectant of wool fabrics from insect pests in store

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The effectiveness of solvent-based sprays of 0.025% and 0.05% deltamethrin on wool fabrics stored for 60 months after the treatment has been evaluated against *Tinea translucens* (the tropical case-making clothes moth), *Anthrenus flavipes* (the furniture carpet beetle) and *Attagenus fasciatus* (the banded carpet beetle). It has been found that spray of 0.025% deltamethrin provides effective protection to the fabrics from the larval feeding of above pest species up to 60 months in store. Deltamethrin residue of 0.025% concentration on fabrics stored for 60 months has been estimated to be 0.011% (on wool weight) which is 62% less than the initial deposit.

**Keywords:** *Anthrenus flavipes*, *Attagenus fasciatus*, Deltamethrin, *Tinea translucens*, Wool fabric

Wool fabrics and garments are frequently damaged in stores by the larvae of *Tinea translucens* Meyrick (the tropical case-making clothes moth), *Anthrenus flavipes* Le Conte (the furniture carpet beetle) and *Attagenus fasciatus* Thunberg (the banded carpet beetle—a common name proposed for this species as it has a sub-basal yellow transverse band of setae on its fore wings). These species are serious pests of wool in India<sup>1,2</sup>.

We have earlier reported<sup>3</sup> that a solvent-based spray of 0.025% deltamethrin effectively protects the wool fabrics from the larval feeding of *T. translucens* and *A. flavipes* for 30 months in dark store<sup>3</sup>.

In this paper, we report the results of studies made on wool fabrics treated with 0.025% and 0.05% deltamethrin and stored for 60 months with a view to determine (i) the effectiveness of deltamethrin sprays in protection of wool fabrics from the larvae of *Tinea translucens*, *Anthrenus flavipes* and *Attagenus fasciatus*, (ii) the toxicity of treated fabrics to adults of pest species, and (iii) stability of deltamethrin on stored fabrics.

A plain weave, undyed and soap scoured 100% wool fabric weighing 250 g/m<sup>2</sup> was used. The fabric samples were treated with 0.025% and 0.05% deltamethrin as reported earlier<sup>3</sup>. The sprayed swatches were stored for 30 months in a dark closet and for the next 30 months in a closet exposed to dim day light at 28-33°C.

The larval feeding tests were carried out with 25-27 days old larvae of *T. translucens*, 10 weeks old larvae of *A. flavipes* and 11 weeks old larvae of *A. fasciatus*. Insect proofness of wool fabric was assessed by visual damage and weight loss according to the established procedure<sup>4</sup> of the International Organization for Standardization.

The toxicity of treated fabrics (after 60 months storage) to the adults of *T. translucens*, *A. flavipes* and *A. fasciatus* was determined as reported earlier<sup>3</sup>.

Deltamethrin from the stored fabrics was extracted with 2-methoxyethanol and estimated using a gas chromatograph (Nucon 5700) having an electron capture detector as reported earlier<sup>3</sup>.

The results of larval feeding tests (Table 1) show that 0.025% and 0.05% deltamethrin pro-

Table 1—Effectiveness of deltamethrin spray on wool fabrics against larvae of *T. translucens*, *A. flavipes* and *A. fasciatus* after 60 months of treatment

Deltamethrin conc. %	Visible damage		Mean wt loss mg	Larval mortality %	Assessment
	Cropping <sup>a</sup>	Holes <sup>b</sup>			
<b><i>Tinea translucens</i></b>					
0.025	1	A	0.77	100	Proof
0.05	1	A	0.64	100	Proof
Nil (Control)	3-4	D	52.65	0	Not proof
<b><i>Anthrenus flavipes</i></b>					
0.025	1	A	0.16	13	Proof
0.05	1	A	0.17	8.3	Proof
Nil (Control)	3-4	D	42.75	0	Not proof
<b><i>Attagenus fasciatus</i></b>					
0.025	1	A	0.21	45	Proof
0.05	1	A	0.67	58.3	Proof
Nil (Control)	4	D	173.50	0	Not proof

<sup>a</sup>Cropping (surface damage): 1—Not detectable; 2—Very slight; 3—Moderate; and 4—Very heavy

<sup>b</sup>Holes: A—Not detectable; B—Yarns partially severed; C—Few holes; and D—Several large holes

Table 2—Toxicity of deltamethrin spray on wool fabrics to adults of *T. translucens*, *A. flavipes* and *A. fasciatus* after 60 months of treatment

Deltamethrin conc. %	Adults knockdown (KD) and dead + moribund (D + M) after exposure, %									
	24h		48h		72h		96h		120h	
	KD	D + M	KD	D + M	KD	D + M	KD	D + M	KD	D + M
	<i>Tinea translucens</i>									
0.025	100	0	0	100						
0.05	40	60	0	100						
	<i>Anthrenus flavipes</i>									
0.025	53.3	0	86.6	6	60	30	55.5	40	0	100
0.05	93.3	0	73.3	26.6	26.6	73.3	0	100		
	<i>Attagenus fasciatus</i>									
0.025	72.2	0	22.2	66.6	0	100				
0.05	64.2	5	28.6	71.4	0	100				

Knockdown: When adults become immobilized after exposure

Moribund: When adults after knockdown become stationary and respond to probing by the movement of legs, mouth parts or antennae

Table 3—Residue of deltamethrin on wool fabrics after 60 months of treatment

Deltamethrin conc. %	Duration of spray min	Deltamethrin residue (% oww) on treated fabric		
		Initial deposit	After 30 months	After 60 months
0.025	20	0.029	0.027	0.011
0.05	20	0.052	0.0436	0.017

vide complete protection to wool fabrics from the larvae of above pest species. Larval mortality in 0.025% deltamethrin treatment shows that the larvae of *A. fasciatus* are more susceptible than the larvae of *A. flavipes*. The descending order of susceptibility to deltamethrin among the test species is *T. translucens*, *A. fasciatus* and *A. flavipes*. Survived test larvae of *A. flavipes* were found at the margins of petridishes where they set in retrogressive metamorphosis (reduction in size).

Adult mortality in deltamethrin treatment (Table 2) shows that all the adults of *T. translucens*, *A. fasciatus* and *A. flavipes* died within 48 h, 72 h and 120 h of exposure respectively to 60 months post-treated fabrics. Adults were not able to oviposit as no egg or alive/dead larva was observed after 6 weeks in any test container while several live larvae of pest species were seen in controls.

The amount of deltamethrin residue recovered after 60 months on fabrics treated with 0.025%

and 0.05% deltamethrin was 0.011% and 0.017% (on wool weight) respectively (Table 3). It is about 62-68% less than the initial deposit of deltamethrin on fabrics.

There was no objectionable odour or stain on dried and undyed treated test fabrics.

A solvent-based spray of 0.025% deltamethrin provides effective protection to the wool fabrics in store from the larval feeding of *Tinea translucens*, *Anthrenus flavipes* and *Attagenus fasciatus* up to 60 months after deltamethrin application. All adults of above pest species died within 120 h of exposure to deltamethrin-treated fabrics stored for 60 months. It is suggested that a solvent-based spray/aerosol of 0.025% deltamethrin may be used for long-term temporary protection of wool fabrics/garments from insect pests in stores.

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#### References

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