

PYRIDAZINONE DERIVATIVES AS ACARICIDES AGAINST *DERMATOPHAGOIDES* MITES

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Abstract—Two pyridazinone derivatives, pyridaben and NC-194, were found by medium mixing test to be potent chemicals which inhibited the growth of *Dermatophagoides* population. Pyridaben (2-*tert*-butyl-5-(4-*tert*-butylbenzylthio)-4-chloropyridazin-3-(2H)-one), which is a new agricultural acaricide, suppressed 90% of the population growth of *D. farinae* at 50 ppm in 4 weeks. NC-194 (2-*tert*-butyl-4-chloro-5-[2-(2,6-dimethyl-4-phenoxyphenoxy) ethylthio]pyridazine-3(2H)-one), which is being developed as an agricultural insecticide, suppressed more than 90% of the population growth of both *D. farinae* and *D. pteronyssinus* at 25 ppm during 4 weeks. Pyridaben and NC-194 thus are highly active in curbing the population growth of *Dermatophagoides* mites and are expected to be superior acaricides for control of these mites.

INTRODUCTION

House dust mites, *Dermatophagoides farinae* and *D. pteronyssinus*, are important pests in many countries of the world. They produce allergens which cause asthma, rhinitis and eczema (Colloff, 1990a). Several products are very effective in controlling these mites (Colloff, 1990b), but the active ingredients of most conventional household insecticides and acaricides are not powerful enough to eradicate the *Dermatophagoides* mites. We therefore searched among the agricultural pesticides registered and under development to find one with high acaricidal activity against these mites. Adequate toxicological information is already available on these pesticides for registration, and they could thus readily be registered as household pesticides without having to go to the expense of doing this.

MATERIALS AND METHODS

Mites

Dermatophagoides farinae and *D. pteronyssinus* were raised on powdered meal for experimental animals (MF, Oriental Yeast Co.) as medium for culture at 25°C, R.H. 65%.

Chemicals

Two pyridazinone derivatives, pyridaben (Hirata *et al.*, 1988) and NC-194, were synthesized by Nissan Chemical Industries Co. Ltd, with a purity of 99.0%.

Medium mixing test

Forty g of medium was mixed with 20 ml acetone solution of the chemical using a magnetic stirrer. Mixtures were left at room temperature for 24 hr to allow evaporation of acetone from the media and their water content were adjusted to 12% by addition of an appropriate amount of water. Six hundred mg of culture medium containing about 120 mites was added to 39.4 g test medium treated with the chemical. Test media were kept at 25°C, R.H. 75% and stirred every 3 or 4 days. Two, 4 and 6 weeks after treatment, 20 to 50 mg of a test medium was taken and the number of living mites was counted under a binocular microscope. Three replicates were done for each concentration of chemicals. The suppression rate of population growth was calculated using the following formula:

$$\text{Suppression rate (\%)} = \{(C - T) / T\} \times 100$$

C: Number of mites alive per 100 mg of untreated medium

T: Number of mites alive per 100 mg of treated medium

RESULTS AND DISCUSSION

Suppression rates of pyridaben and fenitrothion against *D. farinae* are shown in Table 1. Pyridaben completely stopped the population growth of *D. farinae* at a concentration of 250 ppm and at 100 ppm inhibited more than 90 % of the growth of *D. farinae* population from 2 to 6 weeks. At a concentration of 50 ppm, pyridaben inhibited 92 % of the population growth after 4 weeks and suppressed 87 % of the growth at 6 weeks after treatment. Fenitrothion, which is used as an acaricide to control of house dust mites, suppressed more than 90 % of *D. farinae* population growth only at a concentration of 500 ppm.

Table 1. Suppression rates (%) of population growth by pyridaben and fenitrothion against *Dermatophagoides farinae*.

	500 ppm			250 ppm			100 ppm			50 ppm		
	2*	4	6	2	4	6	2	4	6	2	4	6
Pyridaben	—	—	—	100	100	100	100	99	99	68	92	87
Fenitrothion	80	90	90	53	53	40	29	21	11	—	—	—

* Weeks after treatment.

The rate of suppression by pyridaben against *D. farinae* did not greatly differ between 4 and 6 weeks. Mite numbers were, therefore, observed only 2 and 4 weeks after treatment in bioassay on NC-194. Suppression rates of population growth by NC-194 against *D. farinae* and *D. pteronyssinus* are shown in Table 2. NC-194 inhibited more than 90 % of the growth of *D. farinae* and *D. pteronyssinus* populations for 2 and 4 weeks at a concentration of 100 and 50 ppm. After application of 25 ppm, the population growth of both mites at 2 weeks was suppressed more than 85 % and those at 4 weeks were inhibited more than 90 %. The growth of *D. farinae* population was suppressed 66 % in 2 and 4 weeks by NC-194 even at 12.5 ppm and that of *D. pteronyssinus* in 4 weeks was inhibited 74 % by the same amount.

Table 2. Suppression rates (%) of population growth by NC-194 against *D. farinae* and *D. pteronyssinus*.

	100 ppm		50 ppm		25 ppm		12.5 ppm	
	2*	4	2	4	2	4	2	4
<i>D. farinae</i>	97	99	96	99	87	96	37	74
<i>D. pteronyssinus</i>	95	98	92	96	88	91	66	66

* Weeks after treatment.

Both pyridazinone derivatives tested effectively inhibited the population growth of *Dermatophagoides* mites in laboratory studies. NC-194, which almost completely stopped the growth of mite population at 25 ppm, appears to be the most preferable candidate chemical for an acaricide against these mites and should be subjected to further tests for its practical use.

REFERENCE

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