Pesticide Tests with Collembolan

I. KISS and G. BAKONYI

Department of Zoology and Ecology, University of Agricultural Sciences, Gödöllő /HUNGARY/

Springtails /Collembola/ are wide-spread all over the world. Most of the species play an important role in the decomposition of plant residues that get into the soil, as well as in the mineralization of nutrients.

There are some ways in which springtails may come into contact with pesticides. Among others, a drop of spray falls on the animal or the animal passes through the pesticide that has got into the soil-water-capillaries. Mention must be made of the effect of the gases accumulating in the recesses of the soil, which gases are the compound complexes evaporating from the pesticides.

Methods

Exposure unit

In the course of the tests 10 cm long open test-tubes with a diameter of 1.5 cm were used as dishes. Four methods were used for each pesticide test and its control. In three of them the substance was different. When applying the first method pesticide solution was put into the test tubes. In the cases of the second and the third testing methods sterile sand /3.5 g/ and, brown forest soil /2.5 g/ were put into the tubes, respectively, before measuring the appropriate concentration of the chemical. The aim of the fourth test was to measure the toxic effect of the evaporating gas of the chemical. The animals were placed in a glass tube first closed with a tule-net at both ends, then hung into the test-tube as deep as 2 cm above the surface of the liquid.

Test procedure

Ten tubes were used for each pesticide to be tested and in each test type ten control tubes /treated with water/ were included. All products were applied at the concentration recommended by IOBS Working Group.

15 mature animals were put on the surface of the liquid of each agent after measuring the appropriate concentration of the chemicals.

Table 1

Results of the pesticide testing programme /mortality percentages/

	PESTICIDE	Concen-tration of tested product	FOLSOMIA CANDIDA								HETEROMURUS NITIDES		SINELLA COECA	
			24 h				72h				24h	72h	24h	72h
	TRADE NAME	%	liquid	gas	soil	sand	liquid	gas	soil	sand	liquid	liquid	liquid	liquid
Insecticides	Torak E	0.25	100	20	79	64	100	–	93	100	100	100	100	100
	Vydate L	0.15	8	7	95	99	100	89	58	100	63	100	80	100
	Evisect S	0.03	60	2	0	100	100	81	2	100	79	100	87	100
	Apollo SOSC	0.04	0	0	0	0	7	0	0	0	1	48	0	26
	Cesar S.L.	0.025	72	0	0	0	73	9	6	0	63	88	66	85
	Insegar	0.06	3	0	0	0	24	5	0	0	2	61	0	35
	Cropotex	0.1	81	0	0	0	98	6	4	5	100	100	100	100
Fungicides	Baycor	0.37	0	0	0	0	12	6	0	0	4	26	28	48
	Delan flüssig	0.2	0	0	0	0	30	0	0	0	10	100	33	52
	Vitigran	1.0	1	0	0	0	16	5	3	0	13	67	10	61
	Impact	0.16	100	24	0	0	100	27	4	0	100	100	100	100
	Rovral PM	0.15	98	0	0	0	100	14	0	0	98	100	93	100
	Dithane M 22	0.5	100	0	100	100	100	56	100	100	100	100	100	100
	Antracol	0.2	0	0	0	44	12	0	0	71	0	59	1	55
	Euparen	0.15	8	0	0	0	49	–	0	0	31	100	18	46
Herbicides	Luxan 2,4-D amine	0.432	100	0	0	0	100	1	9	0	100	100	100	100
	Basta	0.5	62	0	0	0	100	3	0	0	97	100	100	100
	Tribunil	0.67	20	0	0	0	100	0	11	0	21	100	29	100
	Ally	0.067	0	0	0	0	15	0	0	0	16	100	19	93
	Dirigol-N	0.02	0	0	0	0	0	0	0	0	0	0	0	0

Evaluation of results

The average mortality percentage per treatment was calculated and corrected using the result of untreated control.

Results and discussion

Type of tests

The highest mortality percentages were observed in the case of the first method when the animals were put on the surface of the pesticide solution. In most instances the mortality percentages were much lower when sand or soil was used as test medium. On pesticide solution and on sand the effect of Vydate, Evisect, Torak and Dithane was similar. In the case of Vydate and Evisect 100% mortality was observed on sand after 24 hours but on pesticide solution only after 72 hours. The results of the toxicity tests were usually similar on sand and on soil. Only Vydate, Evisect and Antracol were more toxic on sand than on soil. The gases evaporating from the chemicals were generally harmless but in the case of Vydate, Evisect and Dithane they were as toxic as the pesticide solution itself.

Differences in 24 and 72 hour observations

Aside from Dirigol, which was completely harmless, the mortality percentages observed were higher after 72 hours than in 24 hours except when the mortality was 100% after 24 hours.

Differences between the reactions of the species

The most resistant species was Folsomia candida while Heteromurus nitidus and Sinella coeca were more sensitive. These collembolan species seemed to respond to pesticides in different ways. The lethal effect of the pesticides showed on Sinella coeca quickly but on Heteromurus nitidus only gradually. That is why the former two species are more suitable for initial laboratory toxicity tests than Heteromurus nitidus.

Differences between insecticides, fungicides and herbicides

There are no clear differences between the effects of the pesticide groups on collembolan. A herbicide can be as toxic as an insecticide. That is why there is a possibility to choose the adequate pesticide for use.