TESTING OF RAIN PERSISTENCE OF INSECTICIDES

By Dr. H. HOLTMANN and Eng. C. KESCHTKAR

INTRODUCTION

Rain persistence is one of the important properties of an insecticide formulation which has to be considered in choosing suitable insecticides for the application in rainy areas. This problem is of interest for pest control operatiors in the northern provinces.

As the experimental approach to this kind of tests on living plants is rather time consuming, exact comparative results for a number of insecticides can be obtained easier by a method using a model test with a close imitation of the natural conditions.

DESCRIPTION OF THE METHOD

For the determination of the rain persistence a similar apparatus was used as described by **Görnitz** (1933). It consists of a roof like rack onto which 6 plates of plastic each of 10x15 cm. can be placed: 3 of them on the one and 3 on the other slope. Each plate is bordered by a ridge. The water which runs down over each plate can be collected separately in a 1000 ml glas beaker (Fig. 1).

The artificial rain is produced by a motorsprayer. The water jet is directed upward to a height of 1,80 m by a spray gun with a nozzle orifice of 0,5 mm. The fine droplet rain is pouring down over the treated plates on the rack. Under standardised conditions 1 mi of sprinkling results in 10 ml water per plate. The distribution of the down pouring water on the 6 plates on the rack was rather uniform, the variation coefficient being between 5 and 10 % .

Before applying the insecticide the plastic plates are cleaned in the following manner: hot water plus detergent - distilled water -70 % alcohol distilled water and finally dried.

The insecticide is applied to the plates by an atomizer at a pressure of 5 at. Using a nozzle of 0,5 mm orifice the flow rate amounts to 41-46ml per minute. At a distance of 1 m between nozzle and plate to be treated 30 sec spraying of 1 % Sevin W.P. results in 4 mg deposit per plate.

A spraying time of 30 sec secures a uniform distribution of the deposit. The plastic plates are weighed before and after application and after sprink-

ling. The plates are dried for at least 2 hours after each of the stages in which the plates are treated by liquids before the weighing is performed.

The degree of rain persistence (R) in percent is calculated according to the formula

$$R\,\% = \frac{b \times 100}{a}$$

in which a = deposit on the plate before sprinkling
and b = remaining deposit after sprinkling.

PRELIMINARY EXPERIMENTS FOR STANDARDISATION OF THE METHOD

The question is to what extent the rain persistence is depending on the:

1) Kind of water used for sprinkling
2) Amount of deposit on the plate
3) Amount of water used for leaching

The insecticide used in these experiments is Sevin 85% W. P. of Union Carbide. The results are reported as the means ($\bar{x}$) and standard deviation (s) of the rain persistence (R %)

The number of replicates of each test, the amount of sprinkling water and deposit per plate are mentioned in the tables.

Since the chemical and physical properties of the insecticide formulations are unknown the name of the formulation company is reported instead.

1) Relationship between rain persistence and the kind of water used for sprinkling.

Tap water with a rather high lime content is compared with distilled water.

Kind fo water	Number of plates	sprinkling water, ml	Deposit before leaching, mg	R %	
				$\bar{x}$	s
Tap water	12	47,2	3,0 – 3,5	54,8	18,5
Distilled water	12	42,6	2,8 – 3,4	29,1	10,7

Using distilled water the rain persistence is significantly lover than by leaching with tap water (t-test). The standard deviation in the two tests is considerably higher for tap water. Therefore distilled water is used for all the following tests.

2) Relationship between rain persistence and amount of deposit on the plate

Number of plates	Sprinkling water, ml	Deposit before leaching, mg	R %	
			$\bar{x}$	s
12	50,6	2,2 – 2,5	18,1	3,7
12	61,3	4,2 – 5,5	35,7	12,7
10	53,8	8,4 – 10,3	72,3	7,8
12	60,9	19,3 – 21,5	80,8	4,7

The rain persistence increases with increasing amounts of deposit.

The absolute amount of washed-off deposit is to a great extent independent of the amount of deposit on the plate.

3) Relationship between rain persistence and amount of water used for sprinkling

Number of plates	Sprinkling water, ml	Deposit before leaching, mg	R %	
			$\bar{x}$	s
12	110,8	31,8 – 38,5	72,2	4,5
12	181,0	24,2 – 34,6	62,7	7,0

By increasing the amount of sprinkling water from 110,8 to 181,0 ml the rain persistence decreases from 72,2 to 62,2 %.

Summing up the results of these tests it can be stated that the rain persistence depends on the factors under investigation. This has to be kept in mind for setting up a standardized method. **Synnatschke** (1963) found a similar relationship while testing the rain persistence of formulated fungicides. The reproducibility of the method can be considered satisfactory as can be judged by the standard deviation of the means.

TESTING THE RAIN PERSISTENCE OF SEVERAL INSECTICIDES

In order to approximate natural conditions the amounts of sprinkling water used and formulated insecticides are calculated according to the following guide lines. Assuming a percipitation of 5 mm 75 ml of sprinkling water per plate have to be applied which can be accomplished by a sprinkling time of 7 to 8 minutes. The normally used dosages of insecticides are applied to the plates. The number of kg/ha multiplied by the factor 1,5 results in the number of mg per plate.

Resulfs of the tests

Insecticide	dosage kg/ha	Number of plates	Sprinkling water, ml	Deposit before leaching, mg	R %	
					$\bar{x}$	s
Nexion EC 25 Cela	6	11	75,5	7,7 – 8,9	82,5	2,2
Toxaphen EC Merck	2 – 3	9	74,5	3,5 – 4,7	76,7	4,8
Gusathion EC 20 Bayer	3	12	83,2	4,7 – 5,4	46,8	6,7
Lebaycid EC Bayer	4	11	64,5	5,1 – 6,5	38,4	5,0
Sevin WP Union Carbide	3	12	61,3	4,2 – 5,5	35,7	12,7
Dipterex WP 80 Bayer	1,5 – 6	12	79,5	2,5 – 3,3	29,2	3,7
Dipterex WP 50 Bayer	2 – 3	12	66,5	3,6 – 4,8	28,1	6,0

The degree of rain persistence of the tested insecticides decreases in the following order: Nexion – Toxaphen – Gusathion – Lebaycid – Sevin – Dipterex. Nexion and Toxaphen excell in good persistence. The emulsions are superior to wettable powder formulations. The similar behaviour of the two Dipterex formulations is remarkable.

SUMMARY

A method for testing of the rain persistence of pesticides is described. The reproducibility can be considered as satisfactory.

The rain persistence of Sevin depends on the kind of sprinkling water, and on the amount of sprinkling water and deposit.

The tested Nexion and Toxaphen formulations showed a better degree of rain resistance than the formulations of Gusathion, Lebaycid, Sevin and Dipterex.

REFERENCES

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