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ASSESSMENT OF RESIDUAL EFFECTIVENESS OF IMIDAN, SUMITHION, LEBAYCID AND KILVAL ON TURNIP CROP BY BIOLOGICAL METHOD

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Imidan, sumithion lebaycid and kilval were sprayed in concentrations of 0.05 and 0.075 per cent on early and late stage turnip crop to ascertain their residual effectiveness against *Bagrada hilaris* Burm. It was found that lebaycid remained effective for 22 days whereas the residual effectiveness of sumithion, kilval and imidan persisted for 10–16 days. Further, the higher concentrations of all the insecticides proved more effective against *B. hilaris*. However, both the concentrations exhibited progressive loss of their residues with the passage of time.

INTRODUCTION

The determination of residual effectiveness of different insecticides on agricultural crops against various pest insects is of considerable importance for economising on pest control. Although a good deal of research work on the potentiality of insecticides against insect pests of economic importance has been done in Pakistan yet very little attention has been paid towards finding out their residual toxicity.

The work done in other parts of the world has revealed the residual effectiveness of imidan at 0.5-1.0 lb. a. m. per acre against strawberry aphid, alfalfa weevil and spotted spider mite for about 14 days (Shanks, 1963, Bass and Blake, 1965 and Schaefers, 1965) while that of sumithion at 1.05 kg. a.m. per acre approximately for 9 days against second instar larvae of *Spodoptera littoralis* (Kamel and *Mustafa*, 1968). Lebaycid at 1.00 lb. a. m. per acre gave 66 and 80 per cent control of alfalfa weevil and pea aphid up to 16 days (Steinhauer, 1962).

The present study to determine the residual toxicity of imidan, sumithion lebaycid and kilval on turnip crop using *Bagrada hilaris* Burm. as a test insects is a step in this direction under our conditions.

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MATERIALS AND METHODS

Residues of imidan, sumithion, lebaycid and kilval, each sprayed in the concentrations of 0.05 and 0.075 per cent on early stage (December, 1971) as well as late stage (January, 1972) turnip crop were computed by bioassay technique using fifth instar nymphs of *B. hilaris* Burm. as test insect. Insects were reared under laboratory conditions in order to get a homogenous stock.

Turnip crop was grown in two plots and each plot was divided into 9 sub-plots which were 10 ft. apart from one another in order to avoid contamination by drift spray. One set of 9 sub-plots was used for early stage crop while the other set of 9 sub-plots was used for late stage crop. Eight sub-plots of each set were sprayed separately with 0.05 and 0.075 per cent concentrations of insecticides while one sub-plot was maintained as check. The samples to be bioassayed consisted of leaves, taken from the experimental sub-plots the first sample was taken, just after the drying of spray of each concentration, from five randomly selected plants in each sub-plots and the subsequent samples were taken after every 48 hours. These samples were placed in labelled glass jars (600 ml. capacity) and 20 insects of same age were liberated in each jar and the mouth of such jars was covered with muslin cloth in order to check the escape of the insects under trial. Each treatment was replicated four times on early stage crop and three times on late stage crop. Observations on mortality of the test insect at 48 hours intervals were recorded till zero mortality was reached. Corrected mortality was computed by the use of Abbot's formula (Abbot, 1925).

Standard experiment was carried out for each insecticide with 1, 3, 5, 10, 15, 20, 25, 30 and 35 ppm. concentrations. The fresh turnip leaves taken from check plots were dipped in the solutions of the aforesaid concentrations, dried under fan and placed in the glass jars. Procedure for liberation of insects and for recording mortality data was the same as mentioned earlier.

The following regression equations of the type $^{*}Y = a + bx$ were obtained using Probit analysis technique (Finney, 1952) for each insecticide from standard experiment data with regard to both early and late stage crop.

	Early stage crop		Late stage crop
Imidan	$Y = -2.8431 + 3.3026x$	Imidan	$Y = -0.7733 + 2.5781x$
Sumithion	$Y = -2.7839 + 3.3586x$	Sumithion	$Y = -0.5244 + 2.4199x$
Lebaycid	$Y = 1.7585 + 1.8426x$	Lebaycid	$Y = 1.8323 + 1.8860x$
Kilval	$Y = -1.2709 + 2.8528x$	Kilval	$Y = -0.7923 + 2.7236x$

*Y = Probit value of mortality
X = log (10 × concentration)
a & b = constants

The insect mortality data obtained under field trials were then projected on the basis of standard equation. Quantities of residues were determined by putting the probits of field trials in place of Y and values of x were obtained and by dividing antilog of x by 10, residue of each insecticide (ppm) persisting on the leaves of the crop, on different days after treatment, was determined.

RESULTS AND DISCUSSION

The results achieved on the residual effectiveness of imidan, sumithion, lebaycid and kilval against *B. hilaris* on early (Table 1) and late stage (Table 2) turnip crop have revealed that imidan remained effective for 14-16 days. This finding is in conformity with those of Shanks (1963), Bass and Blake (1965) and Schaefers (1965) who also recorded the effectiveness of this insecticide to last for 14 days, but at variance from those of Shaw *et al.* (1966) who determined by chemical method 0.31 ppm residue of imidan 21 days after treatment. In the present studies the minimum quantity of imidan residue (0.075 per cent) after 16 days of the treatment could only be detected up to 8.15 ppm on early stage crop and up to 4.51 ppm on late stage crop. The variation in the results may be due to more sensitivity of the chemical method used by these workers. However, the variation in the quantity of residue on early (70.3°F, 42.6°F, 63.9% R.H.) and late stage (68.48°F 37.8°F, 68.04) crops may be due to difference in minimum temperature prevailing during the experimental period.

Residual effect of sumithion was observed to persist for 10 days and it is almost in concurrence with the findings of Kamel and Mustafa (1968) who reported effective residual persistence of this insecticide for 9 days. Residue of 0.05 and 0.075 per cent concentrations of lebaycid on early as well as late stage crop remained effective for 22 days and the minimum quantity of last day residues of 0.05 per cent concentration was 0.35 and 0.36 ppm against 1.25 and 1.66 per cent mortality and that of 0.075 per cent concentration it was 0.49 and 0.5 ppm against 2.50 and 3.33 per cent mortalityof the test insect. These results are in agreement with the findings of Leuck and Bowman (1968) who determined the residues of this insecticide less than 1 ppm 21 days after application. Residue of kilval that remained effective for 10-12 days ranged from 2.12 to 3.77 ppm and from 2.62 to 3.69 ppm in case of 0.05 and 0.075 per cent concentrations respectively.

It is concluded that the higher concentration (0.075 per cent) of different insecticides under trial gave better control of *B. hilaris*. However, among these insecticides, lebaycid protected the crop from this insect for 22 days

Table 1. *Residual effectiveness of imidan, sumithion, lebaycid and kilval against Bagrada hilaris Burm on early stage turnip crop.*

Name of the insecticide	Concentrations used (%)	Residual effectiveness (days)	Mortality after 48 hours of spray (%)	Probit values	Residue (ppm)	Last day mortality (%)	Probit values	Residue (ppm)
Imidan	0.05	14	70.00	5.5244	34.17	7.50	3.5605	8.69
	0.075	16	80.00	5.8416	42.62	6.25	3.4699	8.15
Sumithion	0.05	10	76.25	5.7160	33.94	1.25	2.7738	4.52
	0.075	10	80.00	5.8416	36.98	2.50	3.0400	5.42
Lebaycid	0.05	22	85.00	6.0364	20.97	1.25	2.7738	0.35
	0.075	22	90.00	6.2816	28.50	2.50	3.0400	0.49
Kilval	0.05	10	82.50	5.9346	33.55	3.77	3.2256	3.77
	0.075	12	87.50	6.1503	39.93	1.25	2.7738	2.62

Table 2: *Residual effectiveness of imidan, sumithion, lebaycid and kilval against Bagrada hilaris Burm on late stage turnip crop.*

Name of the insecticide	Concentrations used (%)	Residual effectiveness (days)	Mortality after 48 hours of spray (%)	Probit values	Residue (ppm)	Last day mortality (%)	Probit values	Residue (ppm)
Imidan	0.05	14	76.66	5.7290	33.27	5.00	3.3551	3.99
	0.075	16	83.33	5.9661	41.11	6.66	3.4937	4.51
Sumithion	0.05	10	63.33	5.3398	26.51	1.66	2.8799	2.55
	0.075	10	70.00	5.5244	31.59	3.33	3.1616	3.34
Lebaycid	0.05	22	86.66	6.1123	18.59	1.66	2.8799	0.36
	0.075	22	90.00	6.2816	22.87	3.33	3.1616	0.51
Kilval	0.05	10	83.33	5.9661	28.80	1.66	2.8799	2.12
	0.075	10	93.33	6.4985	45.18	3.33	3.1616	2.69

as compared to 10 - 16 days in case of rest of the insecticides but all of them showed progressive loss of their residues with the passage of time. Further, stage of the crop did not show an appreciable effect on the longevity and residual persistence of these insecticides.

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