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RESIDUES OF PHORATE IN RICE

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Studies on residues of phorate on rice plant and subsequent on soil were undertaken. Two doses of phorate at 1.0 Kg ai/ha and 2.0 Kg ai/ha were applied in the soil in the granular form. The samples both soil and plant were taken after 0, 5, 10, 15, 20, 30 and 45 days of application and residue levels were analysed spectrophotometrically. The pesticide reaches non-detectable level within 20 days of application in soil and in case of plant maximum residue was obtained at 5th day of sampling and becomes safe after 30 and 45 days of application for both doses.

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Phorate (0,0-Diethyl-S ethyl thio-methyl) dithiophosphate, a systemic insecticide is absorbed by the plants and translocated to different parts of plants and check the pest infestation. Systemic insecticides are available in different formulations but granules are more preferred for application. Sriharan and Garg (1974) observed that under green house condition, when granular insecticides were applied to flooded soil, near to root zone of paddy, killed optimum greenhopper, *Nephotettix virescens* (Distant). Jain *et al* (1974) found that under irrigated condition, disulfoton and phorate left no residues in grain and straw. The residues in soil persisted for 55 days. Jain *et al* (1980) reported that the rate of dissipation in soil followed by first order reaction and the half life was 12.7 days. Phorate under flooded condition persisted for 2 months. The present investigation was undertaken to study the dissipation of phorate in rice plant and in soil following its application in the form of granules to soil.

MATERIALS AND METHODS

During Rabi season, the rice seedlings (Var. Lalat) were transplanted at Central Farm, Orissa University of Agriculture and Technology in an acid lateritic soil having pH (1:2.5), 5.6, CEC (me/100g) 3.5, Org. C. (%) 0.36 and clay (%) 12.0. Each treatment was replicated thrice in a randomised block design. The

size of the plot was (5X5) Sq. m. Phorate at 1.0 Kg ai/ha and 2.0 Kg ai/ha was applied in the soil in the form of granules. The samples both soil and plant were drawn from each plot randomly, first within one hour and subsequently after 5, 10, 15, 20, 30 and 45 days of granular phorate applied in soil.

Extraction, Clean up and Estimation of phorate residues :

Soil : Air dried soil samples sieved through 2 mm sieve and extracted with distilled chloroform.

Plant : The samples of leaves were cut in small pieces and churned with 100 ml chloroform in a blender for 5 min. and the contents filtered through a buchner funnel. The remains were transferred back to the blender, re-extracted with 50 ml. Chloroform and the contents filtered again. The extracts in each case were combined and concentrated in a Kuderna-Danish evaporator to 100 ml. A suitable volume of the extract from each sample was passed through a 2 cm diameter column (25cm long) containing 5 cm layer of anhydrous Na_2SO_4 overlaid with 5g. of adsorbent mixture of charcoal, celite and MgO (2:2:1) and eluted with 100 ml chloroform for clean up. Residues resulting from phorate was determined by colorimetric method of Getz and Watts (1964) as modified by Jain *et al*. (1974) using p-nitrobenzyl pyridine as the chromogenic reagents. The sensitivity of the method used

for estimation of phorate in soil and plant are 0.1 and 0.08 ppm respectively. The recovery percentage of phorate from the fortified soil sample was 80 to 83 per cent and from plant sample was 75 to 80 per cent. The residue data were then subjected to statistical analysis, as suggested by Hoskins (1961).

RESULTS AND DISCUSSION

From table 1, it was found that the initial deposit of phorate in soil was 1.10 and 1.90 ppm with the granular form of phorate application at the rate of 1.0 Kg ai/ha and 2.0 Kg ai/ha in soil respectively and were reduced to non detectable level within 20 days of application. The rate of

Table 1 Phorate residues in soil

Days after treatment	1.0 Kg ai/ha		2.0 Kg ai/ha	
	Residue ppm	% dissipation	Residue ppm	% dissipation
0	1.10	—	1.90	—
5	0.65	41.0	0.95	50.0
10	0.31	71.9	0.42	75.8
15	0.15	86.4	0.21	88.5
20	N.D.	100	N.D.	100

Regression Equation $Y = 2.067 - 0.058X$
RL 50 = 5.189 days

Regression Equation $Y = 2.288 - 0.064X$
RL 50 = 6.991 days

degradation seemed to have followed a first order reaction i.e., the rate of degradation was proportional to the logarithm of the concentration of toxicant remaining in soil/plant. The RL 50 values were 5.189 and 6.991 days respectively due to soil heterogeneity. After 5 days of application, residues resulted 41.0 and 50.0% dissipation.

From table 2, it was found that the initial residues of 1.00 and 1.60 ppm phorate in plant was found within one hour of application. The 5th day sample showed highest concentration of phorate i.e. 3.90 and

Table 2 Phorate residue in rice plant

Days after treatment	Phorate residues in ppm	
	1.0 Kg ai/ha	2.0 Kg ai/ha
1	1.00	1.60
5	3.90	7.20
10	2.15	3.68
15	1.00	2.50
20	0.55	1.20
30	N. D.	0.50
45	N. D.	N. D.

Regression Equation $Y = 2.388 - 0.025X$
RL 50 = 12.04 days

Regression Equation $Y = 2.678 - 0.028X$
RL 50 = 10.75 days

7.20 ppm respectively at lower and higher dose of phorate application which gradually declined to non-detectable level at 30 and 45 days for two doses respectively. The RL 50 values were 12.04 and 10.75 days respectively.

As per food and Drug Act U.S.A. the safe limit of phorate in rice is 0.5 ppm. Therefore a waiting period of 30 and 45 days after application of phorate in rice should be observed for safe use. The quicken degradation observed in this experiment which may be due to light textured soil and some environmental factors like high relative humidity, temperature,

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