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PERSISTENCE OF RESIDUES OF PHORATE IN RICE GRAIN AND STRAW WHEN APPLIED AT DIFFERENT GROWTH STAGES OF THE PLANT

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Abstract: Studies on the persistence of phorate in the rice grain and straw when applied at different intervals after planting in different soil types of Kerala showed that no detectable residues persist in grains or straw at harvest when the crop was treated at 20 days after planting. Detectable residues were present in grains and straw at the higher two doses of 1.25 and 1.50 kg ai/ha applied at 40 days after planting and at all the doses of 1.0, 1.25 and 1.50 kg ai/ha applied at 60 days after planting and these residues exceeded the tolerance limit also.

INTRODUCTION

The use of pesticides has become inevitable for increased crop production particularly in the case of rice where high yielding and short duration varieties are grown with high doses of fertilizers. The use of systemic granular insecticides like phorate for the control of pests has opened a new vista in paddy pest control. It is effective for longer period against sap feeding insects and tissue borers. (John, 1966; Jayaraj *et al.*, 1976 and Rao *et al.*,1976). However, studies have indicated that use of persistent pesticides in soil as granules towards the later stages of crop for the control of pests like stem borers and brown plant hoppers may leave toxic residues in the grain and straw which may cause serious health hazards (Anon., 1971 and Rajukannu *et al.*, 1976). Therefore, the determination of insecticide residues in rice arising out of the insecticidal application will throw light on the nature and time of application of pesticides by farmers without encountering any residue hazards. The present investigation was aimed to estimate the residues of phorate persisting in rice grain and straw at harvest when phorate was applied at different growth stages of rice plant grown in the three major rice tracts of Kerala.

MATERIALS AND METHODS

Field experiments under the present study were conducted at the Rice Research Station, Moncompu having alluvial soil during puncha season of 1982-83, Rice Research Station, Kayamkulam having sandy soil during puncha season 1983-84 and Regional Research Station, Pattambi having lateritic loam during the virippu season of 1984. The experiments were laid out adopting randomised block design using Jaya, a medium duration rice variety. The crop was raised in plots of 5 x 4 m size. Phorate (0,0-diethyl S-(ethylthio) methyl phosphoro dithioate) at three doses was applied at three occasions after planting. The doses were 1.0, 1.25, 1.5 kg ai/ha and the different occasions were 20, 40 and 60 days after planting. There were ten treatments including control. Thimet 10G supplied by M/s Cynamid India Limited, Bombay was used for the experiments. The harvest was done at maturity and the grain and straw samples were collected from all the treatments for the analysis of insecticide residues.

Residues of phorate was extracted from the rice grain and straw by blending with chloroform following the methods of Jones and Riddick (1952) and

estimation was done colorimetrically following the procedure of Getz and Wats (1964) as modified by Jain *et al.* (1974). The recovery from grain and straw ranged from 80 to 90 per cent.

RESULTS AND DISCUSSION

The results of the studies showed that considerable residues of phorate were present in the rice grains and straw when phorate was applied at the advanced stages of crop growth. In all the locations, application of phorate granules at the doses of 1.25 kg ai/ha and 1.50 kg ai/ha applied at 40 days after planting and the doses of 1.0, 1.25 and 1.5 kg ai/ha applied at 60 days after planting resulted in the accumulation of residues in the grains and straw (Table 1), while no residues could be detected in any of the three doses applied at 20 days after planting and the lowest dose of 1.0 kg ai/ha applied at 40 days after planting. The highest levels of residues noted both in the grains and straw were in plots treated at 1.5 kg ai/ha applied at 60 days after planting the mean content being 1.16 and 1.51 ppm respectively. Among the three different types of soil, highest level of residues was seen in alluvial soil followed by lateritic loam and sandy soil. Rajukannu *et al.* (1976) while estimating the residues of phorate in rice grain and straw observed that the residues ranged from 0.075 to 0.083 ppm in grain and up to 0.15 ppm in straw following phorate application @ 1.25 g ai/ha at 15 and 45 days after transplanting. Visalakshi *et al.* (1979)

Table 1. Residues of phorate (ppm) in grains and straw at harvest of rice grown in different types of soil

Growth stages and phorate doses	Alluvial soil		Sandy soil		Lateritic loam	
	Grain	Straw	Grain	Straw	Grain	Straw
Applied at 20 DAP						
1.0 kg ai/ha	ND	ND	ND	ND	ND	ND
1.25 kg ai/ha	ND	ND	ND	ND	ND	ND
1.50 kg ai/ha	ND	ND	ND	ND	ND	ND
Applied at 40 DAP						
1.0 kg ai/ha	ND	ND	ND	ND	ND	ND
1.25 kg ai/ha	0.19	0.40	0.17	0.31	0.26	0.33
1.5 kg ai/ha	0.40	0.46	0.32	0.38	0.39	0.53
Applied at 60 DAP						
1.0 kg ai/ha	0.55	0.71	0.40	0.52	0.49	0.42
1.25 kg ai/ha	0.96	1.22	0.65	0.95	0.80	0.92
1.50 kg ai/ha	1.16	1.51	0.90	0.97	1.07	1.01

DAP = Days after planting ND = Non-detectable

also reported 0.32 and 0.34 ppm of phorate in rice grains and straw respectively when applied @ 1.25 ai/ha. Rao *et al.* (1986) also observed that phorate 10G @ 1.0 kg ai/ha at 30, 15 and both at 30 and 15 days before harvest recorded residues of 0.07, 0.11 and 0.16 ppm respectively. The residues of phorate obtained in the rice grain and straw exceeded the EPA tolerance limit in samples which received the higher two doses applied at 40 days after planting and all the three doses applied at 60 days after planting. This indicates that it is not safe to apply phorate after 40 days of planting.

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