https://doi.org/10.29321/MAJ.10.A02357

Madras Agric J. 72 (3) 141-145 March, 1985

RESIDUE LEVELS OF CERTAIN INSECTICIDE DUSTS IN RICE GRAIN AND STRAW

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The insecticides viz., methyl parathion, quinalphos, malathion, carbaryl and HCH when used as dust to protect rice crop against rice earhead bug during the flowering and grain forming stage, either left non-detectable level or residues well below the tolerance level in hand pounded rice, bran and straw. Even two rounds of dusting did not alter the situation. Therefore when the above mentioned chemicals were dusted once or twice 26 days before the harvest, the rice samples were devoid of any toxic residues of these chemicals. A safe waiting period of 3 weeks may be recommended between the application of these chemicals and the harvest of rice. The ND values or the low level of residues in all the treatment samples suggest that the waiting period suggested could still be reduced without any residue hazard.

The rice earhead bug *Leptocorisa oratorius* is one of the important pests of rice throughout India, generally appearing from the flowering stage and continuing upto the milky stage. Both the nymphs and adults feed on the sap of peduncle, tender stem and milky grains making the individual grains chaffy. Application of BHC 10% dust once or twice depending on the severity of infestation during the flowering stage has been the practice to control the pest for over a long period of time. Introduction of certain effective organo phosphorus and carbamate compounds in the market has also led to their usage in dust formulation against the earhead bug. As these toxic chemicals are applied to rice earheads very close to maturity, the persistence of these molecules in rice may be expected and a safety interval between the application and harvest / consumption is an essential requisite for the safe consumption of rice. This communication reveals the residues of certain insecticide dust formulations in rice grain, bran and straw at the time of harvest, when applied to crop at the flowering and milky stages.

MATERIALS AND METHODS

A field experiment was conducted at the Paddy Breeding Station, Tamil Nadu Agricultural University, Coimbatore with rice var : Co.43 and insecticides (dust formulations) viz, HCH, carbaryl, quinalphos, malathion and methyl parathion as treatments.

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The crop was raised during December 1983 to February 1984 in plots of 5 m x 10 m size. Each plot was divided into 3 sub-plots of equal size.

Treatment	*Insecticide*	*Dose*
T_1	HCH	25 kg/ha
T_2	Carbaryl	,,
T_3	Control	—
T_4	Malathion	25 kg/ha
T_5	Ekalux	,,
T_6	Methylparathion	,,

Sub-plot A : Plots which received single dusting at the time of flowering (36 days before harvest).

Sub plot B : Plots which received two dustings, one at the time of flowering (36 DBH) and another at 10 days after first dusting (26 DBH).

Sub-plot C : Plots which received single dusting i. e., 10 days after first dusting only (26 DBH).

The insecticides were dusted uniformly with hand duster at the rate of 25kg/ha. The harvest was done after maturity and the grain and straw samples were collected from all the treatments for the analysis of insecticide residues. Rice grain was hand pounded to seperate rice and bran and the residues were separately estimated in rice, bran and straw samples.

Carbaryl residues were extracted with dichloromethane and after a coagulating step clean up, the amount of residues was estimated by following the modified A.O.A C. method as described by Benson and Finocchiaro (1965). The sensitivity of this method was 0 03 ppm in hand pounded rice and 0.12 ppm in bran and straw samples in 50 gram sample size. Average per cent recovery of 91.50, 83.00 and 87.50 was obtained in rice, bran and straw samples respectively.

HCH residues were extracted from the samples using chloroform as solvent. The extract was cleaned up by refluxing it for 45 minutes in the presence of malonic acid and the quantity of HCH residues was finally determined by the method recommended by Anon , BHC panel (1962). The method had the sensitivity of 0.06 ppm for rice and 0.100 ppm in bran and straw samples of 50 g sample size. An average recovery of 89 00 per cent was recorded in rice while the corresponding recovery in bran and straw was 81 and 84.0 per cent respectively.

Malathion, quinalphos and methyl parathion residues were extracted with acetone and after passing through a column containing a mixture of charcoal : celite : MgO (1:1:1), the quantities of each insecticide were determined by the method described by Getz and Watts (1964). The method had the sensitivity of 0.05 ppm for all the three insecticides in rice, bran and straw for a sample

size of 50 g. The recoveries for all the three insecticides ranged between 88.5 to 92.00 per cent in rice, bran and straw.

RESULTS AND DISCUSSION

Table 1 shows the insecticide residues present in hand pounded rice, bran and straw samples of Co. 43 rice which had been dusted with different insecticides at flowering and grain forming stages. Although all the insecticides are of non-systemic nature, it is interesting to note that methyl parathion and quinalphos residues were found only in the plots which received two dustings (26 and 36 days before harvest) and the single dusting applied individually on 26 and 36 days prior to harvest did not leave any residues. Obviously, there was a slight entry of quinalphos molecules into the grain when the concentration of the toxicant was high consequent to dusting the crop twice. In case of methylparathion both in single dusting (26 DBH) and double dusting (26 and 36 DBH) had registered residues in hulled grain and the plots which received single dusting (36 DBH) had not contained methyl parathion residues. When compared to quinalphos the translocation of methyl parathion into the rice was found to be higher. Although the quantity of residues in

Table 1. Insecticide residues in rice

Treatment	Residues in ppm			Tolerance level (ppm)
	Milled rice	Bran	Straw	
Methylparathion				1.00
A	ND	0.053	0.062	
B	0.062	0.080	0.125	
C	0.052	0.061	0.092	
Quinalphos				0.25
A	ND	0.120	0.130	
B	0.035	0.263	0.282	
C	ND	0.192	0.220	
Malathion				4.00
A	ND	ND	ND	
B	ND	0.072	0.080	
C	ND	0.058	0.062	
Carbaryl				1.5
A	ND	ND	ND	
B	ND	0.300	0.321	
C	ND	0.228	0.176	
HCH				3 0
A	ND	0.115	0.240	
B	ND	0.360	0.850	
C	ND	0.158	0.371	

A : Single dusting, 36 days before harvest
B : Double dusting, 26 and 36 days before harvest
C : Single dusting 26 days before harvest

respect of these two insecticides in hulled rice were small and well below the tolerance levels, the study has demonstrated the translocation of methyl parathion and quinalphos molecules into the rice when applied at recommended quantities to rice earhead. Bran and straw samples contained residues of methyl parathion and quinalphos and the amounts of quinalphos residues were found higher than methyl parathion residues. Neverthless, the residues were well below the tolerance levels. Murthy *et al.*, (1983) observed quinalphos residue only in bran and the hand pounded rice did not contain any residues when IR 20 rice crop was applied with quinalphos dust at 10; 10 and 20; 10, 20 and 30 days before harvest. The differences among the two studies could be resolved when another study made by Rajukkannu *et al.*, (1984) is discussed. They observed that quinalphos when applied to 3 rice varieties, had left residues to the level of 0.28 ppm only in the hand pounded rice of culture 658 while the other two varieties viz., Bhavani and IR 20 did not contain any residues in grain. Therefore the translocation and the persistence of quinalphos residues differed among rice varieties and the study demonstrated the translocation and persistence of quinalphos in Co. 43 rice and the observed difference among few studies were due to varietal differences of rice. IR 20 and Bhavani varieties were not prone to the persistence of quinalphos residues in rice grain.

In the case of malathion, carbaryl and HCH, the hulled rice did not show any detectable residues for all the three applications indicating that these chemicals were not translocated into rice. Even in bran and straw samples malathion and carbaryl residues were not found when the insecticides were applied once i.e., 36 DBH. It is probable that both these insecticides might have been degraded to innocuous forms since there was a long gap between the application and harvest. However, there was appreciable HCH residues in bran and straw in the samples treated 36 days before harvest. HCH, being a highly persistent and fat soluble chemical, its residues were found in bran and straw. In all the three treatments, viz., malathion, carbaryl and HCH, their residues were detected in bran and straw sample obtained from single (26 DBH) and double (26 and 36 DBH) applications. Among the three treatments, the quantity of malathion residues was the least and HCH residues the highest. The HCH residue in bran and straw samples were found to be higher and this could be attributed to the fat soluble nature and inherent recalcitrant behaviour of HCH. However the residues were below the tolerance levels.

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Madras Agric. J. 72 (3) : 145—151 March, 1985

RAINFALL PATTERN AND CROPPING SYSTEM IN DENKANIKOTTA TALUK OF TAMIL NADU

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Denkanikotta Taluk is a part of Northwestern agroclimatic zone of Tamil Nadu and 80 per cent area is under rainfed farming The daily rainfall data for 44 years (1940-83) were analysed. Winter, summer, southwest monsoon and Northeast monsoon periods on an average receive 13, 195, 426 and 332 mm respectively. Rains during May in summer, July and September during Southwest and October in Northeast monsoon periods are more dependable. It brought out the feasibility of introducing a second crop in traditionally single cropped drylands. The crop substitution of cowpea in the place of horsegram is also proposed to increase the net income. Suggestions are also made to have double cropping systems with existing cultivars.

In the seasonally rainfed tracts, crop yields are low and highly variable from year to year. The instability in production is caused primarily by undependable and erratic rainfall. The farmers have to cope with the vagaries of a rainy season which is short and highly unpredictable. Agriculturists require a knowledge on rainfall intensity, distribution, variability and dependability for various agricultural operatiens. In this paper, the rainfall pattern of Denkanikotta Taluk of Dharmapuri district of Tamil Nadu

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