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DETERMINATION OF INSECTICIDE RESIDUES IN POMEGRANATE FRUITS

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RUNNING HEAD : Insecticide residues in pomegranate

ABSTRACT

The residues of endosulfan and malathion were estimated in/on fruits of pomegranate 1, 3, 7 and 15 days after insecticide spray at Horticultural Research Station, Yercaud. The initial deposit of endosulfan and malathion in/on fruits were 4.118, 6.149, 4.302 and 6.103 ppm for sprays of endosulfan at 0.07 and 0.14 per cent, malathion 0.1 and 0.2 per cent respectively. The safe waiting periods for the harvest of fruits after the spray of endosulfan and malathion at recommended doses were 2.58 and 0.94 days respectively. More than 99 per cent of residues dissipated within 15 days after the spray of endosulfan and within 7 days after the spray of malathion.

KEY WORDS : Pomegranate, endosulfan, malathion, residue, initial deposit, waiting period.

The pomegranate is mainly attacked by anar butterfly or pomegranate fruitborer, *Deudorix isocrates* (Fabr.) which causes severe damage to pomegranate fruits. The IPM measures such as bagging of fruits, spraying of insecticides, collection and destruction of infested fruits as well dropped fruits were recommended to minimise the fruitborer damage (Mohan kumar *et al.*, 1991 and Vijaya, 1993). The use of chemical insecticides has led to accumulation of toxic residues in the edible fruits and thus necessitates a safe waiting period between the insecticide spray and harvesting of fruits. Chemical control of larvae using endosulfan 0.07 per cent and malathion 0.1 per cent was highly effective when sprayed three times at 15 days interval commencing from flower opening (Karuppuchamy, 1995). Hence, experiments were conducted to study the dissipation of endosulfan and malathion used for the control of fruitborer in pomegranate.

MATERIALS AND METHODS

Spraying of insecticides *viz.*, endosulfan 35 EC at 0.07 and 0.14 per cent, malathion 50 EC at 0.1 and 0.2 per cent was given on 16th May 1994, 31st May 1994 and 15th June 1994 in a three tree plots of variety 'Ganesh' replicated three times in a randomized block design at Horticultural Research Station, Yercaud. The fruit samples were collected on 0 (3 hrs after spray), 1, 3, 7 and 15 days after the third spray. Eight fruits were collected from each treatment @ 2 fruits (one at the bottom and the other at the top) in each direction. The fruits were cut into pieces and pooled. From this, a sample of 100 g was collected for fortification and recovery studies of endosulfan and malathion.

Endosulfan residues were extracted by modifying the technique followed by Maitlen *et al.*, (1963) and Dikshit *et al.*, (1980). The samples were analysed by gas-liquid chromatograph (GLC) equipped with Electron Capture Detector (ECD).

The recovery of endosulfan was studied with fruit samples fortified with endosulfan at 1 ppm. The operational parameters of GLC are

Detector source 260° C

Injection temperature 220° C

Column temperature 200° C

Detector temperature 240° C

Carrier gas N_2 : 60 ml/minute

Column : 3% OV 17

Malathion residues were extracted by modifying the technique followed by Dikshit *et al.*, (1980). The samples were analysed by gas liquid chromatograph equipped with NPD (Nitrogen/Phosphorus) and the recovery study was made by fortifying the sample with standard malation at 1 ppm. The operational parameters of GLC are

Injection temperature 220° C

Column temperature 200° C

Detector temperature 230° C

Flow of carrier gas N_2 : 30 ml/minute ;
H_2 : 30 ml/minute

Air 100 ml/minute

Column 3% SE 30

The standard endosulfan and malathion used in the analysis were obtained from Thudiyalur Co-operative Agricultural Service Ltd. Coimbatore with a purity of 90 and 95 percent, respectively. The tolerance limit of 3 ppm on jujube fruits has been adopted for malathion in the present study for estimating the safe waiting periods on pomegranate fruits as suggested by Sarla *et al.*, (1980). The half life and waiting periods were worked out following the methods prescribed by Regupathy and Dhamu (1990).

RESULTS AND DISCUSSION

The recovery of endosulfan and malathion from fortified samples were 89 and 85 per cent respectively. The initial deposit of endosulfan residues on pomegranate fruits sprayed at 0.07 and 0.14 percent was 4.118 and 6.149 ppm respectively. (Table 1).

Dikshit and Handa (1987) recorded a higher initial deposit of endosulfan (12.64 ppm) on soybean pods whereas Sukul *et al.*, (1986) observed the lowest initial deposit of endosulfan (3.328 ppm) on green foliage of paddy at 0.1 per cent spray. Dethe *et al.*, (1988) reported that the initial deposit of endosulfan was 6.2 ppm at 0.1 percent and 4.1 ppm at 0.05 per cent concentrations on brinjal fruits.

Table 1. Dissipation of endosulfan and malathion in / on pomegranate fruits.

Days after last round of spray	Residues of endosulfan (ppm)								Residues of malathion (ppm)			
	0.07%				0.14%				0.1%		0.2%	
	α-isomer	β-isomer	Total	Dissipation (%)	α-isomer	β-isomer	Total	Dissipation (%)	Residue	Dissipation (%)	Residue	Dissipation (%)
0	3.463	0.655	4.118	-	5.144	1.005	6.149	-	4.302	-	6.103	-
1	1.869	0.332	2.201	46.55	2.797	0.563	3.360	45.36	1.783	58.55	2.310	62.15
3	0.919	0.140	1.059	74.28	1.107	0.196	1.303	78.81	0.514	88.05	0.694	88.63
7	0.367	0.070	0.437	89.39	0.527	0.102	0.629	89.77	0.018	99.58	0.029	99.52
15	0.003	BDL	0.003	99.93	0.007	BDL	0.007	99.89	BDL			
r - value			-0.9846			-0.9871			-0.9983		-0.9979	
r^2 value			0.9694			0.9744			0.9966		0.9958	
Y =			0.6801 - 0.2029 x			0.8039 - 0.1893 x			0.7798 - 00.3296 x			
RL_{50} (days)			1.48			1.59			0.88		0.91	
$T_{1/2}$ (days)			1.55			4.58			0.49		0.94	
MRL (ppm)			2.00			2.00			3.00		3.00	

Experimental period 15th May '94 to 22nd June '94
Maximum temperature 22 to 30° C
Minimum temperature 15 to 19° C
Relative humidity (%) 65 to 70
Number of rainy days : 8
Total Rainfall (mm) 194.6

The initial deposit and the amount of α-isomer of endosulfan were comparatively very high (i.e. 6 times) than β-isomer. About 45-46 per cent of total residues of endosulfan dissipated one day after spray, 74-79 per cent after 3 days and 89-90 per cent 7 days after spray. Nearly cent per cent degradation of residues of endosulfan occurred 15 days after the last spray. The half life values and the time required to reach maximum residue limit (MRL) were 1.48 and 1.59 days and 1.55 and 2.58 days respectively when sprayed at recommended and double the recommended doses.

The level of α-isomer of this compound estimated was higher than β- isomer in the present study, which is in confirmity with the findings of Dethe *et al.*, (1982) and Sukul *et al.*, (1986) indicating that β-isomer was less than 50 per cent of α-isomer in the latter two cases. However, Gopal *et al.*, (1988) reported higher β-isomer on chickpea. In the present study, the level of β-isomer estimated was nearly one sixth of α-isomer. Both the α and β-isomers were degraded almost in the same trend on pomegranate fruits as against faster degradation of α-isomer when compared to β-isomer as reported by Gopal *et al.*, (1988) on brinjal.

In the present study, the residues of endosulfan was dissipated below detectable level 15 days after spraying at 0.07 per cent concentration. Kale *et al.*, (1993) reported that the quantity of residues of endosulfan was below detectable level and 0.135 ppm respectively even 28 days after spraying of endosulfan at 0.05 and 0.1 percent on pomegranate fruits respectively.

The initial deposits on fruits were 4.302 and 6.103 ppm of malathion when sprayed at 0.1 and 0.2 per cent (Table 1). The dissipation of malathion was comparatively faster than that of endosulfan. The percentage reduction of malathion residues were 59 to 62 from 0.1 and 0.2 per cent spray from the fruits sampled one day after spray showing that the degradation of this insecticide was faster. On fifteenth day, the insecticide at both the concentrations were dissipated below detectable level. More than 99 percent of malathion residues were degraded 7 days after spray. While the same amount of degradation of residue took 15 days in case of endosulfan at 0.07 and 0.14 percent concentrations. This is in confirmity with the resutls of earlier workers (Rajukannu *et al.*, 1978 ; 1980 a and b ; Saivaraj, 1984). Sarode *et al.*, (1981) also found that the residues of malation reached below detectable level within 9 days after spray. All these studies had indicated that malathion was degraded quickly as compared to endosulfan. The half life values and the time required to reach MRL at 0.1 and 0.2 per cent sprays of malathion were 0.88 and 0.91 day and 0.49 and 0.94 day respectively. This clearly stated that the residues of malathion were degraded below tolerance level on the first day of sampling after spray. Deshmukh and Jai Singh (1975) found that the initial deposit of malathion itself was lower than the tolerance limit. But they adopted a higher tolerance limit of 8 ppm fixed by FDA of U.S.A.

Kale *et al.*, (1993) extracterd residues from edible parts of pomegranate fruits leaving the outer rind and pulp. However, in the present study, all the fruit parts including seed, pulp and rind were utilized completely for extracting the residues since the rind and other parts do possess medicinal properties.

In general, the interval between the sprays of insecticides and harvest of fruits is sufficient enough for degradation of residues of both malathion and endosulfan below tolerance limits. In the present study, based on the first brood of *D. isocrates* the females started laying eggs on freshly opened flowers and fruits of 15 to 20 days age. But the subsequent broods of the insect caused damage to the fruits nearing harvest also. In such cases, sufficient interval must be given between the last spray and harvest of fruits.

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ROLE OF WEATHER FACTORS ON THE INCIDENCE OF KEY PESTS OF GREEN GRAM

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ABSTRACT

Detailed field studies conducted on greengram at Agricultural College and Research Insitute, Killikulam, Tamil Nadu in the year 1995-96, to workout simple correlations between important weather factors and damage level of major pests of greengram, showed that in the kharif 1995, significant positive correlation was found on the incidence of galerucid beetle, *Madurasia obscurella* (Jacoby), with relative humidity. The thrips, *Megalurothrips distalis* (Karny) population was positively influenced by sunshine and rainfall was positively correlated with podborers damage and the correlation coefficient values (r) of the above are 0.663, 0.293 and 0.418 respectively. The other factors like maximum and minimum temperature, wind velocity exhibited negative correlation. The incidence of stemfly, *Ophiomyia phaseoli* (Tryon) was positively correlated (r=0.900) with wind velocity, while leaf hopper, *Empoasca kerri* (Pruthi) showed positive trend with maximum temperature (r=0.592) and negative with relative humidity (r=0.343) in the rabi 1995, while other weather factors were found negatively correlated with their incidence.

KEY WORDS : Greengram, stemfly, galerucid beetle, leafhopper, flower thrips and podborers weather relationship

INTRODUCTION

Greengram, *Vigna radiata* (L.) (Wilezek) the composition of insect population changes on depends upon the crop stage and seasonal changes in the temperature, rainfall, relative humidity and hours of sunshine (Dhuri *et al.*, 1981 ; Sehgal and Ujagir, 1988). Singh and Beri (1973), Singh and Ipe (1973) and Manohar (1978) noticed the appearance of the stemfly, *O. phaseoli* on blackgram.

Gupta and Singh (1993) reported the occurrence of thirps (*M. distalis*) on greengram.