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Monocrotophos Residues in/on Okra Fruits

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ABSTRACT

The average residues of monocrotophos 0.04 per cent foliar application during fruiting period in/on okra fruits at 0, 1, 3, 6 and 8 days after first spray were 13.34, 1.57, 0.76, 0.28 and 0.06 ppm while after second spray they were 13.98, 1.46, 0.66, 0.32 and 0.07 ppm, respectively. The half life values and withholding period for first spray in 1983-1984 were 1.77-1.45 and 10.65-8.84 days, while for second spray they were 1.31-1.23 and 8.00-7.57 days, respectively. Thus, based on the residue data, a minimum waiting period of 8 to 10 days is recommended for the foliar application of 0.04 per cent monocrotophos used for plant protection work on okra.

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INTRODUCTION

Okra (*Abelmoschus eculentus* (L.) Moench) is subject to severe depredation by various insect pests. The major pests of okra in Gujarat include leaf hopper, *Amrasca biguttula biguttula* Ishida; shoot and fruit borer, *Earias vitella* (Febricius); mite, *Tetranychus cinnabarinus* (Boisduval) and whitefly, *Bemisia tabaci* Geunadius. Monocrotophos has been proved to be effective in controlling these pests of okra by various workers (Singh and Kumar, 1974; Venkatnarayanan *et al.*, 1974; Rathore *et al.*, 1974; Gopalan *et al.*, 1974; Mote and Pokharkar, 1974; Uthamaswamy and Subramanium, 1976; Krishnaiah *et al.*, 1976; Eswarmoorthy *et al.*, 1976; Uthamaswamy *et al.*, 1977; Ramamohana and Ayyanna, 1977; Mote, 1978; Gupta and Dhari, 1978; Hasabe and Moholkar, 1980; Babu and Azam, 1981; Singh *et al.*, 1982 and Mohan *et al.*, 1983 in various States of India). In Gujarat State, Patel *et al.*, 1980; Radadia, 1981 and Radadia, 1983 have reported monocrotophos to be very effective in controlling the okra pests.

The farmers of South Gujarat are used to spray monocrotophos as foliar application at weekly interval for the control of insect pests on okra. Since, no information is available to guide the farmers for observing proper waiting period based on the residue data of monocrotophos for the okra cultivation in Gujarat from point of view of safety to consumer, the present investigations were carried out and the results are presented hereunder.

MATERIALS AND METHOD

The field experiment with okra (cv. N-5) crop in *rabi* season of 1983 and 1984 were conducted at the College Farm of Gujarat Agricultural University, Navsari. The okra crop was sown in the plot of 3.6 m x 5.0 m. The raw to raw distance of 45 cm. and plant to plant distance of 15 cm. were maintained. The monocrotophos foliar application were given twice @ 0.04 per cent at flowering and fruiting stage of the crop.

For determining the monocrotophos residues in/on okra fruits, samples of okra fruits were taken at random from 4 replications collectively at zero time, *i.e.* one hour after spraying treatment as well as on 1, 3, 6 and 8th day after frist and second spraying given during fruiting period. A representatives sample of 25 g. was collected from the composite fruit sample each time and was processed for residue analysis.

The fruit samples (25 g.) were extracted with acetone followed by column chromatographic clean-up. The final residues obtained in acetone was injected (2 µl.) in G C (Perkin - Elmer sigma 3 B) equipped with thermoionic detector (phosphorus detector with rubidian bead) and data station (Perkin - Elmer Sigma 15). The operating condition were : Column 170°C, inlet 200°C and detector 200°C. column consisted of 200 cm. long, 3 mm. i.d. glass tube packed with 3% S E 30 on Gas chrom Q 60/80 mesh. Gas flow of nitrogen (carrier gas) was maintained at 40 ml. per minute (Table 1). The average peak area obtained on data station for the sample was used for estimation of residue using a standard caliberation curve. The average recovery as per this procedure in fortified sample was 75.30%. The half life values (RL 50) and maximum residue limits (MRL) of monocrotophos was calculated as per formula of Hoskins (1961).

RESULTS AND DISCUSSION

It can be seen from the data presented in Table 1 that, the initial residual deposit of monocrotophos 0.04 per cent application in/on okra fruits based on the data of 1983 and 1984 ranged from 13.07 to 13.60 ppm (Av. 13.34 ppm) and 13.59 to 14.36 ppm (Av. 13.98 ppm) after first and second spray respectively. The initial residual reported by Krishnaiah and Prasad (1978) were 0.23 to 0.49 ppm for the monocrotophos applied at the rate of 0.5 kg. a.i./ha Dixit *et al.*, (1983) have reported initial deposit of 2.80 and 6.80 ppm after first spraying while 4.2 and 7.0 ppm after second spraying in the respective concentration of 0.03 and 0.05 per cent of monocrotophos. Thus, the initial deposits found in present investigation as a result of spraying of 0.04 per cent monocrotophos are higher than that reported by above referred workers. This might be due to variation involved in spraying technique, different analytical procedures and agroclimatic condition etc.

The residues observed after first and second spray of monocrotophos 0.04 per cent during 1983 and 1984 ranged from 1.51 to 1.63 ppm (Av. 1.57 ppm), 0.60 to 0.95 ppm (Av. 0.76 ppm), 0.04 to 0.51 ppm (Av. 0.28 ppm) and BDL to 0.12 ppm (Av . 0.06 ppm) while residue after second spray ranged from 1.81 to 1.73 ppm (Av. 1.46 ppm), 0.67 to 0.64 ppm (Av. 0.66 ppm), 0.36 to 0.28 ppm (Av. 0.32 ppm) and 0.06 to 0.07 ppm (Av. 0.07 ppm) on 1, 3, 6 and 8 days, respectively. A more or less similar trend in reduction of the residues were observed at various intervals

TABLE 1

Residues of monocrotophos in/on okra fruits.

Days after treatment	Residue (ppm) 1983	1984	Average
1	2	3	4
First spray after fruiting :			
0	13.07	13.60	13.34
1	01.51	01.63	1.57
	(88.47)	(88.01)	(88.23)
3	00.60	00.95	00.76
	(95.41)	(93.01)	(94.30)
6	00.04	00.51	00.28
	(99.69)	(96.25)	(97.90)
8	BDL	00.12	00.06
	(100.0)	(99.12)	(99.55)
	RL 50 = 01.77 Days	RL 50 = 01.45 Days	
	MRL = 10.65 Days	MRL = 08.84 Days	
Second spray after fruiting :			
0	13.59	14.36	13.98
1	01.18	01.73	1.46
	(91.32)	(87.95)	(89.56)
3	00.67	00.64	00.66
	(95.07)	(95.54)	(95.28)
6	00.36	00.28	00.32
	(97.35)	(98.05)	(97.71)
8	00.06	00.07	00.07
	(99.56)	(99.51)	(99.50)
	RL 50 = 01.31 Days	RL 50 = 01.23 Days	
	MRL = 08.00 Days	MRL = 07.57 Days	

1. BDL : Below detectable level.
2. RL 50 : Half life in days.
3. MRL : Time in days required for the residues to reach the maximum residue limit of 0.2 ppm fixed by FAO/WHO.
4. Figures in parenthesis are the percentage reduction over initial deposit.

in case of first and second spray in 1983 and 1984 as can be seen from data in table 1. Further, it can be seen that, the toxic residue of monocrotophos foliar application at the rate of 0.04 per cent goes below the tolerance limit of 0.2 ppm prescribed by FAO/WHO (Anonymous, 1978) only after 8 days of its application. Hence, a minimum 8 days waiting period should be observed between its application and harvesting of fruits so as to avoid any health hazard to human being. Monocrotophos deposits reported on okra fruits at 1, 3, 4, 7 and 10 days of application @ 0.5 kg. a. i./ha. was 0.21 to 0.38, 0.20, 0.18 to 1.19, BDL to 0.04 and BDL to 0.03 ppm respectively as per Krishnaiah and Prasad (1978). Similarly, monocrotophos deposits on okra fruits are reported to be 1.17, 0.62 and 0.04 ppm at 3, 7 and 10 days after application at 0.05 per cent concentration (Shetagar *et al.*, 1983). Thus, the present data on monocrotophos residues are almost closer to that reported by above referred workers.

The half life (RL 50) values of monocrotophos on the basis of residue data were found 1.77 and 1.45 days for the first spraying while 1.31 and 1.23 days for the second spraying after fruiting in 1983 and 1984, respectively. The maximum time required for monocrotophos residue to reach the level of maximum residue limit (MRL) of 0.2 ppm was 10.65 and 8.85 days after first spray while 8.0 to 7.57 days after the second spray in 1983 and 1984, respectively. Krishnaiah and Prasad (1978) have reported the half life values at 1.63 to 2.30 days for the monocrotophos applied on okra @ 0.5 kg. a.i./ha. during fruiting period while Shetagar *et al.*, (1983) have reported half life value and withholding period for 0.05 per cent monocrotophos application as 1.48 and 6.78 days, respectively. Thus, the present findings on waiting period and half life value of monocrotophos are closely in concurrence with the findings reported above referred workers. However, a waiting period of 15 days before the treated fruits are consumed has been recommended by Dixit *et al.*, (1983) because of longer persistance of 0.03 and 0.04 per cent monocrotophos application on okra.

Thus, based on the present finding, it can be recommended that a minimum waiting period of 8 to 10 days should be invariably observed in case of okra crop if the insecticide monocrotophos is to be used at 0.04 per cent concentration for plant protection work.

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