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Residual study of a synthetic parathyroid on okra

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Abstract
Okra is an annual green vegetable crop cultivated in various parts of India and popularly known as bhendi. Residue of fenvalerate 20 EC was analyzed by GLC. Total recovery of fenvalerate was observed to be 89%, 98% and 99% at 0.1, 0.5 and 1.0 mg/kg fortified fruit samples respectively. Dissipation was faster on both fruits and leaves at double dose (0.150) as compared to normal dose (0.075). Peak I was found to dissipate faster on fruit as compared to leaves. The half life ranged between 2.24 to 2.62 days on fruits and 4.11 to 5.52 days on leaves. Application of fenvelarate 20 EC is found to be safe on okra crop for pest management because MRL of the insecticide was found to be higher than the deposit of pesticide on fruits.

Keywords: Fenvalerate, residue, fortification, dissipation, okra, MRL

Introduction
Okra is one of the major vegetable crops cultivated in India and it belongs to family Malvacae. It contains various carbohydrates, vitamins and other nutrients. Yield of okra is reduced due to many factors and insect pests is one of the major constrains for reducing quality and quantity of produce. 28 pests recorded on this crop [1] while 78 pests were found to be associated with okra [2] from different parts of India among which, the sucking pest complex comprising of aphids (*Aphis gossypii* Gloner), leaf hopper (*Amrasca biguttula biguttula* Ishida), whitefly (*Bemisia tabacii* Green), cause 17.46 per cent yield loss in okra [3]. *Earias vittella*, *Earias insulana* causes 40-57% damage to fruits of okra [4, 5, 6] and a total loss of about 35-40% was reported [7].
During the IPM phase the pests are controlled by the combination of selective synthetic pesticides which are compatible with other pest management practices. Certainly the use of various pesticides in pest management is one of the major factors for escalating the yields of agricultural crops but after harvesting, pesticides' residues remain on crops or food materials which directly affect the health of consumers. Synthetic pyrethroids effective at very low dosage, having low mammalian toxicity along with low risk of contamination have been recommended to control fruit borers [8, 9].

Materials and Methods
A field experiment was carried out at the Entomolgy farm of Dr Y.S.P. University of Horticulture and Forestry, Solan, Himachal Pradesh. Okra crop was shown on 5x4 m^2 bed area during April and May month following the package and practices as per university recommendations for normal crop growth. A 45 cm row to row and 15 cm plant to plant distance was maintained. Fenvalerate 20 EC insecticide was sprayed at the rate 0.075 and 0.150 kg a.i. /ha and each dose replicated three times. Samples were drawn at 0(1 hr after treatment), 1, 3, 5 and 7 days of each treatment to study the dissipation of fenvalerate on okra fruit and leaves and brought to laboratory for residue analysis.

Residue analysis
A 50 g fruit and leaf samples was added in 150 ml acetone and blended for two minutes. The extract was filtered through Buchner funnel using Watman's No. 1 filter paper with the help of vacuum pump. After that acetone extract was concentrated in Flash evaporator, diluted with 100 ml of 5% sodium sulphate in water in a separating funnel. This aqueous layer was partitioned thrice with 50 ml of hexane and collected over sodium sulphate bed. The filtrate was evaporated to about 1-2 ml and further cleaned up by column chromatography. A 50 g of okra fruits were fortified at three levels (0.1, 0.5 and 1.0 mg/kg) and each level replicated three

times. The residues were detected by using Gas Liquid Chromatography (GLC). The GLC parameters were: Model-HP5890A, Oven temperature- 250 ^{0}C, Injection temperature-270 ^{0}C, Detector temperature- 300 ^{0}C, Column- OV-17, N_2 flow- 50 ml/min.

Results and discussion

The Fenvalete20 EC @ 0.075 and 0.150 kg a.i/ha was evaluated for residue dynamics on fruits and leaves of okra crop and data was presented in table 1, 2 and 3. Recovery of fenvalerate showed two peaks with retention time of 7.03 (Peak I) and 7.58 (Peak II) minutes. On an Average fenvalete was recovered 89%, 98% and 99% at 01., 0.5 and 1.0 mg/kg fortified fruit samples respectively (Table 1). The results of residue analysis of fenvalerate 20 EC in okra fruits and leaves at 0.075 and 0.150 kg a.i/ha and the percent dissipation of residues are presented in Table 2 and 3. Fenvalerate when applied at 0.075kg a.i./ha gave a deposit of 0.330mg/kg (Peak I+PeakII) which dissipated to 0.045mg/kg(two peaks combined) showing a decline of 86% and when applied at the double dose a deposit of 0.540mg/kg (PeakI+PeakII) was observed which dissipated by 91.85% to 0.044mg/kg(both peaks combined) in 7 days on okra fruits. The half life of the insecticide for the two doses was 2.62 and 2.24 days, respectively (Table 2). On leaves a deposit of 4.032 and 5.459 mg/kg was observed at the two doses which degraded to 1.686 and 1.763 mg/kg in 7 days. The half life value of the insecticide was found to be 5.52 and 4.11 days respectively for single and the double dose (Table 3). The deposit of the insecticide at 0.075 a.i./ha was 1.7 times lower than that at double the dose while on okra leaves an increase of 1.3 fold in deposit was observed when the dose was doubled. Similar findings were reported [10, 11] on okra and radish leaves where 1.6 times increases of deposits due to higher dose over lower dose were observed. Half of fenvalerate deposit on okra fruits dissipated in 2.62 days at normal dose and in 2.24 days at double dose level. Similarly on leaves also the double dose dissipated faster (RL50=4.11 days) than single dose (RL50=5.52 days).The results show close approximation to [12] fenvalerate deposit reduced to half in 2.2 days. Thus it can be concluded that the use of fenvalerate to control the pests of okra is safe to human beings because the deposits on fruits are below the MRL and again the lower deposits further reduce to half in less than 3 days thus further making the fruits more safe for human consumption as the okra fruits require harvest every 3 days as it is fast growing crop.

Table 1: Recovery study of fenvalerate from okra fruits.

	Amount fortified (mg/kg)	Amount recovered mg/kg	Recovery %	Total recovery %
Peak I	0.1	0.046	92.0	89.0
Peak II		0.043	86.0	
Peak I	0.5	0.260	100.0	98.0
Peak II		0.230	92.0	
Peak I	1.00	0.520	100.0	99.1
Peak II		0.471	94.2	

Table 2: Residue of different doses of fenvalerate on okra fruits

Days after application	Fenvalerate 0.075 kg a.i./ha				Fenvalerate 0.150 kg a.i./ha			
	Peak I		Peak II		Peak I		Peak II	
	Residue* (mg/kg)	Percent dissipation	Residue* (mg/kg)	Percent dissipation	Residue* (mg/kg)	Percent dissipation	Residue* (mg/kg)	Percent dissipation
0	0.197 ± 0.032	--	0.133 ± 0.015	--	0.287 ± 0.009	---	0.253 ± 0.013	---
1	0.103 ± 0.014	47.72	0.093 ± 0.006	30.08	0.126 ± 0.002	56.08	0.106 ± 0.016	58.10
3	0.067 ± 0.016	65.99	0.057 ± 0.016	57.14	0.076 ± 0.006	73.52	0.057 ± 0.007	77.47
5	0.048 ± 0.001	75.63	0.053 ± 0.002	60.15	0.054 ± 0.009	81.18	0.057 ± 0.009	77.47
7	0.023 ± 0.001	87.82	0.024 ± 0.002	79.70	0.022 ± 0.005	92.33	0.022 ± 0.000	91.30

Average of three replications.

Correlation coefficient r= -0.985.Regression equation Y= -0.458-0.115x. RL50= 2.62 days (0.075kg a.i./ha i.e. single dose, peakI+peakII).
Correlation coefficient= -0.960. Regression equation Y= -0.347-0.134x. RL50= 2.24 days(0.150kg a.i./ha i.e. double dose, peakI+peakII)

Table 3: Dissipation for different doses of fenvalerate on okra leaves.

Interval days	Fenvalerate 0.075 kg a.i./ha				Fenvalerate 0.150 kg a.i./ha			
	Peak I		Peak II		Peak I		Peak II	
	Residue* (mg/kg)	Percent dissipation	Residue* (mg/kg)	Percent dissipation	Residue* (mg/kg)	Percent dissipation	Residue* (mg/kg)	Percent dissipation
0	2.053 ± 0.101	--	1.979 ± 0.067	--	3.063 ± 0.138	--	2.396 ± 0,021	--
1	1.512 ± 0.077	26.35	1.426 ± 0.049	27.94	2.746 ± 0.192	10.35	2.175 ± 0.152	9.22
3	1.067 ± 0.015	48.03	1.069 ± 0.039	45.98	1.431 ± 0.161	53.28	1.205 ± 0.152	49.71
5	0.960 ± 0.007	53.24	0.848 ± 0.042	57.15	0.959 ± 0.056	68.69	0.903 ± 0.049	62.31
7	0.888 ± 0.052	56.75	0.797 ± 0.063	59.73	0.915 ± 0.089	70.13	0.847 ± 0.109	64.65

Average of three replications. Correlation coefficient r= -0.951.Regression equation Y= -0.567-0..055x. RL50= 5.52 days (0.075kg a.i./ha i.e. single dose, peakI+peakII).Correlation coefficient= -0.936. Regression equation Y= -0.735-0.073x. RL50= 4.11days (0.150kg a.i./ha i.e. double dose, peakI+peakII)

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