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RESEARCH ARTICLE

EFFECT OF SIMPLE KITCHEN TECHNIQUES ON DISSIPATION OF PESTICIDE RESIDUES ON OKRA FRUITS.

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Abstract

Insecticides are used to manage insect pests of okra. Residue accumulates on consumable parts due to indiscriminate use and non-adaptation of safe waiting period of insecticides. The simple household practices have been found to dislodge the insecticides' residues. Therefore, present study was carried out to assess the effect of simple kitchen techniques on the dissipation of pesticide residues on okra fruits. In present study field was sprayed at normal and double dose of monocrotophos 36SL (0.350 kg a.i. /ha and 0.750 kg a.i. /ha) and fenvalerate 20EC (0.75 kg a.i. /ha and 0.150 kg a.i. /ha). Okra fruit samples were collected from field after 0 day (1hr after treatment) and washed for 5 minutes, and washed + cooked for 10 minutes. Residue was analyzed by GLC to study effect of processing on dissipation of insecticides residue. Washing of okra fruit sample treated with normal dose of monocrotophos (0.350kg a.i. /ha) and fenvalerate (0.75 kg a.i. /ha) dislodged 23.98% and 10.27% insecticides deposits whereas, washing and cooking decreased them by 32.35%, 14.50%. Washing of okra fruit sample treated with double dose of monocrotophos (0.750kg a.i. /ha) and fenvalerate (0.150kg a.i. /ha) dislodged 23.06%, 2.97% insecticides deposits. Washing and cooking removed 37.10% of monocrotophos, but there is no decrease in okra fruit treated with double dose of fenvalerate. Finding revealed that washing and cooking combined together dislodged more residues of monocrotophos than washing alone. However, there was a negligible impact of the washing and cooking combined on fenvalerate residues/deposits.

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Introduction:-

Vegetables are important constituents of our daily diet to supplement nutrient requirement (Slavin, 2012). In India out of recommended 300gm vegetables per capita only about 150gm is consumed. Insect pest and diseases are major obstacles in the way of vegetable production. To overcome yield losses caused by insect pests, insecticides are most commonly employed weapon in managing them due to their high efficacy (Sinha, *et al.*, 2007). However, the pesticides have many harmful effects due to their leftover toxic residues on fruits and vegetables. Residue accumulates in vegetables due to repetitive application and non-adoption of safe waiting periods. Many of the vegetables have been found to be contaminated with pesticide residues and that also above MRLs (Blankson, 2016; Kumari, *et al.*, 2002). Pesticide residue leads to many health problems like cancer, nervous system dysfunction etc.

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(Stamti, 2016). Okra a highly nutritious crop grown in many parts of the world belongs to malvaceae family. It is grown for its tender green fruits which are used as vegetable. Its other uses are in the sugar industry and its seeds after being roasted and ground are used as a substitute for coffee in turkey (Chauhan, 1972). Various pesticides are applied on okra crop due to being attacked by number of insect pests (Anitha, 2008; Nair, 2017). The simple household practices like washing and cooking have been found to dislodge the insecticides residues (Kumari, 2008; Parmar, 2012; Chandra, 2015). Therefore, present study was carried out to assess the effect of simple kitchen techniques on the dissipation of pesticide residues on okra fruits.

Materials and Methods:-

A field experiment was carried out at the entomology farm of Dr. Y.S.P. university of Horticulture and forestry, Solan, Himachal Pradesh. During April and May okra crop was sown on bed area of 5 x4m² spaced 45 cm row to row and 15cm plant to plant following the package and practices as per university recommendations for normal crop growth. Monocrotophos 36SL insecticide was sprayed at the rate of 0.350 and 0.700kg a.i. /ha and Fenvalerate 20 EC insecticide was sprayed at the rate 0.075 and 0.150 kg a.i. /ha each dose replicated three times. To test the effect of washing after 0 day (1hr) of spraying, fruit samples were collected from each insecticide treated field at both the concentrations and washed under running water for 5minutes and to test the effect of cooking fruit samples collected in the above manner were washed and cooked in beakers for 10 minutes.

Residue analysis of monocrotophos

The 50gm sample of each washed fruits and washed + cooked fruits was blended in a blender for 2 minutes in 150ml, 100ml and 100ml portions of acetone. Three extract samples were 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 250 ml of 2% sodium sulphate solution containing water in a separating funnel. This aqueous layer was partitioned thrice with 50 ml of hexane. The hexane phase was discarded. The hexane phase was again partitioned thrice with 50 ml of chloroform. Chloroform phase dried over anhydrous sodium sulphate after discarding aqueous phase. Concentrated chloroform extract removed from flasks by adding distilled ethyl acetate 2-3 times and concentrated. Residue was taken in 25ml distilled ethyl acetate for GLC analysis. The 50 g of okra fruits were fortified at three levels (Unprocessed, Washed and Washed + Cooked) and each level replicated three times. The residues were detected by using Gas Liquid Chromatography (GLC). The GLC parameters were: Model- HP5890A, Oven temperature-150⁰C 5min@ 20⁰C /min- 190⁰C- 5min, Injection temperature 240 ⁰C, Detector temperature-300 ⁰C, Column-OV-17, N₂ flow-30 ml/min, H flow- 1ml/min.

Residue analysis of fenvalerate

A 50 gm. each washed fruits and washed + cooked fruit 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 gm. of okra fruits were fortified at three levels (Unprocessed, Washed and Washed + Cooked) and each level replicated three times. The residues were detected by using Gas Liquid Chromatography (GLC). The GLC parameters were: Model- HP5890A, Oven temperature- 250⁰ C, Injection temperature- 270⁰ C, Detector temperature- 300⁰ C, Column- OV-17, N₂ flow- 50 ml/min.

Results:-

Effect of processing (washing and boiling/cooking) on monocrotophos 36SL deposits @ 0.350 and 0.700 kg a.i. / ha was evaluated on okra fruits. The result of processing on monocrotophos 36SL treated okra fruit at 0.300 and 0.700 kg a.i. /ha and the relief % have been presented in table 1. In unprocessed fruits treated with monocrotophos at the rate of 0.350kg/ha the deposit was 2.856mg/kg. Washing of fruit sample reduced deposits to 2.171 mg/kg providing 23.98% relief on deposits. After cooking it further reduced to 1.932 mg/kg that provide percent relief of 32.35%. On unprocessed fruits treated with monocrotophos at the rate of 0.700kg/ha the deposit was 3.677 mg/kg. Washing of fruits sample reduced the deposits to 2.829 mg/kg (23.62%). After washing and cooking combined, deposit was decreased to 2.313 mg/kg thereby providing 37.10% relief.

The effect of processing (washing and washing + boiling / cooking) on okra fruits treated with fenvalerate 20EC at two doses (0.075 and 0.150kg a.i. /ha) was evaluated for peak I and peak II individually as well as for both

combined. In the unprocessed fruits the deposits of peak I and peak II were 0.197 and 0.133 mg/kg when applied at 0.75kg a.i. /ha. Washing dislodged 27.41% of the deposit of peak I whereas, there was no relief of the peak II deposit. Washing and cooking combined removed 21.33% of peak I and 3.01% of the peak II deposit on okra fruits. The data has been presented in table 2. In the unprocessed fruits the deposits of peak I and peak II were 0.287 and 0.253 mg/kg when applied at 0.150 kg a.i. /ha. Washing dislodged 10.45% of the deposit of peak I whereas, there was no relief of the peak II deposit. On washing and cooking combined no residues of peak I and peak II were reduced. The data has been presented in table 3. Table 4 shows the effect of processing on total fenvalerate at normal and double dose (0.75, 0.150 kg a.i. /ha). Sample taken from field treated with 0.75kg a.i. /ha shown reduction by washing from 0.330 mg/kg to 0.297 mg/kg showing 10.27% relief of residue. After cooking residues were 0.283 mg/kg showing 14.50% relief. Fruit sample taken from field treated with 0.150kg a.i. /ha in unprocessed fruits showed deposits of 0.539 mg/kg which reduced to 0.523 mg/kg showing only 2.97% relief. On washing and cooking combined the residue was 0.612 mg/kg which was more than the deposit in unprocessed fruits.

Table 1:-Effect of processing on the harvest time residues of monocrotophos on okra fruits.

Treatment	Dose (0.350 kg a.i. /ha)		Dose (0.700 kg a.i. /ha)	
	Mean \pm SD	Relief %	Mean \pm SD	Relief %
Unprocessed	2.856 \pm 0.203	--	3.677 \pm 0.123	--
Washed	2.171 \pm 0.119	23.98	2.829 \pm 0.085	23.062
Washed + cooked	1.932 \pm 0.081	32.35	2.313 \pm 0.289	37.10

Table 2:-Effect of processing on the harvest time residues of fenvalerate due to 0.75 kg a.i. /ha.

Treatment	Average residues \pm SD (mg/kg)		Relief Percent	
	Peak I	Peak II	Peak I	Peak II
Unprocessed	0.197 \pm 0.032 (0.161 - 0.239)	0.133 \pm 0.015 (0.112 - 0.146)	---	---
Washed	0.143 \pm 0.027 (0.114 - 0.179)	0.154 \pm 0.036 (0.108 - 0.197)	27.14 ---	---
Washed + cooked	0.154 \pm 0.003 (0.150 - 0.157)	0.129 \pm 0.197 (0.103 - 0.143)	21.83 ---	3.01 ---

Table 3:-Effect of processing on the harvest time residues of fenvalerate due to 0.150 kg a.i. /ha.

Treatment	Average residues \pm SD (mg/kg)		Relief Percent	
	Peak I	Peak II	Peak I	Peak II
Unprocessed	0.287 \pm 0.009 (0.275 - 0.298)	0.253 \pm 0.013 (0.237 - 0.268)	---	---
Washed	0.257 \pm 0.025 (0.226 - 0.287)	0.267 \pm 0.016 (0.247 - 0.286)	10.45 ---	---
Washed + cooked	0.316 \pm 0.021 (0.290 - 0.342)	0.296 \pm 0.015 (0.277 - 0.314)	---	---

Table 4:-Effect of processing on the harvest time residues of fenvalerate (peak I + peak II) on okra fruits.

Treatment	Dose (0.75 kg a.i. /ha)		Dose (0.150 kg a.i. /ha)	
	Mean \pm SD	Relief %	Mean \pm SD	Relief %
Unprocessed	0.331 \pm 0.036	----	0.539 \pm 0.022	----
Washed	0.297 \pm 0.027	10.27	0.523 \pm 0.041	2.97
Washed + cooked	0.283 \pm 0.016	14.50	0.612 \pm 0.036	----

Discussion:-

Simple process of decontamination like washing and cooking are often quite effective in achieving relief from the pesticide residues. Therefore, in the present investigations the effect of washing and cooking on insecticide deposit was studied.

On washing, the monocrotophos deposits were decreased by 24.98 and 23.06% in single and double dose, respectively, which is less compared to 68.14-80.85% reported by Shetgar, Pawar, Puri, Raodeo & Patil (1983). Kumari (2008) recorded that washing removed 50% residue of organophosphates on okra fruits, 74% on cauliflower and 77% on brinjal fruits (samples collected from local markets). These higher results may be due to the reason that all the organophosphates were taken together. Chandra, Kumar, Mahindrakar & Shinde (2015) recorded 62.4-65.5% dissipation of monocrotophos treated okra fruits by washing whereas, 65.6-66.4% in brinjal fruits. The present investigations show similarity to those (24-29%) obtained on grape berries Rao, Sultan & Reddy (1987). However, a complete removal of monocrotophos has also been reported on washing the chilli fruits in 2% salt water Rao & Subbaiah (1987). High relief on washing is due to highly water soluble nature of monocrotophos and the washing was done at zero time so that the pesticide could not enter into the plant system. Washing did not give much relief from fenvalerate deposits on okra fruits in the present investigations. Washing could remove only 10.27 and 2.97% of fenvalerate from okra fruits at normal and double dose, respectively. Low relief on washing of fenvalerate residues was expected due to highly lipophilic nature of the synthetic pyrethroid. Kumari (2008) observed that washing dislodged 31% residue of synthetic pyrethroid insecticides treated okra fruits whereas, 29% and 26% reduction of residue on cauliflower and brinjal fruits (samples collected from local markets). Jain, Agnihotri & Srivastava (1979) observed about 61% relief of fenvalerate by washing on okra fruits. However, the results of present investigations show some similarity to their findings on cauliflower where 7-28% relief of fenvalerate was observed at different time intervals. This may be attributed to difference in washing methods.

The initial deposits of monocrotophos were decreased by 32.35 and 37.10%, respectively after washing and cooking at normal and double dose. However, Chandra, Kumar, Mahindrakar & Shinde (2015) recorded dissipation of 98.8-99.5% through boiling on okra fruits recorded whereas, 98.5-99.7% through boiling of brinjal fruits. Kumari (2008) reported that boiling removed 75% residue of organophosphate on okra fruits and 92% and 100% on cauliflower and brinjal (samples collected from local markets). During present investigations fenvalerate was not removed considerably on cooking the okra fruits for 10 minutes. Only up to 14.50% reduction was observed for the two doses. Kumari (2008) recorded that boiling removed 42% residue of synthetic insecticides on okra fruits and 40% and 37% on cauliflower and brinjal. Jain, Agnihotri & Srivastava (1979) obtained 85% loss of fenvalerate deposit after cooking okra fruits for 15 minutes. The huge difference in the relief can be explained on the basis of treatment time. The increased cooking, it appears, removed more insecticide from fruits.

Conclusion:-

Washing and cooking combined together dislodged more residues of monocrotophos than washing alone. However, there was a negligible impact of the washing and cooking combined on fenvalerate residues/deposits.

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