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# Relative pesticide residue in Okra (Abelmoschusesculentus L) Crop during crop growth stages

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**-----------------------------------------------------ABSTRACT-----------------------------------------------------**

*Present study was conducted to evaluate the pesticide residuespresent in okra crop at different growth stages (vegetative, flowering and fruiting stages)in plant parts (shoot, root and fruits). From the study it is found that presence of organophosphorous (triazophos and ethion) and strobilurin (Trifloxistrobin) molecules were found in the samples of okra(Abelmoschusesculentus L) plant parts (Shoot and Roots) in all the growing stages analysed using GC MS/MS.*

*Pesticide residues of triazophos, ethion and trifloxystrobin were found in okra fruit samples and the residue concentration of all the three molecules were higher than the EU MRL. From the residue data of okra fruit samples, residues are at non hazardousconcentration to humans.The TMRC (Theoretical maximum residue concentration) residue levels of triazophos (0.0075 mg/ person/day), trifloxystrobin (0.0035 mg/ person/day) andethion(0.0305 mg/person/day) were obtained and were below the MPI (Maximum Permissible Intake) of triazophos (0.06 mg/person/day),trifloxystrobin (6 mg/person/day) and ethion (0.12 mg/person/day)considering average daily consumption of okra is 150g per person per day.*

***Key Words**: Pesticide residues, Okra growth stages, TMRC, MPI*

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## I. INTRODUCTION

Crop protective agentsapplication is needed on crops to protect from the losses caused by pests and diseases. Applied crop protective agents moves in the plat depending on the nature of molecule. Depending on the molecular movement crop protective agents are called as systemic and non-systemic.

It is estimated that of the total amount of pesticides applied for weed and pest control, only a very small part (<0.1%) actually reaches the sites of action (Pimental 1995). Benefits of applying CPA are balanced by an increased risk of phytotoxicity, since treated seeds are often exposed to significantly higher chemical concentrations than occur in foliar treatments applied to established plants. Depending on the concentration of pesticide residue in the fruits or vegetable, those are categorised as hazardous and non-hazardous to human beings. Clear guidelines were there to calculate and classify the food as hazardous by FAO (Food Agriculture Organisation), PPDB (Pesticide property data base) and EU MRL (European Union Maximum residue levels).

## II. MATERIALS AND METHODS

Location of the experiment field was Koonavarm village of East Godavari district of Andhra Pradesh state.

In this study different crop protective agents accumulation among the plant parts were analysed. Plant samples were collected at different growth stages of the crop i.e. vegetative stage (14 days after planting), flowering stage (30 days after planting) and fruiting stage (50 days after planting). For the study okra (*Abelmoschusesculentus* L) crop was selected as the crop has lowharvest interval (Time between harvests) and pesticide intensive. Plant samples were collected from three different blocks from the experimental field.

After collecting, the plants samples were segregated as shoot (Plant part above soil except fruits), roots (Plant part below soil) and fruits (fruits including immature ones). From each block 10 plants were collected. All the plant parts were dried in shade and stored in refrigerator @ 4 $^{0}$c before analysing the pesticide residues.

Residual estimation: All the plant samples were grinded and extracted the pesticide residues from the sample.Modified QuEChERs method of EURL-FV (European Union Reference Laboratory for Fruits and Vegetables) was followed for extraction of residue. The extracted solution is fed into Gas chromatography

MS/MS and analysed for residues present in the sample.All the pesticide residues found in the fruits were compared with the EU MRL standards. EU MRL for ethion is 0.01 mg/kg, triazophos is 0.01 mg/ka and trifloxystrobin is 0.02 mg/kg (APEDA – EU MRL).

## III. RESULTS AND DISCUSSION

From the study the obtained data was tabulated and statistical tools like standard deviation and mean values were obtained and presented.

Vegetative stage:

All the residues detected in the samples were presented in the table 1 and Fig 1. From the analysis results the concentration of residues were very high in shoots as the Crop protective agents were applied on the shoots directly. Pesticide residues observed were in the decreasing order of Triazophos>Ethion>Trifloxystrobin in the shoots of okra and residues of Ethion>Triazophos were found in the roots of okra crop during vegetative stage.

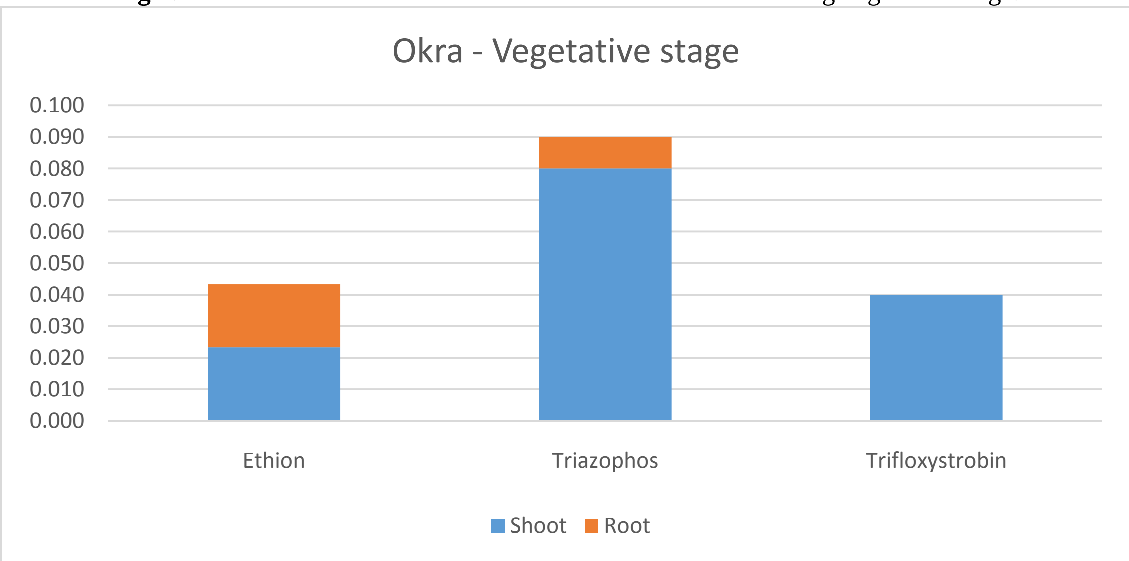
Lower residual level in the roots are because the smaller quantity translocated with in the plant depending on the chemical and the amount absorbed by the roots from the available pesticide in the soil. Logan 1974, reported similarly that pesticide molecule in the soil moves along with the water and roots absorb the molecules in the water solution and translocation of the molecule with in the plant from shoot to root in another means of pesticide accumulation in the roots.

**Table 1:** Pesticide residues in vegetative stage of chilli crop

| Vegetative stage | | Ethion | Triazophos | Trifloxystrobin |
|---|---|---|---|---|
| Shoot | Mean | 0.023 | 0.080 | 0.040 |
| | Standard Deviation | 0.015 | 0.040 | 0.000 |
| Root | Mean | 0.02 | 0.01 | BLQ |
| | Standard Deviation | 0 | 0 | |

BLQ : Below the Limit of Quantification (0.01)

**Fig 1**: Pesticide residues with in the shoots and roots of okra during vegetative stage.




Flowering stage:

All the residues detected in the samples were presented in the table 2 and Fig2. From the analysis results the concentration of residues were very high in shoots as the Crop protective agents were applied on the shoots directly. Pesticide residues observed were in the decreasing order of Triazophos>Ethionin the shoots of okra and residues of Triazophos>Ethion was found in the roots of okra crop during flowering stage. Pesticide residues were observed in the flowering stage were similar to the trend observed in residual concentration of vegetative stage.

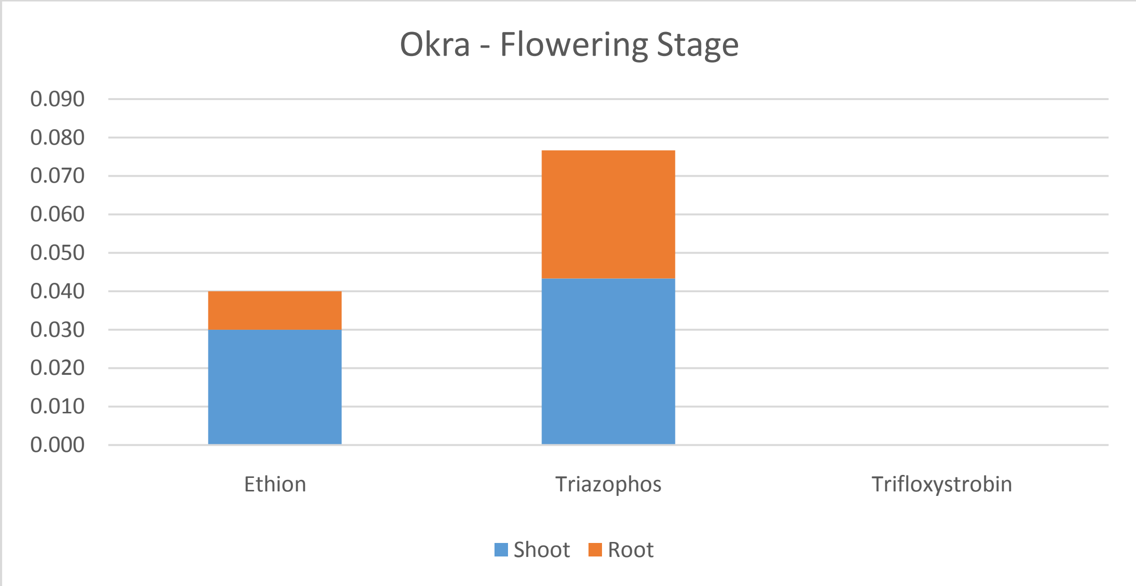
**Table 2:** Pesticide residues in flowering stage of okra crop

| Flowering stage | | Ethion | Triazophos | Trifloxystrobin |
|---|---|---|---|---|
| Shoot | Mean | 0.030 | 0.043 | BLQ |

| | | | | |
|---|---|---|---|---|
| | Standard Deviation | 0 | 0.025 | |
| Root | Mean | 0.01 | 0.033333 | BLQ |
| | Standard Deviation | 0 | 0.025166 | |

BLQ : Below the Limit of Quantification (0.01)

**Fig 2:** Pesticide residues with in the shoots and roots of okra during flowering stage.




Fruiting stage:

All the residues detected in the samples were presented in the table 3 and Fig 3. From the analysis results the concentration of residues were very high in shoots as the Crop protective agents were applied on the shoots directly. Pesticide residues observed were in the decreasing order of Ethion>Triazophosin the shoots and roots of okra during fruiting stage.

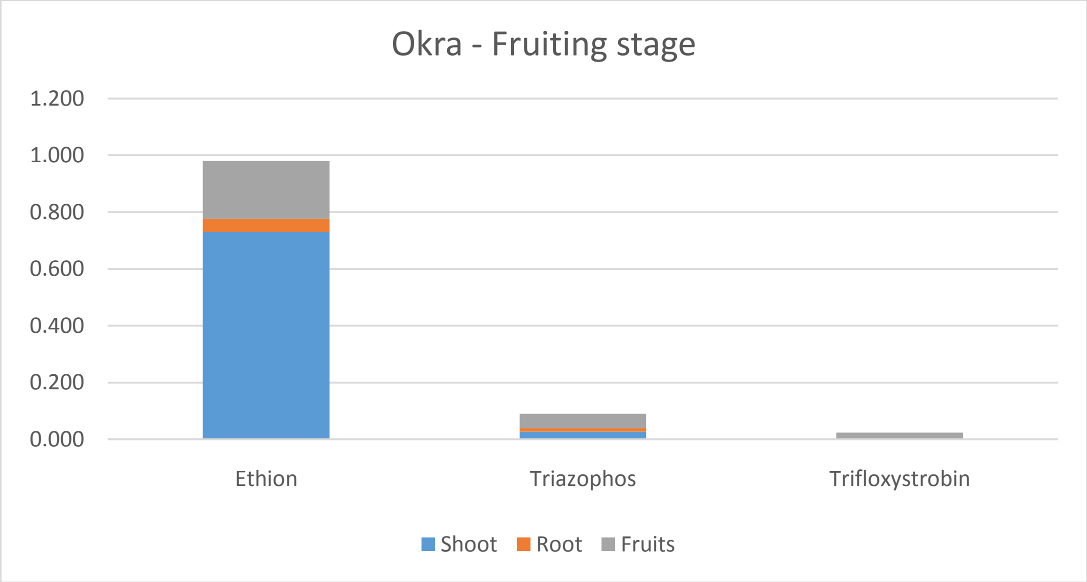
Pesticide residues found in the fruits of okra were in the order of Ethion>Triazophos>Trifloxystrobin. All the three molecules detected in the okra fruits were above the EU MRL levels. Similarly organochlorine, organophosphorous and synthetic pyrethroid residue were observed by Singh et al., 2006; and Jabir et al., 2014 in vegetables.

**Table 3:** Pesticide residues in fruiting stage of okra crop

| Fruiting stage | | Ethion | Triazophos | Trifloxystrobin |
|---|---|---|---|---|
| Shoot | Mean | 0.730 | 0.027 | BLQ |
| | Standard Deviation | 0.387 | 0.006 | |
| Root | Mean | 0.047 | 0.013 | BLQ |
| | Standard Deviation | 0.015 | 0.006 | |
| Fruits | Mean | 0.203 | 0.050 | 0.023 |
| | Standard Deviation | 0.021 | 0.052 | 0.006 |

BLQ : Below the Limit of Quantification (0.01)

**Fig 3**: Pesticide residues with in the shoots and roots of okra during fruiting stage.




Human Consumption:

From the residue data in the fruit samples of okraas vegetable is allowed and consumption of these okra vegetables are not hazardous to humans. As the TMRC (Theoretical maximum residue concentration) residue level 0.0025, 0.0012 and 0.0102 mg/person/daycompared to MPI (maximum permissible Intake) of 0.06, 6, 0.12 0.06 mg/person/day for triazophos, trifloxystrobin and ethion respectively, considering average daily consumption of okraat150g per person per day. Total vegetable consumption per Indian adult is 400 gm (Narsingarao 2013). Similar observation was found by Ock et al., 2003 during the study on finding the risks of food intake in Korea.Osei et al., 2015 observed organochlorine and organophosphorous residues in okra fruits were above MRLs in Kumasi.

**Table 3:** Pesticide residues in fruiting stage of okra crop

| | Pesticide residue (mg/kg) | Standard Deviation | TMRC (mg/ person/ day) | MPI (mg/ person/ day) | ADI (mg/kg bw) |
|---|---|---|---|---|---|
| Triazophos | 0.05 | ± 0.052 | 0.0025 | 0.06 | 0.001 |
| Trifloxystrobin | 0.023 | ± 0.006 | 0.0012 | 6 | 0.1 |
| Ethion | 0.203 | ± 0.021 | 0.0102 | 0.12 | 0.002 |

TMRC (Theoretical maximum residue concentration in mg/person /day) = Residue x Average daily consumption (150g)
MPI (Maximum Permissible Intake in mg/person/day) = ADI x Average body weight (60 Kg)
ADI (Acceptable Daily Intake) mg/kg bw by PPDB

## IV. CONCLUSION

From the study it is concluded that presence of organophosphorous and strobilurin residues were present in okra crop during all the growing stages (vegetative, flowering and fruiting stages) and the presence of residues in the shoot (Above soil) part is high compared to roots (Below soil). Residue concentration in okra fruits are in decreasing order of Ethion>Triazophos>Trifloxystrobin.
Residual concentration in okra fruits are higher than EU MRL for Triazophos>Ethion>Trifloxystrobin and consuming these vegetable are non-hazardous as TMRC is lower than MPI at 150gm/person/day.

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