

Original Research Article

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Evaluation of Different Decontamination Studies of Imidacloprid 17.8 SL on Okra

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ABSTRACT

Okra is the major crop grown all over India. India is the largest producer of okra in the world with the largest productivity. The crop is susceptible to a wide range of sucking pests hence there is an indiscriminate usage of pesticide on okra. A detailed survey was conducted to analyze the pest and pesticide status of okra growing farmers of Tirunelveli and Thoothukudi districts. The survey reported that the higher number of farmers was found to use imidacloprid 17.8 SL for the management of sucking pests on okra. Different decontamination studies were carried out to evaluate a suitable decontamination method for the imidacloprid residues on okra. The different treatments employed were washing in tap water for 2 min. (T1), washing in tap water for 2 mins. + Dipping in 2 per cent salt solution for 30 sec. (T2), washing in tap water for 2 mins. + Dipping in 2 per cent tamarind solution for 30 sec. (T3), washing in tap water for 2 mins. + Dipping in 2 per cent salt solution for 30 sec. + cooking for 10 mins. (T4), washing in tap water for 2 mins. + Dipping in 2 per cent tamarind solution for 30 sec. + cooking in 10 mins. (T5), washing in tap water for 2 mins. + cooking for 10 mins. (T6) and untreated sample (T7). The extraction and clean up were done using QuEChERS method. The analysis of samples was done using UHPLC (Ultra High Performance Liquid Chromatography) with photo diode array detector. From the experiment conducted, the results indicated that the mean initial deposit of imidacloprid residue detected in untreated sample was detected to be 0.29 $\mu\text{g g}^{-1}$. The mean residue level decreased to 0.16, 0.12, 0.13, 0.05, 0.05 and 0.08 $\mu\text{g g}^{-1}$ after different processes like washing in tap water, dipping in 2 per cent salt solution, dipping in 2 per cent tamarind solution, dipping in 2 per cent salt solution followed by cooking, dipping in 2 per cent tamarind solution followed by cooking and cooking alone. The treatments T4 and T5 showed the highest decontamination percentage of 84.59 and 83.91 mean per cent, respectively.

Keywords

Decontamination studies, Imidacloprid, Okra

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Introduction

Okra (*Abelmoschus esculentus* (L) Moench) is one of the major cultivated crops in India. India is the largest producer of okra in the world with the highest productivity. Okra is susceptible to a wide range of sucking pests and borers, due to which there has been an indiscriminative usage of pesticides on okra. The usage of pesticides at flowering and fruiting stages and non-adoption of safe harvest waiting period leads to accumulation of pesticide residues in consumable fruits which may lead to multiple health complexities. Hence, proper decontamination methods have to be developed to reduce the insecticide residues in vegetables for safe consumption.

Materials and Methods

From the survey conducted among the okra growing farmers of Tirunelveli and Thoothukudi districts of Tamil Nadu, it was found that imidacloprid was commonly preferred by the okra growing farmers for the management of sucking pests of okra. To analyze the dissipation and decontamination activity of imidacloprid 17.8 SL a supervised plot was observed at Kaliyavoor village of Thoothukudi district. Okra fruits were collected from the plot and analyzed. The spraying of imidacloprid 17.8 SL was given at recommended dose (20 g a.i. ha⁻¹) for evaluating the different decontamination methods on okra.

The QuChERS (Quick, Easy, Cheap, Effective, Rugged and Safe) method was adopted to analyze the residues of imidacloprid on okra. The okra samples were collected at regular interval from the day of till the residues become Below Detectable Limit (BDL). The imidacloprid residues in okra were carried out using Ultra High Performance Liquid Chromatography

(UHPLC) with photo diode array detector.

Sampling and extraction

One kilogram of okra fruit samples was collected randomly from each imidacloprid treated plot at 0 (one hour after spraying) after application. The tip and stalk portions of the okra were cut and removed. A sub sample of 500g was drawn by quartering method and homogenized with a mixer grinder. A representative sample of 10 g was taken in a 50 ml centrifuge tube and mixed using a vortexer for one minute after adding 20 ml acetonitrile. About four gram anhydrous magnesium sulphate (MgSO₄) and one gram of sodium chloride (NaCl) were subsequently added and again shaken well by vortexer, then centrifuged at 6000 rpm for 10 minutes.

Clean-up

After centrifuging, nine ml of supernatant was transferred to test tube containing anhydrous magnesium sulphate (MgSO₄). From which six ml of the supernatant aliquot was transferred into a 15 ml centrifuge tube containing 100 mg Primary Secondary Amine (PSA), 600 mg anhydrous magnesium sulphate (MgSO₄) and 10 mg Graphitized Carbon Black (GCB). The mixture is vortexed for one minute and then centrifuged at 3000 rpm for 10 minutes. The upper extract of four ml was transferred into a heating mantle in a glass vial and concentrated near to dryness. The final volume was reconstituted to about one ml and transferred into a 1.5 ml glass vial by filtering through 0.2µm syringe filter for analysis in UHPLC.

Evaluation of different decontamination methods

Different decontamination methods were employed to evaluate the degradation of imidacloprid on okra fruits under laboratory

conditions. Different treatments with three replicates were evaluated (Table 1).

Results and Discussion

The results indicated that the mean initial deposit of imidacloprid residue detected in untreated sample was detected to be 0.29 $\mu\text{g g}^{-1}$. The mean residue level decreased to 0.16, 0.12, 0.13, 0.05, 0.05 and 0.08 $\mu\text{g g}^{-1}$ after different processes like washing in tap water, dipping in 2 per cent salt solution, dipping in 2 per cent tamarind solution, dipping in 2 per cent salt solution followed by cooking, dipping in 2 per cent tamarind solution followed by cooking and cooking alone.

From the different decontamination methods evaluated on imidacloprid, it was concluded that the treatment T4 (washing in tap water for 2 mins + dipping in 2 per cent salt solution for 30 secs + cooking for 10 mins) showed the higher degradation of imidacloprid of 84.59 mean per cent, which was followed by

treatment T5 (washing in tap water for 2 mins + dipping in 2 per cent tamarind solution for 30 secs + cooking for 10 mins) (83.91%). This was followed by washing in tap water for 2 mins + cooking for 10 mins (73.41%), washing in tap water for 2 mins + dipping in 2 per cent salt solution for 30 secs (57.45%) and washing in tap water for 2 mins + dipping in 2 per cent tamarind solution for 30 secs (54.88%). The treatment with washing the fruit samples only with tap water showed the least reduction in initial concentration of residue of 44.97 mean percent (Table 2).

The Maximum Residue Limit (MRL) for imidacloprid on okra given by Food Safety Standards Authority of India (FSSAI), Codex MRL was 2.0 $\mu\text{g g}^{-1}$. The mean initial deposit of imidacloprid 17.8 SL (0.29 and 0.43 $\mu\text{g g}^{-1}$) were below the Maximum Residual Limit (MRL) in both recommended and double the recommended dose and their waiting periods were also found to be within one day.

Table.1 Different treatments evaluated for decontamination studies

Treatment	Decontamination method	Time
T1	Tap water wash	2 minutes
T2	Tap water wash + Dipping in 2 per cent salt solution	2 secs + 30 secs
T3	Tap water wash + Dipping in 2 per cent tamarind solution	2 secs + 30 secs
T4	Tap water wash + Dipping in 2 per cent salt solution + Cooking	2 mins + 30 secs + 10 mins
T5	Tap water wash + Dipping in 2 per cent tamarind solution + Cooking	2 mins + 30 secs + 10 mins
T6	Tap water washig + cooking	2 mins + 10 mins
T7	Untreated sample	-

Table.2 Effect of decontamination methods on residues of imidacloprid @ 20 g a.i. ha⁻¹ on okra fruits

Treatment No.	Treatment details	Residues in $\mu\text{g g}^{-1}$			Residues ($\mu\text{g g}^{-1}$)*	Per cent reduction of residues
		R1	R2	R3		
T7	Control (Initial deposit)	0.28	0.26	0.32	0.29	-
T1	Tap water washing for 2 min.	0.16	0.15	0.18	0.16	44.97
T2	Tap water washing for 2 min. + Dipping in 2 per cent salt solution for 30 sec.	0.15	0.10	0.12	0.12	57.45
T3	Tap water washing for 2 min. + Dipping in 2 per cent tamarind solution for 30 sec.	0.16	0.15	0.18	0.13	54.88
T4	Tap water washing for 2 min. + Dipping in 2 per cent salt solution for 30 sec. + cooking for 10 min.	0.04	0.04	0.05	0.05	84.59
T5	Tap water washing for 2 min. + Dipping in 2 per cent tamarind solution for 30 sec. + cooking for 10 min.	0.04	0.04	0.06	0.05	83.91
T6	Tap water washing for 2 min. + cooking for 10 min.	0.08	0.07	0.09	0.08	73.41

It was observed that The residues of imidacloprid on okra fruit of $0.29 \mu\text{g g}^{-1}$ was brought down to $0.05 \mu\text{g g}^{-1}$ and there is substantial reduction of 84.59 per cent after treatment, when subjected to the combination of tap water washing for 2 min., dipping in 2 per cent salt water solution for 30 sec. and cooking for 10 min. Equal amount of reduction ($0.05 \mu\text{g g}^{-1}$) in residue was observed when okra was subjected to combination of tap water washing for 2 minutes, dipping in 2 per cent tamarind water solution for 30 seconds and cooking for 10 minutes. It could be concluded that the treatment T4 followed by T3 were effective among the various degradation methods employed for the decontamination experiments.

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