



DECONTAMINATION OF PROFENOPHOS AND BIFENTHRIN RESIDUES IN CABBAGE  
(*BRASSICA OLERACEA VAR. CAPITATA*)

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ARTICLE INFO

Article History:

Received 05<sup>th</sup> July, 2014  
Received in revised form  
16<sup>th</sup> August, 2014  
Accepted 18<sup>th</sup> September, 2014  
Published online 25<sup>th</sup> October, 2014

Key words:

Insecticides,  
Initial deposit and dissipation outer top  
Three,  
Leaves.

ABSTRACT

An experiment was conducted in cabbage utilizing the insecticides profenophos 50 EC (1000g a.i.ha<sup>-1</sup>) and bifenthrin 10 EC (100 g a.i.ha<sup>-1</sup>) by spraying on cabbage at head initiation stage followed by another spray after 10 days and the samples were collected at 0, 5, 10, 15 and 20 days after last spray and analyzed. The initial deposits of 0.99 mg kg<sup>-1</sup> profenophos recorded at 2 hours after last spray dissipated to 0.16 mg kg<sup>-1</sup> by 5 days and below determination level (BDL) by 10<sup>th</sup> day. By removing outer top three layers the initial deposits of 0.08 mg kg<sup>-1</sup> profenophos recorded at 2 hours after last spray dissipated to below determination level (BDL) by 5<sup>th</sup> day. The initial deposits of 2.24 mg kg<sup>-1</sup> of bifenthrin recorded at 2 hours after last spray dissipated to 0.82 mg kg<sup>-1</sup> by 5 days after last spray and below determination level (BDL) by 10<sup>th</sup> day. By removing outer top three layers the initial deposits of 1.66 mg kg<sup>-1</sup> of bifenthrin recorded at 2 hours after last spray dissipated to below determination level (BDL) by 5<sup>th</sup> day.

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INTRODUCTION

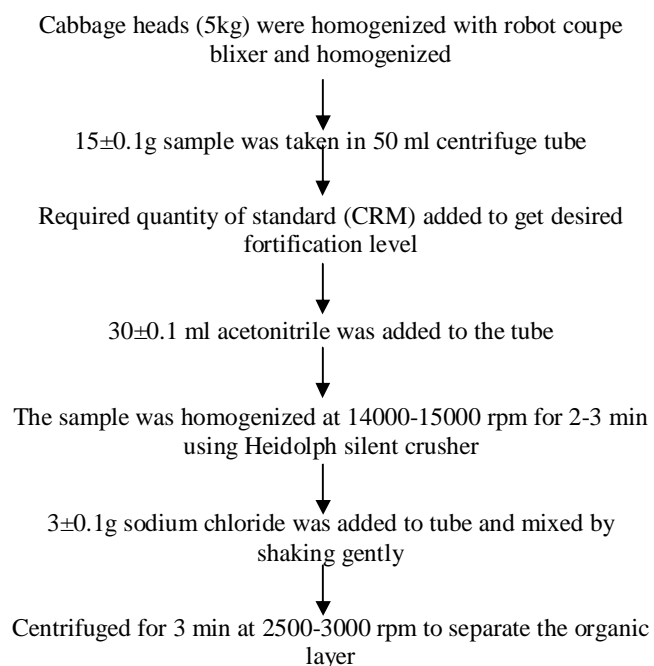
Cabbage (*Brassica oleracea var. capitata L.*) is the second important cruciferous vegetable crop in the world. In India, it is cultivated in an area of 0.369 m ha with an average annual production of 7.949 m MT and productivity of 21.5 MT ha<sup>-1</sup>. The major cabbage producing states are Maharashtra, Bihar, Karnataka, Orissa, West Bengal and Andhra Pradesh, whereas West Bengal ranks first both in area and production with 0.0753 m ha and 2.087 m MT, respectively (NHB, 2011). Despite the advantages of usage of insecticides, the irrational use of insecticides is leading to adverse effects like environmental pollution and harmful effects on non target organisms especially to human beings in the form of residues. Insecticide residues being toxic to consumers, the need to ensure safety of food from pesticide contamination has made pesticide residue research one of the important aspects of agricultural research

MATERIALS AND METHODS

The experiment was laid out with three replications by spraying chemicals profenophos 50 EC at 1000 g a.i.ha<sup>-1</sup> and bifenthrin 10 EC at 100 g a.i.ha<sup>-1</sup> and the dissipation studies conducted by collecting cabbage samples at regular intervals i.e. 0, 5, 10, 15 and 20 days after last spray in polythene bags

and brought to the laboratory immediately for further sample processing in the laboratory as detailed here under and also analyzed by removing top three layers for decontamination purpose.

EXTRACTION AND CLEAN –UP



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↓  
 The top organic layer of about 16 ml was taken into the 50 ml centrifuge tube  
 ↓  
 9±0.1 g anhydrous sodium sulphate was added to remove the moisture content  
 ↓  
 8 ml of extract was taken in to 15 ml tube containing 0.4±0.01g PSA sorbent (for dispersive solid phase d-SPE cleanup) and 1.2±0.01 gr anhydrous magnesium sulphate  
 ↓  
 The sample tube was vortexed for 30 sec followed by centrifugation for 5 min at 2500-3000 rpm  
 ↓  
 The extract of about 2ml was transferred into test tubes and evaporated to dryness using turbovap with nitrogen gas and reconstituted with 1ml n-Hexane: Acetone (9:1) for GC analysis with ECD and TSD for profenophos and bifenthrin analysis.

## RESULTS AND DISCUSSION

Initial deposits of 0.99 mg kg<sup>-1</sup>, profenophos were detected at 2 hours after last spray, which dissipated to Below Determination Level (BDL) of 0.05 mg kg<sup>-1</sup>, by 10<sup>th</sup> day after last spraying on cabbage (Table-1).

The initial deposits dissipated to 0.16 mg kg<sup>-1</sup> by 5 days after last spray. From the Cabbage samples collected at 0 days top three leaves were removed and 0.08 mg kg<sup>-1</sup> residues were found indicating that 91.91% of residues are removed from cabbage. The initial deposits of 2.24 mg kg<sup>-1</sup> bifenthrin recorded at 2 hours after last spray dissipated to 0.82 mg kg<sup>-1</sup> by 5 days after last spray and below determination level (BDL) by 10<sup>th</sup> day (Table-2).

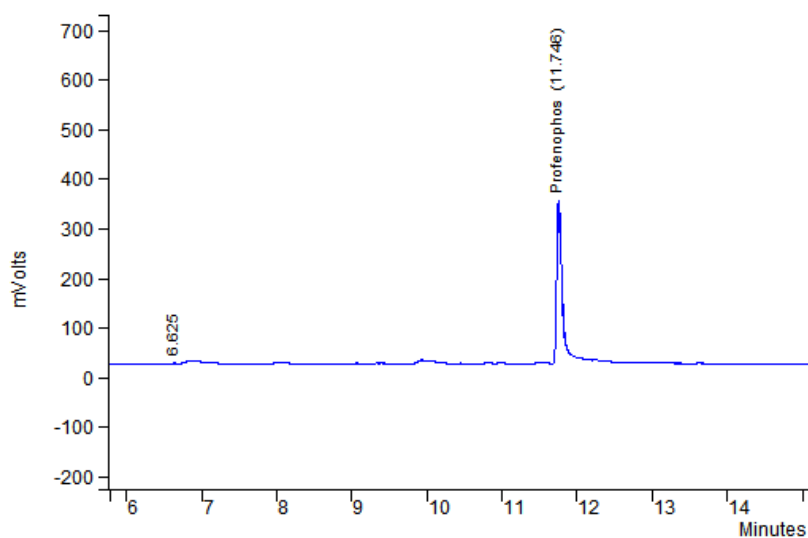
From the Cabbage samples collected at 0 day removed top three leaves were removed and 1.66 mg kg<sup>-1</sup> residues were detected which indicated that 25.90 % of residues were removed from cabbage.

**Table 1. Decontamination of Profenophos (1000 g a.i.ha<sup>-1</sup>) residues in cabbage**

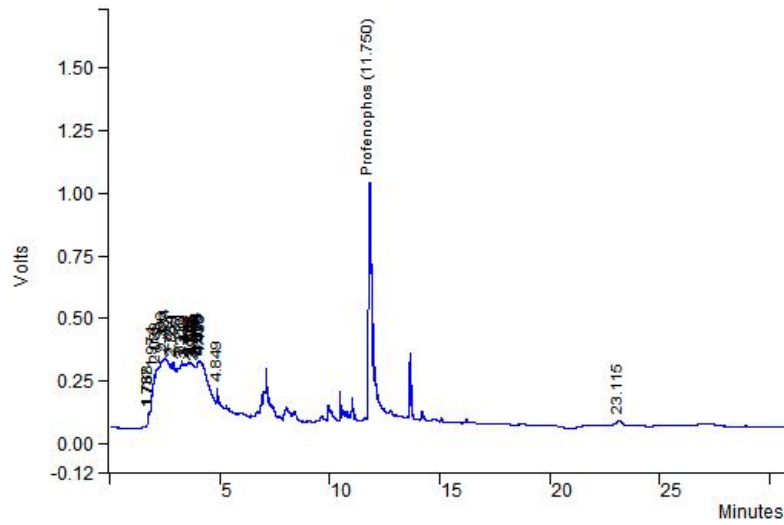
Processing procedure	0 days after spraying		5 days after spraying	
	Residues (mg/kg)	Per cent removal	Residues (mg/kg)	Per cent removal
Initial residues	0.99	0	0.16	83.84
After Removal of top three layers	0.08	91.91	0	100

**Table 2. Decontamination of bifenthrin (100 g a.i.ha<sup>-1</sup>) residues on cabbage**

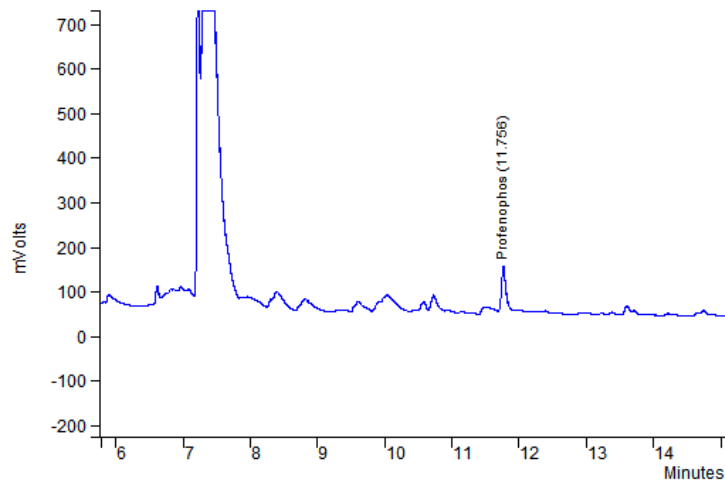
Processing procedure	0 days after spraying		5 days after spraying	
	Residues (mg/kg)	Per cent removal	Residues (mg/kg)	Per cent removal
Initial residues	2.24	0	0.82	63.39
After Removal of top three layers	1.66	25.90	0	100



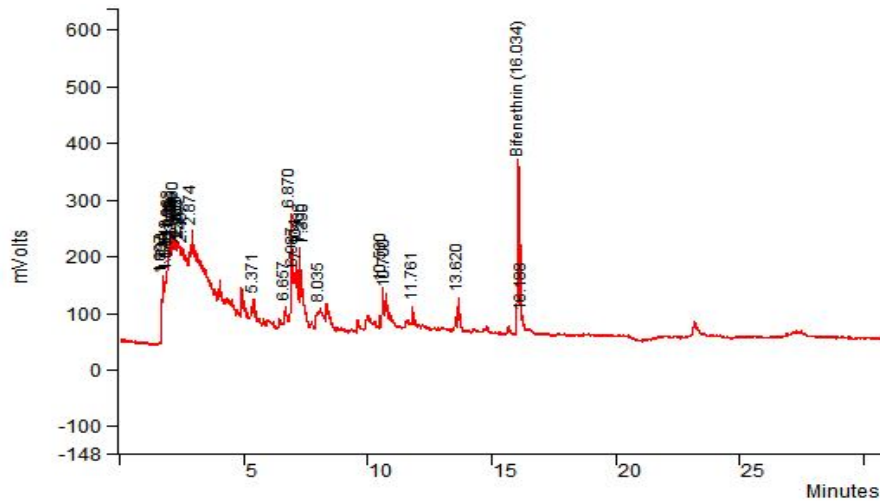
**Chromatogram of profenophos in zero day sample in normal method**



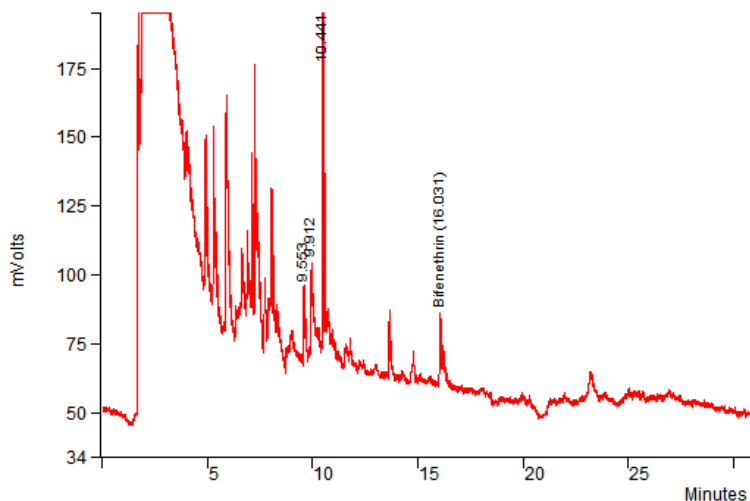
Chromatogram of profenophos in fifth day sample in normal method



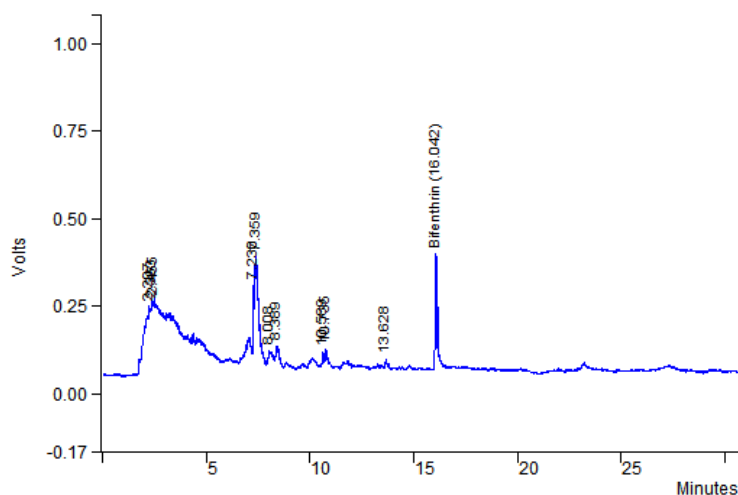
Chromatogram of profenophos in zero day sample after removing top 3 leaves



Chromatogram of bifenthrin in zero day sample in normal method



Chromatogram of bifenthrin in fifth day sample in normal method



Chromatogram of bifenthrin in zero day sample after removing top 3 leaves

The present results are in agreement with the findings of Malla Reddy (2003) who reported that profenophos at 0.05% sprayed on cabbage heads, had very low initial deposits of  $0.91 \text{ mg kg}^{-1}$ , i.e., less than the MRL value of  $1.00 \text{ mg kg}^{-1}$  with a waiting period of one day. The residues of profenophos (0.05%) dissipated from cabbage heads to an extent of 93.40% in ten days after spraying. The removal of upper most layer on cabbage heads and subsequent water washings reduced the initial deposit of profenophos to an extent of 91.20%. The results of the present studies are in agreement with the findings of Reddy *et al.* (2007) who studied the dissipation of profenofos ( $0.1\% \text{ a.i.ha}^{-1}$ ) on chillies sprayed at 15 days interval, starting from 45 days after transplanting and recorded initial deposits of profenophos  $0.36 \text{ mg kg}^{-1}$  after last spray which dissipated to  $0.02 \text{ mg kg}^{-1}$  by 30 days amounting to loss of 92.4%. These levels were reduced to below determination level (BDL) after 15 days of application. Maximum Residue Limit for bifenthrin in cabbage as per European Union (EU) is  $1.0 \text{ mg kg}^{-1}$ , and the calculated safe waiting period 1.34 days based on dissipation pattern data. Hence, a safe waiting period

of 2 days is recommended. Maximum Residue Limit for bifenthrin in cabbage as per Codex Alimentarius Commission (CAC(1998)  $0.40 \text{ mg kg}^{-1}$ , and the calculated safe waiting period 2.89 days based on dissipation pattern data. Hence, a safe waiting period of 3 days is recommended. The half life of bifenthrin on cabbage was 2.70 days.

## REFERENCES

- Codex alimentarius 1998. Maximum residue limits (MRL) valiums – *Codex alimentarius* Volume 2B 533pp
- Malla Reddy, K. 2003. Bio-efficacy and dissipation of certain insecticides on pests of cabbage. *M.Sc (Ag.) Thesis*. Acharya N G Ranga Agricultural University, Hyderabad, India.
- National Horticultural Board. *Annual report 2011*.P 184-187.
- Reddy, K. D. Reddy, K. N. Mahalingappa, P. B. 2007. Dissipation of fipronil and profenofos residues in chillies (*Capsicum annum L.*). *Pesticide Research Journal*, 19: 1, 106-107.

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