Int.J.Curr.Microbiol.App.Sci (2017) *6*(8): 669-674

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 8 (2017) pp. 669-674**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.608.084

Dissipation Pattern of Profenophos on Dolichos Bean

S. Srinivasa Reddy*, C. Narendra Reddy, C. Srinivas, A. Manohar Rao and S. Narendar Reddy

College of Agriculture, PJTSAU, Rajendranagar, Hyderabad-500 030, T.S., India
**Corresponding author*

Keywords

Insecticides, thrips, initial deposit, efficacy and dissipation.

Article Info

Accepted:
04 June 2017
Available Online:
10 August 2017

A B S T R A C T

An experiment was conducted during *kharif*, 2015 to evaluate the efficacy of eight insecticides *viz.*, fipronil 5% SC, flubendamide 480% SC, chlorantraniliprole 20% SC, bifenthrin 10% EC, profenophos 50% EC, lambda cyhalothrin 5% SC, imidacloprid 17.8 % SL and beta cyfluthrin + imidacloprid 300 OD were studied byspraying thrice replicated thrice in randomized block design on field bean @ 500 g a.i ha^{-1}, 60 g a.i ha^{-1}, 30 g a.i ha^{-1}, 812 g a.i ha^{-1}, 400 g a.i ha^{-1}, 15.63g a.i ha^{-1}, 25 g a.i $ha^{-1}$and 30 g a.i ha^{-1}, respectively. Against major insect pests of field bean. The dissipation pattern of profenophos 50 EC (400 g a.i.ha^{-1}) was studied collecting samples at regular intervals *i.e.* 0, 1, 3, 5, 7, 10 and 15days after last spray and analyzed. The initial deposits of 3.23 mg kg^{-1}profenophos recorded at 2 hours after last spray dissipated to 1.68, 0.94, 0.58 and 0.19 mg kg^{-1} at 1, 3, 5 and 7 days, after last spray respectively and below determination level (BDL) by 10th day.

Introduction

Pulse crops belong to the family Leguminosae and subfamilies Papilionoideae, Caesalpinoideae and Mimosoideae. They were narrated as the jewels of Indian agriculture, in view of their unique capacity to fill the dietary requirements of protein to thirsty population of rural India, besides their sustainable character through replenishing soil fertility. The average protein content varies from 18 to 26 per cent. *Lablab purpureus* (L.) Sweet. Popularly known as field bean, hyacinth bean, dolichos bean, country bean, butter bean, and Indian bean which is an important pulse cum vegetable crop in India and is cultivated extensively in recent past for its fresh tender pods, leaves and seeds and as cattle feed. The fresh and dried seeds constitute major vegetarian source of proteins in the human diet of Indians.

The field bean fresh pods are acceptable and liked by all, especially during winter season under South Indian conditions and it is rich in nutritive value as it is a rich source of carbohydrates, minerals, vitamins, such as vitamin A, vitamin C, fat and fiber. The protein content of field bean is quite high varying from 20.0 to 28.0 per cent (Schaaffhausen, 1963). However, some of these insecticides leave residues on pods and these residues may persist up to harvest. Presence of pesticide residues in the harvested

beans was posing problem at the time of export and in recent times importing countries have rejected few consignments. Pesticide use has increased rapidly over the last two decades at the rate of 12 per cent per year.

The extensive and irrational use of pesticides resulted in the presence of residues of insecticides on beans is likely to be associated with severe effects on human health. Hence, great significance has to be given to estimate pesticide residues in beans.

Materials and Methods

The experiment was laid out in a Randomized Block Design (RBD) with 9 treatments including untreated control replicated thrice with individual plot size of 20 m^2 (5mx4 m) and the insecticides *viz.*, fipronil 5% SC, flubendamide 480% SC, chlorantraniliprole 20% SC, bifenthrin 10% EC, profenophos 50% EC, lambda cyhalothrin 5% SC, imidacloprid 17.8 % SL and beta cyfluthrin + imidacloprid 300 OD were studied by spraying thrice replicated thrice in randomized block design on field bean @ 500 g a.i ha^{-1}, 60 g a.i ha^{-1}, 30 g a.i ha^{-1}, 812 g a.i ha^{-1}, 400 g a.i ha^{-1}, 15.63g a.i ha^{-1}, 25 g a.i ha^{-1} and 30 g a.i ha^{-1}, respectively on field bean first at 50% flowering and the second and third spray ten days later to evaluate the efficacy against major insect pests and the dissipation studies were conducted for the same by collecting samples at regular intervals *i.e.* 0, 1, 3, 5, 7, 10 and 15 days after last spray in polythene bags and brought to the laboratory immediately for further sample processing in the laboratory as detailed here under.

Fortification and recovery results of profenophos on beans

Field bean samples fortified with profenophos at 0.05 mg kg^{-1}, 0.25 mg kg^{-1} and 0.5 mg kg^{-1} were analysed under GC- ECD and the mean recovery of the residues using the method was 98.25, 103.08 and 107.69 per cent, respectively (Table 2). The results shown that the method was suitable for the analysis of profenophos residues up to 0.05 mg kg^{-1}, and the limit of quantification (LOQ) was0.05 mg kg^{-1}.

Hence, the method described above is suitable for the analysis of samples collected from the field sprayed with profenophos residues to study the residue dynamics / dissipation pattern.

Samples of beans were collected from profenophos @ 400 g a.i./ha sprayed plots at regular intervals i.e. 0, 1, 3, 5, 7, 10 and 15 days after last spray, and analysed for residues following the validated methods. Residues (mg kg^{-1}) were calculated using the formula given below.

$$\text{Residues (mg kg}^{-1}\text{)} = \frac{\text{Sample peak area X conc. of std (ppm) X µl std. injected X Final volume of the sample (2 ml)}}{\text{Standard Peak area X weight of Sample Analysed (2 g) X µl of sample injected}} \text{ X recovery factor}$$

The following parameters were calculated to know the dissipation pattern of the insecticides on cabbage.

Dissipation percentage

$$\text{Per cent dissipation} = \frac{\text{Initial deposit - Residues at given time}}{\text{Initial deposit}} \text{ X } 100$$

Waiting period

Waiting period (T_{tol}) is defined as the minimum number of days to

lapse before the insecticide reaches the tolerance limit. The waiting periods were calculated by the following formula.

$$T_{tol} = \frac{[a - \text{Log tol}]}{b}$$

Where,

T_{tol} = Minimum time (in days) required for the pesticide residue to reach below the tolerance limit.

a = Log of apparent initial deposits obtained in the regression equation (Y = a+bX)

tol = Tolerance limit of the insecticide (MRL)

b = Slope of the regression line

Results and Discussion

Profenophos 50% EC @ 400 g a.i $ha^{-1}$was sprayed thrice at flowering to pod formation stage and green pod samples were collected at regular intervals at zero (2 hours after spray), 1, 3, 5, 7, 10 and 15 days after third spray on field bean. The field bean green pod samples were processed and estimated for residues of profenophos on Gas Chromatography (GC-ECD) (Table 1). Dissipation pattern of profenophos presented in table 3 and depicted in figure 1. The results of profenophos residues showed that the initial deposits of 3.23 mg kg^{-1} were detected on field bean pods. The residues recorded at 1, 3, 5 and 7^{th} day after third spraying were found to be 1.68, 0.94, 0.58 and 0.19 mg kg^{-1}, respectively and showing a dissipation per cent of 42.99, 70.90, 82.04 and 94.12, respectively. The residues were below detectable level (BDL) after 10 days showing 100 per cent dissipation. The regression equation was Y= 2.539+ (-0.3797) X with R^2 of 0.8229.

The maximum residue level (MRL) values were not available for profenophos in field bean by either Codex Alimentarius Commission (CAC) or by Food Safety and Standards Authority of India (FSSAI), hence the day at which the residues reached below detectable level (10 days)was considered as waiting period.

The results were in concurrence with Jain and Gupta (2012) who evaluated the dissipation pattern on pigeonpea crop with different insecticides and found that initial deposits of profenophos 3.8524 to 6.0151 ppm on leaves, 3.2865 to 5.0152 ppm on pods and waiting periods were 6.54 to 8.78 days (leaves) and 6.30 to 8.48 days (pods) for profenophos.

Table.1 Gas chromatograph parameters

Gas Chromatograph	Gas Chromatography- AGILENT- 7890B
Column	VF-5ms Capillary Column 30 m length, 0.25 mm Internal Diameter, 0.25 □ m film thickness; 1% methyl siloxane
Column Oven (^{0}C)	Profenophos - Initial 150ºC for 1 min - increase @ 20ºC/min upto250ºC – hold for 9mins.
Detectors	Electron Capture Detector (ECD)
Detector Temperature (^{0}C)	300
Injector Temperature (^{0}C)	280
Injector Status	Split Ratio: 1:2
Carrier Gas	Nitrogen, Iolar II, Purity 99.999%
Carrier Gas Flow (ml min^{-1})	2
Make-up Flow (ml min^{-1})	25
Retention time (min)	Profenophos 11.87

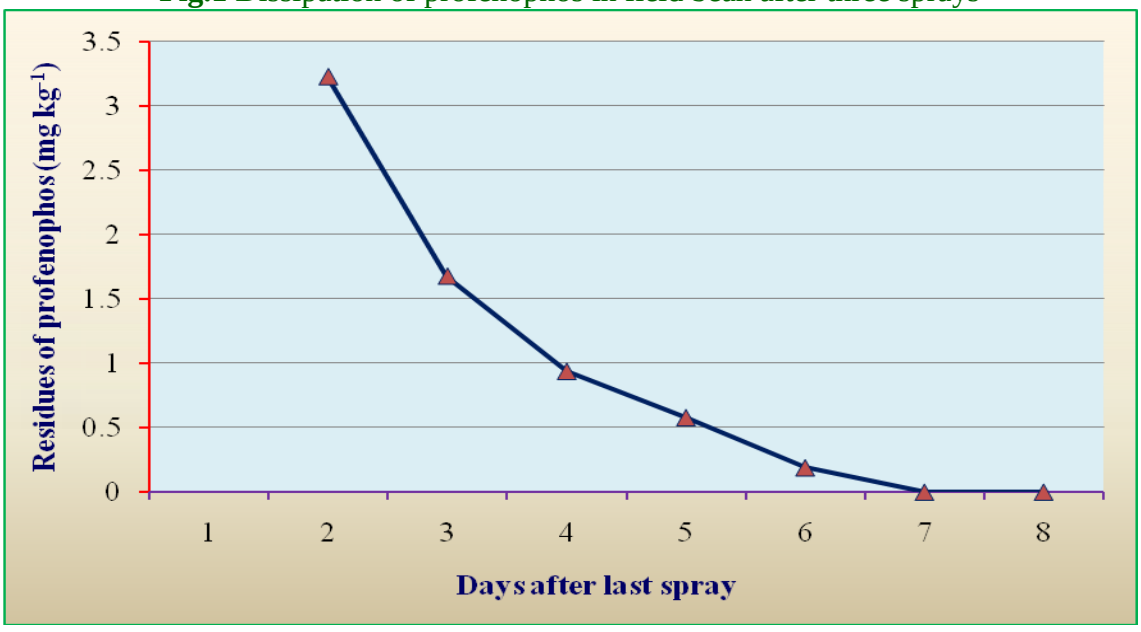
Table.2 Recovery of profenophos residues in field bean

Details	Recoveries of profenophos from fortified field bean samples					
	Fortified level					
	0.05 mg kg^{-1}		0.25 mg kg^{-1}		0.5 mg kg^{-1}	
	Residues recovered (mg kg-1)	Recovery %	Residues recovered (mg kg-1)	Recovery %	Residues recovered (mg kg-1)	Recovery %
R1	0.051	101.31	0.259	103.65	0.539	107.86
R2	0.049	97.59	0.267	106.91	0.535	107.00
R3	0.048	95.86	0.247	98.70	0.541	108.21
Mean		98.25		103.08		107.69
SD		2.783		4.137		0.62
RSD		2.832		4.01		0.57

Table.3 Dissipation of profenophos 50% EC (400 g a.i. ha-1) in field bean after three sprays

Days after last spray	**Residues of profenophos (mg kg^{-1})**				**Dissipation %**
	R1	**R2**	**R3**	**Average**	
0	3.21	3.25	3.22	3.23	--
1	1.65	1.68	1.7	1.68	42.99
3	0.96	0.95	0.92	0.94	70.90
5	0.58	0.56	0.59	0.58	82.04
7	0.19	0.18	0.21	0.19	94.12
10	BDL	BDL	BDL	BDL	100
15	BDL	BDL	BDL	BDL	100
Regression equation	Y = 2.539 + (-0.3797) X				
R^2	0.8229				
MRL	NA				
Safe waiting period	10 days				
BDL- Below Determination Level NA- Not Available					

Fig.1 Dissipation of profenophos in field bean after three sprays



Extraction and Clean –Up

Beans (5kg) were homogenized with robot coupe blixer and homogenized

↓

15±0.1g sample was taken in 50 ml centrifuge tube

↓

Required quantity of standard (CRM) added to get desired fortification level

↓

30±0.1 ml acetonitrile was added to the tube

↓

The sample was homogenized at 14000-15000 rpm for 2-3 min

Using Heidolph silent crusher

↓

3±0.1g sodium chloride was added to tube and mixed by shaking gently

↓

Centrifuged for 3 min at 2500-3000 rpm to separate the organic layer

↓

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 vertexed 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 for profenophos analysis.

Raghu *et al.*, (2014) reported that in chilli, 3.71and 2.24 mg kg^{-1} initial deposits were recorded in the poly house and the open field, respectively when profenophos 50 EC was sprayed @ 500 g a.i. ha^{-1}. Residues were found upto 10 and 7 days in the poly house and open field, respectively.

Priyadarshini *et al.*, (2017) recorded dissipation pattern profenophos 50 EC at 500 g a.i. ha^{-1} on curry leaf variety Suwasini and found the initial deposit of profenophos was 19.83 mg kg^{-1} after second spray. The residues reached to below determination level (BDL) at 25^{th} day. The variation in initial deposit of profenophos in the present study may be due to variation in dose, climatic conditions and matrix.

According to Khay *et al.*, (2008) the initial deposits and dissipation vary from crop to crop depending up on the crop canopy, season, age of the crop, sample matrix, surface area of sample and dosage applied etc., and the same can be witnessed based on the test reports published by Radwan *et al.*, 2004 and Priyadarshini *et al.*, (2017) on various crops at different doses.

References

Jain, D.K and Gupta, H.C.L. 2012. Comparative assessment of insecticides in/on pigeonpea. *Pestology*. 36(5): 21-25.

Khay, S., Choi, J.H and Abd El-Aty, M.A. 2008.Dissipation behavior of lufenuron, benzoyl phenyl urea insecticides, in/on Chinese cabbage applied by foliar spraying under greenhouse conditions. *Bulletin of Environmental Contamination and Toxicology*.81: 369-372.

Priyadarshini, G., Shashi, V., Reddy, C.N and Swarupa, S. 2017. Dissipation pattern of ethion and profenophos in curry leaf. *Journal of Global Biosciences*. 6(1): 4661-4665.

Radwan, M.A., Shiboob, M.H., Abu-Elamayem, M.M and Abdel-Aal, A. 2004.Residues of pirimiphos-methyl and profenofos on green pepper and eggplant fruit and their effects on some quality properties. Emirates Journal of Agriculture Sciences.16 (1): 32-42.

Raghu, B. 2014.Dissipation dynamics of certain insecticides in poly house and open field situations in chilli (*Capsicum annum* L.). *M. Sc. Thesis*. ANGRAU, Rajendranagar, India.

Schaaffhausen, R.V. 1963. *Dolichos lablab* or Hyacinth bean, its use for feed, food and soil improvements. *Economic Botany*. 17: 146-153.

How to cite this article:

Srinivasa Reddy, S., C. Narendra Reddy, C. Srinivas, A. Manohar Rao and Narendar Reddy, S. 2017. Dissipation Pattern of Profenophos on Dolichos Bean. *Int.J.Curr.Microbiol.App.Sci.* 6(8): 669-674. doi: https://doi.org/10.20546/ijcmas.2017.608.084