

SHORT NOTE

EFFECT OF DRYING ON THE RESIDUES OF DICOFOL, ETHION AND CYPERMETHRIN IN CHILLI (*Capsicum annum* L.)

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India is a major producer, exporter and consumer of chilli (*Capsicum annum* L.) in the world. It is an important spice cum vegetable crop extensively grown in India. It is a rich source of ascorbic acid, capsaicin and colouring matter used in pharmaceutical preparation for flavor and pungency. It has a vast potential to be processed into various forms such as sauces, ketchup, oleoresin and dehydration etc. Among them the dry power is the major form, which is largely used by the consumer. Chilli crop suffers from damage due to pests like thrips (*Scirtothrips dorsalis* Hood), aphid (*Aphis gossypii* Glover), fruit borer (*Helicoverpa armigera* Hübner), cutworm (*Agrotis ipsilon* Rott) and mite (*Polyphagotarsonemus latus* Bank). The reduction in the yield of chilli ranges from 40-70 per cent due to incidence of mites and thrips. Dicofol, ethion and cypermethrin have been recommended to control these pests (Kumar *et al.*, 2001, Amrit Phokela and Vishwanath, 2005 and Rai, *et al.*, 2008). Processing of chilli leads to increase in the concentration of the pesticides in final product. Hence, in view of the possible residue problems posed by these chemicals to the consumers, this study was taken up to find out the magnitude of increase in concentration of these insecticides (processing factor) in processed chilli so as to prescribe the suitable processing factor for chilli.

A laboratory experiment was conducted at the Agricultural Research Station, Durgapura,

Jaipur during 2006 with three treatments *viz.* dicofol (18.5 EC), ethion (50 EC) and cypermethrin (25 EC) at 0.05, 0.05 and 0.015 per cent concentration respectively, and a control replicated thrice. Fruits (1.0 kg) were dipped in aqueous solution of each pesticide solution for 20 seconds and then dried under shade. Fifty gram of the sample was drawn in the beginning to find out the initial residue level. One kilogram of fresh chilli sample from each replications was collected and residues of these pesticides were estimated on the same day to determine the initial deposits. Remaining chilli fruits from each replication were dried under shade for 25 days. These samples were then processed to powder and were subjected to residue analysis.

Extraction and Cleanup

A representative 50 g sample of fresh red chilli was extracted with 150 ml acetone using high speed blender for 2 minutes (dry chilli powder was extracted with 30 per cent water in acetone). The content was filtered through Buchner funnel and further washed with 2 x 25 ml extracting solvent. The aliquot (80 ml) was transferred to one litre separating funnel and partitioned with dichloromethane (100 ml) and n-hexane (100 ml) by vigorous shaking. Upper organic layer was dried with Na₂SO₄ and lower aqueous layer was partitioned with 2 x 100 ml dichloromethane by adding 5 g NaCl. Combined organic layer was reduced to 3 ml ensuring complete removal of dichloromethane (Agnihotri *et al.*, 1973).

The estimation of residues of all the insecticides was carried out by Gas Chromatograph (Shimadzu-2010) equipped with electron captured detector (ECD) and nitrogen phosphorus detector (NPD). Gas Chromatograph operating conditions were as follows; Temperature (°C) IP 200; Oven 180° – 2.5°C – 260°C; detector; ECD 300°C; column fused silica capillary column BP-10 (25 M length), 0.25 mm ID column. Column NPD : DB-5, length 30 m x 0.25 mm i.d., column temperature 160°C – 3°C-260°C, detector temperature 270°C, I P temperature 270°C. The retention time (min) of reported pesticides were dicofol 8.42 min, ethion 13.06 min and cypermethrin 19.14 min. The processing factor was calculated by using the following formula

$$\text{Processing factor} = \frac{\text{Residue in dry chilli powder (ug/g)}}{\text{Initial residues (ug/g) in fresh chilli fruit}}$$

To ensure and check the reliability of the analytical technique, as well as to minimize variation due to handling procedures, recovery experiments were conducted for dicofol, ethion and cypermethrin in chilli at 0.01, 0.05 and 0.10 mg kg⁻¹ fortification levels. The recovery percentage for dicofol was 86.33, 90.06 and 87.83 per cent and for ethion it was 89.02, 94.40 and 87.03 per cent and for cypermethrin 88.40, 90.80 and 85.76 per cent.

The results of the experiment revealed that respective initial deposits of dicofol (18.5 EC), ethion (50 EC) and cypermethrin (25 EC) in fresh chilli were 0.72, 0.40 and 0.02 mg kg⁻¹, whereas in sundried chilli powder they were 4.03, 1.41 and 0.15 mg kg⁻¹ (Table-1). In case of control and background samples, residues of none of these three pesticides were detected. The dehydration factor (the magnitude of weight loss after dehydration) was calculated as 10.48. The processing factors computed for dicofol, ethion and cypermethrin were 5.59, 3.52 and 7.5 respectively. It was revealed that by reducing the weight by 10.48 times after dehydration of the fresh chilli, the concentration of the pesticides increased by 5.59, 3.52 and 7.50 times, respectively. Similar results have also been reported in a field experiment by Parihar *et al.*, (2009). Processing factor can also be utilized as a tool to find out the amount of pesticide residue concentration available in processed food by multiplying it with the pesticide residue available in fresh chilli powder, as it gives the pesticide residues in processed chilli powder. It can be inferred that the increase in concentration of pesticides in dry chillies is due to reduction in total weight. Some part of the pesticides might have dissipated during the processing (Tiwari, *et al.*, 2008). Importance of processing factor has also been reported by FAO (2006) for establishment of MRL in processed foods, as it

Table 1. Residues (mg kg-1) and processing factor for dicofol, ethion and cypermethrin in chilli.

Treatments	Conc. (%)	Residues (mg kg ⁻¹)*		Processing factor
		Green/fresh chilli	Sundried red chilli powder	
Background	-	ND	ND	-
Control	-	ND	ND	-
Dicofol (18.5 EC)	0.05	0.72	4.03	5.59
Ethion (50 EC)	0.05	0.40	1.41	3.52
Cypermethrin (25EC)	0.015	0.02	0.15	7.50

*Residues are based on three replications average

ND = Non-detectable

Table 2. Recovery per cent of dicofol, ethion and cypermethrin in chilli

Fortification Level (mg/g)	µg recovered			Per cent recovery		
	Dicofol	Ethion	Cypermethrin	Dicofol	Ethion	Cypermethrin
0.01	0.00891	0.00871	0.00891	89.1	87.1	89.1
0.01	0.00842	0.00921	0.00885	84.2	92.1	88.5
0.01	0.00857	0.00878	0.00876	85.7	87.8	87.6
	Average ± S.D.			86.33 ± 2.510	89.00 ± 2.703	88.40 ± 0.754
0.05	0.0485	0.0451	0.0468	97.0	90.2	93.6
0.05	0.0409	0.0430	0.0495	81.8	98.0	99.0
0.05	0.0457	0.0475	0.0400	91.4	95.0	80.0
	Average ± S.D.			90.06 ± 7.687	94.40 ± 3.934	90.86 ± 9.790
0.10	0.0891	0.0857	0.0895	89.1	85.7	89.5
0.10	0.0875	0.0862	0.0857	87.5	86.2	85.7
0.10	0.0869	0.0892	0.0821	86.9	89.2	82.1
	Average ± S.D.			87.83 ± 1.137	87.03 ± 1.892	85.76 ± 3.700

includes the dilution or dissipation of the residues in the product due to decomposition.

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