

DISSIPATION OF QUINALPHOS AND MONOCROTOPHOS RESIDUES IN CARDAMOM CAPSULES

Thomas Biju Mathew, A. Visalakshi, S. Naseema Beevi, P. A. Rajan Asari and B. Rajagopal
College of Agriculture, Vellayani 695 522, Trivandrum, India

Abstract : The paper describes the results of a field experiment conducted in the Cardamom Research Station, Pampadumpara, to study the dissipation of two insecticides used for controlling cardamom thrips and to fix their waiting periods. The results showed that the residues of quinalphos reached below the tolerance limit of 0.25 ppm within 23 to 24 days in fresh cardamom and within 20 to 21 days in cured cardamom. The corresponding periods for monocrotophos did not differ between fresh and cured cardamom (22 to 23 days) because of the systemic nature of the residues.

Key words : Cardamom, monocrotophos, quinalphos, residues, waiting period.

INTRODUCTION

Insecticides are extensively used in cardamom plantations for controlling the most serious insect pest, cardamom thrips (*Sciothrips cardamomi* Ram) and up to twelve rounds of spraying are often practised by the planters for obtaining satisfactory control of the pest. Repeated exposure of capsules to regular schedules of insecticide sprays may leave toxic residues even after curing operation. Presence of any such residues in the final produce has to be viewed very seriously as it will deteriorate the quality standards of the produce. Hence investigations were undertaken to study the dissipation of one contact insecticide (quinalphos) and one systemic insecticide (monocrotophos) in / on fresh as well as cured cardamom capsules and to fix up waiting periods, the maximum time interval to be given between the insecticide application and harvest. This paper reports the results of the field trials conducted at the Cardamom Research Station, Pampadumpara with the above objectives.

MATERIALS AND METHODS

A well maintained cardamom field planted with the variety, Malabar was selected for the experiment. The trial was laid out in a randomised block design with four repli-

cations, at the Cardamom Research Station, Pampadumpara. Twenty clumps constituted one replication and buffer zones were left between plots to prevent cross contamination. Quinalphos (Ekalux 25 EC) and monocrotophos (Nuvacron 36 WSC) were applied at the recommended (0.05%) and double the recommended (0.1%) doses at monthly intervals using a high volume continuous knapsack sprayer. Spray fluid was used @ 300 ml / clump. Matured and uniform sized capsules were collected at 1, 3, 7, 14, 21 and 28 days after the last application of the insecticides. From each lot about 300 g fresh capsules was collected. Sub-samples of 50 g fresh capsules were used for *in situ* extractions and a similar set of sub-sample was washed, dried, polished and smoked as per the common curing techniques followed.

Quinalphos and monocrotophos residues were extracted with acetone, partitioned to dichloromethane and cleaned up through florisil column with dichloromethane-acetone mixture as the elutant. Solvent was then evaporated and the residue was concentrated in hexane. Residues in the final cleaned up extract were measured using a gas chromatograph equipped with a nitrogen-phosphorus detector at the operating parameters given below.

Operating parameters	Quinalphos	Monocrotophos
Column	3% SE-30	4% SE-30
Detector	NPD	NPD
Gas flow		
N ₂	40 ml min ⁻¹	40 ml min ⁻¹
H ₂	10 ml min ⁻¹	10 ml min ⁻¹
Air	140 ml min ⁻¹	140 ml min ⁻¹
Temperature, °C		
Column	220	165
Injector	250	185
Detector	280	200

RESULTS AND DISCUSSION

The results showed that the initial residues of quinalphos (0.05%) in fresh cardamom capsules on the first day of application was 2.44 ppm (Table 1) which got reduced to 0.01 ppm by 28th day and when applied at 0.1% concentration, the corresponding values were 3.09 and 0.1 ppm respectively. In cured cardamom, the initial residues when applied at

0.05 and 0.1% concentrations were 2.63 and 3.8 ppm respectively which got reduced to 0.05 and 0.17 ppm by 28th day after treatment.

The monocrotophos residues of 3.02 ppm in fresh cardamom at 1 day after treatment dissipated to 0.1 ppm by 28th day when applied at 0.05% and corresponding values were 4.77 and 0.2 ppm respectively when applied at 0.1%. In cured cardamom, monocrotophos residues of 2.03 ppm got reduced to 0.03 ppm by 28th day when applied at 0.05% and the corresponding values were 3.53 and 0.07 ppm respectively when applied at 0.1%.

Based on the dissipation curves, waiting periods were worked out using linear semi-logarithmic regression analysis. Results (Table 2) showed that the residues of quinalphos in fresh cardamom reached below the maximum residue limit (MRL) value of 0.25 ppm (FAO, 1991) within 23 and 24 days when applied at 0.05 and 0.1% respectively while the corresponding waiting periods in cured cardamom were lesser than in the case of fresh cardamom (20 and 21 days respectively). Chozhan (1988) has also reported that quinalphos residues were removed considerably by the curing operation resulting in a reduction in the waiting period.

Table 1. Mean residues (ppm) of insecticides in cardamom capsules

Sampling intervals, days	Fresh cardamom				Cured cardamom			
	Quinalphos		Monocrotophos		Quinalphos		Monocrotophos	
	0.05%	0.1%	0.05%	0.1%	0.05%	0.1%	0.05%	0.1%
1	2.44	3.09	3.02	4.77	2.63	3.80	2.03	3.53
3	2.19	2.32	2.22	2.59	1.73	2.04	1.84	2.19
7	1.72	1.32	0.88	1.18	0.58	0.91	0.88	1.22
14	1.36	1.07	0.71	0.98	0.31	0.46	0.53	0.83
21	0.11	0.39	0.19	0.30	0.14	0.08	0.09	0.19
28	0.01	0.10	0.10	0.20	0.05	0.17	0.03	0.07

Table 2. Waiting periods of insecticides recommended for the control of cardamom thrips

Insecticides and doses	Waiting period, days	
	Fresh	Cured
<i>Quinalphos</i>		
0.05%	23	20
0.1%	24	21
<i>Monocrotophos</i>		
0.05%	22	23
0.1%	23	23

In the case of *monocrotophos* the waiting periods fixed for fresh cardamom were 22 and 23 days when applied at 0.05 and 0.1% respectively, while for cured cardamom it was 23 days for both the doses tested. It may be seen that the rate of degradation of *monocrotophos* did not differ much between fresh and cured capsules even though about 25 to 33 per cent of the initial residue was lost by curing. This might be due to the fact that *monocrotophos* molecules would be more stable to high temperature regimes experienced during the process of curing. Moreover the penetrated portion of *monocrotophos* residue might have escaped the direct removal by washing and polishing processes done prior to curing while this might have removed more of the surface residues of *quinalphos*.

Thus in general, a period 20 days should be observed between last round of spraying and harvesting when *quinalphos* is used at the recommended dose whereas in the case of *monocrotophos* a period 23 days should be observed.

The only feasible means to ensure the produce reaching the consumer free from toxic residues will be to enforce waiting period for all pesticides commonly used by the planters. This should be emphasised in cardamom because of its export value and its increasing domestic consumption in the country.

ACKNOWLEDGEMENT

This forms a part of the work done under the All India Co-ordinated Research Project on Pesticide Residues. The authors are thankful to the ICAR for the financial assistance.

REFERENCES

- Chozhan, K. 1988. Studies on the multiresidue analysis of OP insecticides in cardamom. M. Sc. (Ag) thesis, Tamil Nadu Agricultural University, Coimbatore
- FAO, 1991. Maximum Limits for Pesticide Residues CX/PR2, Codex Alimentarius Commission, FAO, Rome