

The effect of household washing methods on reduction of malathion residue in cabbage

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ABSTRACT

Field and laboratory experiments were carried out to estimate the effect of household washing methods on malathion residues in cabbage. This vegetable was raised in the kitchen garden area of Home Science College, MAU, Parbhani and sprayed with insecticide malathion at fruiting and marketing stage. The residue reduction for cabbage was recorded according to the waiting periods and household washing methods. A significant reduction of malathion residues was noticed after each wash and waiting period. Higher reduction was found in warm water washing with third day waiting period.

Key words : Tolerance limit, MTL- Maximum residue limit, Cabbage, Malathion

Pesticides play an important role in crop protection technology. In vegetables, they are used to avoid or control the infestation for healthy growth of the crops. Though protective to the crops, the pesticide residues left on the surface penetrate inside the crop and create harmful effects on human health. A significant amount of residues have been found to be persisting even after washing. Waiting period is an important aspect in insecticide utilization to bring down the residues below the maximum permissible limit. A tolerance limit of 2-3 ppm has been prescribed in India for malathion on vegetables (Verma and Lal, 1981). The alarming situation challenging the healthy existence of the mankind requires immediate conscious efforts at every level, including household. In the household, washing of vegetables prior to consumption is a common practice. But washing may not bring the commodity under safe level of consumption (Verma and Lal, 1981). In the light of these facts, the different washing methods need to be tested for their efficacy. So, the study was undertaken to estimate the efficiency of selected household washing methods on malathion residue in cabbage.

METHODOLOGY

For this study, commonly used vegetable *i.e.* cabbage was selected as it is susceptible to infestation of insects and hence commonly sprayed with insecticide *i.e.* malathion. The seedlings of cabbage were obtained from the Department of Horticulture, MAU, Parbhani and were raised in plots 10x10 ft each in triplicate in the kitchen garden areas of Home Science College, Parbhani.

Untreated plot was also maintained for comparison. The commonly advised commercial insecticide malathion 50 EC (Emulsible concentrate) was selected for application and sprayed at fruit stage and marketing stage (0.05 % concentration). The samples of cabbage were randomly drawn from treated and controlled plot after 1,3,5 and 7 days of application. They were labelled and stored in deep freezer for further analysis.

50 gm sample of cabbage vegetables was washed by following methods.

- Washing cabbage four times by holding under the running cold tap water for half minute.
- Washing cabbage four times by holding under the running warm tap water for half minute.
- Dipping with light rub in cold water for 1,2,3 minutes.
- Dipping with light rub in 42°C warm water for 1, 2, 3 minutes.

The procedure for washing under tap was standardized for water pressure (at 0.7 pound/inch² pressure) and time. Dipping methods were standardized for size of vessel, volume of water, immersion period, temperature and the size and weight of the sample. Numbers of frequencies of washing were also fixed.

The samples were chopped uniformly in 1-1.5 cm size with steel knife (weight 50 g) with the selected spray intervals. Extracts of malathion were blended in mixer with 100 ml of acetone for 3-4 minutes. Then it was filtered through funnel. This filtrate was further washed with chloroform and was stored in deep freeze with labeling. The elutes were collected and reduced to 10 ml

for its estimation by Gas Chromatography method. Recovery experiment was also carried out from control plot samples. Recovery ranged from 85 to 93 per cent.

RESULTS AND DISCUSSION

It is obvious from Table 1 that by holding cabbage under cold tap water *i.e.* first method, the initial pesticide deposition 7.789 ppm was reduced to 6.834 ppm, 5.232 ppm, 3.192 ppm and 2.567 ppm in 1, 2, 3 and 4th washing, respectively and not brining the residue below the tolerance limit. The total reduction was 68% though the residue persisted was at above the tolerance limit.

Washing cabbage at 3rd day spray application received the deposit of 3.459 ppm deleted 53% residue after 2nd wash brought it to below tolerance limit. Further, washes lead 90% reduction in the initial residue. Pokharkar *et al.* (1982) reported that 2-3 days of waiting period was required for the safe consumption of chillies when sprayed endosulphon at different concentrations.

Washing cabbage by second method *i.e.* by holding under running tap warm water brought reduction at 19, 36, 36 and 79 per cent from 7.789 ppm initial malathion residue at first day of spray application. The above tolerance content was reduced to below tolerance level

Table 1 : Effect of selected washing methods on the malathion residue reduction (in ppm) on cabbage harvested at different spray applications

Sr. No.	Washing methods	Waiting periods (Days) →				
			1	3	5	7
	Initial value		7.789	3.459	0.66	0.22
1.	Holding under running tap water					
a	First wash (1/2 minute)		6.834 (13)	2.734 (21)	0.042 (36)	0.010(55)
			ATL	ATL	BTL	BTL
b	Second wash (1/2 minute)		5.232(33)	1.635(53)	0.22 (66)	N D
			ATL	BTL	BTL	
c	Third wash (1/2 minute)		3.192 (60)	0.345 (90)	0.02 (97)	N D
			ATL	BTL	BTL	
d	Fourth wash (1/2 minute)		2.567 (68)	0.055 (98)	N D	N D
			ATL	BTL		
2.	Holding under running warm water (42^oc)					
a	First wash (1/2 minute)		6.345(19)	2.134(38)	0.031 (51)	0.003(87)
			ATL	ATL	BTL	BTL
b	Second wash (1/2 minute)		4.892(36)	1.464(58)	0.012 (82)	N D
			ATL	BTL	BTL	
c	Third wash (1/2 minute)		1.292 (36)	1.464 (58)	0.012(82)	N D
			ATL	BTL	BTL	
d	Fourth wash (1/2 minute)		1.654 (79)	N D	N D	N D
			BTL			
3.	Dipping in cold water with light rub					
a	First wash (1/2 minute)		7.634(2)	3.145 (9)	0.052 (22)	0.017 (23)
			ATL	ATL	BTL	BTL
b	Second wash (1/2 minute)		7.129(9)	2.545(27)	0.02(52)	0.008(64)
			ATL	ATL	BTL	BTL
c	Third wash (1/2 minute)		5.464(30)	1.924(45)	0.017(75)	N D
			ATL	BTL	BTL	
4.	Dipping in warm water with light rub					
a	First wash (1/2 minute)		7.134(9)	2.942(15)	0.045(32)	0.014(37)
			ATL	ATL		BTL
b	Second wash (1/2 minute)		6.345 (19)	2.504 (28)	0.025(62)	0.005(78)
			ATL	ATL	BTL	BTL
c	Third wash (1/2 minute)		5.123(35)	1.545(56)	0.004(94)	N D
			ATL	BTL	BTL	

Figures in the parenthesis indicate percentages, Tolerance limit: 2 ppm

ATL- Above tolerance limit BTL – Below tolerance limit ND – Non detectable

in 4th wash and eliminating 79% of the total residue. This study can be supported by the experiment carried out by Jadhav (1984) who reported that the initial deposits of above tolerance limit on cauliflower was reduced to non detectable level by processing like washing and boiling in hot water.

Washing on 3rd day removed 58% loss in 2nd wash brought the residue to safe consumption level while 4th wash resulted in non-detectable level.

Dipping cabbage in cold water with light rub wash *i.e.* 3rd method reduced the initial level of 7.789 ppm to 7.634, 7.129, and 5.464 in 1st, 2nd, 3rd wash, respectively, denoting only 30% reduction of residue which was above tolerance limit. The third day waiting period reduced the residue to 9, 27 and 45 per cent in 1st, 2nd, and 3rd wash, respectively thus lowering it to below tolerance limit.

Dipping cabbage in warm water *i.e.* fourth method with slight rubbing reduced the initial deposit 7.789 ppm to 7.134, 6.345, 5.123 ppm at one day of spray application eliminating 35% residue but still remained above tolerance limit. Again the deposit of 3.459 ppm was reduced to 2.942, 2.504, 1.545 ppm and thus brought down to the below tolerance limit. With each additional wash, the residue reduction was increasing in all the methods.

The original residues on 5th and 7th days after spray application were below tolerance limit, which were further reduced to non-detectable level after 3rd and 2nd wash, respectively. Wadnerkar (1989) studied the dissipation of synthetic pyrethroids in cabbage and reported that cabbage can be consumed after six days of spray without any residue hazard to the consumer.

Ranking of selected washing methods with regards to pesticide reduction:

On the basis of efficacy in reducing the malathion residue to safe consumption level, the selected washing methods were ranked. As observed, washing under running warm tap water secured 1st rank as malathion residue on cabbage was reduced to safe consumption level in 4th, 3rd, 2nd and 1st wash at both 1st and 3rd day.

This was followed by washing under running cold tap water as initial deposits at 3rd day was reduced to safe consumption level after 2nd washing.

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