

## EFFECT OF PROCESSING CUCUMBER FRUITS ON CHLORPYRIFOS-METHYL INSECTICIDE RESIDUES

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### **Abstract**

Persistence of chlorpyrifos-methyl organophosphorous insecticide residues on cucumber fruits was studied. The effect of washing, peeling and pickling on chlorpyrifos-methyl residues were also studied. The residue half-life value of chlorpyrifos-methyl on cucumber fruits was 17 hours. The residues reached a safe level below the MRL three days after treatment. All the previously mentioned processing steps caused a significant reduction in the insecticide residues.

Another part of this study was a survey carried out for detection of organophosphorous insecticide residues on cucumber fruits in some local markets (i.e. Benha, Kaha, El-Mansoura, Belkas, El-Mahalla). The results indicate that all detected organophosphorous residues were below the MRLs of Codex.

### **INTRODUCTION**

The study of pesticide persistence and residual behaviour gives an idea about the pre-harvest interval that should pass following application and before marketing in order to minimize health hazards. On the other hand, many investigators emphasized the role of home and commercial preparations in removing the pesticide residues from agricultural products (Liska and Stademan 1969, Geisman 1975 and Celino and Magallona 1985, Besser *et al.*, 1991) .

Chlorpyrifos-methyl is recommended in Egypt for controlling of *Aphis gossypii* and *Bemisia tabaci* attacking cucumber plants. The present investigation aims to determine the residues of chlorpyrifos-methyl on and in cucumber fruits as affected by pickling and peeling processes. Another part of the study includes a survey of organophosphorous pollutants on cucumber fruits in some local markets.

## MATERIALS AND METHODS

### 1- Chlorpyrifos-methyl residues on Cucumber

Cucumber (*Cucumis sativus*) seeds were planted on March 20<sup>th</sup> 1992 in two plots of 1/100 faddan at El-Ramlah village Qalubia Governorate, Egypt. Plants were sprayed with chlorpyrifos-methyl (Reldan) EC 50% at the rate of 0.5 L/feddan (diluted to 200 L. water per feddan) on June 25<sup>th</sup> (65 days after planting) using a knapsack sprayer. Representative samples were taken two hours after spraying and then after 1,3,7, 10 and 15 days, respectively. Another part of the initial sample was taken for processing including washing peeling and pickling .

### II- Pickling of Cucumber

- a- Scaling and washing : suitable fruits were collected, washed and cut into slices and a good starter was used for pickling.
- b- Salting : a salting solution of 8% salt per weight of substance + Lactic acid 2-3 % was used.
- c- Filling : glass containers were filled to the top and a layer of oil was put on the surface to prevent the growth of aerobic bacteria or fungi .

### III- Survey of organophosphorous insecticide residues on cucumber

Samples were picked from different markets in three provinces; El-Qalubia (Benha and Kaha), El-Dakahlia (EL-Mansoura and Belkas) and El-Gharbia (El-Mahalla) in 1992 summer.

#### Residue analysis

##### a- Extraction

The multi-residue method for organophosphorous insecticides mentioned in

"Ministry of Welfare, Health and Cultural Affairs, Leidschendam-Netherlands, Analytical Methods for Residues of Pesticides (1985) was used for organophosphorous insecticides extraction as follows :

50 Grams of cucumber fruit were macerated with 50 grams of anhydrous sodium sulphate in a blender. Then 200 ml of distilled ethyl acetate were added and the sample blended for 5 minutes . A known volume of the extract was taken in a graduated cylinder after filtration through a pad of cotton. The extract was then evaporated to dryness using a rotary evaporator at 40°C .

#### b- GLC-determination

PU-4500 gas chromatograph equipped with FPD operated in the phosphorous mode and a pyrex glass column (1.5 m x 4 mm. i.d.) packed with 4% SE-30 + 6 % OV-210 on gas chromosorb Q 80-100 mesh was used for chlorpyrifos-methyl determination under the following conditions :

Injector temperature : 242°C.

Column temperature : 240°C.

Detector temperature : 245°C.

Carrier gas (N<sub>2</sub>) flow rate : 30 ml/min

Hydrogen and air flow rates : 30 ml/min

Chlorpyrifos-methyl retention time under these conditions was 4.28 minutes.

Rate of recovery of chlorpyrifos-methyl by using these method for residue analysis was 100 % while rates of recovery for other organophosphorous ranged between 80 and 100 % at the level of 1 ppm .

## RESULTS AND DISCUSSION

### 1- Persistence of Chlorpyrifos-methyl on cucumber

Residues of chlorpyrifos-methyl on cucumber fruits are shown in Table 1. The initial deposits of chlorpyrifos-methyl were 2.227 ppm two hours after treatment. This amount reduced to 0.621 ppm after one day and then to 0.124 ppm three days

after treatments. This indicates that only three days period was enough for the chlorpyrifos-methyl residues to reach a safe level less than the MRL of Codex (0.5 ppm). The half life value of chlorpyrifos residues on cucumber fruits was 17 hours. Similar results on chlorpyrifos-methyl persistence were obtained by El-Sayed *et al.* (1976-1977 a,b)

Almaz (1985) found that the half life value of chlorpyrifos-methyl on spearmint plants was 16.8 hours.

## 2- Effect of washing on chlorpyrifos methyl residues

Washing of cucumber fruits caused significant reduction in chlorpyrifos residues as shown in Table 1. The initial deposits (2.227 ppm) reduced to 1.043 ppm revealing 53.17 % loss. Washing of cucumber fruits harvested one day after treatment, insecticide level was 0.201 ppm after washing (less than Codex MRL 1993). Cucumber fruits will be ready for use after good washing by tap water several times if it was taken one day after treatment. These results are in agreement with that obtained by Talker *et al.* (1977) who found that washing by tap water removed 45 % fenitrothion insecticide from Chinese cabbage .

## 3- Effect of peeling and pickling

Peeling and washing processes resulted in reducing the major portion of chlorpyrifos-methyl from cucumber fruits as shown in Tables 1 and 2. Peeling of cucumber fruits (taken 2 hours after insecticide treatment) resulted in 97.30% loss of the initial deposits, while peeling of the washed fruits of the same period resulted in 99.91 % loss of chlorpyrifos-methyl residues. The results indicate that 95.05 % of the initial deposits were retained in the peels of the unwashed cucumber fruits. Karagorgiev (1979) found that peeling of fruits resulted in complete disappearance of pesticide residues.

The results are in agreement with that of Hegazy *et al.* (1988) on peeled potato tubers.

Pickling of cucumber unwashed fruits till 6 months resulted in 92.81% loss of the initial deposits while 96.11% loss of the the initial deposits was recorded if the same fruits were washed before pickling. It is clear from table (2) that peeling and pickling of washed or unwashed cucumber fruits reduced chlorpyrifos-methyl residues to amounts less than the MRL of Codex (0.5 ppm).

Table 1. Chlorpyrifos methyl residues in washed and unwashed cucumber.

Period after treatment	Unwashed		Washed	
	Residues (ppm)	% loss	Residues (ppm)	% loss
Initial (2 hours)	2.227	0.00	1.043	53.17
1 day	0.621	72.11	0.201	90.97
3 days	0.124	94.43	0.084	96.23
7 days	0.061	97.26	0.031	98.61
10 days	0.029	98.70	0.005	99.78
15 days	UND	100	UND	100

UND = Undetectable

Table 2 . Effect of peeling and pickling on chlorpyrifos-methyl residues in cucumber

Treatment	Unwashed		Washed	
	Residues (ppm)	% loss	Residues (ppm)	% loss
Initial deposits	2.227	0.00	1.043	53.17
1- Peeling				
a) Peels	2.110	5.25	0.930	58.24
b) Peeled fruits	0.060	97.30	0.002	99.91
2- Pickling for 6 months	0.160	92.81	0.071	96.11

#### 4- Survey of organophosphorous insecticides on cucumber fruits collected from some local markets

As shown in table (3) all organophosphorous insecticide residues detected on cucumber fruits were below the MRLs of Codex. These results are in agreement with that of Kawamura *et al* (1986) in Japanese market, and Frank *et al* (1990).

Table 3. Organophosphorous residues (ppm) detected on cucumber samples collected from local markets .

Insecticide	Moloukhia leaves					MRLs of Codex
	Benha	Kaha	El-MAnsoura	Belkas	El-MAnsoura	
Chlorpyrifos	UND	UND	UND	UND	UND	0.05
Chlorpyrifosmethyl	UND	UND	UND	UND	UND	0.5
Dimethoate	0.023	0.014	UND	UND	UND	2.0
Fenitrothion	UND	UND	UND	UND	UND	0.05
Malathion	0.021	0.301	UND	0.023	0.009	0.5
Primifosmethyl	0.008	0.010	0.003	UND	UND	1.0
Profenofos	0.002	UND	UND	0.005	UND	0.1

UND = Undetectable

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## تأثير عمليات تجهيز ثمار الخيار على متبقيات مبيد الكلوربيريفوس مثيل

محمد السعيد على حجازى<sup>١</sup> ، مصطفى محمد أبو زهوا<sup>١</sup>، عبد الرحمن بيومى<sup>٢</sup> ، سليمان  
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تمت دراسة بقاء المبيد الفوسفورى العضوى كلوبيريفوس مثيل على ثمار الخيار  
كما درس أيضا تأثير الغسيل والتخليل على متبقيات المبيد وكانت قيمة نصف العمر لهذا  
المبيد على ثمار الخيار ١٧ ساعة وقد وصلت المتبقيات الى مستوى أمن للاستهلاك (دون  
الحدود القصوى للمتبقيات المحددة بواسطة كودكس). بعد ثلاثة أيام من الرش . وقد أدت  
خطوات الغسيل والتقشير والتخليل الى خفض معنوى فى متبقيات المبيد.

وفى جزء آخر من الدراسة تم عمل مسح لبعض الاسواق المحلية لتقدير متبقيات  
المبيدات الفوسفورية العضوية المحتمل وجودها فى ثمار الخيار وذلك فى صيف ١٩٩٢  
بأسواق كل من بنها وقها بمحافظة القلوبية والمنصورة و بلقاس بمحافظة الدقهلية والمحلة  
بمحافظة الغربية . وقد اوضحت النتائج ان كل متبقيات المبيدات الفوسفورية التي أجري  
تقديرها كانت دون الحدود القصوى المسموح بها من متبقيات هذه المبيدات فى ثمار  
الخيار بواسطة الكود كس (١٩٩٢).