

Technological Studies on Residues of Some Pesticides on Some Vegetables (Broccoli and Eggplants)

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ABSTRACT

The aim of this research was conducted to study the effect of preparation and processing on the percentage loss of some residues pesticide in both broccoli and eggplant. The obtained data showed that all treatments led to increasing the percentage loss in all used pesticides. The boiling of broccoli led to increasing the percentage loss which recorded 68.53% and 23.96% with Grap and PestBan respectively. On the other hand the freezing process led to full loss 100% with Grap while the percentage loss was lower (24.69%) with PestBan. In eggplant the washing process led to high loss with Pest-Ban and low loss with Grap and the results were 97.83 and 81.30%, respectively. While some processes, treatments lead to full loss of pesticides residues. The frying and cooking led to full loss 100% of Grap and Pest-Ban pesticides.

Keywords: loss - pesticides - preparation - processing

INTRODUCTION

Pesticides are used for pest control in large quantities all-over the world and particularly in developing countries. Although pesticide chemicals provide numbers of benefits in terms of increased production quality, but pesticides residues in the environment are of concern everywhere (Sannino et al., 1999).

Reported that fungicide residues decreased upon washing and cooking of contaminated tomato fruits collected after 5 and 10 days of spray application. The rate of loss of the residues was almost the same from both application rates (0.2 and 0.4%) upon washing and washing followed by cooking present, while the intensity of dislodging the residues was more due to washing followed by cooking. The effect of washing and peeling on the behavior and persistence of chloropyrifos –methyl, diazinon and phenthaote in cucumber was investigated. The effect of insecticides on carbohydrate, chlorophyll and soluble protein contents as well as the activity of peroxidase and phenyl oxidase were also studied. After one hour from application, the residues on cucumber were 1.42, 1.71 and 0.53 ppm for chloropyrifos –methyl, diazinon and phenthaote, respectively by Hanuman-Tharju and Awasthi (2003). The residues of half –life values (R150) for the same pesticides were 23.31, 18.71 and 17.85 respectively. Washing with top water after one hour from the application removed 31.69% of chloropyrifos –methyl, 64.91% of diazinon (Hanuman-Tharju and Awasthi, 2003) and 26.41% of phenthaote. The corresponding value after pulping were 95.07%, 76.02% and 94.32% respectively (Hegazy et al., 2004).

Chavarri and Herrerea (2005) studied the decrease in pesticides in fruits and vegetables during commercial processing and found that sample of tomatoes, peppers, asparagus, spinach, and peaches were exposed to their insecticides (acephote, chlorpyrifos and cypermethyrling there fungicides (moncozob, maneb, propineb,) to commercial processing on the residues. In most cases, coming operation led to gradual decrease in residue level in the finished products, particular washing, and blanching, and cooking processes. The results indicated that washing plus blanching led to more than 50% loss in pesticides; expect for in peaches, Fungicides were completely removed for tomatoes and spinach by washing followed by hot water blanching. The total of pesticide removed by all of canning operations ranged from 90 to 100% in most

products. Vysal –pala and Bilisli(2006) studied fate of endosulfon and diltamethrin residues during tomato paste production and showed that the effects of tomato paste processing steps on pesticides with active ingredient endosulfon and investigated in Turkey washing decreased endosulfon and diltamethrin, 30.62 and 47.58%, respectively. Pre heating, pulping, evaporation and half –pasteurization increased diltamethrin 2.33% while decreasing endosulfon 66.5% after washing. The whole process decreased endosulfon and diltamethrin, 78.5% and 46.3% respectively. The residues were mostly collected in promise. This study aimed to study effect of preparation and processing of broccoli and eggplant fruits on the percentage loss of pesticides residues in broccoli and eggplant and its products.

MATERIALS AND METHODS

1-Materials:

Broccoli (*Brassica oleracea*) and eggplant seeds (*Solanum melongena*): Heritage and Sawaad El-Lail from semines company, USA were obtained from smarted company located in El-Maadi, Cairo, Egypt.

Tested pesticides:

Samoctin, Grap and Pest-Ban were obtained from Agriculture Local Market in Salhia region and its characteristics are shown in table (1) according to the pesticides manual (2016) and all of these pesticides were used according to the recommended dose by the Egyptian Ministry of Agriculture.

Table 1. Characteristics of tested pesticides used in this investigation according to the pesticides manual (2016)

Chemical name	Active ingredients	Common name	L.D ₅₀ (mg/kg)	Purity (%)
5-0-demethyl avermectin A _{1a} (1) mixture with 5-o de methyl)-25-de propyl -25 -(1-methyl-ethyl) avermectin A _{ai} (ii)	Abamectin	Samoctin	10	99
(s)-α-cyano-3-phenoxybenzyl (IR)-cis-3-(2,2-dibromovinyl)-2,2-dimethylcyclopropanecarboxyate	Delta-methrin	Grap	135	>98
0,0-dimethyl 0-(3, 4, 6 trichloro-2-pyridinyl) phosphorothioate	-Chloropyrifos -methyl	PestBan	>3000	97

2-Methods:

Spraying process:

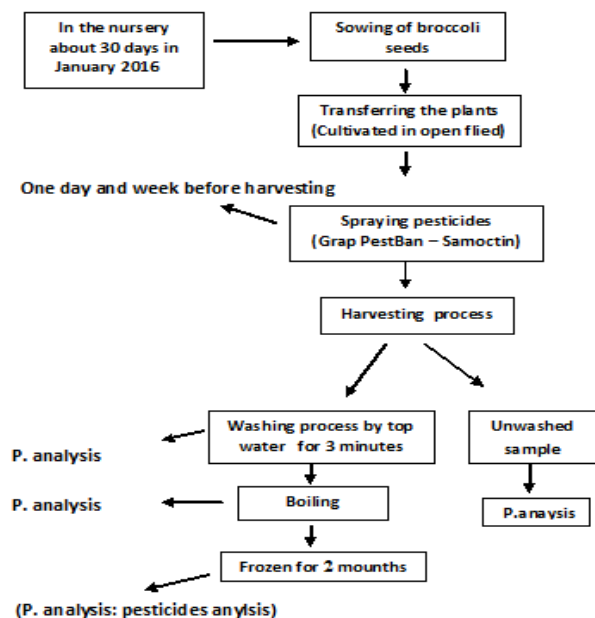
The spraying processing had been done by motor sprayer 20 liter according to the recommended doses (Grap 1.5 cm/liter, Pest-Ban 1.5 cm/liter and Samoctin 0.5 cm/liter) accredited by Ministry of Agriculture of Egypt.

Preparation and processing of broccoli samples:

The broccoli samples were harvested after one day of spraying and divided into four groups for processing techniques as following:

a- **Raw broccoli:** The broccoli samples were taken directly without any treatments to determine the pesticides after one day and after one week from spraying process.

The treatments of broccoli are shown in flow sheet (1):



b- **Washing process:** The broccoli samples were washed by running tap water for 3 minutes to remove any soil grits.

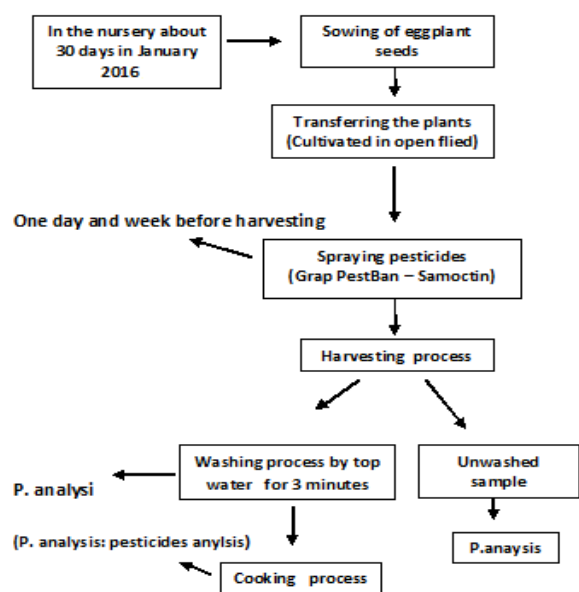
c- **Boiling process:** The wahed broccoli samples were put in boiling water for 5 mintues.

d- **Freezing process:** After cooling the samples boiled broccoli frozen at -18°C and kept for two months.

e- **Control Sample:** The sample control was taken directly without any treatment and without any spraying pesticides to determine the pesticides residues.

Preparation and processing of eggplant samples:

The treatments of eggplant are shown in flow sheet (2):



The eggplant samples were harvested after one day of spraying and divided into four groups for processing techniques as following:

a- **Raw eggplant:** The eggplant samples were taken directly without any treatments to determine the pesticides after one day and after one week from spraying process.

b- **Washing process:** The eggplant samples were washed by running tap water for 3 minutes.

c- **Frying process:** The washed eggplants samples were cut into pieces by knife and were fired into sunflower oil in 180 c for about 4 minutes.

d- **Cooking process:** The fried samples were cooked in a mixture of tomato paste and onion with adding salt the mixture was 200 gram, fried sample, and 50g tomato paste 30g onion with 3 gram of salt.

e- **Control Sample:** The control sample was taken directly without any treatments and without any spraying pesticides to determine the pesticides residues.

Determination of abamectin residues:

HPLC analyses were performed with an Agilent 1100 HPLC system, with photodiode array detector. The chromatographic column was c8 zorbax SB (250 x 4.6mm, 5µm film thickness). Flow Rate of mobile phase (acetonitrile 60% x water 40%) Flam Rate was 1ml/min. and injection volume was 20µl. Move length 220mm according to QUECHERS method 2009).

Determination of chloropyrifos and deltamethrinresidues:

Hewlett Packard GC model 6890 equipped with on Ni⁶³ –electron capture detector. GC conditions: Pas-5 methyl silicone (30m x 0.32mm i.d x 0.25 µm film thickness) was used carrier gas: N₂ at a flaw rate of 4ml/min; injector and detector temperature were 300°C and 320°C, respectively. The initial column temp. was initial oven temp. 220°C for 2 minutes raised at 10°C/min and then held at 280°C for 10 min., according to (QUECHERS method 2009) and (A.O.A.C 2005).

RESULTS AND DISCUSSION

Pesticides residues on broccoli:

Table (2) and Fig (1) showed that the effect of preparation and processing of the percentage loss of pesticide residues in broccoli samples had higher PestBan residues than that of Grap. The concentration of tested Grap and PestBan insecticide residues in unwashed broccoli samples was 2.08 and 4.09 ppm, respectively. On the other hand, washing process lead to remarkable reduction in tested pesticides by different rates. The highest percentage loss after washing process was recorded the higher Grap. While the lower was recorded with PestBan of broccoli samples. The value of percentage loss were 67.30 and 19.55%, respectively.

Blanched process of broccoli samples caused an increase in the percentage loss of all tested pesticides residues by different rates.

The maximum percentage loss was recorded with Grap (86.53%) while the lowest loss was recorded with PestBan (23.96%) Table (2).

On the other hand, the freezing recorded a (24.69%) with PestBan. complete loss (100%) in Grap while the lowest loss was

Table 2. Effect of preparation and processing on the percentage loss of pesticides residues in broccoli (ppm):

Treatments	Residues (ppm)			Percentage loss %		
	Samocitin	Grap	PestBan	Samocitin	Grap	PestBan
Control sample	N.D	N.D	N.D	N.D	N.D	N.D
Unwashed after one day from spraying	N.D	2.08	4.09	N.D	0.0	0.0
After one week	N.D	1.69	3.51	N.D	18.75	14.18
Washed	N.D	0.68	3.29	N.D	67.30	19.55
Boiled	N.D	0.28	3.11	N.D	86.53	23.96
Frozen for 2 months	N.D	N.D	N.D	N.D	100	24.69

Control sample: Without spraying. N.D: Not detected

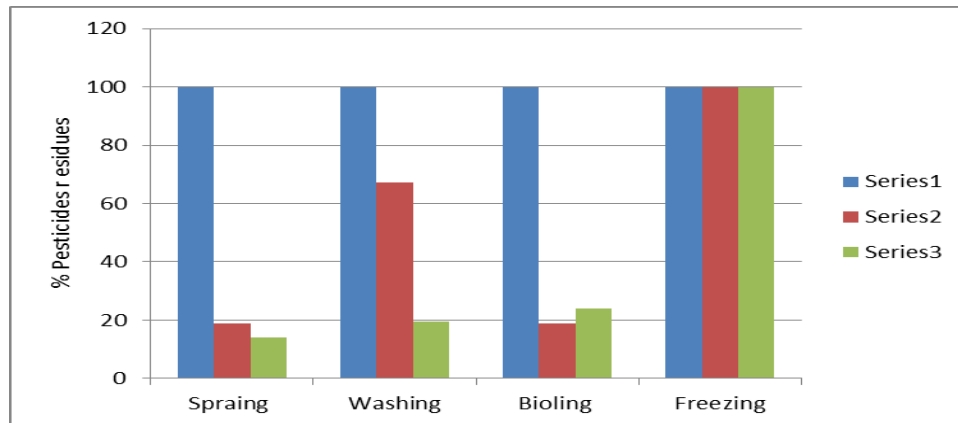


Fig. 1. Effect of preparation and processing on the percentage loss of pesticides residues in broccoli.

Broccoli samples were analyzed after about one week of spraying and recorded percentage Loss 18.75 and 14.18% respectively from Grap and PestBan. On the other hand, samocitin not detected in all samples of

broccoli and that give indicator to be safe in pesticides, the date in agreement with result obtained by Hanuman-Tharju and Awasthi (2003) and Hegazy et al., (2004).

Table 3. Effect of preparation and processing of percentage loss on pesticides residues in eggplant (ppm):

Treatments	Residues (ppm)			Percentage loss %		
	Samocitin	Grap	PestBan	Samocitin	Grap	PestBan
Control sample	N.D	N.D	N.D	N.D	N.D	N.D
Unwashed after one day from spraying	N.D	1.23	1.57	N.D	0.0	0.0
After one week	N.D	0.98	0.86	N.D	20.32	45.22
Washed	N.D	0.23	0.034	N.D	81.30	97.83
Fried	N.D	N.D	N.D	N.D	100	100
Cooked	N.D	N.D	3.08	N.D	100	100

Control sample: Without any spraying. N.D: Not detected.

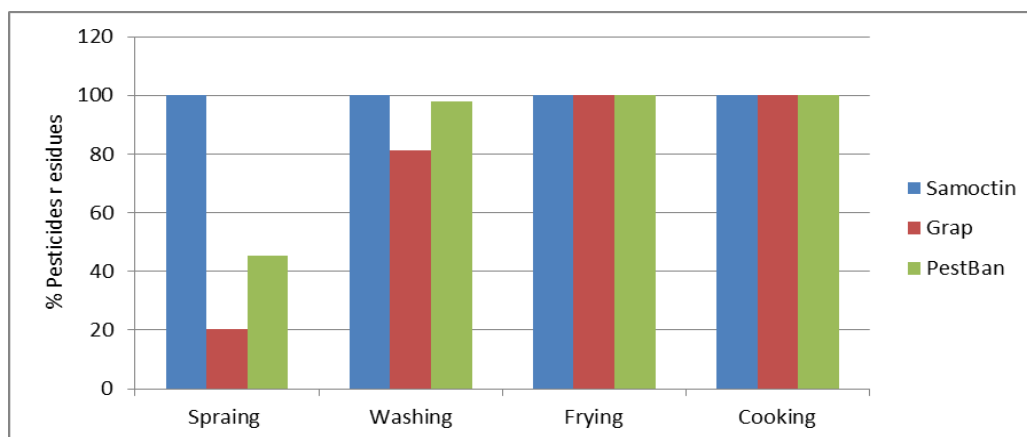


Fig. 2. Effect of preparation and processing on percentage loss of pesticides residues in eggplant

In Table (3) and Fig (2) generally, all tested eggplants samples had a variation rates of residues pesticides from Grap and PestBan while samoctin not detected in all samples. On the other hand, washing process lead to remarkable reduction in tested pesticides residues by different rates. The highest percentage loss was recorded with PestBan while the lowest was recorded with Grap of eggplant samples. The percentage loss were 97.83 and 81.30% respectively. Frying and cooking process of eggplant samples caused an increase in the percentage loss of all tested pesticides residues, the percentage loss were 100% of Grap and PestBan.

Eggplant samples were analyzed after one week of sparing recording 18.75 and 14.18% percentage loss of Grap and Pest-Ban respectively.

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دراسات تكنولوجية على متبقيات بعض المبيدات في بعض الخضراوات (البروكلي والباذنجان)
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يهدف هذا البحث إلى دراسة تأثير عمليات الإعداد والتصنيع على نسبة الفقد في بعض متبقيات المبيدات الحشرية في كلاً من البروكلي والباذنجان. ولقد أوضحت النتائج المتحصل عليها أن كل المعاملات التي تم اجرائها على البروكلي والباذنجان أدت وبشكل ملحوظ على زيادة النسبة المئوية للفقد في بقايا كل أنواع المبيدات المستخدمة. وجد ان عملية السلق البروكلي أدت الى زيادة النسبة المئوية في الفقد من جميع متبقيات المبيدات المختبرة بمعدلات مختلفة. سجلت مع مبيد جراب نسبة مئوية هي 86.53% بينما سجلت نسبة اقل مع مبيد بيستبان (23.96%). من ناحية أخرى، سجلت طريقة التجميد فقد كامل (100%) في مبيد جراب في حين سجل فقد أقل بنسبة (24.69%) مع مبيد بيستبان. وفي الباذنجان اظهرت عملية الغسيل نسبة فقد اعلى مع مبيد بيستبان ونسبة اقل مع مبيد جراب فكانت على التوالي 97.83%، 81.30%. وفي حين أن بعض العمليات التصنيعية أدت إلى فقد كامل لكل بقايا المبيدات الحشرية وقد اظهرت كل من عملية القلي والطبخ إلى فقد 100% من كلاً من مبيد جراب وبستبان .

الكلمات الدالة : المبيدات الحشرية - الإعداد - التصنيع - فقد