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EFFECT OF PREPARING AND PROCESSING ON PESTICIDE RESIDUES OF SOME FRUITS (ORANGE AND JUAVA)

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ABSTRACT: *Pesticide residues in fruits and vegetables are among the primary sources of pesticide exposure through diet, but the lack of adequate measurements hinder the research on health effects of pesticide residues. The aim of this investigation was to study the effect of preparation and processing on the percentage loss of some pesticide and fungicides on orange and juava fruits contents. The effects of processing washing, peeling and jam processing on the levels of the pesticide residues were quantified. The obtained data showed that the most of treatments in both orange and juava lead to an increasing on the percentage loss of all pesticides and fungicides.*

On the other hand, some treatments lead to a full loss of percentage in the pesticides and Fungicide, for example, jam processing lead to loss 100% from vydata and teldor in orange and juava. Washing of orange fruits leads to loss up to 47.65%, 26.41% and 46.20% from perfekthoine, vydate and telader, respectively. While, washing of juave fruits lead to losses up to 44.78%, 51.85% and 60.26% of perfekthoine, vydate and lelader, respectively.

Key words: *Pesticide residues- processing- preparation- jam processing.*

INTRODUCTION

The risk to human health resulting from the widespread application of pesticides for many decades is well known in recent years, attention has been focused on food safety. This is especially true for pesticide residues, and degradation rates on strawberries subjected to field treatments (Wennrich *et al*., 2001) and post harvest processing (Will and Kruger, 1999).The dissipation of pesticides after their application depends on various factors, including plant, species, chemical formulation, application method, climatic condition, physical environmental phenomena (mainly volatilization), and chemical degradation, in which sunlight plays a prominent role (Elbert *et al*., 1999; Mouden *et al*., 2009).

Pesticide residues have also been identified in multiple fruits and vegetables, and the residues of certain pesticides were found to be more than maximum residue level values recommended by European Union, World Health Organization and Food and Agricultural Organization (Bakırcı *et al*., 2014; Yu *et al*., 2016). The concerns regarding the impacts of food-borne pesticides on human health have led advocacy organizations to develop an index to rank food items in terms of pesticide residue levels based on the PDP data (EWG, 2014).

Toshihiro, 1997 examined the effect of food components on pesticide residues from citrus fruit which heated to make marmalade using several kinds of solvents (nohexane, acetone, methanol, and water). From the IR spectra, the chief ingredient of the gel was considered to be pectin, which is contained on most plants. Thus, the pectin of grapefruit was considered to have masked organophosphorus pesticides from organic solvent extraction. Pectin is easily uansuded from food stuffs by cooking and appears to play a role in reducing the amount of pesticides extracted by organic solvents with healing.

It is well known that processing food can affect the level of pesticide residues. Typical operations employed in processing food crops such as washing, peeling, blanching

and cooking play a role in the reduction of residues (Kaushik, *et al*., 2009; Timme and Walz-Tylla, 2004). It is expected that fruits and vegetables contain higher pesticide residue levels compared to other foods of plant origin, such as bread based on cereal processing, because they are mainly consumed raw or semi-processed (Chen *et al.*, 2011). Conversely, processing can also result in a higher residue concentration, for example, as a result of the loss of water during processing (Timme and Walz-Tylla, 2004).

The aim of their research is to study effect of preparation and processing of orange and juava fruits on the percentage loss of pesticides and Fungicides residues in orange and juava fruits and its products.

MATERIALS AND METHODS

1- Materials:

1-1 Orange and juava fruits were obtained from El-Hady farms in Salhya, Sharkia, Governorate in January 2016

1-2 Tested pesticides:

Perfekthione, vydate and teldor were obtained from Agriculture local market in Salhya region and its characteristics are shown in Table (1) according to the pesticide manual (2016) and all of these pesticides were used according to the recommendation dose by the Egyptian Ministry of Agriculture.

2- Methods:

2-1 Preparation and processing of orange samples:

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

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

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

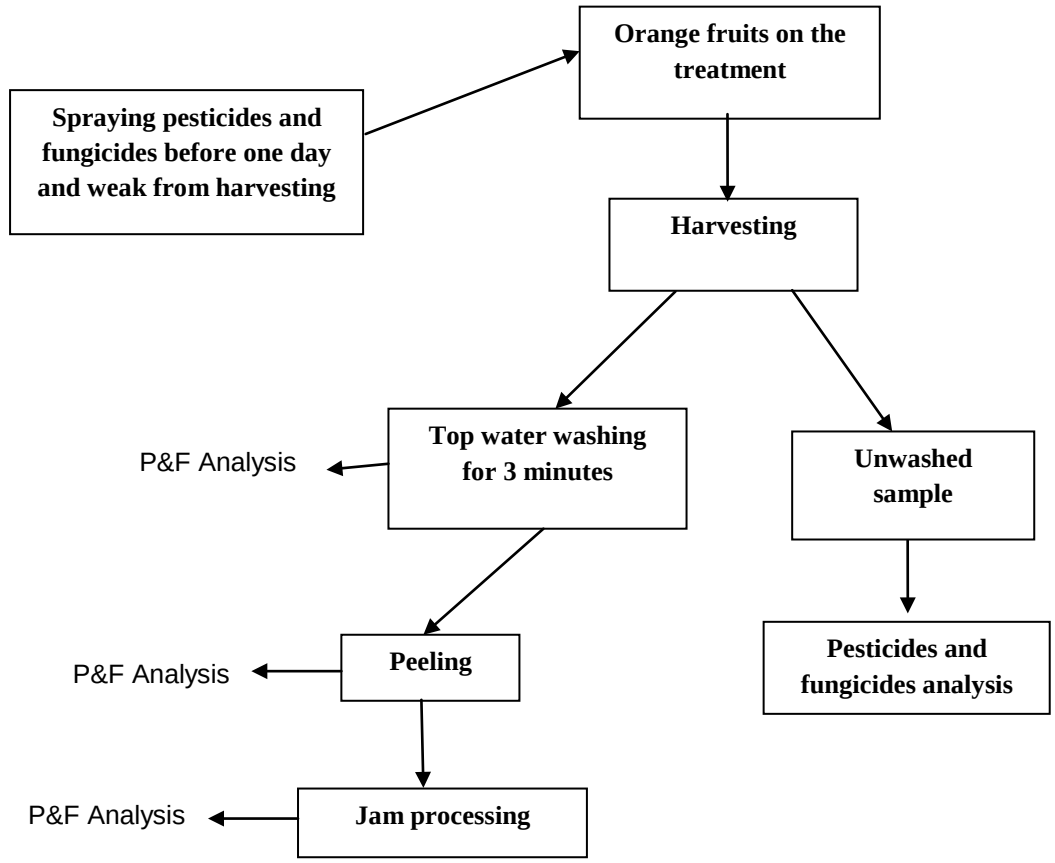
c- Peeling: The orange samples were peeled.

d- Cooking: The peeled orange samples were cooked with sugar by rate 1:1 and citric acid by rate 3mg/1kg. To make an orange jam and the total solid were measured by refract meter to 68%. These treatments are shown in flow sheet (1):

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
O, o-dimethyls – methylcarba – moylmethyl phsphorodithioate	Dimethoate	Perfekthione	320-380	>95
N, N- dimethyl – 2 – methyl – carbamoyloxyimino – 2 – (methyl thio) acetamide	Oxamyl	Vydate	4-5	>95
N-(2, 3- dichloro – 4 – Hydroxy phenyl) – 1 – methylcy clohex – ane - carboxamide	Fenhexamid	Teldor	>5000	>95

Flow sheet (1) Orange preparation and processing for pesticides and fungicides analysis



P&F Analysis: pesticides and Fungicides Analysis

2-2 Preparation and processing of juava samples:

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

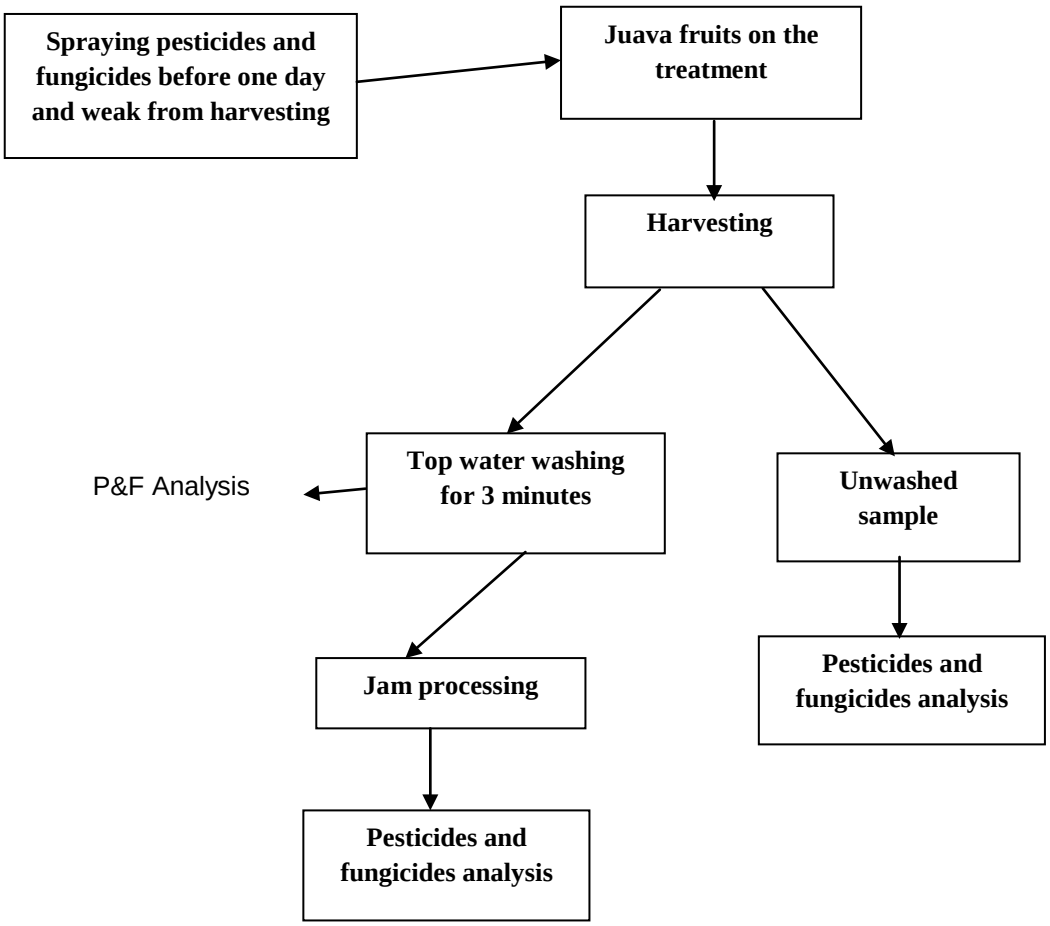
a- Raw juava: The juava samples were taken directly without any treatment to determine the pesticides after one day and after one week from spraying.

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

c- Crushing: The juava samples were crushed by electrical blender and seived to remoring the seeds from samples.

d- Cooking: The crushed and sieved juava samples were cooked with sugar by rate 1.1 and citric by rate 3mg/1kg. To make juava jam and the total solid were measured by refractometer to 68%. These treatments are shown in flow sheet (2):

Flow sheet (2) Juava preparation and processing for pesticides and fungicides analysis



P&F Analysis: pesticides and Fungicides Anylsis

2-3 Determination of pesticides and fungicides residues using gas chromatography (GC):

The tested residues were determined using a Hewlett Packard 5980 series II gas chromatography fitted with both flame photometric detector (FPD) with 550nm phosphorus filter and a nitrogen phosphorus detector (NPD) attached to a DB 1701 column (30m x 530 µm x 1.0 µm film), with the split made with the split made with the split temperature ratio 250°c using auto injector.

Helium was used as the carrier gas at a pressure of 10 Psi. The detector temperature was maintained at 250°c and the oven temperature programmed from an initial temperature was 100°c (hold for 0.5 min) to 250°c at 10°c/min – and hold for 10 min. The pesticide was detected with both flame photometric detector (FPD) and nitrogen phosphorus detector (NPD) at 330°c according to the method described by (A.O.A.C, 2005).

RESULTS AND DISCUSSION

1-Effect of preparation and processing of the percentage loss of pesticides residues in orange are presented in Table 2 and Fig 1

Generally, pesticides residues in orange fruits in control samples without spraying not detected. The concentration of the

pesticides residues on unwashed orange samples after one day from spraying were 3.84, 4.05, 2.64 ppm from perfekthione, vydate and teldor respectively. After one week from spraying, the percentage loss of pesticides residues was 27.34, 20.49 and 61.42 from perfekthione, vydate and teldor respectively. Washing process was recorded the highest percentage loss was 47.65% of perfkthione while the lowest percentage loss was 26.41% of vydate, while the percentage loss of teldor was 46.20%. Washing is the most common and straightforward form of processing. It is generally the first step in various types of treatments (household and commercial preparation), which is applied to food commodities (Kaushik *et al.*, 2009). The effectiveness of washing in removing residues depends on the location, the water solubility of the pesticide and the temperature of the wash.

Peeling process were recorded a high percentage loss of all pesticides residues, the value were 61.19, 63.20 and 91.01% from perfekthione, vydate and teldor respectively. On the other hand, the cooking temperature on prepared jam leads to breaking the active ingredients of both vydate and teldor. While reduced the percentage loss of perfekthione to 87.50%.

Table (2): Effect of preparation and processing of the percentage loss of pesticides residues in orange:

Treatments	Residues (ppm)			Percentage loss %		
	Perfekthione	Vydata	Teldor	Perfekthoine	Vydate	Teldor
Control sample	N.D	N.D	N.D	N.D	N.D	N.D
Un washed after one day from spraying	3.84	4.05	2.67	0.0	0.0	0.0
After one week	2.79	3.22	1.03	27.34	20.49	61.42
Washed	2.01	2.98	0.64	47.65	26.41	46.20
Peeled	1.49	1.49	0.24	61.19	63.20	91.01
Orange jam	0.48	N.D	N.D	87.50	100	100

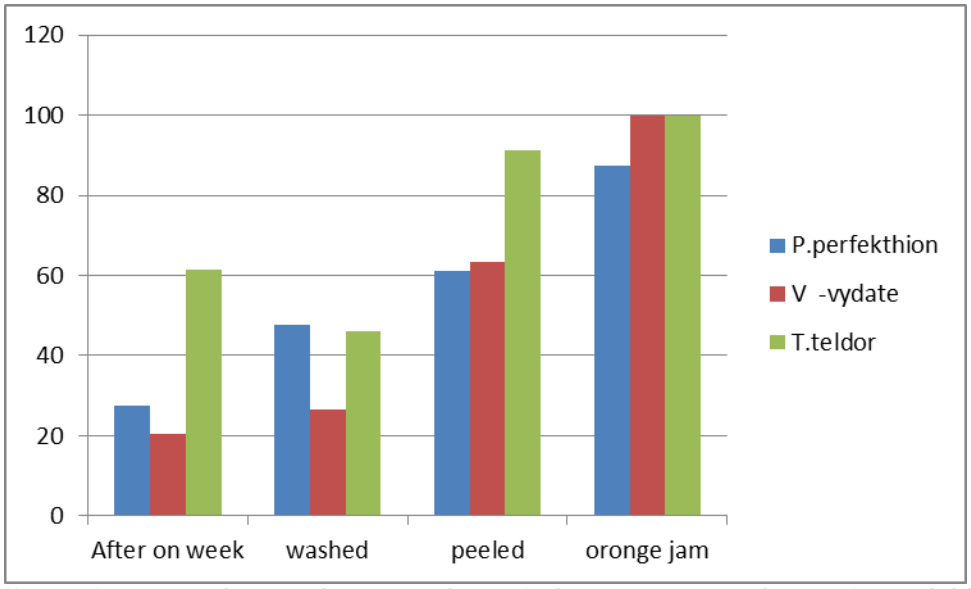


Fig (1). Effect of preparation and processing of the percentage loss of pesticides residues in orange:

2- Effect of preparation and processing of the percentage loss of pesticides residues in juava fruits.

Pesticides residues in juava fruits are presented in Table 3 and Fig 2. Generally, pesticides residues in juava fruits samples in control sample "without spraying" not detected. The concentration of tested pesticides residues was recorded 4.51, 2.97 and 3.07 ppm from perfekthione, vydate and teldor respectively in unwashed sample after one day from spraying. After one week from spraying, the percentage losses were recorded 12.86, 33.33 and 49.51% from perfekthione, vydate and teldar respectively. Washing process was recorded a high percentage loss of all pesticides residues, the value of percentage loss were 44.78, 51.85 and 60.26% from perfekthione, vydate and teldor respectively. Washing process was recorded a high percentage loss of all pesticides residues, the values of percentage loss were 44.78, 51.85 and 60.26% from perfekthione, vydate and teldor respectively. On the other hand, cooking temperature was lead to break down the active ingredients of vydate and teldor while the percentage loss of perfekthione was 72.50%. This may be attributed to hydrolysis of the compound in water at elevated temperatures, which affect the nature of the residue during heating processes (Timme and Walz-Tylla, 2004).Cooking is the act of preparing food for eating by the application of heat.

Table 3. Effect of preparation and processing of the percentage loss of pesticides residues in juava fruits.

Treatments	Residues (ppm)			Percentage loss %		
	Perfekthione	Vydata	Teldor	Perfekthoine	Vydate	Telder
Control sample	N.D	N.D	N.D	N.D	N.D	N.D
Un washed after one day from spraying	4.51	2.97	3.07	0.0	0.0	0.0
After one week	3.93	1.98	1.55	12.86	33.33	49.51
Washed	2.49	1.43	1.22	44.78	51.85	60.26
Juava jam	1.24	N.D	N.D	72.50	100	100

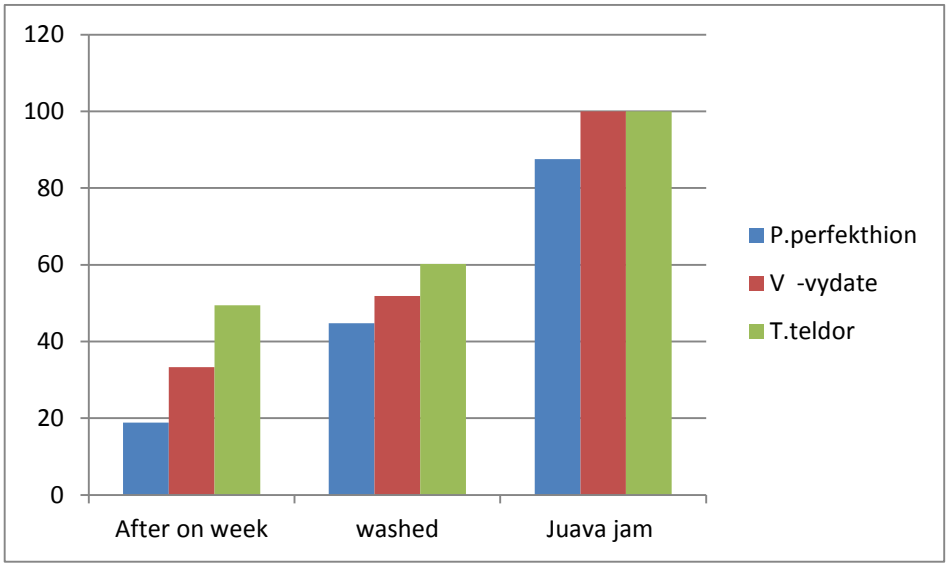


Fig (2): Effect of preparation and processing of the percentage loss of pesticides residues in juava fruits.

Conclusion

The effect of various processing i. e washing, peeling and cooking (jam processing) of orange and juava on the residues of some pesticides (Perfekthione, vydate and teldor) were determined. Washing, peeling and cooking processes were lead to break down the active ingredients of vydate and teldor while.

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تأثير عمليات الإعداد والتصنيع على متبقيات بعض المبيدات في بعض أنواع الفاكهة (البرتقال والجوافة)

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الملخص العربي:

يهدف هذا البحث إلى دراسة تأثير عمليات الإعداد والتصنيع على نسبة الفقد في بعض المبيدات سواء الحشرية أو الفطرية على كلاً من البرتقال والجوافة, والمعاملات هى الغسيل والتقشير وعمل المربى.ولقد أوضحت النتائج المتحصل عليها أن معظم المعاملات لكل منتجات الجوافة والبرتقال أدت إلى زيادة نسبة الفقد في بقايا كل أنواع المبيدات سواء الحشرية أو الفطرية المستخدمة.في حين أن بعض المعاملات التصنيعية أدت إلى فقد كامل لكل بقايا المبيدات. والخلاصة ان عملية غسيل ثمار البرتقال ادت الى فقد ٤٧,٦٥% و ٢٦,٤١% و ٤٦,٢٠% على التوالى من كلا من برفكتيون والفايديت وتيليدور فى حين ان عملية الغسيل ثمار الجوافة ادت الى فقد ٤٤,٧٨% و ٥١,٨٥% و ٦٠,٢٦% على التوالى من كلا من برفكتيون والفايديت وتيليدورعلى التوالى بينما عملية تصنيع المربى في كلاً من البرتقال والجوافة أدت إلى فقد ١٠٠% من كلاً من مبيد التيليدور، والفايدبت.

الكلمات الدالة : الإعداد – التصنيع–المبيدات