Delta J. Sci. 16 (3) 1992

DETERMINATION OF PROFENOPHOS RESIDUES IN FRESH AND BLANCHED POTATOES

By

M. A. El-Tantawy*, I.M.El-Nabarawy** and A.A. Sallam**

*Plant Protec . Dept., Fac. of Agric., Zagazig Univ.

**Plant protec. Dept., National Research Centre, Dokki, Cairo, Egypt.

Received: 30-12-1992

ABSTRACT

Profenophos {o- (4-bromo-2- Chlorophenyl) o-ethyl s-propyl phosphorothioate} was sprayed three times to protect potato plants from infestation with the potato tuber worm, Phthorimaea operculella (Zeller) and for residue analysis during the 1991 season. It was found that the total residues of profenophos, just after harvest and during storage were well bellow the permissible limit (3.0 ppm) in fresh and processed potatoes. Data obtained indicated that high amounts of profenophos could be eliminated in the peel (58.3%). As time lapsed between harvest and storage, high amounts of residues are disappeared. Processing of potatoes removed Ca. 67% of profenophos residues in the blanching water.

INTRODUCTION

Potato crop is considered one of the most important vegetable crops under the Egyption conditions. Potato plants are attacked with many insect species including the potato tuber worm, *Phthorimaea operculella* (Zeller) (Assem, 1972). The chemical control is, however, nessecary to obtain tubers

free from infestation either just after harvest or during storage (El-Tantawy et al., in preparation). Investigators tried to evaluate the activity of several insecticides against the potato tuber worm with the aim to find a suitable and effective insecticides, e.g., El-Nabarawy (1987) and Hydar and El-Sherif (1987). Sallam (1992) found that profenophos has ovicidal, larvicidal and adulticidal actions against the potato tuber worm and thus fulfil the requirements needed to control this serious pest.

The present investigation aimed to detect the residues of profenophos in the potato tubers just harvest and during storage. The role of blanching and scaling of potatoes in removing the residues of profenophos was dealt with.

MATERIALS AND METHODS

1- Insecticidal treatment:

Potato plants were sprayed in the field with the organophosphorus insecticide profenophos (E.C. 72%) at the rate of 0.75 litre per a feddan to protect the plants from infestation with the potato tuber worm, *Phthorimaea operculella* (Zeller) as well as other insect species, profenophos was sprayed three times every ten days using a knapsack sprayer fitted with one nozzle. The first spray took place on April 20 th. The experiment was carried out at El-dawakhlia village, El-Mahalla El-Kubra centre, Gharbia Governorate during the 1991 season.

2- Detection of Profenophos residues:

One hundred g of potato were randomly taken from the

obtained crop just after harvest as well as one and two months from the onset of storage. To determine profenophos residues in the peel, some tubers were peeled off and 20 g. of potato peel were divided into two samples each of 10 g. Twenty g of peeled potatoes were used to determine the internal residues. Twenty g of intact tubers were used to determine the total residues. To study the role of blanching process in the removal of profenophos residues, one hundred g. of intact tubers were blanched after which 20 g of the blanching water as well as peeled of blanched potatoes were taken for residue analysis.

Preparation of the standard solution, extraction of residues, and clean up procedures were done according to the method adopted by El-Nabarawy and Carey (1988). Attempts to analyze profenophos residues using the conventional methods of analysis (Ballee et al. (1976) were unsuccessful. Using, alumina in this method of analysis for clean up was ineffective to remove interferences in the area of interst. Thus the method adopted by El-Nabarawy and Carey (1988) was used for more accuracy.

Quantitation was done using G.C. (Hp-5890) equipped with mass spectra detector (Hp-5970) and Capillary column (Hp-101) as described by El-Nabarawy and Abou-Donia (1992).

To determine the recovery of the used method of analysis a specific amount of a standard solution containing profenophos was added to the untreated tubers to obtain levels of profenophos ranged between 0.1-1.0 ppm. These fortified samples were processed throughout all steps of the analytical

method to validate the assay procedure.

RESULTS AND DISCUSSION

Data presented in Table (1) show the recovery percentages obtained with adding different amounts of profenophos to untreated tubers. It is obvious that percentage of recovery ranged between 85-96 which reflect the validity of the used procedure for analysis. The recovery was found to be time independent.

Table (1): Recovery percentages of profenophos from peel, pulp, and intact fresh potatoes.

Added ppm	Peel	Pulp	Intact Tuber
1.0	96.0	94.0	95.0
0.5	89.0	92.0	92.0
0.1	85.0	87.0	86.0
Average	90.0	91.0	91.0

El-Nabarawy and Abou-Donia (1992) and El-Nabarawy et al., (1992), working on the residues of profenophos in green cowpea pods and tomatoes, found that the average of profenophos recoveries, using the same method of analysis, ranged between 91-93%.

Residues of profenophos in the peeled potatoes, peel, blanching water, blanched potatoes and intact fresh potatoes are shown in Table (2).

Delta J. Sci. 16 (3) 1992

Table (2): Profenophos residues (ppm) in fresh and processed potatoes:

Treatment	Residues at the indicated periods of harvest		
	Just after harvest	One month	Two months
Fresh potatoes			
a.Peel	0.131	0.049	0.030
b.Pulp	0.093	0.053	0.030
Blanched potatoes			
a.Blanching water	0.132	0.045	0.015
	0.065	0.058	0.039
b.Intact potato	0.034	0.034	0.030
Control			

Data obtained in the table indicate that the total residues at all the different intervals were well bellow the permissible limit (3.0 ppm; Federal Register, 1985); even just after harvest. Data in the table show that approximately 15% of the total amount detected in the treatment just after harvest was found in the control. This may be due to the accumulation of the residues of this compound during previous usage in the field or the movement of the insecticides from treatment to another in leached water after irrigation during the same season.

Great interest to note that the same phenomemon was observed with other vegetable crops. El-Sayed et al. (1980) reported that soybean leaves contained 1.1 ppm of Curacron residues 12 days after spraying; the mature seeds at harvest (47 days after foliage treatment) did not contain detectable

amounts. Ramadan et al. (1988) found that the total residues of profenophos on and in unwashed and washed eggplant and green pepper fruits were 0.041 and 0.032 ppm and 0.053 and 0.038 ppm, respectivity, after 15 days of spraying. El-Nabarawy and Abou-Donia (1992) found that the total residues of profenophos were well bellow the permissible limit at the 5 th day after spraying of cowpea plants.

Data presented in Table (2) show that high amounts of profenophos residues are found in the peel (58.4 %). Abdel-Razik et al. (1984-1985) found that most of the insecticide residues are found in the peel and small amounts of the toxicant penetrate to the pulp of tubers and these amounts are removed under cooking or frying conditions.

It is obvious that as time lapsed between harvest and determination of profenophos residues, high amounts of the insecticide are disappeared. Loss percentages after one month from harvest were 62.32, 42.83, 65.83 and 10.31% in the peel, pulp, blanching water, and blanched potatoes, respectively. The corresponding values after two months were 77.19, 67.88, 88.64 and 40.0% . Blanching process removed magnitude amounts of profenophos (67%) in the blanching water. The removal of such amounts of the parent compound may be due to the polarity of profenophos (solubility in water is 20 mg/ L. water). Pesticide manual 1991; profenophos is a phosphate compound.

El-Nabarawy et al. (1992) found that processing of tomatoes into paste results in about 45% loss of profenophos total residues. Abdel-Rahim et al. (1991) showed that washing, peeling, blanching, cooking, frying and freezing play an

important role in removing magnitude amounts of the insecticide residues. Zidan et al. (1991) reported that processing of tomatoes removed most of the insecticide residues

REFERENCES

Abdel-Rahim, N.R.; Zidan, Z.H.; Mahmoud, R.M;Zidan, A.A., and Soliman, Y.A. (1991): Effect of storage and processing on the elimination of insecticide residues from potatoes. Fourth Arab Congress of plant protection Cairo 1-5 Dec. 364-372.

Abdel-Razik,M.; Khalil M.R., and Hegazi, M.E.A (1984-1985): Primiphos-methyl residues on and in potato-tuber. Bull Ent. Sec. Egypt. Econ. Ser- 14:165-169.

Assem, A.M. (1972): Effect of some insecticides on the potato tuber worm in the field and storage. Z. Ang. Entomol., 70: 157-160.

Ballee, D.L.; Cuanc, W.C.; Stallard,D.E; and Wolfe, A.L. (1976): Analytical methods for pesticides and plant growth regulators. Vol.8, G.; Zweig and J. Sherma (Eds), Academic press, New York, N.Y. pp. 263-274.

El-Nabarawy, I.M. (1987): Bioresidual action of certain insecticides against *Phthorimaea opeculella* (Zeller) larvae, Delta J. Sci. 11(4): 2120-2127.

El-Nabarawy, I.M., and Abou-Donia, M.A. (1992): Determination of profenophos and pirimiphos-methyl residues in green cowpea pods.

Egypt.J.Appl. Sci. 7(2): 433-438.

El-Nabarawy, I.M.; Abou-Donia, M.A.; and Amra, H.A. (1992): Determination of profenophos and malathion residues in fresh tomatoes and paste. Egypt. J. Appl. Sci., 7(4): 106-111.

El-Nabarawy, I.M.; and Carey, W.F. (1988): Improved method for determination of chlorothalonil and its related residues in cranberries. J. Assoc. Off. Anal. Chem., 71(2): 358-360.

El-Sayed, M.M., Shaaban, A.M. Zidan, A.H. and Abou-Zahw, M.M. (1980): Persistence and biological transformation of curacron, cyolane and Reldan insecticides as affected by temperature, U.V. rays and sunlight. 1 st.Conf., Pl.Prot. Res. Ins., Dokki, Cairo, Egypt, p. 68

El-Tantawy, M.A.; El-Nabarawy I. M., and Sallam, A.A. Selective toxicity of certain insecticides against the different stages of the potato tuber worm, *Phthorimaea operculella* (Zeller): In preparation.

Federal Register (1985): 50, 30172, U.S. Government printing office, Washington, DC.

Hydar, M.F.; and El-Sherif, L.S. (1987): Microbial control of the potato tuber worm, *Phthorimaea operculella* (Zeller) in the field. Bull ent. Soc. Egypt. Econ. Ser., 16: 127-131.

Pesticide Manual (1991): Published by the British crop protection council p. 705.

Ramadan, A.R.; El-Shemy, M.K.; and Hegazy, M.E. (1988): Residual behaviour of methomyl and profenophos on and in eggplant and pepper fruits. Egypt. J. Appl. Sci., 3:(2) 103-107.

Sallam, A.A.A. (1992): Toxicological studies concerning the effect of some pesticides on the potato tuber worm *Phthorimaea operculella* (Zeller) with special reference to residue analysis after harvest and during storage. M.Sc. thesis, Fac. of Agric. Zagazig Univ.

Zidan, Z. H., Abdel-Rahim, N.R., Zidan A.A. Mahmoud, R.M. and Soliman, Y.A. (1991): Elimination of fenitrothion and fenpropathr in insecticides redsidue from tomato by processing. Fourth Arab Congress of plant Protection Cairo 1-5 Dec. 373-379.

Delta J. Sci. 16 (3) 1992

تقدير متبقيات مبيد البروفينوفوس فى البطاطس الطازجة والمسلوقة

* مصطفى عبد الحفيظ الخطاوى
** ابراهيم مولى النبراوى ** أحمد أحمد سليم
* قسم وقاية النبات كلية زراعة الزقازيق
** قسم وقاية النبات المركز القومى للبحوث بالدقى ٠

يهدف هذا البحث إلى تقدير متبقيات إحدى المركبات الفوسفورية الذى أظهر كفاءة بيولوجية عالية ضد مختلف أطوار فراشة درنات البطاطس ٠ تم زراعة قطعة أرض من البطاطس فى العروة الصيفية لموسم ١٩٩١ ورشت النباتات ثلاث مرات بفاصل عشرة أيام لوقايتها من الإصابة بهذه الآفة وبعض الآفات الحشرية الأخرى ٠

وجد أن إجمالى متبقيات البروفينوفوس بعد الحصاد مباشرة وخلال التخزين كانت دون مستوى الحد المسموح به دوليا (٣ جزء فى المليون) كما وجد أن نسبة عالية من المبيد يمكن إزالتها فى القشرة (٥٨,٣٪) ٠ وجد كذلك أنه بتقدم الوقت منذ بداية التخزين يختفى قدر كبير من المبيد ٠

أدت عملية سلق البطاطس إلى إزالة مايقرب من ٦٧٪ من متبقيات المبيد فى ماء السلق ٠