J. Agric. Sci. Mansoura Univ., 27(3): 1873 - 1877, 2002

PERSISTENCE OF LEBAYCID AND MALATHION RESIDUES ON AND IN SUGER-BEET PLANTS.

Hegazy, M. E. A. [1]; Sh. A. A. Shokr[1]; M. M. Abu-zahw [1] R.M.Salem [2] and A .A. Basuni [3]

[1] Central Agricultural Pesticides Laboratory Agricultural Research Center, Dokki-Giza, Egypt.

[2] Plant Protection Institute. Agricultural Research Center, Dokki-Giza, Egypt.

[3] Sugar Crops Research Institute. Agricultural Research Center, Dokki-Giza, Egypt.

ABSTRACT

These studies were carried out to investigate the residual behaviour of lebaycid and malathion organophosphorus insecticides on sugar-beet (vegetative parts and roots) plants. Determined residue half-life values (RL_{50}) in vegetative parts were 14.4 and 14.7 hours for lebaycid and malathion , respectively.

In vegetative parts, the initial amount detected of lebaycid (5.04 ppm) was less than the initial amount found of malathion (40.90 ppm), while the initial concentration was undetected in sugar-beet roots for each of lebaycid and malathion. The vegetative parts did not have any detectable residues of lebaycid and malathion after 9 and 20 days from application, respectively. No detectable amount of lebaycid and malathion residues were found in the roots all days after treatment. So sugar-beet roots treated with each of the two tested insecticides could be used safely in sugar industry .

INTRODUCTION

Sugar-beet plant (*Beta vulgaris*) is an important and fundamental crop for sugar production in Egypt. The high sucrose content of sugar-beet roots accounts for the extraction of sugar from them and the high nutritive value of its leaves suggests using them as an extra source as forage for farm animals.

This crop is attacked with various insects. Cotton aphid (*Aphis gossypii* Glover), beet-weevil (*Lixus junci* Boh.), beet-fly (*Pegomyia mixta* Vill.), beet moth (*Scrobipalpa ocellatella* Boyd.) and cotton leafworm (*Spodoptera littoralis* Boisd.) are the most economically important insects infesting sugar beet plants. Lebaycid (fenthion) (O,O-dimethyl O-4-methyl thio-m-tolyl phosphorothioate) and malathion (S-1,2-bis(ethoxycarbonyl) ethyl O,O-dimethyl phosphorothioate) insecticides are recommended for controlling these pests in Egypt.

The present study was carried out to investigate the persistence of lebaycid and malathion residues in sugar-beet plants (vegetative parts and roots).

MATERIALS AND METHODS

The experimental work was conducted at Sakha Experimental Station , Kafr El-Sheikh Governorate from November 1997 to May 1998. Sugar-beet seeds of the Pleno variety were planted on November 23th, 1997.

lebaycid 50% E.C.and malathion 57 % E.C. were applied on April 13th 1998, at recommened dose (500 ml for each 100 L of water), respectively, using a knapsack sprayer equipped with one nozzle.

Samples were taken including 5 plants for each sample at intervals of one hour after application (zero time), 1, 3, 6, 9, 13, 16, 20 and 37 days after spraying. Then sub-samples of 50 and 100 g. from vegetative parts and roots respectively, were taken for residue analysis.

Analytical procedures :

A- Extraction :

1- Vegetative samples :

Fifty gram of homogenized sample was mixed with 50 g. anhydrous sodium sulphate and 100 ml ethylacetate. The mixture was blended for 3 min. and filtered(Ministry of Welfare, Netherlands, 1988)..

2- Root samples :

Methanol was found to be the best solvent for extraction of the two insecticides from roots.

One hundred gram sample of the roots was placed in the blender cup and a constant amount of methanol (2 ml/gram root) was added then blended for 3 minutes and filtered. Extracts were shaken successively with 70, 70 and 50 ml of methylene chloride in separatory funnel after adding 40 ml of sodium chloride solution (20%); then the water phase was discarded. The combined methylene chloride phases were dried by filtration through anhydrous sodium sulphate. Then it was evaporated just to dryness using a rotary evaporator at 40°C, and the residues were ready for chromatographic determination without clean-up.

B- Clean-up of extracts :

The clean-up procedure was done according to the method of Mills *et al.* (1972). The vegetative extracts were cleaned up through activated florisil using the elution solvent system of methylene chloride , n-hexane and acetonitrile at the ratio of 50 : 48.5 : 1.5 v/v/v , respectively, and collected extracts evaporated just to dryness using a rotary evaporator at 40°C and the residues were ready for chromatographic determination.

C- Gas liquid chromatography determination :

A Pye Unicam 4500 gas chromatograph equipped with a flame photometric detector operated in the phosphorus mode (526 nm filter) was used for lebaycid and malathion determination. The column (1.5 m x 4 mm i.d. pyrex) was packed with 4% SE-30 + 6% OV-210 on gas chromosorb Q (80-100 mesh); temperature degrees were 230°C for column, 240°C for

detector and 235°C for injector and gas flow was 30, 30, 30 ml/min. for nitrogen, hydrogen and air, respectively. Retention times for lebaycid and malathion under these conditions were 3.77 and 2.57 min., respectively.

Results were corrected according to the rates of recovery which were determined in fortified untreated samples. Following the techniques previously mentioned, the rates of recovery of lebaycid and malathion were (95.59,96%) and (96 , 96.31%) in vegetative parts and roots, respectively.

RESULTS AND DISCUSSION

Results in Table (1) represent the residues of lebaycid and malathion on and in sugar- beet plants (vegetative parts and roots). The data showed that the concentration of the initial deposits on and in vegetative parts were 5.04 ppm and 40.90 ppm for lebaycid and malathion, respectively, one hour after application.

Table (1) : Residues of lebaycid and malathion on and in sugar-beet plant.

Time after application (days)	Residues (ppm)			
	Lebacid		Malathion	
	Vegetative parts	Roots	Vegetative parts	Roots
Zero time*	5.04	UND	40.90	UND
1	0.55	UND	9.82	UND
3	0.065	UND	2.67	UND
6	0.021	UND	1.95	UND
9	0.018	UND	0.514	UND
13	UND	UND	0.123	UND
16	UND	UND	0.041	UND
20	UND	UND	0.035	UND
37	UND	UND	UND	UND
RL_{50} in hours	14.4		14.7	

*** One hour after application**

The amount of residues was decreased sharply to 0.55 ppm and 9.82 ppm, for lebaycid and malathion respectively, within the first 24 hours after spraying. The residues of lebaycid and malathion insecticide dropped to 0.018 ppm for lebaycid and, 0.035 ppm for malathion after 9 and 20 days, respectively. The vegetative parts did not have any detectable residues of lebaycid and malathion after13 , 20 days from application, respectively .

The half-life values of lebaycid and malathion in vegetative parts were 14.4 and 14.7 hours, respectively.

Residues of lebaycid and malathion were undetected in sugar beet roots in all studied time intervals.

The present results agree with the findings of Hegazy *et al*. (1989) who found that no detectable amount of malathion residues in the roots of sugar-beet plants at all the intervals of study, while very small amounts of pirimiphos-methyl and methamidophos were detected.The present study confirmed that initial deposits of lebaycid and malathion was 5.04 and 40.9

ppm in vegetative parts, respectively. Such difference could be attributed to the less rate of application of lebaycid 500 ml (*i.e.* 250 g a.i.)/100 L water than malathion (500 ml (*i.e.* 285 g a.i.)/100 L water .

The fast disappearance of lebaycid and malathion may be due to its higher vapor pressure of lebaycid (3x10 –5 mm Hg at 20°C) and malathion (4x10 mm Hg at 30°C) of malathion, and also to other factors such as weathering, metabolic conversions or other degradation processes. However, the first day following application is critical in the sense of sharply decreases in insecticides residues reach to 10.91% for lebaycid and 24% for malathion from the initial deposit.

On the other hand, reduction of insecticide residues from leaves of the plant probably resulted from dilution by plant growth and the effect of volatilization from the plant tissue surface due to meteorological conditions for the duration of the experiment such as temperature, humidity, rainfall and UV-light.

The loss of chlorpyrifos-methyl from the plant surfaces is mainly occurred by volatilization (Anonymous, 1972), while fenitrothion gets onto a plant, rapidly penetrate into its tissues (over 50% of the total amounts in 24 hours), but does not migrate along the vascular system, exhibiting only a penetrating effect (Gruzdyev *et al*., 1983).

The obtained data indicated that lebaycid and malathion had short persistences on the vegetative parts of sugar-beet plants. These results are in agreement with those of Shokr (2000), who studied the residual behaviour of fenitrothion and chlorpyrifos-methyl organophosphorus insecticides on sugar-beet plants (vegetative parts and roots) and the contamination of soil under these plants. The residue half-life values (RL_{50}) determined on vegetative parts and soil were 16.8 and 134.4 hours for fenitrothion and 14.4 and 118.8 hours for chlorpyrifos-methyl, respectively.

From the present investigation it could be concluded that the root parts of the treated suger-beet plants with lebaycid or malathion could be used safely for extracting suger . As the vegetative parts may be used in animal feeding without problem after 3days from application (Hegazy *et al*., 1989 and CODEX , 1997) .

REFERENCES

Anonymous (1972). Noltran 2E (Reldan) Lebal drait proposed to Egyptian Ministry of Agriculture, Dow Co.

CODEX,Alimentarius Committee for Pesticide residues(CAC/PR) (1997). Guide to codexrecommendation conerningpesticide residues part 2 Maximum Limits for Pesticide Residues .

Gruzdyev, G.S.; V.A. Zinckenko; V.A. Kamps and R.I. Slovtsov (1983). The chemical protection of plants (Gruzdyev, G.S. Ed.), MIR Publishers Moscow, 180- 181, 189.

Hegazy, M.E.A.; M.A. Kandil; Amal Y. Saleh and M.M. Abu-Zahw (1989). Residues of three organophosphorus insecticides on and in sugar-beet plants. Bull. Fac. of Agric., Univ. of Cairo, 40 (2) : 399-408.

Mills,P.A.;B.A.Bong;L.R.Kamps and J.A.Burkke (19972). Elution solvent system for florisil column clean-up in organochlorine pesticide residuses analyses.J.A.O.A.C. 55 :(1)41-43.

Ministry of Welfare, Health and Cultural Affairs, Rijswijk, Netherlands (1988). Analytical Methods for Residues of Pesticides in Foodstuffs. PA Greve Ed., Bilthoven.

Shokr, A.A. Sh. (2000).Persistence and fate of fenitrothion and chlorpyrifos-methyl residues in suger-beet plants and soil.Egypt J.Agri. Res.,78(4), 1509-1515.

ثبات متبقيات مبيدى الليباسيد والملاثيون على وفى نباتات بنجر السكر

محمد السعيد على حجازى[١] ، شكر عبد السلام شكر[١] ، مصطفى محمد أبوزهو[١] ، رمضان محمد بهى الدين سالم[٢] ، أحمد أبوسيد بسيونى[٣]

١.المعمل المركزى للمبيدات، مركز البحوث الزراعية، الدقى - الجيزة، مصر.
٢. معهد وقاية النباتات ، مركز البحوث الزراعية ، الجيزة .
٣. معهدبحوث المحاصيل السكرية ، مركز البحوث الزراعية ، الجيزة .

يهدف هذا البحث لدراسة مدى ثبات متبقيات مبيدى الليباسيد (فينثيون) والملاثيون على وفى نباتات بنجر السكر. أوضحت الدراسة أن فترات نصف العمر بالنسبة لمبيد الليباسيد كانت ١٤,٤ ساعة؛ ولمبيد الملاثيون كانت ١٤,٧ ساعة على الأجزاء الخضرية.

المتبقى الأولى على المجموع الخضرى لنبات البنجر كان أعلى فى حالة مبيد الملاثيون (٤٠.٩٠ جزء فى المليون) عنه فى حالة مبيد الليباسيد (٥,٠٤ جزء فى المليون). هذا ولم يوجد المتبقى الأولى على جذورنباتات البنجر كلا من مبيدى الليباسيد واللملاثيون.

لم يحتوى المجموع الخضرى على أى متبقيات يمكن الكشف عنها عند اليوم التاسع و اليوم العشرين من المعاملة لمبيدى الليباسيد والملاثيون على التوالى، أيضا لم يكتشف أى متبقيات لكلا المبيدين فى الجذور بعد المعاملةعند جميع الفترات الزمنية تحت الدراسة.كما وجد ان مبيد الليباسيد اقل ثباتاً نسبيا من الملاثيون على المجموع الخضرىلنباتات البنجر.