RESIDUES OF DIAZINON AND FENITROTHION INSECTICIDES ON AND IN SUGAR-BEET PLANTS

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Abstract

Sugar beet plants were treated Two times in the field with diazinon (60%EC) and fenitrothion (50% EC) at the rate of 150 and 125 grams a. i. per 100 ml. water respectively. The first treatment was carried out when plants were five months old and repeated after 40 days.The data showed that no accumulation for diazinon and fenitrothion after 40 days from first application.

Residue analysis showed that the total initial deposits determined one hour after second application were 99.05 and 28.83 ppm on and in vegetative parts of diazinon and fenitrothion treatments. These figures decreased to 0.76 and 0.05 ppm after ten days. The residue half-life values (RL50) on vegetative parts were 18 and 16 hours for diazinon and fenitrothion, respectively.

No detectable amounts of diazinon and fenitrothion residues were found in the roots at all the intervals of study. This indicates that the root parts could be used safely for manufacturing sugar.

INTRODUCTION

Sugar beet crop importance is due to that is produced about 40% of the world total production of sugar (Hend, 2000). In Egypt sugar beet has become the second crop for sugar production after the sugar cane. The total cultivated area of sugar beet in Egypt reached 160000 feddan in the season of (2001/2002) (Anonymous, 2001/2002). Every commercial beet crop is subjected to infestation with some of the insect pests or diseases. The most important insect that attack this crop in Egypt are: the cotton aphid (*Aphis gosspyii*), the beet weevil (*Lixus junci*), the beet fly (*Pegomia mixta*), and the cotton leaf worm (*Spodoptera littoralis*), diazinon and fenitrothion insecticides are recommended for the control of beet fly (Anonymous, 2001).

The aim of the present study was to determine the residues dissipation behavior of diazinon and fenitrothion insecticides on and in sugar beet plants with special concern of their accumulative effects.

MATERIALS AND METHODS

Sugar beet Beta ploy variety was planted on September 7th 2003 in the Farm at Deer El-Azab, El-Fayoum governorate. The cultivated area was divided into 3 plots each 216 m^2 . Plot A, control, without insecticide application, plots B and C were treated according to the recommendation of Ministry of Agriculture,Egypt.

The two insecticides: Diazinon (Diazonox EC 60%) and Fenitrothion (Sumithion EC 50%) were sprayed two times, the first treatment was carried out on February 12th when plants were about 5 months old. Application was repeated at 40 days on March 24th, 2004, by the recommended rates of 250 ml formulated material per 100 ml. water for both insecticides. Spraying were carried out by using a knapsack sprayer equipped with one nozzle. Field samples were taken after first treatment (one hour) and before the second treatment to evaluate any accumulation effect of diazinon and fenitrothion.

Whole plant samples were taken at random from each experimental plot. Sub sampling was done at the laboratory, where three representative samples of 50 grams vegetative part and 100 grams of root were taken. The initial samples were taken one hour after the second treatment followed by the intervals of 1, 2, 3, 6, 10 and 14 days. Sub samples were kept in clean polyethylene bags and stored at -20 OC in deep freezer till residue analysis.

Analytical procedures:

a. Extraction the technique of extraction that mentioned by Mollhof (1975) was adopted and was found suitable for the extraction of the two insecticides under study. Plant material (50-100gm) of homogenized sample was mixed with 200ml. Distilled methanol in a warning blender, the sample was blended for 3 mints at high speed and filtered through a dry pad of cotton into a graduated cylinder. Know volume of extract (100 ml) was taken and shaken successively with 100,50 and 50 ml of methylencloride in separator funnel after adding 30ml. of saturated sodium chloride solution, then the combined organic solvent phases were dried by filtration through anhydrous sodium sulfate. Then, it was evaporated just to dryness using a rotary evaporator at 40 OC and the residues were ready for chromatographic determination without clean up for root samples.

b-clean up of extract vegetative samples the samples extract were subjected to a column (250 x 15 mm id) packed with 6 grams of activated florisl (60-100 mesh) and topped with anhydrous sodium sulfate. The column was eluted with 200 ml.

eluant (50% methylenchloride-1.5% acetonitrile – 48.5 % hexane) at a rate 5 ml/min. the collected eluate was concentrated on rotary evaporator and dissolved in a known volume of ethyl acetate for residue analysis, according to the method of Mills *et al.* (1972).

c. GLC determination PYE Unicum 4500 gas chromatograph equipped with FPD operated in the phosphorous mode and a Pyrex column (1.5m x 4mm id) packed with 3% OV-225 on gas chromosorb Q 80-100 mesh was used under the following conditions: Injector temp. 245 OC Detector temp. 250 OC Oven temp. 230 and 205 OC for fenitrothion and diazinon, respectively. Carrier gas (N2) flow rate 38 ml/min., hydrogen and air flow rate 30ml/min.

Diazinon and fenitrothion retention times under these condition reached 1.6 and 2.5 min. respectively the rate of recovery of diazinon and fenitrothion were 96.81, 91.75 and 99.81, 98.05% leaves and roots, respectively.

RESULTS AND DISCUSSION

Table 1 show that the initial deposits after first treatment in sugar beet plants (vegetative parts) were 31.88 and 9.79 ppm for diazinon and fenitrothion, respectively. After 40 days no detectable amounts of residues in vegetative parts and roots were found. This indicate no accumulative behaviour occurred with the tow tested compounds.

As for the second application, data in the same table indicate that diazinon residues were detected in all vegetative parts. The highest residue levels were found in the samples taken just after the pesticide applications, and ranged between 99.05 and 28.83 ppm for diazinon and fenitrothion respectively. The amounts of residues were greatly decreased to 32.25 and 7.37 ppm, respectively, within the first 24 hours after spraying. The residues of diazinon dropped to 12.27, 7.78, 5.36, 0.76 and 0.08 ppm after 2, 3, 6, 10 and 14 days from spraying. The corresponding amounts of fenitrothion residues detected were 2.46, 2.21, 0.63 and 0.05 ppm after 2, 3, 6 and 10 days from spraying.

To demonstrate the degradation behaviour of tested insecticides on as total sugar beet vegetative part, the rate of loss of the initial deposits estimated 10 days after application were 99.23 and 99.82%, respectively. This finding indicate that diazinon has a longer persistent period than fenitrothion. The aforementioned results coincide with those investigated by Hegazy *et al.* (1989) where they studied the

residues of pirimiphos methyl and methamidofos in the sugar beet plants. They found that the first three days after application were critical in the dissipation of the tested pesticides residues in the vegetative parts.

Time after application (days)	Diazinon			Fenitrothion		
	Vegetative parts		Roots	Vegetative parts		Roots
	ppm	% loss	ppm	ppm	% loss	ppm
First application						
Initial*	31.88	0.00	UND	9.79	0.00	UND
40 days Second application	UND	0.00	UND	UND	0.00	UND
Initial	99.05	0.00	UND**	28.83	0.00	UND
1	32.25	67.44	UND	7.37	74.44	UND
2	12.27	87.61	UND	2.46	91.46	UND
3	7.78	92.14	UND	2.21	92.33	UND
6	5.36	94.59	UND	0.63	97.81	UND
10	0.76	99.23	UND	0.05	99.82	UND
14	0.08	99.92	UND	UND	100	UND
Half-life	18 hours			16 hours		

- Figures are the average of three replicates
* One hour after application
** Undetectable amount = < LOD = 0.02 for diazinon and 0.05 for fenitrothion

Similar results were obtained by Kashyap and Walia (1986). They found that about 33.37% of fenitrothion residues on okra fruits were degraded within the first 3 days.

The estimated half-life values of the applied insecticides were 18 and 16 hours for diazinon and fenitrothion, this short persistence in vegetative parts could be attributed to of environmental factors especially such as sunlight and temperature (Lichtenstein, 1972). These results are in agreement with those of Shokr (2000) who found that the residue half-live value (RL50) of fenitrothion in sugar beet (vegetative parts) was 16.8 hours.Hegazy, *et al.* (2002) found that the half life values of diazinon was 14.86 hours in the vegetative parts. Nasr and Almaz (2004) reported that the half life value of tetraconazole in suger beet foliage was 3 days and El-Sayed *et al.* (1977) who found that the safe period of harvesting the organophosphorus insecticides

treated vegetables, ranged between 1 and 12 days post treatment, depending of the chemistry of tested pesticide and king of crop.

Analysis the sugar beet roots indicated that no residues of diazinon and fenitrothion were detected therefore. Accordingly the root parts could be used safely for manufacturing sugar. These results are ingreement with Hegazy *et al.* (1989). Shokr (2000). Hegazy *et al.* (2002) and Nasr and Almaz (2004).

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سلوك متبقيات مبيدى الديازينون والفينتروثيون على وفى نباتات بنجر السكر

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يهدف البحث إلى إلقاء الضوء على سلوك متبقيات مبيدى الديازينون والفينتروثيون على وفى نباتات بنجر السكر .تم رش نباتات بنجر السكر على مرتين ، المرة الأولى بعد خمس شهور من عمر النبات حيث أخذت عينه بعد الرش مباشرة والعينه الثانية بعد ٤٠ يوم من الرشة الأولى (قبل الرشه الثانية مباشرة) لمعرفة مدى استمرار تواجد مخلفات المبيدين على وفى نبات بنجر السكر وأظهرت النتائج عدم تواجد المبيدين بعد فترة ٤٠ يوم من الرشه الأولى وكانت كمية المتبقي بعد ساعة من الرش على المجموع الخضري لنبات البنجر أعلى في مبيد الديازينون (٩٩,٠٥ جزء في المليون) فى مقابل ٢٨,٨٣ جزء فى المليون مع مبيد الفينتروثيون.

كذلك لوحظ حدوث تدهور شديد فى متبقيات الفينتروثيون على وفى المجموع الخضري لبنجر السكر خلال ٢٤ ساعة الأولى من الرشة الثانية حيث انخفضت من ٢٨,٨٣ إلى ٧,٣٧ جزء في المليون وكان معدل الفقد ٧٤,٤٤% وعلى الجانب الأخر كان انخفاض متبقي مبيد الديازينون على وفى المجموع الخضري لبنجر السكر من ٩٩,٠٥ الى ٣٢,٢٥ جزء فى المليون خلال نفس الفترة بمعدل فقد ٦٧,٤٤% قدرت فترة نصف العمر لمبيد الديازينون حوالي ١٨ ساعة بينما كانت ١٦ ساعة في حالة مبيد الفينتروثيون . أظهر تحليل المجموع الجذري عدم الكشف عن أي متبقيات للمبيدين في حدود حساسية الطريقة المستخدمة فى التحليل مما يشير الى امان الجذور من النباتات المعاملة فى التصنيع الى سكر .