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The Correlation between Fertilizer Types and Chlorpyrifos Dissipation in Tomato Cultivated Soil

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Abstract

When an insecticide reaches the soil, its fate depends on a host of conditions. So, this study aimed to investigate the effect of fertilizer types on tomato vegetative growth and fruit yield characteristics; the correlation between fertilizer types and tomato plants and chlorpyrifos dissipation in soil. Obtained data revealed that compost fertilizer gave the best vegetative growth characteristics compared with the other fertilizer types (31.6, 50, and 70 % above the control level of leaves number, branches number/ plant, and plant height, respectively), followed by organic and chemical fertilizers. Also, chemical fertilizer gave the highest mean yield (0.67 kg pot-1 with 17.9% above the control yield).The insecticide dissipated rapidly 1 week after application. Four months after application, the amount of residue declined by 99.7 and 99.85%. Obtained data revealed there is a negligible effect of cultivated plants on chlorpyrifos disappearance in soil. The same respect, the calculated residue half-life time of chlorpyrifos was 8.23 and 7.54 days in uncultivated and cultivated soil, respectively. Obtained results revealed the critical role of tomato cultivation on the dissipation of chlorpyrifos residues in soil compared with uncultivated soil. The degradation percent of chlorpyrifos residues in treated soil reached more than 99 % of detected amounts in unfertilized, biofertilized, and chemically fertilized soil at 4 months of application, while no detected residues in compost and organic manure fertilized soils.

Keywords:
Pesticides, fertilizer, remediation, chlorpyrifos, tomato.

INTRODUCTION

Tomato, (*Solanum lycopersicum* Mill.) is one the most important economic vegetables in Egypt so far as the area under vegetables and commercial value of the crop is concerned. The tomato is considered as one of the few cultures for which pests and diseases are equally important, being a host plant to about 200 species of arthropods (Shalaby *et al*., 2012). Also, tomato is considered to be an important vegetable crop in Egypt in terms of market value, productivity and area coverage. Tomato is a basic component of the Egyptian diet and is consumed almost daily fresh, cooked or processed (canned product or paste). In general, tomatoes are rich in lycopene and vitamin C; they still have low acidity, carbohydrate contents, and energetic value, which represent the consumer advantage from the nutritional, sensory, and functional point of view (Vieira *et al*., 2014; Nassur *et al*., 2015). The use of agricultural pesticides has increased dramatically during the past two decades for the control of insect pests, weeds and diseases in Egypt. Nevertheless, approximately 90% of agricultural pesticide application never reaches it is target organisms but is, instead, dispersed through the air, soil, and water (Moses *et al*., 1993). As a result, they are routinely detected in air, surface and ground water, sediment, soil, vegetable, and to some extent in foods. In addition, many soil-applied pesticides are also intentionally introduced into the soil environment for the control of soi lborne pests and pathogens, which result in an accumulation of their residues and metabolites in soil at unacceptably high levels (Redondo *et al*., 1997). However, soil still constitutes a major environmental compartment, and persistence and degradation of insecticides in soil have been the subjects of many research projects (Shalaby and Abdalla, 2006). When an insecticide reaches the soil, its fate is depended on a host of conditions including soil type, pH, organic content, mineral ion content, moisture content, the nature of the soil colloids, the flow of liquid and air through the soil, the amount of cultivation and plant growth present, and the exposure to environmental parameters, such as wind, sunlight, rain, temperature, humidity, etc. (Jones and Norris, 1998). A variety of microorganisms (bacteria and fungi) have been used in soil inoculations intended to improve the supply of nutrients to crop plants, to stimulate plant growth, to control or inhibit the activity of plant pathogens and to improve soil structure. Other more recent objectives for the introduction of microorganisms into soil are the mineralization of organic pollutants (bioremediation of polluted soils) Van Veen, *et al.* (1997). In the same respect, some microorganisms living in soil are known to be detoxification agents of pesticides, although pesticides may have a degree of persistence despite of the same microorganisms. That may due to the difference in the physico-chemical properties of soils and also the environmental factors such as pH, moisture content and temperature as well (Shalaby and Abdou, 2010, Shalaby and El-Metwally, 2016). Fertilizers have a very profound effect on crop growth and yield especially nitrogen which is an essential element for plant growth and maintenance since it is considered a key nutrient in crop production (Abo Arab *et al*., 2008). The rate of pesticide degradation in soil does not depend on organic contents of soil. Although, adsorption of pesticides increases with soil organic matter content and that possibly resulting in reduce in an availability of pesticides for degradation of soil water. This often offset by an increase in microbial biomass, which increases the rate of degradation (Shalaby and Abdou, 2010). So, this study aimed to investigate: 1) Effect of fertilizer types on tomato vegetative growth and fruit yield characteristics; 2) the correlation between tomato plants and chlorpyrifos dissipation in soil; 3) the influence of fertilizer types on chlorpyrifos persistence in treated soil.

MATERIALS AND METHODS

1. Pesticide used:

Chlorpyrifos 48 % EC: O, O-diethyl O-(3, 5, 6-trichloro-2-pyridinyl) phosphorothioate (Chlorzane E. C.48 %, trade name, was produced by Kafr El Zayat Pesticides and Chemicals Co., Egypt).

2. Reagents and solvents:

Certified reference standard of pesticide was of >98% purity and purchased from Dr. Ehrenstorfer GmbH (Augsburg, Germany). Acetonitrile, methanol and deionized water HPLC grade solvent were used; analytical grade such as trisodium citrate, disodium acetate, anhydrous magnesium sulfate; primary secondary amine (PSA) and 50 ml and 15 ml centrifuge tubes were purchased from Agilent Technologies, Egypt. A stock solution of chlorpyrifos was prepared at a concentration of 1 mg · ml–1 in acetonitrile and kept in a refrigerator (0–5°C). Calibration standard and working solutions in concentrations ranging from 0.01 to 2.0 mg/kg were prepared by serial dilution of the stock solution.

3. Semi-field experiment:

This study was carried out at Experimental station of Faculty of Agriculture, Sohag University. Tomato *Lycopersicon esculentum* (Mill.) variety "Super Strain B" after seeded in a greenhouse and then transferred to the pots; seedlings were cultivated in earthenware pots of 6 kg soil capacity in 18 September 2019. This experiment was divided into ten treatments; each arranged in randomized blocks design with four replicates for each treatment:

1. Uncultivated soil (pesticide only).
2. Cultivated without fertilizer and without sterilization soil (control).
3. Cultivated soil (untreated by pesticide and without fertilizer).
4. Uncultivated sterilized soil.
5. Cultivated with sterilized soil, to determine the influence of soil microorganisms on the degradation of tested insecticides (soil was autoclaved at 120 ºC for 1 hour three consecutive days, Shalaby and Abdou, 2010).
6. Cultivated with microben (biofertilizers) soil, [A mixture of four microbial species in equal portions (*Bacillus megatherium*, *Azotobacter* sp., *Azospirillium* sp. and *Pseudomonus* sp.). Microben produced by General Organization of Agric. Fund, Ministry of Agric. Egypt and used commercially as biofertilizer], microorganism suspensions were adjusted at 1 x 10^8 cells / ml. Treated soils were amended with bioagents suspensions at the rate of 50 ml / kg soil (Zidan *et al.*, 2002; Shalaby and Abdou, 2010).
7. Cultivated with compost fertilizer soil, (Wastes of food industries that exposed to technological bacteria fermentation and maturation processes using certain beneficial bacteria to be standardized organic fertilizer. It produced by Delta Bio- Tec, Egypt.), compost added to the soil at rates of 2.5 % of the pot soil weight, (according to El-menesy *et al*., 2005; Shalaby and Abdou, 2010), this addition was thoroughly mixed with soil before cultivation.
8. Cultivated with organic fertilizer soil; organic fertilizer as processed cow manure was added at a rate of 2.5 % (25g/kg soil) according to Al-fehaid *et al*. (2022).
9. Cultivated soil (without fertilizer and sterilizer).

A small amount of chlorpyrifos pesticide was dissolved in 100 ml water and added to soil in pots (6 kg), resulting in final concentration of 100 ppm, irrigation was done immediately for 5 days interval after soil treatment.

1) Vegetative growth characters:

Representative samples, five plants were randomly taken from each experimental unit at 65 days after transplanting to estimate the plant height (cm), number of branches/plant, number of leaves/ plant (Ali *et al*., 2019).

2) Fruit yield Characteristics:

a. Fruit fresh weight (g):

The fresh weight of the fruit was measured by a Balance Sensitive scale (Mettler Pc 4000) and the fresh fruit weight was calculated by dividing the weight of the experimental unit yield (g) by the number of fruits of the experimental unit.

b. Fruit dry weight (g):

The dry weight of the fruit was estimated by taking 4 fruits randomly from each treatment, and they were placed in an electric oven at a temperature of 105 °C for 72 hours until the weight was stable. Fresh and dry weights were determined according to methods of Gabal *et al*. (1984).

c. Fruit yield:

The average total weight of fruits in each treatment was calculated from the yield of the pot by weighing the yield of plants in the experimental unit.

d. Statistically analysis:

All recorded data were statistically analyzed and (Tuckey's Test) was used to compare the means at the level of significance ($P \leq 0.05$) using the SAS statistical analysis program according to Snedecor and Cochran (1980).

3) Residue analysis:

a. Sampling:

Samples of the treated soil were taken at depth of 5 cm from the pots of the treated soil before irrigation. These samples were taken after one hour as well as 1 day and 1, 2 weeks, 1, 2, 3 and 4 months from pesticides application. The collected soil samples were air dried through 2-mm sieve. The sieved soil samples were weighted and stored in clean polyethylene bags at -20 ºC until residue analysis.

b. Analysis of pesticides residues in soil samples:

Extraction and clean-up:

The pesticides were extracted and clean-up by using the QuEChERS method (ILNAS-EN, 2018). About 10 g of tomato fruit samples were weighed into 50 ml centrifuge tube; 10 ml of acetic acid 1% was added and shaken for 2 min then the sample was sonicated for 1 min. Ten ml of acetonitrile was added to the tube and shaken vigorously for 2 min. Then the sample was centrifuged for 5 min at 4000 rpm. An aliquot of 6 ml of the acetonitrile phase was moved into 10 ml centrifuge tube containing 1g magnesium sulfate and 200 mg PSA, shaken energetically for 30 seconds and centrifuged at 3000 rpm for 2 minutes. The supernatant was evaporated to dryness then reconstituted in 2 mL acetone: n-hexane (1:9 v/v). The mixture was subjected to ultra-sonication for 30 seconds then filtered into a glass vial. The extract is analyzed using HPLC.

c. Chromatograph analysis:

Determination of pesticide residues was carried out in the Pesticides Laboratory, Pests and Plant Protection Department, Agricultural and Biological Research Institute, National Research Centre, Dokki, Cairo. Quantitative of chlorpyrifos was performed by HPLC, Thermo Ultimate 3000 system; with quaternary pump, automated injector, and thermostat compartment for the column and fluorescence detector (λ_{Ex} and λ_{Em} set at 280 and 340 nm, respectively). The chromatographic column was C18 Zorbax XDE (25 mm x 4.6 mm. 5 µm). The column was kept at room temperature. The flow rate of mobile phase (methanol/ deionized water = 95/5 v/v) was 0.8 mL / min, and the injection volume was 20 µL. Under these conditions, the retention time for chlorpyrifos was 5.0 min.

d. Half-life calculated:

The residual half – lives (RL_{50}) values of chlorpyrifos were calculated using Moye *et al*., (1987) equation.

RESULTS AND DISCUSSIONS

Effects on vegetative growth characters:

Five plants were randomly taken from each experimental unit 65 days after transplanting to estimate the plant height (cm), branches number/plants, and leaves number/ plant. Data presented in Table 1 revealed that compost fertilizer gave the best vegetative growth characteristics compared with the other fertilizers types (31.6, 50 and 70 % above the control level of leaves number, branches number/ plant, and plant height, respectively), followed by organic and chemical fertilizers; while the microben fertilizer was the lowest efficiency. Also, data showed that sterilize soil had bad effects on the growth characteristics of tomato plants. While data obtained by Ali *et al*., (2019) showed that the inorganic fertilizer gave the best vegetative characteristics for tomato plants, the highest values of plant height (77.87 and 80.95 cm), number of branches/plant (10.60 and 10.93), number of leaves/plant (61.66 and 63.53), leaf area/plant (0.51 and 0.55 m^2). On the other hand, El-Fehaid *et al*., (2022) reported that the organic with bio fertilizers gave the best results in all studied characteristics (growth, yield and quality of cucumber crop) and were not significantly different from chemical (inorganic) fertilization. Also, Muhsin, (2018) concluded that cattle manure incorporated into soil increased the organic matter content, made a more porosity and better aggregation of soil and penetration resistance. These enhancements in soil physical properties in addition to the role of organic manure and compost to provide and/or protect the essential elements in soil can play a role to improve the plant media resulting in an increasing plant growth characteristics and nutrient uptake.

Effects of fertilization on fruit yield characteristics:

a. Tomato yield:

The treatments had statically significant effects on tomato yield (kg pot^{-1}) Table 1. The highest mean yield (0.67 kg pot^{-1} with 17.9% above control yield) was noticed in chemical fertilizer, followed by organic and compost treatments (0.6 kg pot^{-1} with 9.1% above control level). While the lowest yield was obtained in sterilized soil (10.9 % below control yield). These results are in line with previous studies, which reported higher tomato yields with the application of chemical fertilizers compared with organic management (Bilalis *et al.*, 2018). The main issue in organically managed soil is the slow release of nutrients, especially N, from the organic matter, which limits the conditions for plant growth (Sánchez-Navarro *et al.*, 2020). While some previous studies (de Ponti *et al.*, 2012; Seufert *et al.*, 2012; Willekens *et al.*, 2014) have shown no significant difference in tomato yield between sole application of chemical fertilizer and combined manure–chemical N fertilizer applications. However, in our study, the tomato yield was lower. Also, Ali *et al.*, (2021) reported that application of 100 % of NPK on onion gave the highest values of plant height and total yield. Carricondo-Martínez *et al.*, (2022) reported that conventional mineral fertigation management gave the highest yield of tomato, followed by vermicompost treatments at two different doses (3 and 9 kg/m), with no statistical differences. While the organic treatments with fresh crop residues, compost, and goat manure resulted in lower yields. On the other hand, data obtained by Muhsin, (2018) revealed that the corn plant height, leave area, number of ears per plant, and biological yield significantly increased by 19.20, 18.27, 31.29 and 65.05% with combined NPK+ organic manure treatment compared with NPK treatment, respectively, and by 40.71, 51.40, 70.80, and 151.33% compared with unfertilized treatment, respectively.

b. Fruit dry and fresh weight:

Data listed in the same Table revealed that there are no significant differences in tomato fruit dry and fresh weight between all treatments with each other and with control. Chemical fertilizer gave the highest dry and fresh weight/fruit amounts (5.8 and 4.3 % above the control plants), followed by organic fertilized plants (4.9 and 2.0 %); while the lowest amounts were observed in sterilized soil (0.35 and 0.9 % below the untreated plants).In the same trend, data obtained by Ali *et al.*, (2019) showed that inorganic fertilizer (NPK) caused the highest values of fresh weight/plant (430.57 and 441.78 g) and dry weight/plant (98.15 and 101.32 g during two growing seasons) compared with other treatments.

Table (1): Effects of fertilizer types on vegetative growth and fruit yield characters

Parameter / Treatment	Vegetative growth characters			Fruit yield characters		
	Number of leaves / plant	**Number of branches/ plant**	**Plant height (cm)**	**Dry weight (g)**	**Fresh weight (g)**	**Yield / pot (kg)**
***Cultivated (untreated) Control**	102.8^{AB}	20.75^{BC}	30.0^{B}	5.67^{A}	101.05^{A}	0.55^{BC}
****Cultivated**	77.88^{BC} (-28.2)	14.38^{C} (-30.7)	28.0^{B} (-6.7)	5.67^{A} (0.0)	101.72^{A} (+0.66)	0.54^{BC} (-1.8)
Cultivated + sterilization	60.0^{C} (-41.7)	13.0^{C} (-37.3)	16.0^{C} (-46.7)	5.65^{A} (-0.35)	100.1^{A} (-0.9)	0.49^{C} (-10.9)
Cultivated + Organic fertilizer	111.3^{AB} (+8.27)	22.75^{B} (+9.6)	30.13^{B} (+0.43)	5.95^{A} (+4.9)	103.10^{A} (+2.0)	0.60^{AB} (+9.1)
Cultivated + Microben	83.75^{BC} (-18.5)	17.13^{BC} (-17.4)	25.88^{B} (-13.7)	5.75^{A} (+1.4)	102.75^{A} (+1.7)	0.54^{BC} (-1.8)
Cultivated + Compost	135.3^{A} (+31.6)	31.13^{A} (+50.0)	51.0^{A} (+70.0)	5.87^{A} (+3.5)	102.42^{A} (+1.4)	0.6^{AB} (+9.1)
Cultivated + Chemical fertilizer	108.3^{AB} (+5.35)	23.25^{B} (+12.0)	33.25^{B} (+10.8)	6.00^{A} (+5.8)	105.35^{A} (+4.3)	0.67^{A} (+17.9)

Values within the same column with different letters denote significant differences ($p<0.05$) according to dunce; *= without fertilizer and pesticide; **= without fertilizer but treated by chlorpyrifos

Chlorpyrifos residue determination:

Recovery rate from soil was in the range of 85.27 to 92.68 % with %RSD of 3.68–8.50% Table 2. The recovery and the RSD for tomato fruits and soil were within the acceptable limits for routine analysis of chlorpyrifos residues leading to high precision.

Table (2): Recovery percentages of chlorpyrifos in soil samples

Fortification concentrations (ppm), n= 4	% Recovery ± SD	% RSD
2.0	92.68±4.2	3.56
1.0	91.17±2.19	4.25
0.5	89.32±3.7	3.75
0.1	87.17±3.4	6.52
0.01	85.27±2.6	4.14
Average	89.122	4.44

n= number of replicates; SD= standard deviation; RSD = relative standard deviation

The correlation between tomato plants and chlorpyrifos dissipation in soil:

Data presented in Table (3) revealed the effect of tomato cultivation on chlorpyrifos dissipation in soil. Results showed that residues of chlorpyrifos, applied at 100 ppm after one hour of application were 83.45 and 81.98 ppm in uncultivated and cultivated soil. The insecticide dissipated rapidly 1 week after application to reach a loss of 52.1 and 55.72 %, respectively. Four months after application, the amount of residue declined by 99.7 and 99.85%. Obtained data revealed there is a negligible effect of cultivated plants on chlorpyrifos disappearance in soil. in the same respect, the calculated residue half-life time of chlorpyrifos was 8.23 and 7.54 days in uncultivated and cultivated soil, respectively. Obtained results revealed the critical role of tomato cultivation on the dissipation of chlorpyrifos residues in soil compared with uncultivated soil. These results are in accordance with those obtained by Shalaby and Abdou, (2010), who reported that potato plantations had an important effect on the disappearance of carbofuran, ethoprophos, and chlorpyrifos residues in soil. The persistence of pesticides is influenced by a variety of factors. These include the pesticide's general stability as a parent ingredient or as metabolites, volatility, solubility, formulation, and method and site of application. (Cabras *et al*., 1989). Additional environmental factors including temperature, precipitation (and humidity), and air movement (Gennari *et al.*, 1985), affect the longevity of pesticides. In addition to the correlation between the treated surface's weight and the living state of the plant surface, other factors include the characteristics of the treated surface, the treated surface's species, the nature of the harvested crop, the cuticle's structure, the stage and rate of growth, and the general health of the plant (Gaber *et al.*, 2022).

Table (3): The correlation between tomato plants and chlorpyrifos dissipation (ppm) in soil

Treatments / Periods	Uncultivated (Control)			Cultivated		
	ppm	% Loss	Persistence %	ppm	% Loss	Persistence %
***Initial deposits**	83.45	…..	100	81.98	…..	100
1 day	70.6	15.4	84.6	69.74	14.9	85.1
1 week	40.0	52.1	47.9	36.3	55.72	44.28
2 weeks	20.1	78.9	21.1	17.1	79.14	20.86
1 month	10.38	87.6	12.4	6.8	91.7	8.86
2 months	3.08	96.3	3.7	1.46	98.2	1.8
3 months	1.9	97.7	2.3	0.97	98.8	1.2
4 months	0.21	99.7	0.3	0.12	99.85	0.15
****K**	0.0842			0.0919		
RL 50 (days)	8.23			7.54		

*Initial deposits = one hour after application; RL50 = Residual half-lives; ND = none detected
**K= rate of decomposition

The correlation between fertilizer types and chlorpyrifos dissipation in treated soil:

Results listed in Table 4 clearly showed that the amounts of chlorpyrifos initially detected in fertilized soils were 81.98, 86.5, 86.4, 87.6, and 88.2 ppm in unfertilized soil, biofertilized, compost, organic manure, and chemically fertilized soil, respectively. A slight degradation percentage in pesticide residues that occurred 1 day after application was 14.9, 18.9, 26.04, 26.7, and 16.78 %, respectively. Pesticide residues disappearance sharply after one week; the percent of pesticide loss values were 55.72, 55.1, 87.67, 85.6, and 54.4 % in unfertilized, biofertilized, compost, organic manure, and chemically fertilized soil, respectively. After 1 month of application, over 90 % of the initial amount of chlorpyrifos disappeared in all treatments. The degradation percent of chlorpyrifos residues in treated soil reached more than 99 % of detected amounts in unfertilized, biofertilized, and chemically fertilized soil at 4 months of application, while no detected residues in compost and organic manure fertilized soils. Also, the addition of compost and organic manure to the soil caused increase adsorption of pesticides and also increases in microbial biomass, which increases the rate of degradation (Shalaby and Abdou, 2010). In the same trend, Gruzdyve *et al.*, (1983) reported that the rapid dissipation of the residues of the applied pesticides from the soil through few weeks could be attributed to the removal from the soil as a result of volatilization, evaporation, irrigation, down ward movement, chemical and microbial degradation. Also, Shalaby and El-Metwally, (2016) reported that the soil organic matter or soil rich in humus content are more chemically reactive with pesticides than non-humified soil. Afterwards, tested pesticides were faster disappearance in organic and compost fertilized soils than other treatments. They reported also, the highest amount of metribuzin residues was detected in unfertilized soil followed by chemical and bio-fertilizer (0.81, 0.78 and 0.73 ppm, respectively). The lowest concentration of this herbicide was noticed in organic (0.4 ppm) and compost (0.62 ppm). No pendimethalin residues were found in soils fertilized with organic manure and compost, but its residues 0.22, 0.24 and 0.16 ppm in unfertilized, biofertilized and chemical fertilized soils, respectively at the end of the experiment. Generally, soil organic matter or soil rich in humus content are more chemically reactive with pesticides than nonhumified soil. Thereby, the dissipation of tested pesticides in organic and compost fertilized soil was faster than in other treatments.

Table 4: The correlation between fertilizer types and chlorpyrifos dissipation (ppm) in soil

Treatments / Periods	Cultivated (Control)			Biofertilizer			Compost			Organic manure			Chemical fertilizer		
	Ppm	% Loss	Persi. %	ppm	% Loss	Persi. %	ppm	% Loss	Persi. %	ppm	% Loss	Persi. %	ppm	% Loss	Persi. %
*Initial deposits	81.98	…..	100	86.5	…..	100	86.4	…..	100	87.6	…….	100	88.2	…..	100
1 day	69.74	14.9	85.1	70.12	18.9	80.1	63.9	26.04	73.95	64.25	26.7	73.3	73.4	16.78	83.22
1 week	36.3	55.72	44.28	38.8	55.1	44.9	10.65	87.67	12.33	12.6	85.6	14.4	40.2	54.4	45.6
2 weeks	17.1	79.14	20.86	18.4	81.0	19.0	6.78	92.15	7.85	8.6	90.2	9.8	17.3	80.4	19.6
1 month	6.8	91.7	8.86	5.9	93.2	6.8	1.08	98.75	1.25	1.26	98.6	1.4	6.8	92.3	7.7
2 months	1.46	98.2	1.8	2.4	97.2	2.8	0.45	99.48	0.52	0.69	99.2	0.8	1.23	98.6	1.4
3 months	0.97	98.8	1.2	1.1	98.7	1.3	0.09	99.89	0.11	0.12	99.86	0.14	0.67	99.2	0.8
4 months	0.12	99.85	0.15	0.2	99.7	0.3	ND	>99.9	<0.1	ND	>99.9	<0.1	0.09	99.8	0.2
K*	0.0919			0.976			0.1667			0.1596			0.0971		
RL_{50}(days)	7.54			7.1			4.16			4.34			7.14		

Initial deposits = one hour after application RL_{50} = Residual half-lives ND = none detected; K= rate of decomposition; Persi. = Persistence

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تقنيات المعالجة البيولوجية للمبيدات الملوثة للتربة و أثرها علي بعض خصائص النبات والتربة

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الملخص العربى

مصير المبيد الحشري في التربة يعتمد على مجموعة من الظروف. لذلك تهدف هذه الدراسة إلى معرفة تأثير أنواع الأسمدة في النمو الخضري للطماطم وخصائص إنتاجية الثمار؛ العلاقة بين أنواع الأسمدة ونباتات الطماطم وتبدد الكلوربيريفوس في التربة. أظهرت البيانات التي تم الحصول عليها أن سماد الكومبوست أعطى أفضل خصائص النمو الخضري مقارنة بأنواع الأسمدة الأخرى (31.6، 50، 70٪ بالمقارنة مع الكنترول من حيث عدد الأوراق، عدد الفروع / النبات، وارتفاع النبات) على التوالي، يليه السماد العضوي ثم الأسمدة الكيماوية. و قد أعطت الأسمدة الكيماوية أعلى متوسط إنتاجية (0.67 كجم وعاء-1 بنسبة 17.9% بالمقارنة مع الكنترول)، تليها الاسمدة العضوية والكومبوست (0.6 كجم وعاء-1 بنسبة 9.1% بالمقارنة مع الكنترول). تحلل المبيد الحشري بسرعة بعد أسبوع واحد من التطبيق. وبعد أربعة أشهر من التطبيق، انخفضت كمية المتبقيات بنسبة 99.7 و99.85%. كشفت البيانات التي تم الحصول عليها أن هناك تأثير ضئيل للنباتات المزروعة على اختفاء الكلوربيريفوس في التربة. وفي نفس الصدد، كان نصف عمر المتبقيات للكلوربيريفوس 8.23 و7.54 يومًا في التربة غير المزروعة والمزروعة، على التوالي. أظهرت النتائج التي تم الحصول عليها الدور الحاسم لزراعة الطماطم في تحلل بقايا الكلوربيريفوس في التربة مقارنة بالتربة غير المزروعة. وصلت نسبة تحلل بقايا الكلوربيريفوس في التربة المعاملة إلى أكثر من 99% من الكميات المكتشفة في التربة غير المسمدة والمسمدة بيولوجياً والمسمدة كيميائياً عند 4 أشهر من الاستخدام، بينما لم يتم اكتشاف اي متبقيات في التربة المسمدة بالكمبوست والسماد العضوي. وبشكل عام فإن الكمبوست والسماد العضوي الموجود في التربة يسبب زيادة في امتصاص المبيدات الحشرية وزيادة الكتلة الحيوية الميكروبية مما يزيد من معدل التحلل