

The Residual Effect of Malathion (Organophosphate) and Sevin (Carbamate) application on Soil and Carrot (*Daucus carota* L.) Growth

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Abstract

An experiment was conducted at Shambat Agricultural Farm, College of Agricultural Studies, Sudan University of Science and Technology, to study the effect of Sevin and Malathion residues on soil and carrot growth. Both pesticides were added at the concentrations of 1.08 (recommended dose) and 1.78 Kg/ha, (excessive dose) in addition to a control to evaluate their effect on plant and soil. The measurements taken were plant height, shoot fresh and dry weight, leaf area, pH, total nitrogen, CO_3^{2-} , HCO_3^- , Cl^- , Ca^{2+} , Mg^{2+} , and the electric conductivity (Ec.) of the soil solution. The results revealed that both chemicals affected positively carrot vegetative growth and yield, at the recommended dose, but negatively at the excessive dose. Both pesticides reduced the measured soil characteristics.

Keywords: Malathion , Sevin , Pesticides, Residues

Introduction

The excessive use of pesticides results in a great damage to the ecosystem. The production was greatly affected by this phenomena and the soil was polluted. Zaki (1978) stated some pesticides might undergo alot of changes and become more toxic. Khishin (1980) reported the effect of pesticides on plant parts.

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Abdelelhamid (1989) reported that the residues might affect the presence of some minerals especially trace elements. Soil fumigation with carbon sulphate, increased the manganese and potassium content of the soil.

On the other hand addition of sodium nitrite and DDT to the soil decreased the production of ammonia and the change of ammonia to nitrate.

Omer (2001) studied pesticides residues at Fasher district (West Sudan). He found high amounts of Sevin (0.0156 PPM).

When the soil is treated, it is difficult not to find a trace of residues in the plant parts (Mansour; 1971). Applying Sevin on lettuce, Younis (1979) noticed an increase in the vegetative growth two weeks after treatment. He explained that, the residues might work as foliar fertilizers. Using malathion with tomato he found no effect on plant height but the roots were greatly affected. Traul (1987) and Mansour; (2010) found a negative effect of Malathion in alfalfa and maize .

Pesticide effect on soil was studied by many researchers (Shiah 1980 and Aljundi 1972). They reported that soil worms were related to fertility especially forest soil where it acts as natural ploughing. A decrease of some nutrients were found by Dennis (1999), especially heavy minerals. Abdel Hamed (1989) stated that, the presence of pesticide residues in soil lead to the decrease of many essential nutrients especially copper, zinc, manganese, iron and calcium. Two experiments were conducted at the College of Agricultural Studies by Mobark, 2009 and Abdel Muntalab, 2007 on pesticide effect on wheat growth. The results showed negative effects of pesticides on growth of wheat. Accordingly this study is objected to study the effect of pesticides residues on soil and carrot growth.

Materials and Methods

Afield experiment was conducted at The College of Agricultural Studies Farm (380) m above sea level to study the effect of two pesticides on carrot growth. The treatments Viz, control, malathion and sevin were used in six plots each. Two concentrations of both malathion and sevin at the recommended dose (1.09Kg/ha) and high (1.78Kg/ha) were used. Carrot seeds were sown on February 2011 on ridges

70cm apart and 10 cm between plants. Urea and phosphorus fertilizers were used at the rate of 150 Kg/ha and 120kg/ha, respectively.

The pesticides were sprayed one month after planting. Plots were separated by sacks to prevent lateral movement of the pesticides.

The whole plants were pulled and then washed for different measurements. Soil samples were taken before and after planting from 30cm. depth for all treatments.

Measurements taken, were height (cm) fresh and dry weight (gm), leaf area (cm^2), pH, total nitrogen%, phosphorus (ppm) $\text{CO}_3 + \text{HCO}_3$, Cl , $\text{Ca}^{++} + \text{Mg}^-$ and ECe (dS/m). The collected data were subjected to statistical analysis.

Results and Discussion

As in Tables1 and 2 both sevin and malathion pesticides affected positively the growth of carrot plant at the recommended dose but the growth decreased at the excessive dose. Such positive effect was also found by Younis (1979) on lettuce which was attributed to the effect of sevin as foliar fertilizers. However, no significant differences were noticed between the recommended dose and control. Similar results were obtained by Zaki (1978) on tomato and Traul (1981) on alfalfa, maize and watermelon.

Table1: Effect of sevin on the vegetative growth (plant height, leaf area and shoot fresh and dry weight) of carrot

Sevin dose Dry weight	Plant height cm	Leaf area/ plant (cm^2)	Fresh (g)	weight (g)
Control	51.0	12.0	52.0	10.0
Recommend dose (1.09kg/ha)	55.0	10.0	48.0	8.0
50% higher dose (1.78(Kg/ha)	39.0	8.0	32.0	5.0
L.S.D at $P \leq 0.05$	3.7	2.0	1.9	1.6

Table2: Effect of Malathion on vegetative growth (plant height, leaf area and shoot fresh and dry weight) of carrot

Malathion dose	Plant height (cm)	Leaf area (cm ²)	Fresh weight (g)	Dry weight (g)
control	51.0	11.0	47.0	11.0
recommended dose (1.09 kg/ha)	45.0	9.0	39.0	8.0
50% higher dose (1.78 kg/ha)	26.0	6.0	27.0	6.0
L.S.D at P ≤ 0.05	0.9	0.6	1.3	1.1

Table 3: Effect of malathion and sevin pesticides on some soil characteristics

Dose pH	Pesticide %	Total N ppm	.P mg/l	Ca+Mg dS/m	ECe meg/L	CO ₃ +HCO ₃ mg/l	Cl paste	
Before Planting	malathion	0.04	5.2	8.5	1.3	2.9	5.2	7.6
	sevin	0.04	5.1	7.3	1.2	2.4	5.1	7.4
Dose after Planting	malathion	0.03	4.9	7.2	1.02	2.6	4.6	7.2
	sevin	0.03	4.8	6.3	0.95	2.1	4.1	7.1
Excess Dose before Planting	malathion	0.02	4.2	6.4	0.92	2.1	2.8	7.0
	sevin	0.02	4.3	5.3	0.81	2.0	2.6	7.0
Excess Dose after planting	malathion	0.01	3.4	2.5	0.6	1.1	1.2	6.8
	sevin	0.01	3.2	2.4	0.5	0.95	1.1	6.2

As shown in Table 3 there is a clear decrease in all soil parameters during the addition of both pesticides before planting and after planting using both excessive and recommended doses due to the heavy clay soil and the ionic effect of both pesticides which hinder the uptake of soil nutrients and their distribution through the carrot roots, Gafer et al. (2012).

Traul (1987) and Abdel Jawad (2001) reported that both pesticides affected soil nitrogen and pH. They attributed the reduction of total nitrogen to the effect of nitrogen bacteria and microorganism. It was found by Mulder and Barbered (2010)

that control with insecticides in alfalfa is usually unsatisfactory due to the persistence of attack and restriction against using chemicals with long residual effects.

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