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EFFECT OF FUNGICIDES AND HERBICIDES INTERACTIONS ON TOMATO DAMPING-OFF AND PLANT GROWTH

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Abstract

Fusarium oxysporum f. sp. *lycopersici* and *Rhizotonia solani* were isolated from tomato seedlings showing damping-off symptoms. Both fungi caused high incidence of damping-off to UC-97and Super marmande tomato cultivars. The disease incidence varied according to each pathogen and the date of planting. High percentage of disease was detected when tomato seeds were planted in soil infested with *F. oxysporum* f. sp, *lycopersici* during July, August and October. On the other hand, when tomato seeds were planted in soil infested with *R. solani*, the highest incidence of damping-off disease was attained during October and December. Application of Enide or Devrinol as pre-emergence herbicide was not effective in minimizing the disease incidence. Vitavax-thiram or Vitavax-captan as fungicidal seed treatment were effective in controlling the disease. However, date of sowing affected the efficiency of these fungicides. Vitavax-captan gave better disease control than vitavax-thiram during October, while the reverse was observed during July and August plantations. Application of Enide enhanced the efficacy of Vitavax-thiram against the Fusarium pathogen during october plantation while Devrinol enhanced the potency of Vitavax-captan during August plantation. The efficacy of these combined treatment against Rhizoctonia pathogen did not greatly differ from the effect of each fungicide alone. However , they enhanced its efficiency against the mixture of both pathogens. Also, the application of these pesticides affected the growth of tomato plants.

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is one of the most important vegeta-

ble crops in Egypt. It is subject to attack by some important seed and soil borne fungi especially those causing damping -off disease. *Fusarium oxysporum* f. sp. *lycopersici* Sacc. Snyder & Hansen and *Rhizoctonia solani* Kuhn are the most frequent fungi causing damping-off disease to many field crops (El-Kadi 1955, Harrison 1955, Purss 1962, Harfoush 1970 , Abdel - Gallel 1977 and Snyder *et al.* 1981).

This disease is commonly controlled through the use of seed treatment fungicides that increase the percentage of healthy seedlings (Ashour 1959, Michail 1960, Borum and Sinclair 1968, Erwin *et al.* 1968, Fuchs *et al.* 1970, El Said *et al.* 1974, Singh *et al.* 1982 and Sumner *et al* 1988).

At the same time, weeds compete with the growing tomato plants and reduce the seedlings growth and finally the yield. Thus, herbicides usage is increasing due to the shortage of labor and the manual elemination of weeds is seldom practiced (Welker 1962, Eshel and Katan 1972, Meissner and Oosthuizen 1976, El-Khadem *et al.* 1979, Ali *et al.* 1983 and Pombo *et al.* 1985).

The use of herbicides either before or after planting along with fungicidal seed treatment created conflicting results in the control of damping -off disease of tomato as well as in other crops. Hence, the aim of this investigation was to study the impact of herbicides application on the efficacy of seed treatment fungicide for the control of tomato damping-off as well as the effect of interaction of both pesticides on seed germination, plant survival and dry weight of growing tomato plants.

MATERIALS AND METHODS

1. Isolation and Identification of The Causal Pathogens

Isolation was carried out from the roots and stems of tomato plants showing damping -off and wilt symptoms using surface sterilization with sodium hypochlorite solution (El-Shami 1987). The isolated fungi were purified using the single spore or hyphal tip techniques (Riker and Riker 1936). These fungi were identified according to their morphological characteristics following Booth (1971) and Barnett & Hunter (1972).

II Pathogenicity Test

The pathogenicity of the isolated fungi was carried out in sterilized pots (20

cm in diameter) filled with equal amounts of autoclaved sandy clay soil. The soil was infested with sand -barley culture of each fungus singly or in combination at the rate of 5% (W/W) following El-Shami (1987). Seeds of UC-97 and Super Marmande tomato cultivars were planted during October and December 1988 as well as during July and August 1989 at the rate of 20 seeds/ pot. Similarly, seeds of each cultivar were planted in noninfested soil as a control. The pots were kept under greenhouse conditions (22-28 ^{o}C) and irrigated as needed. The percentages of pre-and post emergence damping off were recorded and then corrected according to the germination in the control treatment.

III Pesticidal Treatments

Pots containing infested soil were treated with herbicides at the recommended doses (Tabel 1) .

Seeds of both tomato cultivars were treated with Vitavax-captan (Vitavax-300) or Vitavax -thiram (Vitavax-200). The treated seeds were planted in infested soil treated or untreated with the herbicides during Oct. & Dec. 1988 and August 1989. Also , seeds were planted in infested soil only as a contol. The percentages of pre -and post emergence damping off were estimated in each treatment and the efficiency of pesticidal treatment was calculated according to the following formula:

$$\text{Efficiency \%} = \frac{\text{Total damping-off in control - Total damping - off in treatment}}{\text{Total damping - off in control}} \times 100$$

At the same time, seed germination was followed up until germination stopped, where the germination capacity was determined as the highest percentage of germination reached. The percentages of surviving plants were also recorded and the efficiency of treatment relative to the control was calculated. The plant vigour in each treatment was determined by measuring the length of roots and stems as well as the dry weight of 4-weeks old tomato seedlings.

RESULTS

1 . Pathogencity of *Fusarium oxysporum* f. sp. *lycopersici* and *Rhizoctonia* solani.

The two fungi isolated from diseased tomato seedlings proved to be highly vir-

Table 1. Trade, common and chemical names as well as producing companies and recommended doses of the herbicides and fungicides used.

Trade name	Common name	Chemical name	Producing Compay	Recommended dose
Herbicides: Enide	Diphenamid 50 and 80% WP, 5% granules.	NN-Dimethyl-2,2-diphenylacetamide	Upjohn Compay (Tuco Products Co.)	4.0 Kg/feddan
Devrinol	Napropamide 50%, WP, 2 EC.	N,N-diethyl-2-(1-naphthalenyloxy) Propionamide	Stauffer Chemical Co.	1.0 Kg/fedan
Fungicides: Vitavax 300 (Vit./captan)	37.5 % Carboxin. + 37.5 % Captan.	2.6 dihydro-2-methyl-1,4 otathin-3-carboxanilide + N-trichloromethyl mercapto 4-cyclohetan 1,2- dicarboxl mide.	Uniroyal Inc.	1.5g/kg seeds
Vitavax 200 (Vit./thiram)	37.5 % Carboxin. + 37% Thiram	5,6 dihydro-2-methyl - 1,4- oxathin-3-carboxanilide. + tetramethyl thiuram disulphide.	Uniroyal Inc.	1.5g/kg seeds

ulent on UC -97 and Super Marmand tomato cultivars were identified as *Fusarium oxysporum* f. sp. *Lycopersici* (Sacc.). Snyder & Hansen and *Rhizoctonia salani* kuhn. Results in Table (2) indicated that the two fungi either separately or combined caused high percentage of damping -off.

The date of sowing greatly affected the incidence of damping-off. High percentages of disease were noted when tomato seeds were planted in soil infested with F. *oxysporum* f. sp. *lycopersici* during July, August and October, when relatively high temperatures prevail. The percentages of damping - off ranged from 55 to 65 % during these periods. On the other hand, disease incidence decreased to 40 % when tomato seeds were planted during December, as low temperatures generally prevail. During OCtober and December, *R. solani* caused higher incidence of pre-and post-emergence damping-off than did Fusarium . These data indicated that both fungi were highly pathogenic to tomatoes and caused high incidence of damping-off disease during the different sowing periods.

2. Effect of pesticidal treatments on the Incidence of Tomato Damping-off

Application of the herbicide Enide or Devrinol to soil previously infested with damping - off pathogens slightly increased the incidence of the disease. Results in Table (3) showed that total damping -off ranged from 61 to 66 % in Enide- treated soil infested with either *Fusarium* or *Rhizoctonia* or both , while in Devrinol-treated soil it ranged from 39 to 62%. On the other hand, damping -off ranged from 55 to 60 % in the control during October 1988.

During August 1989 , the herbicides were tested in soil infested with the *Fusarium* only. The percentage of damping-off was much higher than in the control (Table 4).

On the other hand , the application of seed dressing fungicides significantly decreased the incidence of damping - off specially that caused by *Rhizoctonia*. However, both fungicides (Vitavax 200 , Vitavax 300) were less effective against *Fusarium* or the mixture of both fungi in October plantation . Vitavax-captan was less effective than Vitavax/thiram. On the other hand, in August plantation, these fungicides were more potent in disease control (Table 4). Their efficiencies ranged from 52 to 63%. When these fungicides were used in combination with pre-planting herbicidal application, almost similar findings were obtained (Tables 3 and 4).

Table 2. Effect of soil infestation with *Fusarium oxysporum* f. *sp. lycopersici* and *Rhizoctonia solani* singly or combined on percentage of damping - off in tomatoes planted at different dates.

Cultivar and pathogen	October 1988			October 1988		
	% Pre-emergence damping - off	% Post-emergence damping - off	% Total damping - off	% Pre-emergence damping - off	% Post-emergence damping - off	% Total damping - off
UC-97 cultivar: *F. oxysporum* f. sp. *lycopersici*	51.25	3.75	55.0	38.75	1.25	40
R. solani	55.00	5.00	60.0	45.00	6.25	57.25
F. oxysporum f. sp. *lycopersici* + *R. solani*	48.75	11.25	60.0	42.50	10.00	52.50
Super Marmande cultivar:		**July 1989**			**August 1989**	
F. oxysporum f. sp. *lycopersici*	42.50	13.75	56.25	50.00	15.00	65.00

Table3. Effect of soil and seed treatments with some pesticides and their interactions on the percentages of damping-off of tomato (UC-97 cultivar) planted in soil infested either with *F.oxysporum. f.sp. lycopersici* or *R.solani* as well as with both during October 1988.

Treatments	Fusarium-infested				Rhizoctonia-infested				Fusarium+Rhizoctonia - infest.			
	Pre em. damping off	Post em. damping off	Total damping off	% Efficiency	Pre em. damping off	Post em. damping off	Total damping off	% Efficiency	Pre em. damping off	Post em. damping off	Total damping off	% Efficiency
* **Herbicides:**												
Enide	57.50	3.75	61.25	-11.364	61.25	5.00	66.25	-10.417	45.00	16.25	61.25	-6.522
Devrinol	46.25	16.25	62.50	-13.636	30.00	8.75	38.75	35.417	41.25	12.50	53.75	6.522
* **Fungicides:**												
Vitavax / Captan	35.00	16.25	51.25	6.818	20.00	5.00	25.00	58.333	30.00	11.25	41.25	28.261
Vitavax / Thiram	41.25	3.75	45.00	18.182	25.00	5.00	30.00	50.00	31.25	5.00	36.25	36.956
* **Herb.+Fungicides:**												
Enide + V./ Captan	31.25	20.00	51.25	6.818	40.00	3.75	43.75	27.083	18.75	5.00	23.75	58.697
Enide + V./ Thiram	20.00	18.75	38.75	29.545	26.25	6.25	32.50	45.833	21.25	10.00	31.75	45.652
Devrinol + V./ Captan	30.00	15.00	45.00	18.182	22.50	5.00	27.50	54.167	21.25	6.25	27.50	52.174
Devrinol + V./ Thiram	30.00	15.00	45.00	18.182	22.50	7.50	30.00	50.00	18.57	6.25	25.00	56.522
* **Control**	51.25	3.75	55.00	0.00	55.00	5.00	60.00	0.00	48.75	8.75	57.50	0.000
L.S.D. 5 %	7.48	4.98	7.68	--	5.55		5.67	--	6.02	4.06		---

3 . Effect of pesticides on Seed Germination and plant Stand

Application of Enide or Devrinol to soil infested with *Fusarium Oxysporum* f. sp. *Lycopersici* did not greatly improve seed germination or the stand of tomato seedlings for all planting dates (Table 5 & 6). Moreover, both herbicides decreased seed germination when applied during August (Table 5). Also, Devrinol enhanced seed germination in soil infested with *Rhizoctonia* in October and December plantations (Table6).

The use of fungicides as seed treatment greatly enhanced the germination capacity of tomato seeds, planted in soil infested with *Fusarium* or *Rhizoctonia* as well as with their mixture (Tables 5&6). During October and December plantation, Vitavax-captan was more potent than vitavax-thiram. However, Vitavax/Thiram showed the greatest effect when used during the hot month of August (Table 5). Such enhancment is attributed to the elimination of a portion of pre emergence domping off which occurs in the absence of fungicidal seed treatment.

The use of combined treatment of fungicides and herbicides either did not affect the germination of tomato seeds as compared with the use of fungicides alone , specially during the hot month or improved the germination during October and December (Tables 5 and 6)

4 Effect of Pesticidal Treatments on plant Growth

The results obtained in Table (7) indicated that the application of herbicides to soil infested with *Fusarium oxysporum* f. sp. *lycopersici* during October did not significantly affect the root and stem lengths of tomato plants . However, the dry weight was greatly reduced specially with the Devrinol treatment.

Also , the application of seed treatment with Vitavax-captan did not affect the root and stem lengths but It reduced the dry weight. On the other hand, the use of Vitavax-thiram increased the root and stem lengths as well as the dry weight.

The combined treatments of herbicides and fungicides did not significantly affect the root and stem lengths. However, the dry weight was not affected when these herbicides were combined with Vitavax-captan treatment, but they sharply reduced the action Vitavax-thiram.

During August, Enide or Devrinol mostly reduced the lengths of roots and stems , but they did not significantly affect the dry weight of plants. On the other

Table 4. Effect of soil and seed treatments with some pesticides and their interactions on the percentages of damping -off of tomato (Super Marmande cultivar) planted in soil infested with *F. oxysporum.* f. sp. *lycopersici* during August 1989.

Treatments	Pre-emergence damping - off	Post-emerrgence damping - off	Total damping - off	% Efficiency
* **Herbicides:**				
Enide	78.75	8.75	87.50	-34.615
Devrinol	62.50	7.50	70.00	- 7.692
* **Fungicides:**				
Vitavax / Captan	27.50	3.75	31.25	51.923
Vitavax / Thiram	21.25	2.50	23.75	63.462
* **Herb.+Fungicides:**				
Enide + V./ Captan	30.00	2.50	32.50	50.00
Enide + V./ Thiram	27.50	2.50	30.00	35.846
Devrinol + V./ Captan	16.25	2.50	18.75	71.154
Devrinol + V./ Thiram	18.75	8.75	27.50	57.692
* **Control**	50.00	15.00	65.00	00.00
L.S.D. 5 %	6.99	6.34	8.91	---

Table 5. Effect of soil and seed treatments with some pesticides on the germination capacity and its relative efficiency on plant stand of UC 97 tomato cultivar planted in soil infested with *F. oxysporum* f. sp.*lycopersici.*

Treatments	October 1988		December 1988		August 1988	
	Germination capacity	Relative eff. to plant stand	Relative eff. to plant stand	Relative eff. to plant stand	Relative eff. to plant stand	Relative eff. to plant stand
* **Herbicides:**						
Enide	45.50	0.861	71.25	1.121	21.25	0.357
Devrinol	53.75	1.033	53.75	0.771	37.50	0.827
* **Fungicides:**						
Vitavax / Captan	65.0	1.212	80.00	1.333	72.50	1.964
Vitavax / Thiram	58.75	1.082	72.50	1.188	78.75	2.179
* **Herb.+Fungicides:**						
Enide + V./ Captan	68.75	1.083	76.25	1.229	70.00	1.929
Enide + V./ Thiram	80.00	1.361	80.00	1.250	79.50	2.000
Devrinol + V./ Captan	70.00	1.222	73.75	1.220	83.75	2.321
Devrinol + V./ Thiram	70.00	1.222	80.00	1.313	81.25	2.071
* **Control**	48.75	1.000	61.25	1.000	50.00	1.000
L.S.D. 5 %	6.83	---	9.18	---	6.99	---

Table 6. Effect of soil and seed treatments with some pesticides on the germination capacity and its relative efficiency on plant stand of UC97 tomato cultivar planted in soil infested with either *R. solani* or a mixture of *R. solani* and *F. oxysporum*.

Treatments	*R. solani*				*R. solani* + *F. oxysporum*			
	October 1988		December 1988		October 1988		December 1988	
	Germination Capacity	Relative eff to plant stand	Germination Capacity	Relative eff to plant stand	Germination Capacity	Relative eff to plant stand	Germination Capacity	Relative eff to plant stand
1 . Enide	38.75	0.861	55.00	1.000	55.00	1.000	52.50	0.895
2 . Devrinol	70.00	1.033	67.50	1.128	58.75	1.088	57.50	0.974
3 . Vitabax - captan	80.00	1.212	80.00	1.590	70.00	1.500	80.00	1.585
4 . Vitavax-thiram	75.00	1.083	70.00	1.436	68.75	1.382	75.00	1.476
5 . Enide + V. capatan	60.00	1.083	76.25	1.462	81.25	1.794	75.00	1.553
6 . Enide + v. thiram	73.75	1.080	75.00	1.487	78.75	1.706	80.00	1.658
7 . devrinol + V. capatan	77.50	1.361	76.25	1.513	78.75	1.706	88.75	1.447
8 . Devrional + V. thiram	77.50	1.222	78.75	1.538	81.25	1.795	86.25	1.579
9 . Control	45.00	1.000	55.00	1.000	51.25	1.000	57.50	1.000

Table 7. Effect of pesticides on tomato plant growth in soil infested with *F. oxysporum.*

Treatments	October 1988			August 1989		
	Root length (cm)	Stem L. (cm)	Dry weight (mg)	Root length (cm)	Stem L. (cm)	Dry weight (mg)
1 . Enide	4.31	8.38	271.25	5.56	5.13	50.00
2 . Devrinol	3.17	7.92	133.25	5.94	8.75	124.00
3 . Vitabax - captan	4.50	6.50	260.00	10.00	11.50	312.75
4 . Vitavax-thiram	6.75	11.50	506.25	10.50	12.13	226.25
5 . Enide + V. capatan	5.16	9.25	282.50	9.50	11.25	232.25
6 . Enide + v. thiram	7.75	7.33	145.75	10.50	13.25	213.75
7 . devrinol + V. capatan	4.50	8.17	273.25	9.31	11.25	172.50
8 . Devrional + V. thiram	5.46	10.89	440.00	11.19	12.38	230.00
9 . Control	4.48	8.97	327.50	9.00	7.00	80.00
L.S.D. at 5%	2.05	N.S.	62.08	2.46	2.39	55.12

Table 8. Effect of pesticides on tomato plant growth in soil infested with either *R. solani* or a mixture of *R. solani* and *F. oxysporum* during October 1988.

Treatments	*R. solani*			August 1989		
	Root tength (cm)	Stem Lenth (cm)	Dry weight (mg)	Root length (cm)	Stem Lenth (cm)	Dry weight (mg)
1 . Enid	5.83	8.58	280.00	2.75	3.25	020
2 . Devrinol	4.44	8.73	295.00	5.33	9.00	282
3 . Vitabax - captan	6.45	10.63	408.28	4.25	6.75	318
4 . Vitavax-thiram	5.00	7.25	256.25	4.50	8.50	300
5 . Enide + V. capatan	6.67	8.50	476.75	6.13	9.42	422
6 . Enide + v. thiram	4.92	7.83	233.25	3.00	4.25	095
7 . devrinol + V. capatan	5.61	9.00	243.75	5.06	9.81	345
8 . Devrional + V. thiram	5.00	7.25	247.50	5.88	10.96	339
9 . Control	4.16	8.42	228.25	3.69	7.13	191
L.S.D. at 5%	N.S.	1.87	111	1.23	2.75	145

hand, fungicidal seed treatments either separately or combined with the herbicide significantly increased the stem length and dry weight.

With respect to the growth of tomato plants grown in soil infested with *R. solani* during October 1988, there were no significant differences between the root and stem lengths as well as the dry weight when Enide or Devrinol was applied to the soil. However, only the application of Vitavax- captan caused significant increase in plant growth either when it was used separately or combined with Enide or Devrinol.

When the soil was infested with both pathogens , Enide application decreased root and stem lengths as well as the dry weight of tomato plants, while Devrinol increased it. On the other hand, the application of seed treatment fungicides either separately or combined with herbicides, increased the dry weight of tomatoes, except when Enide was applied along with vitavax-thiram.

DISCUSSION

Fusarium oxysporum f. sp. *lycopersic* and *Rhizoctonia solani* proved to be highly virulent on UC- 97 and Super Marmande tomato cultivars. High percentages of damping -off were recorded either for each pathogen alone or for their mixture. This result agreed with the findings of Harfoush (1970), Abd-El-Gallel (1977) and Snyder *et al* . (1981) The percentage of damping - off was affected by the date of planting . This might be due to the effect of prevailing temperatures on the causal pathogens as well as on plant growth (Abdel-Nour 1991).

Pesticides including herbicides and Fungicides are used for the managment of tomato crop in Egypt. The interaction sof herbicides with seed treatment fungicides, used nearly at the same period, are of a great concern in crop management . These interaction might influence the efficiency of these pesticides. Results obtained indicated that seed treatment with Vitavax-captan or Vitavax-thiram alone was efective in controlling both pathogens. Hence, it improved seed germination and germination capacity as well as the dry weight of plants. Michail (1960), Ashour (1961), Ko and Oda (1971) and Leskovas and Sims (1987) reported the efficiency of different seed treatment fungicide against *Fusarium* and *Rhizoctonia*. At the same time, the systemic fungicides Vitavax and Benlate were more effective than nonsystemic ones against damping-off and vascular wilt diseases of tomato and other platns (Borum and Sinclair 1968, Erwin *et al.* 1968, Kirk and Sinclair 1968 and Singh *et al.* 1982).

The efficency of the seed treatment fungicides was influenced by the date of planting. This might be due to the effect of prevailing temperatures on the absorption and translocation of the fungicide in tomato plants (Edgington and Petereson 1977).

On the other hand, herbicides application sometimes increased the percentages of damping - off. The use of Enide seemed to enhance *Fusarium oxysporum* specially during August and *Rhizoctonia* soloni and their mixture during December. Hence , it decreased the germination capacity and seedlings stand during these periods. This indicated that this herbicide might have direct effect on these pathogens during the favourable times of their growth in addition to its effect on the antagonistic soil microflora as indicated by Eshel and Katan (1972) as well as on plant growth . Also, Sanghir *et al.* (1973), Wilson and Stewart (1973) and Meissner and Costhuizen (1976) reported the toxic effect of herbicides on the growth of plants grown in treated soil during the hot weather.

Slight differences with repect to disease control and germination capacity as well as the growth parameters were detected when herbicidal treatment was followed by seed treatment application. This depends on the date of planting and the pesticdes used. Enide application enhanced the efficacy of Vitavax-thiram against the Fusarium wilt pathogen during October plantation, while Devrinol enhanced the potency of Vitatax-captan during August plantation. The efficacy of these combined treatments did not greatly differ from that of each fungicide alone. However, they enhanced the efficiency against the mixture of both pathogens.

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تأثير التداخل بين المبيدات الفطرية ومبيدات الحشائش علي موت بادرات الطماطم وعلي نمو النباتات

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تم عزل فطري الفيوزاريوم أوكسيسبورم فورما اسبيشز ليكوبيرسيكاي والرايزوكتونيا سولاني من بادرات طماطم مصابة بمرض موت البادرات والتي أظهرت قدرة مرضية عالية علي صنفي الطماطم يو سي ٩٧ وسوبر مارمند.

ولقد تباينت شدة الأصابة بالمرض تبعاً للفطر الممرض وكذا ميعاد الزراعة ، حيث ارتفعت شدة الأصابة بالمرض الناتج عن فطر الفيوزاريوم عند الزراعة في يوليو، أغسطس وأكتوبر بينما زادت شدة الأصابة بالمرض الناتج عن فطر الرايزوكتونيا عن الزراعة في أكتور وديسمبر.

ولم تظهر أي فعالية لمبيد الحشائش الأينايد (داي فيناميد) والديفرينول (نابروباميد) ضد مرض موت البادرات في حين كان مبيد الفيتافاكس كابتان (كاربوكسين كابتان والفيتافاكس ثيرام (كاربوكسين ثيرام) فعاله في مقاومه المرض. إلا أن ذلك يتوقف علي ميعاد الز راعة، حيث كان مبيد الفيتافاكس كابتان أكثر فعاليه من مبيد الفيتافكاس ثيرام عند الزراعة في اكتوبر في حين ظهر العكس عند الزراعة خلال يوليو وأغسطس . ولقد أدت معاملةالتربة بمبيد الأينايد الي زيادة فعالية مبيد الفيتافاكس ثيرام ضد فطر الفيوزاريوم عند الزراعة في أكتوبر، في حين أدي استعمال مبيد الديفرينول الي زيادة فعاليه مبيد الفيتافاكس كابتان عند الزراعة في اغسطس . ولم تظهر المعاملات المزدوجة بمبيد الحشائش والمبيد الفطري أي اختلافات كبيرة بالمقارنه بتأثير المبيدات الفطرية وحدها. إلا أن المعاملات المزدوجة أدت الي زيادة فعالية المبيدات الفطرية ضد خليط من الفطرين الممرضين . ولقد أدي استعمال هذه المبيدات الي تأثيرات مختلفه علي نباتات الطماطم.