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CONTROL OF FABA BEAN ROOT ROT DISEASE BY ~~means of~~USING ~~some chemical inducers~~MICRO-ELEMENTS AND THE FUNGICIDE, RHIZOLEX-T

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ABSTRACT

~~The effect of s~~Some ~~plant chemical inducers~~microelements, ~~i.e.~~namely zinc, manganese and calcium ~~and Rhizolex-T 50 (half and recommended dose)~~ were used singly or in combination with typical fungicide, Rhizolex-T 50 to investigate their ~~ability to~~effect towards the control of faba bean root-rot caused by *Rhizoctonia solani*. Laboratory, greenhouse and field studies were conducted during 2008/2009 & 2009/2010 seasons ~~to study the effect of some plant chemical inducers and Rhizolex-T on reduction of root-rot of some~~ using the faba bean cultivar, ~~of faba bean (~~Giza ~~340)~~. Results of *in vitro* studies showed that ~~in comparing with Rhizolex-T 50 w.p as a fungicide. Using chemical inducers~~microelements ~~and~~ or Rhizolex-T significantly ~~reduced~~ inhibited the ~~linear~~ mycelial growth of the pathogen, *R. solani*, when compared with the untreated control.

Under greenhouse conditions, all ~~tested~~isolated ~~fungi were~~ proved to be pathogenic and caused pre- and post-emergence damping-off while *R. solani* ~~was~~ being the most virulent. ~~Under field conditions, root-rot disease and yield components varied greatly according to the tested inducer and / or variety???غير متوفر.~~

All ~~some treatments~~ microelements or the fungicide, tested as seed treatments for field experiments led to ~~an effective Giza 3 gave the highest values of~~ an increase in the plant height, ~~branches plant in comparison with the untreated control???~~. Rhizolex-T 50 followed by zinc were the most effective treatments in reducing the incidence of faba bean damping-off. Calcium followed by zinc were the most effective ~~and~~ in increasing~~ed significantly~~ the number of pods per plant, the weight of 100 seeds, and seed yield / plot. The most effective seed treatment~~s~~ in reducing ~~faba bean infection with~~ the root-rot disease incidence was~~were the coating of faba bean seeds by~~ Rhizolex-T followed by~~,~~ zinc and then calcium ~~in decreasing order~~.

Key-words: Faba bean, root-rot, *Rhizoctonia solani*, microelements, zinc, manganese, calcium, ~~and~~ Rhizolex-T.

INTRODUCTION

Faba bean (*Vicia faba* L.) is a legume crop with high nutritional value. It contains about 18.5 ~~OF WHAT???~~and 37.8% protein (El-Syed *et al.,* 1982). Faba bean plants could be infected with many fungal pathogens, which can cause~~d~~s a considerable yield losses (Mahmoud, Nagwa 1996). In this respect, root-rot disease ~~was~~ is among the most important fungal disease affecting faba bean production in Egypt. Hussein (1985) re~~cord~~ported that root-rot / wilt complex and mosaic ~~disease~~ are the major diseases of faba bean ~~crop~~ in the Sudan. ~~Sepulveda (1991~~Omar (1986) ~~mentioned that based~~

~~on symptomatology, cultural and morphological characteristics and pathogenicity tests, a fungus causing root rot of faba bean plants in central Chile during 1990 – 1991 was identified as *Rhizoctonia solani*~~tested several pathogens, and found that *Rhizoctonia solani* was the most virulent in causing root disease. Susceptibility increased with increasing inoculums level and decreased with increasing plantage. The fungus was pathogenic to several legume crop and its saprophytic ability was low in soil previously cultivated with maize and soybean. El-Morsy *et al.* (1997), Akem and Bellar (1999), and Hugar (2004) isolated *R.~~hizoctonia~~ solani* and *Fusarium oxysporum* from wilted and rotten roots of faba bean in different parts of the world ~~as well as~~and considered them the most important and wide spread fungal diseases observed at all locations. In this respect also, Metwaly (2004) found that *R. solani* isolated from Kafr El-Sheikh governorate was ~~the most~~more virulent ~~isolate~~ than that of Sharkia governorate. Control of the root rot disease depends mostly on using chemical fungicides (Marschner, 1986 and Hanounik and Bisri, 1991). The resistance to diseases depended on the host plant physical or chemical barriers activated by biotic or a~~-~~biotic agents (Kloepper *et al.,* 1992). The resistance can be systemically induced by chemical substances (Gamil, 1995). El-Baz and Shaltout (2007) revealed that adding microelements, either manganese or zinc, increased all growth parameters of the host plant ~~significantly more than~~when compared with the control treatment ~~with~~ infested with the pathogen ~~alone~~.

The objective of the present work is to investigate the effect of some microelements and fungicide Rizolex-T in controlling root rot of faba bean under laboratory, greenhouse and field conditions.

MATERIALS AND METHODS

~~1.~~ Disease survey of faba bean root-rot in different governorates:

Survey was carried out in three ~~different~~ governorates in Egypt, namely Minufiya, Gharbia and Kafr El-Sheikh. ~~Faba bean d~~Diseased plants of faba bean showing root-rot symptoms were collected from ~~faba bean~~ growing fields and greenhouses. The average percentage of disease incidence was calculated as the number of rotted ~~faba bean~~ plants in relative to the total number of examined plants.

~~2.~~ Isolation, purification and identification of ~~the~~ fungi associated with faba bean diseased plants:

Infected roots w~~as~~ere cut into small fragments, washed thoroughly with tap water, then sterilized with sodium hypochlorit~~e~~e solution (1%), then dried between two sterilized filter papers. Fragments were then placed on potato dextrose agar (PDA) medi~~a~~um in Petri dishes and incubated at 25°C for 7 days and observations were recorded (Christensen, 1957). Hyphal-tips and single sporea ~~-~~of grown fungi were transferred individually to new PDA plates (Riker and Riker, 1936) and then identified according to their morphological and microscopically characters as described by Jenset *et al.*

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(1991). Identification was confirmed by the Department of Mycology, Plant Pathology Institute, Agricultural Research Center, Giza, Egypt.

3. Pathogencity tests:

Pathogencity tests were carried out under greenhouse conditions at (Sers El-Layian Agricultural Research Station atin 2008 growing season). At the first, all fungal isolates which were isolated from rotten roots of faba bean were tested for their pathogenic potentialities on the susceptible cultivar, Giza 40, under greenhouse conditions as in order to select the highly pathogenic isolates.

Pots (25 cm-diameter) were sterilized by dipping into 5% formalin solution for 5 min and then left in open air till dryness. Soil was sterilizedation was accomplished withusing 5% formalin solution, by mixinged throughtly. Then the treated soil was covered with plastic sheet for one week and then the plastic sheet for one week and then the plastic sheet was removed in order to allow complete formalin evaporation (Whitenhead, 1957). Soil infestation with each individual fungalus pathogen was carried out at the rate of 3% of soil weight (Metwelly, 2004). Fungi were individually grown on sand-barley (SB) medium (25 g clean sand, 75 g barley and enough water to cover the mixture). Flasks containinged sterilized medium were inoculated with each particular fungus and incubated at 25°C for two weeks. Potted soil was watered daily for a week to enhance fungal growth. Soil of control pots was mixed with the same amount of sterilized fungus-free sand-barley (SB) medium. Ten faba bean seeds were surface sterilized using 5% sodium hypochlorite 5% for 2 min., washed several times with sterilized water, before and then sowing. Three replicate pots with a total of 30 seeds were used for each particular treatment (Farahat, 1970).

$$\text{Pre-emergence (\%)} = \frac{\text{Number of non germinated seeds}}{\text{Total number of sown seeds}} \times 100$$

$$\text{Post-emergence (\%)} = \frac{\text{Number of dead seedling}}{\text{Total number of sown seeds}} \times 100$$

$$\text{Survival plant (\%)} = \frac{\text{Number of survived plant}}{\text{Total number of sown seeds}} \times 100$$

Disease assessment:

Percentages of pre- and post-emergence damping-off as well as healthy survival plants in each treatment were determined 15 and 30 days after sowing, respectively using the next formula according to El-Helaly *et al.* (1970).

Laboratory experiment:

This experiment was conducted to investigate the effect of zinc, Manganese and calcium (3 g / l medium; the recommended dose)using the recommended, used all the quantity and it's half dose of and the fungicide Rhizolex-T 50 in its full dose (3 g / l medium) addition to two of the known microelements i.e. zinc, Manganese and calcium to inhibit theon the mycelia

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growth of ~~*Rhizoctonia* *R.* *solani*~~. These substances were used singly or in combination to be added to the PDA medium before solidification. ~~used concentrations of~~ Rhizolex-T was used at 1/2 strength (~~contained~~ 1.5 ~~and 3.0~~ g / l medium) when combined with microelements ~~(50 and 100% rd), respectively~~ (El-Baz, 2007).

~~Microelements, chemical inducers were used at the recommended dose (3 g / l medium). Rhizolex-T and chemical inducers were separately mixed with PDA medium before solidification. Then poured in sterile Petri dishes.~~ Three replicates (culture plates) for each ~~concentration~~ substance/combination were inoculated with a fungal disc cut from the ~~pepiphery~~periphery of a 5 days old culture of *R. solani*~~the tested fungus~~. The plates were incubated at 25°C. The linear growth of the tested pathogen ~~fungus~~ was measured when the fungal growth of the control treatment filled the Petri ~~dish~~plate.

Greenhouse experiment:

Greenhouse experiment was carried out to evaluate the effect of ~~using chaemical inducers such as~~ the microelements, zinc, manganese and calcium as well as the chemical fungicide, ~~with a half doses of~~ Rhizolex-T 50 (used at 50% of the recommended doze) on the disease incidence of faba bean root-rot in pot experiment. The microelements were tested singly or in combination with a half dose of Rhizolex-T as seed treatment. Sterilized pots (25 cm diam.) filled with autoclaved sandy-clay soil were used. ~~The previously prepared fungus~~ *Rhizoctonia solani* inoculum was produced on sand-barley (SB) medium as previously described and used to infest the ~~autoclaved~~ sterilized soil at ~~the~~ a rate of 3% ~~soil weight~~ (w/w). ~~t~~The inoculum~~s~~ was mixed thoroughly with the upper layer of the soil, then watered and left for one week to ensure the distribution of the inoculum~~s~~ and establishment of the pathogen. Zinc, manganese and calcium treatments were ~~used~~ applied as ~~a~~ seed soaking treatment. While, Rhizolex-T 50% was used as seed coating. Faba bean seeds (c.v. Giza ~~3~~40)~~,~~ was soaked for 20 min~~utes~~ in each tested ~~of substance chemical inducers~~ (El-Baja, 2007). Three pots (as replicates) were used for each treatment and three pots were left without pathogen infestation to serve as control. Ten seeds of faba bean were sown in every ~~used~~ pot. Disease incidence was recorded as the percentage of pre- and post-emergence damping-off as well as healthy/ survive~~d~~~~al~~ plant~~s~~ after 15, 30 and 35 days from sowing, respectively.

Field experiment:

Field experiment was carried out at Sers El-Lyain Research Station, Minufiya Governorate, Egypt ~~during the~~in two growing season (2008/2009 & 2009/2010). The experiment aimed ~~to~~ at studying the effect~~s~~ of the microelements ~~some chemical inducers i.e.~~, zinc (3 gm / l) in zinc ~~s~~chelates, calcium (3 gm / l) and manganese (3 gm / l), and the fungicide, Rhizolex-T 50% w.p at the rate of 3 gm / kg seed ~~as fungicide an induction of resistance in faba bean plant~~ against the faba bean root- rot disease~~s~~. Faba bean seeds (c.v. Giza ~~3~~40) were~~as~~ soaked for 20 min. in ~~each~~ the tested microeliment singly or in combination with the fungicide Rhizolex-T in half and full dose~~s~~~~of treatment the quantity and its half~~. The wetted seeds were left until air dried

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before sowing. A split plot design with three replicates was used in this experiment. The area of each sub-plot was 10.5 m^2 (3.5 × 3 m). Three hundred seeds were sown in each plot.

The seed germination percentage, and the pre- and post-emergence damping-off were determined after 15 and 30 days from sowing. Also, healthy/survived plants were counted and expressed as percentage after 35 days after sowing. In addition, faba bean plant samples were taken after harvest to measure plant height, number of branches/plant, number of pods/plant, weight of 100-seeds and weight of seed yield/plot were recorded. The disease severity of root-rot diseases was determined after 55 days from sowing according to Soleman *et al.* (1988).

Statistical analysis:

All data were subjected to the proper statistical analysis of variance (ANOVA) of randomized complete block design or split plot design as appropriate, with three replicates (Gomez and Gomez, 1984).

RESULTS

1. Isolation and identification of the causal organisms:

As shown in Table (1), two hundred and five isolates of different soil-borne fungi were isolated from rotten roots of faba bean plants (cv Giza 40) cultivated in three Egyptian governorates namely Minufiya, Gharbia and Kafr El-Sheikh.

These isolates were identified as *R. solani* (54 isolates), *Macrophomina phaseolina* (31 isolates), *Fusarium moniliforme* (30 isolates), *Fusarium solani* (28 isolates), and *Fusarium semitectum* (22 isolates). Meanwhile, 40 isolates stayed without identification from the three governorates and named unknown fungi. As for the frequency of the isolated fungi in the three governorates, *R. solani* followed by *Macrophomina phaseolina* were the most frequent fungi recovered in the three governorates.

Table (1). Fungi isolated from rotten roots of faba bean and their frequency at three different governorates.

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Tested fFungus	Gharbia		Kafr El-Sheikh		Minufiya		Total
	*F	**F %	F	F%	F	F%	
M. phaseolina	13	19.12	8	12.12	10	14.08	31.0
RF. solani	10	14.71	8	12.12	10	14.08	28.0
F. semitectum	5	7.35	9	13.63	8	11.27	22.0
F. moniliformea	10	14.71	10	15.15	10	14.08	30.0
R. solani 222	18	26.47	16	24.24	20	28.17	54.0
Unknown fungi	12	17.65	15	22.72	13	18.31	4.0
L.S.D at 0.05	68	-	66	-	71	-	205

*** F: frequency** **** F %: frequency %**

2.

Pathogencity tests:

Four different isolates of *R. solani* were selected in each governorate for carrying out the Ppathogenicity test.of 12 isolates of root isolates (four isolates) of the same fungus represent the three different governorates.

Data in Table (2) show that all tested isolates of *Rhizoctonia R. solani* were pathogenic but varied in their pathogenicity, at different degrees, on the tested faba bean plants. Data indicate that isolate NO"R_2 M" (from Minufiya) was the most pathogenic isolate causing ed the highest percentage33% of pre- and post-emergence root-rot (33.33 and 33.33%), respectively(Table 2). On the other hand, the lowest least virulent isolate was ("R_2 G)", which was obtained from Gharbia governorate.

Table (2). Pathogencity tests of four selected *R. solani* isolates (from each governorate) on faba bean plants under greenhouse conditions.

Source of isolates / Governorate	Isolate No.	Pre-emergence damping off (%) after 15 days	Post-emergence damping off (%) after 30 days	Plants survivedal (%)
Gharbia	R_1 G	13.33	10.00	76.67
	R_2 G	3.33	16.67	80.00
	R_3 G	6.67	23.33	70.00
	R_4 G	10.00	16.67	73.33
Kafr El-Sheikh	R_1 K	23.33	16.67	60.00
	R_2 K	20.00	10.00	70.00
	R_3 K	10.00	20.00	70.00
	R_4 K	16.67	13.33	70.00
Minufiya	R_1 M	13.33	20.00	66.67
	R_2 M	33.33	33.33	33.34
	R_3 M	16.67	20.00	63.33
	R_4 M	23.33	16.67	60.00
Check	-	0.00	0.00	100.00
L.S.D at 0.05		2.17	2.30	4.07

3. Laboratory experiment:

3. Effect of the tested chemical inducersmicroelements and Rhizolex-T on the linear growth of *Rhizoctonia solani*:

Data represented in Table (3) show that the used microelements Zn, Mn and calcium that used alone relatively inhibited the mycelial growth by 72.22, 556.55 and 621.60%, respectively, although while the fungicide Rhizolex-T caused 97% inhibition to *R. solani* mycelial growthit could not

reach the percentage of mycelia inhibition caused by the fungicide which gave 96.66%. However, dData also reveal that in case of using the combinations of microelements with a half dose of Rhizolex-T 50%, the percentage ofhas increased the level of mycelia inhibition raised fromto be 798.89%, 72.22, and 865.55% for Zn, Mn and calcium combined with 50% Rhizolex-T, respectively.

Table (3). Effect of some the tested microelements and Rhizolex-T inhibition of theon the linear growth of *Rhizoctonia solani* of the tested pathogen.

Treatment	Inhibition of lLinear growth (colony diameter)	
	Linear growth (cm)	% ReductionGrowth inhibition
Zn	2.5	72.22
Mn	4.0	55.55
Calcium	3.5	61.60
Rhizolex-T (RT)	0.3	96.66
Zn + Mn	3.2	64.44
Zn + R.T (50% rd)	1.9	78.89
Mn + R.T (50% rd)	2.5	72.22
Calcium + R.T (50% rd)	1.3	85.55
Untreated Ccontrol	9.0	0.00
L.S.D at 0.05	2.9	-

4.

Greenhouse experiment:

Effect of using micro-elements and Rhizolex-T 50% on the incidence of faba bean root-rot under greenhouse conditions:

Under A greenhouse experiment was conducted to test if adding microelements such as (Zn, Mn and calcium) singly or combined with a half and recommended dose of Rhizolex-T 50%(the recommended dose) can control the root-rot disease of faba bean. Data in Table (4) show that using Zn, Mn and calcium alone reduced the percentagehad negative effect on faba bean plants where they induced of the pre-emergence damping-off from by 30.0%, in case of using Zn and to 36.33%, in case of using Mn and 33.33%, respectively in case of using calcium. On the other handHowever, using micro-elements combined with quarter, and the recommendedrecommended half dose of Rhizolex-T apparently increased the percentage of survival plants over the pathogen-alone control treatment (Table 4). Also, using zinc with the recommended dose of Rhizolex-T gave more percentage of survival plants than using the fungicideNOT TRUE ACCORDING TO THE TABLE DATA.

Table (4). Effect of micro-elements and Rhizolex-T 50% on the incidence of faba bean root-rot under greenhouse conditions. Effect of

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~~the tested chemical inducers and Rhizolex-T on the incidence of faba bean root-rot in greenhouse experiment.~~

Treatment	Pre-emergence damping off (%)	Post-emergence damping off (%)	Plants survived (%)~~Survival plant (%)~~
Zn (no pathogen-~~free~~)	30.00	20.00	50.00
~~? IS THIS CORRECT?~~	36.33	~~22~~27.76	35.91
Mn (no pathogen-~~free~~)~~?~~	33.33	21.22	45.45
Calcium (no pathogen ~~pathogen-free)?~~	0.00	0.00	100.00
Rhizolex-T 50% (no pathogen~~pathogen-free)?)~~	40.00	25.00	35.00
	43.00	30.00	27.00
Zn + *R. solani*	30.00	25.00	45.00
Mn + *R. solani*	6.70	10.00	83.~~33~~30
Calcium + *R. solani*	10.00	13.33	76.67
Zn + *R. solani* + Rhizolex-T 50% r.d	10.00	10.00	80.00
Mn + *R. solani* + Rhizolex-T 50% r.d	60.00	20.00	20.00
Calcium + *R. solani* + Rhizolex-T 50% r.d	0.00	0.00	100.00
R. solani ~~Pathogen-free~~C~~c~~Control			
L.S.D at 0.05	17.00	15.32	19.67

~~5.~~

Effect of seed treatment with micro-elements and Rhizolex-T 50% on the incidence of faba bean root-rot under field conditions~~: Effect of treating faba bean plants with micro-elements and Rhizolex-T 50% on root-rot:~~

The effects of Zn, Mn and Ca^{++} as well as ~~-~~Rhizolex-T (applied as seed treatment) on pre- and post-emergence damping-off of faba bean plants are presented in Table (5). The results revealed that ~~both~~ these micro-elements ~~or~~ and Rhizolex-T ~~application~~ significantly reduced ~~significantly~~ pre- and post-emergence damping-off when compared to the untreated plants (control). Rhizolex-T ~~was~~ produced the ~~best~~highest level of the disease control ~~in reducing pre- and post-infection and consequently increased~~with the highest number of survived~~al of~~ plants, whereas, manganese was ranked as the ~~lowest~~ least effective micro-element~~s~~ minimizing the disease ~~impact~~ incidence in both~~this shown in the two~~ seasons (2008/2009 and 2009/2010).

Table (5). Effect of treating faba bean seed with micro-elements and Rhizolex-T ~~50%~~ on the incidence of root-rot ~~during~~ in two growing seasons under field conditions.

~~Tested fungus~~Treatment	Season 2008/2009			Season 2009/2010		
	Pre-emergence damping off~~-~~ (%)	Post-emergence damping off (%)	Survival plants (%)	Pre-emergence damping off (%)	Post-emergence damping off (%)	Survival plants (%)
Zn	10.00	10.00	80.00	8.33	7.66	84.01
Mn	13.33	13.33	73.34	10.00	10.00	80.00
Calcium	12.00	13.33	74.67	9.33	8.33	82.34
Rhizolex-T	3.67	6.67	89.66	0.00	0.00	100.00
Zn + Rhizolex-T(100%)	0.00	0.00	100.00	0.00	0.00	100.00
Zn + Rhizolex-T(50%)	0.00	3.33	96.67	0.00	0.00	100.00
Mn + Rhizolex-T(100%)	0.00	3.33	96.67	0.00	0.00	100.00

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Mn + Rhizolex-T(50%)	3.33	3.33	93.34	3.33	6.67	80.00
Ca + Rhizolex-T(100%)	3.33	0.00	96.67	0.00	0.00	100.00
Ca + Rhizolex-T(50%)	6.70	3.33	89.97	3.33	3.33	93.34
Control	20.00	20.00	60.00	12.18	4.33	76.49
L.S.D at 0.05	9.55	10.12	13.21	9.80	11.22	17.32

As for the effect of some micro-elements and Rhizolex-T on disease ~~severity~~ incidence, growth and yield component of faba bean under field conditions, the obtained data in Table (6) revealed ~~a~~ significant positive effects of micro-elements and Rhizolex-T 50% when compared with the control where they~~se~~ lowered the ~~effects were shown in case of~~ disease ~~severity,~~incidence while increased the plant height ~~after harvest~~, number of pods per plant, 100-seed weight, and seed yield / plot ~~kg~~. ~~t~~The ~~obtained~~ results of the first season ~~were~~ confirmed by those of the 2nd one~~from the two experiments conducted in 2008/2009 and 2009/2010 seasons, respectively~~. Rhizolex-T was the best ~~treatment~~ among ~~the test~~all treatments, while calcium gave a ~~good~~ better performance than ~~that the~~ Zn and Mn in ~~improving~~ inhancing faba bean plant growth and yield components.

Table (6). Effect of treating faba bean seeds with micro-elements and Rhizolex-T ~~chemical inducers~~ on plant growth characters and some yield components ~~/ plant~~ under field conditions.

Treatments	Season 2008/2009					Season 2009/2010				
	Disease ~~severity~~incidence	Plant height (cm)	No. of pods / plant	100-seed weight	Seed yield / plant	Disease incidence ~~severity~~	Plant height (cm)	No. of pods / plant	100-seed weight	Seed yield / plant
Zn	12.22	110.0	17.50	75.20	3.20	11.11	100.0	17.00	73.13	3.00
Mn	14.33	108.0	16.30	73.30	3.10	13.33	98.0	15.33	70.22	2.90
Calcium	15.66	107.0	21.40	78.85	3.90	14.44	103.0	18.00	75.00	3.85
Rhizolex-T	11.20	108.0	18.35	76.13	3.70	10.00	105.0	17.55	74.14	3.50
Zn + Rhizolex-T (100%)	5.33	115.0	19.50	78.00	3.40	6.66	108.0	18.00	75.18	3.50
Zn + Rhizolex-T (50%)	7.77	110.0	19.00	76.00	3.30	6.66	107.0	16.85	75.00	3.40
Mn + Rhizolex-T (100%)	9.99	112.0	18.00	74.00	3.20	10.00	108.0	17.00	73.33	3.15
Mn + Rhizolex-T (50%)	11.11	108.0	18.00	73.00	3.10	10.90	105.01	16.00	72.12	3.10
Ca + Rhizolex-T (100%)	10.00	110.0	22.70	82.00	4.00	9.99	08.0	21.34	81.14	3.90
Ca + Rhizolex-T (50%)	12.22	106.0	21.80	80.00	3.90	11.11	107.0	20.00	78.00	3.70
Control	23.33	102.0	13.50	70.00	2.90	26.66	95.0	11.00	68.00	2.80
L.S.D at 0.05	7.18	6.33	2.13	1.70	1.20	8.02	6.00	2.70	2.00	1.50

DISCUSSION

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Faba bean (*Vicia faba* L.) is a legume crop with high nutritional value. Soil borne diseases including root- rot cause ~~important~~ considerable yield losses ~~in yield~~. In the present investigation, extensive surveys w~~a~~sere conducted throughout three Egyptian governorates to determine the occurrence and frequency of various fungi~~a~~l pathogens associated with diseased faba bean plants. The surveys showed differences in the frequency of the isolated fungi similar results were early reported by ~~(~~El-Morsy *et al.*~~,~~ (1997~~;~~), Akend and Bellar~~,~~ (1999~~;~~), Hugar~~,~~ (2004) and Metwaly~~,~~ (2004).

The present investigation indicated that faba bean seeds pre-treated with Rizolex-T and Zn, Mn and Ca singly reduced root-rot disease incidence. Moreover, combined Rizolex-T and the tested microelement reduced significantly the disease impact. This finding was confirmed under greenhouse and field trails over two successive seasons. On the other hand, plant growth characters and seed yield were also increased.

It can be explained that Zn, Ca or Mn application improved plant growth and that may-partily-increased defense mechanism of the plant to soil borne infection and also to same extent increase plant growth parameters. This finding was previously reported by Soleman *et al.* (1988) and Omar *et al.* (1992). They found that application of microelements gave a renearkeble protection against faba bean fungal diseases.

Manganese activates some of the enzyme reactions in tricarboxylic acid and dehydrogeneres (Marschener, 1986). The results of this study revealed the appearance zinc and calcium as root-rot for faba bean plants. Both treatments have greatly reduced of root-rot disease and also, increased seed yield.

In short, use of Rhizolex-T and / or some microelement can improve disease resistance of faba bean to root-rot disease and increase growth and yield of the plant.

~~Pathogencity test of two live isolates of the most frequently isolated fungus, *Rhizoctonia R. solani* proved that they were pathogenic and virulent for on faba bean plants. The lowest was caused by isolate No. R_1M from Minufiya governorate. The results of this study showed that application of micro-elements alone or with different concentrations of Rhizolex-T 50% reduced inhibited the linear growth of *Rhizoctonia R. solani*. Zinc was the most more effective microelement in reducing inhibiting the pathogen growth. The greenhouse experiment results indicated that using micro-elements can reduce lower the percentage incidence of pre- and post-emergence damping-off. Also, using micro-elements with quarter??? the recommended doses of Rhizolex-T 50% gave~~

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approximately the same results when using the fungicide was used alone. Manganese activates some of the enzyme reactions in tricarboxylic acid and dehydrogeneres **(Marschener, 1986)**. The results of this study revealed the appearance zinc and calcium as root-rot for faba bean plants NOT CLEAR هذه الجملة غير مفهومة. Both treatments have greatly reduced of root-rot disease and also, increased seed yield.

جزء المناقشة يحتاج مزيد من إلقاء الضوء على دور العناصر الصغرى في استحثاث المقاومة في النبات وكيف يتم ذلك فسيولوجيا.

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سحر عباس السيد
معهد بحوث أمراض النباتات – قسم أمراض البقوليات والعلف – مركز البحوث الزراعية – الجيزة – مصر

الملخص وجز

- أظهرت نتائج الدراسة المعملية أن تأثير بعض العناصر الصغرى مثل الزنك والمنجنيز والكالسيوم وكذلك المبيد الفطرى الـ"ريزولكس- تى" لها تأثير مضادمثبط على فطر الريزوكتونيا سولانى المُسبب لمرض عفن الجذور فى الفول البلدى و، فقد وجد أنه تحت ظروف المعمل أدى إضافة هذه المواد لبيئة النمو إلى انخفاض تثبيط النمو الميسليومى للفطر المُمرض الريزوكتونيا سولانى باستخدام هذه المعاملات مقارنة بالكنترول الغير معامل .
- وتحت ظروف الصوبة وجد أن هذه العناصر أدت إلى انخفاض فى نسبة موت البادرات وبالتالى زيادة فى عدد النباتات المتبقية الناجية من الإصابة مقارنةً بالكنترول المُمرض الغير معامل بهذه العناصر .
- وتحت ظروف الحقل وجد أن معاملة البذور بالعناصر الصغرى أوالمبيد الفطرى الريزولكس- تى أدت إلى انخفاض نسبة موت البادرات وكذلك زيادة فى عدد القرون ووزن الـ ١٠٠ بذرة وزيادة فى كمية البذور فى قطعة التجربة ، وكانت المعاملة بالمبيد الريزولكس- تى أفضلهمأعلى المعاملات تأثيرا فى بالبسلة إلى خفض نسبة موت البادرات أما بالنسبة إلى للصفات الخضرية وكمية المحصول فكان الكالسيوم أفضل العناصر يليه الزنك ، لذا ننصح باستخدام العناصر الصغرى أفضل بدلا من استخدام المبيدات فى الزراعة لمقاومة مرض عفن الجذور الرايزوكتونى فى الفول البلدى.

قام بتحكيم البحث
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Dear Dr. Sahar,
السلام عليكم ورحمة الله وبركاته
I apologize for my late response.

Attached is the annotated manuscript. I have used the "Track Changes" function in the "Tools". All my corrections and changes are in red font and the deletions are marked as strikeouts. The highlighted text is unclear or questionable. You may know, you can generate a clean copy without these markings by turning off the track changes functions. But when you do, save the resulting copy under a different file name so that you will have my marked copy for reference.

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