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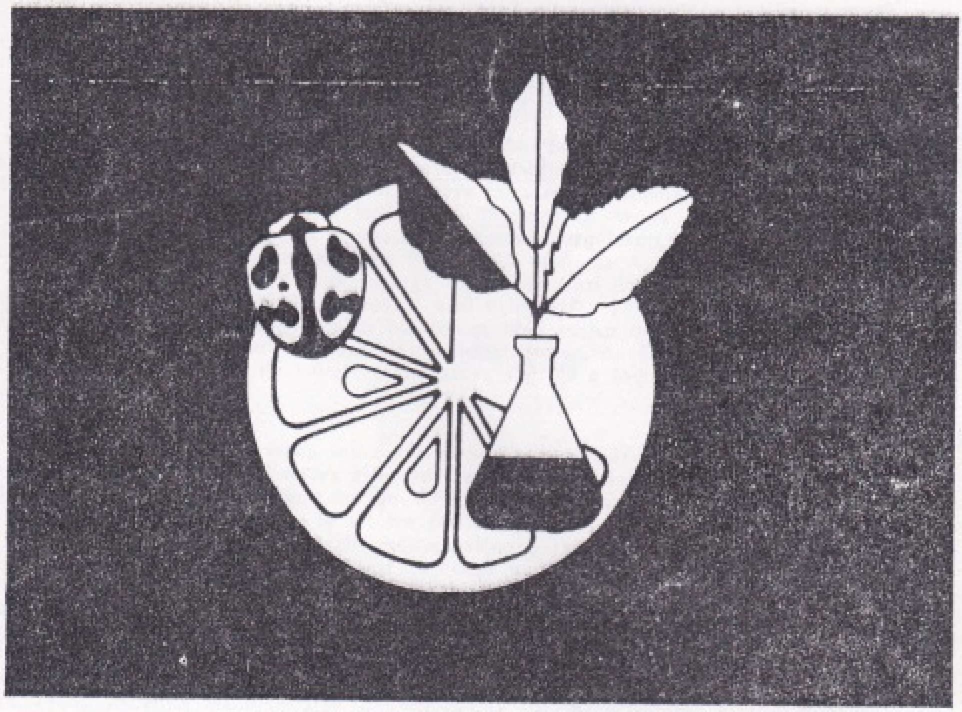

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BIOLOGICAL CONTROL OF Rhizoctonia DAMPING-OFF IN SESAME

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ÖZET

Susamda Çökerten Etmeni Rhizoctonia'nın Biyolojik Mücadelesi

Sağlıklı susam bitkilerinin rhizophere ve rhizoplane'inden elde edilen birçok Trichoderma spp. izolatından biri (T 162), susamda Rhizoctonia solani'nin aktivitesine rakip olabilmiştir. Bu izolat büyüme odası şartlarında çıkış öncesi veya çıkış sonrası dönemlerde çökertenin hastalık oluşturmasında belirgin bir azalma sağlamıştır. R.solani'nin neden olduğu toplam kayıp (% 64.0) Trichoderma spp.'nin T 162 izolatı bulaşık toprağa uygulandığında % 25-28'e düşmüştür. Ancak R.solani'nin çıkış sonrası aktivitesi T 162 ile % 46.0 dan % 15.78'e düşmüştür.

Tarlada Rhizoctonia ile infekteli toprağa buğday daneleri üzerinde 2 g T 162 verildiğinde 30.günde fidelerdeki kayıp % 26.27 den % 4.90'a inmiştir. T 162 nin aktivitesi sağ kalan bitkilerin sayısını ve uygulama yapılan bitkilerden elde edilen ürünü artıracak kadar yüksek olmuştur. Rhizoctonia ile bulaşık topraklardan hasat zamanında 618 g ürün elde edilirken T 162 uygulanmış Rhizoctonia ile bulaşık topraklardan 1501.25 g ürün elde edilmiştir.

INTRODUCTION

Damping-off caused by many soil borne pathogens particularly Rhizoctonia solani kuhn is one of the most important diseases affected the yield potential of many crops. The disease' resistance against such pathogen is too difficult (Adams and Butler, 1979; Parmeter et al.,1969) and a chemical control is not the desirable method because it is expensive, causing an environmental pollutions and might induce pathogen resistance (Larson, 1987). Therefore, a biological control could be the most practical and economical method since numerous successfully attempts have been reported (Elad et al., 1981, 1982; Henis et al., 1978). In Iraq, sesame plants are annually suffered from soil born pathogens. Although R.solani, Macrophomina phaseolina and Fusarium spp. are the most frequently isolated fungi from infected plants, R. solani found to be the aggressive one and significantly induced a synergistic effect on disease incidence of damping-off with the others (AL-Hamdany and Salih, 1986). Recently many isolates of Trichoderma spp. were isolated from the rhizospbere and rhizoplane regions of sesame healthy plants grown in a field suffered from damping-off. However most isolates were successfully approved the antagonistic activities against R.solani (Al-Hamdany and Salih, 1988).

The objective of this study is to evaluate the efficiency of isolate T 162 of Trichoderma spp. in disease control of Rhizoctonia damping-off in sesame under growth room and field conditions and its role in the productivity of sesame plants.

MATERIALS AND METHODS

Preparation of Inocula of R.solani and T 162. Both isolates were grown on wheat brain in 250-ml flasks. The medium was sterilized twice before the addition of spore and

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fragment suspensions of T 162 and R.solani respectively. Incubation was two weeks at 25 °C. The inocula were air dried and grinded to a fine powder.

Effect of Infestation level of T 162 on Disease Incidence.

1. At growth room conditions. Sterilized sandy loam soil was artificially infested with R.solani (0.1 g powder/kg soil). During the infestation, the soil was mixed throughly, moistened to 20 % (w/v) and placed in plastic pots (20-cm diameter). All the pots were immediately covered by a polyethylene mulch for seven days at 25-27 °C with 14 hr photoperiod. The check pots contained noninfested wheat brain and treated similarly. Following the incubation period, powder of T 162 was added as a band in each pot 10 cm below the soil surface using three levels of infestation (0.1, 0.2 and 0.3 g/kg of Rhizoctonia infested soil). The pots once again were covered for seven days.

Surface sterilized sesame seeds of mutant L which was induced by gamma rays from the local cultivar (AL-khalisii, and wohayeb, 1981) were used in all the tests reported here. Each pot (4 kg soil) was seeded with 50 seeds. The seeding was conducted on moistened soil. Therefore no water was used until the emergence of 70 % of seedlings at control treatment. One treatment was added in which the seeds were coated with powder of T 162 and planted in Rhizoctonia infested soil. There was six pots for each level including the control and seed coated treatments. Statistical analysis of variance (Snedecor and Cochran, 1976) was applied on seed germination and post-emergence damping off incidence. The first reading for seed germination (10 days after seeding) showed the loss due to pre-emergence damping off. The total loss in seedlings after 40 days was measured also.

2. At field conditions. Field plots (3x3 m) consist of three single rows 200 cm long spaced 70 cm a part were used. The soil of each row (10 cm wide) was replaced by Rhizoctonia infested soil (0.1 g/kg soil). The rows then were slightly irrigated and covered for seven days. Following the incubation period, inoculant of T 162 was added at three levels, 0.5. 1 and 2 g of powder/kg soil. Once again all the rows were covered for seven days before seeding time. Each row was seeded with 100 surface sterilized sesame seeds of mutant L. The seeding was conducted on moistened soil, thus the first irrigation was made on day 10th. This experiment was demonistrated in six replicates. The survival plants were counted at day 30 to obtain the percent loss based on control. The mature plants were also counted at harvesting time (125 days after seeding) to find the percent loss occurred during the period 30-125 days. Seeds of healthy plants from three replicates were obtained.

RESULTS AND DISCUSSION

Effect of Infestation Level of T 162 on Disease Incidence

1. At growth room conditions. Data of seed germination revealed that planting the sesame seeds in Rhizoctonia infested soil reduced the percent germination about 33 in contrast to 11-18 % when T 162 was added to the same soil. Meanwhile coating the seeds with T 162 did not show any significant difference in disease incidence of pre-emergence damping-off (table 1). The failure of seed coating in sesame might be attributed to insufficient time for T 162 to work against the well established inoculant of R.solani in the seed bed. However this explanation is supported by the results obtained for percent loss occurring later (10-40 days after planting). The percent loss in emerged seedlings was highly approved the suppression of R.solani by T 162 of Trichoderma spp. The disease incidence of post-emergence damping-off was significantly reduced from 46.0 in R.solani infested soil to 37.60, 33.60, 15.78 and 16.90 when T 162 was used as seed dresser, 0.1, 0.2 and 0.3 g/kg soil respectively. Meanwhile, the total loss at day 40 due to both pre and post emergence damping-off was remarkably reduced especially at level 0.2 and 0.3 g of T 162/kg (table 1).

2. At field conditions. Data of loss percentages either at first readings (30 days) or at harvesting time (125 days) were successfully approved the antagonistic activity of T 162 fragment suspensions of T 162 and R.solani respectively. Incubation was two weeks at 25 °C. The inocula were air dried and grinded to a fine powder.

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2. At field conditions. Data of loss percentages either at first readings (30 days) or at harvesting time (125 days) were successfully approved the antagonistic activity of T 162

Table 1. Efficiency of T 162 of Trichoderma spp. in disease control of Rhizoctonia damping off in sesame at growth room conditions.

Treatments*	Germination %	Losses based on control % at 10-40d.	0-40 d.
Control	97.30 a***	0.00 a	0.00
R.solani	66.67 c	46.00 e	64.00
R.solani+ T162 on seed**	70.00 c	27.60 c	49.33
R.solani+ T162 (0.1g/kg)	81.30 b	33.60 d	45.00
R.solani+ T162 (0.2g/kg)	88.67 b	15.78 b	25.33
R.solani+ T162 (0.39/kg)	86.67 b	16.90 b	28.00

* Inocula of R.solani and T162 were grown on wheat brain for two weeks, air dried, grinded to a fine powder.

** Sesame seeds were coated with T162 and planted in Rhizoctonia infested soil.

*** Means (six replicates) with the same letter are not significantly different (P=0.05) according to Duncan Multiple Rang Test (DMRT).

against R.solani regardless the level of infestation. The addition of T 162 to Rhizoctonia infested soil reduced the losses in survivals from 26.27 to 4.90-9.76 % at day 30 and from 26.41 to 4.23-14.10 % at harvesting time respectively (table 2). Considering the total loss occurred at day 30 and later, the T 162 1 or 2g/kg reduced the percent loss from 45.74 to 13.5 %.

The survival plants grown in Rhizoctonia infested soil were significantly reduced (25.58 %) while no significant differences in survivals were observed among the treatments of T162 with the control except the level T162 0.5g/kg.

The results revealed that T162 significantly increase the survival number at harvesting time in comparison to the control. The infestation level of T162 significantly affected the productivity. The highest yield was obtained from plants grown in Rhizoctonia infested soil augmented with T162 at level of 2g of T162/kg of Rhizoctonia infested soil. This level of T162 increassed the yield from 610.0 to 1501.0g. However the yield of the later treatment was significantly surpassed the yield of controlled plants (table 3).

Data of survivals at harvesting time in table 3 showed a remarkable reduction in sesame plants even at control treatment (62.16 %). This reduction could be due to the salt sensitive character in sesame (Cerda et. al., 1977; Yousif et.al. 1972; 1972).

The electric conductivity (EC) of the soil used was 7 mmhos/cm.

Therefore, the successful reduction in disease incidence induced by T162 is promissing since a biological control with Trichoderma spp. has proven difficult in alkaline soils (Chet and Baker, 1980; Liu and Baker, 1980).

Table 2. Effect of infestitaion levels of T162 on disease incidence of Rhizoctonia damping off in sesame at field conditions.

Treatments*	Percent loss based on control (30 d.)%	Percent loss based on survival no at 30 d. (harvesting) time %
Control	0.00	0.00
R.solani	26.27	26.41
R.solani+ T162 (0.5g/kg)	8.60	14.10
R.solani+ T162 (1g/kg.)	9.76	4.23
R,solani+ T162 (2g/kg.)	4.90	9.12

* Inocula of R.solani and T162 of Trichoderma spp. were grown on wheat brain for two weeks, air dried, grinded to a fine powder. The powder of T162 was added after seven days from the infestation of the soil with R.solani.

Table 3. Effect of T162 on survivals and productivity of sesame plants grown in Rhizoctonia infested soil.

Treatments	Percent surv. based on seed no. %	Productivity* of survival plants (g)	Percentages based on control %	
			survivals	productivity
Control (No R or T162)	62.16 a**	1338.50 c	100.00	100.0
R.solani	25.58 c	610.00 g	41.15	46.17
R.solani T162 (0.5g/kg)	46.17 b	742.50 f	74.28	55.47
R.solani+ T162 (1g/kg)	52.58 a	1441.50 b	84.58	107.70
R.solani+ T162 (2g/kg)	52.48 a	1501.25 a	84.43	112.16

* The productivity of survival plants was measured in three replicates with 100 seeds each.

** Means with the same letter are not significantly different (P=0.05) according to Duncan Multiple Range Test (DMRT).

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