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EFFECT OF SOME FUNGICIDES, BIOAGENTS AND ESSENTIAL OILS FOR CONTROLLING PURPLE BLOTCH DISEASE OF ONION

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ABSTRACT

Linear growth of *Alternaria porri* (Ellis) Ciferri. was significantly reduced after 5 days with Ridomil plus 50% and Ridomil M 72 respectively. The same trend was observed with spore germination *A. porri*. Also, *Trichoderma hamutum* was the best antagonistic fungi in reducing the linear growth of *A. porri* compared control followed by *Trichoderma harizianum* and *T. viride*, while, *Glicoladium roseum* gave a moderate inhibition while, antagonistic bacteria gave highly inhibition. *Bacillus subtilus* gave high inhibition compared control.On the other hand, the tested essential oils inhibited in linear growth of *A. porri* at all tested concentrations compared with untreated control. Cinnamon, mint and clove oils gave the highest inhibited the linear growth of the pathogenic fungus, respectively followed by camphor and thyme.

Under greenhouse and field conditions, observed that disease incidence, disease severity and yield (Ton/feddan).Ridomil plus 50% and Ridomil M-72 gave great inhibition were determined to pathogen compared with control and other fungicides while, the some bioagents (fungi and bacteria) decreased disease incidence and disease severity *T. hamutum* and *B. subtilus* were best treatments on controlling pathogen other treatments. Also, the yield (Ton/feddan) was the high yield were observed in the same treatments. Effect of someessential oils, gave highly inhibition of disease incidence and disease severity as well as yield (Ton/feddan). The mint and clove were the best compared with control and other treatments.

INTRODUCTION

Purple blotch disease caused by *Alternaria porri* is a very important a disease that affects foliage. It caused yield reduction from 30-50% (Nolla, 1927) and even up to 100% (Skiles, 1953).Chemical application was used as methods to control purple blotch. Fungicides such as chlorethalonil, copper oxychloride, metalaxyl plus mancozeb, mancozeb, azooxystrobin and iprodione give high control of purple blotch disease (Sugha and Tyagi, 1994 and Bird *et al.*, 2002). Evaluation the antifungal activity of biological control with antagonistic fungi (*T. harizianum, T. viride, T. hamatum* and *G. roseum*) studying as antimicrobial to some pathogenic activity of the antagonistic bacteria (*Psudomonas fluoresens* and *Bacillus subtilus*) were used (Sastrahidayat, et al. 1993 and Sastrahidayat, 1995). Pawar and Thaker (2008) used 75 different essential oils *Fusarium oxysporum* f. sp. *cicer* and *Alternaria porri*. The most active essential oils found on *A. porri* were lemongrass, clove, cinnamon bark, cinnamon leaf, cassia, fennel, basil and evening prim rose. However, the effectiveness of these essential oils with the tested fungi showed different responses.

Tiwariand and Srivastava (2004) studied the efficacy of some plant extracts i.e. neem, eucalyptus, mint, datura, lantana and ramphal against the onion all pathogens (*F. oxysporum, A. porri, A. niger* and *S. cepivorum*) were evaluated in the laboratory. The antifungal activity of the extracts at 5, 10 and 20% were evaluated by measuring pathogen mycelyal growth. All extracts exhibited significant antifungal activity. Mint inhibited the growth of all pathogens. Pawar and Thaker (2008) studied the effect of anti-*Fusarium oxysporum* f.sp. *cicer* and anti-*Alternaria porri* effects were evaluated for 75 different essential oils. The most active essential oils found were on lemon grass, clove, cinnamon bark, cinnamon leaf and cassia.

MATERIALS AND METHODS

I- Laboratory experiments:

1) Effect of some fungicides on linear growth of *A. porri*.

The antifungal activity of some fungicides against linear growth of *A. porri* was s. Each fungicide was incorporated into PDA at four concentrations (0, 125, 250 and 500 ppm). Disks (5 mm. in diameter) from actively growing culture of *A. porri* were transferred aseptically to amended plates. Four replicates plates of each treatment were used and inculcated at 25±2^{0}C in the dark. The diameter of the colony was measured after 3 and 5 days.

2) Effect of some bioagents on linear growth of *A. porri*.

Four antagonistic fungi (*T. harzianum*, *T. viride, T. hamatum* and *G. roseum*) and two antagonistic bacteria (*B. subtilis* and *P. fluorescens*) were used. The effects of antagonistic fungi on linear growth of *A. porri* were studied. Each of obtained fungal antagonist, and *A. poori* grown on PDA for 5-7 days at 25±2^{o}C. The antagonistic effect of the used antagonists on the pathogen was done through using one disc (5 mm. in diameter) of the antagonist facing one disc of the pathogen carrying mycelial growth on the PDA surface and relatively closed to the periphery of the dishes. The untreated control treatment was done on the same medium in Petri dishes by growing one disc of the pathogenic fungus in the same place but there was no antagonistic disc. In case of antagonistic bacteria, All pure cultures of *B. subtilis* and *P. fluorescens* were grown on nutrient agar medium (NA). Four replicates were used; all dishes were incubated at 25±2^{o}C for 5 days. Data were recorded on the diameter average of zones of the pathogenic fungus.

3) Effect of some essential oils on the linear growth of *A. porri*.

Six essential oils; cinnamon (*Cinnamomum zeylanicum*), camphor (*Eucalyptus globulus)*, thyme (*Thymus vulgaris*), mint (*Mentha* spp.), clove (*Syzyginum aromaticum*) and negilla (*Negilla sativum*) were tested for their antifungal activity at four concentrations 0.0, 0.5, 1.0 and 1.5% against *A. porri*. Concentrations prepared by supplying PDA medium, after autoclaving with 0.5% of tween-80 (v/v) to enhance oil solubility, then poured in sterile Petri dishes (Hammer *et al*., 1999). Four replicates were used for each concentrate; all dishes were inoculated with 5 mm discs in diameter of fungus taken from 4 days old culture. All dishes were incubated at 25±2^{o}C for 5

days. Data were recorded as average diameter of zones of the pathogenic fungus.

II- Greenhouse experiments:-

1) Effect of some fungicides

The antifungal effects of some fungicides (Ridomil M-72%, Ridomil plus 50% Galben cupper 46%, Kocid 2000 and Ditheine M-45) against *A. porri* were tested at recommended dose. Inoculation potential was prepared by growing each of the tested isolates on PDA medium at 25±2°C for 15days. Then ten ml of sterile distilled water were added to each plate and colonies were carefully scraped with a sterile needle. The resulting conidial suspension from each isolate was adjusted to 10^4cfu/ml and used for spraying on leaves and seed-stalks of onion plants (110-day-old Giza-20 cv.), using an atomizer. After, spraying, plants were covered with polyethylene bags for 48 hours to maintain high humidity after this period, the bags were removed and plants were kept under normal conditions. Fifteen days after spraying, disease severity was recorded. Autoclaved pots (20-cm-diameter) were filled with autoclaved clay soil and each pot was planted by two seedlings. Three replicates were used. Each replicate consisted of four pots and absolute treatment was used as control treatment.

2) Effect of some antagonistic fungi and bacteria

This experiment carried out was done to evaluate the antagonistic efficacy of four fungal antagonists, *T. harzianum, T. viride, T. hamatum* and *G. roseum* as well as *B. subtilis* and *P. fluorescens* previously tested in laboratory against *A. porri* as spraying on foliar plants. Onion plants (110-day-old) were sprayed with each of the spore suspensions alone at concentration of 10^6, cfu/ml. Inoculum was prepared by growing the bioagents on PD broth, incubated at 25±2°C on an orbital shaker at 200 rpm for 7 days while inoclum bacteria was prepared by growing the bacteria cultures in nutrient yeast extract broth, incubated at 25±2°C on an orbital shaker at 200 rpm for 24 h. Bacteria was subsequently pelleted by centrifugation at 15000 rpm for 5 min and washed in0.1% saline solution. The bioagents were sprayed, each alone, on onion plants by using a hand atomizer. Bioagents were applied at the same time of inoculation and/or three days before inoculation with the pathogen. The experiment was repeated one season under greenhouse condition in 2008. Autoclaved pots (20-cm-diameter) were filled with autoclaved clay soil. Were used Three replicates were used. Each replicate consisted of four pots and each pot consisted of 2 plants. Disease assessment was recorded at 15 days after inoculation

3) Effect of some essential oils

Antifungal effects of mint, cinnamon and clove oils on disease incidence caused by *A. porri* were tested. Choosing of these oils was due to their good effect under laboratory conditions. The mode of artificial spraying with the fungus pathogen and planting was done as mentioned before.

Control treatments were as before. Data collection was recorded done as before in the other greenhouse tests.

III. Field experiments:

1) Effect of some fungicides

The experiment was performed on loamy (pH 7.16) at an area of onion production. This experiment was established at Kafar Saad city, Damietta governorate, where fields are naturally infested with *A. porri*, this trail was done at three seasons 2007/2008, 2008/2009 and 2009/2010 all agricultural practices were applied as recommended. The experiment had randomized complete block design. These tre + atments were tested to evaluate some fungicides mentioned previously against on purple blotch on 1.5m X 5m field plots planted with bulbs of small onion cultivar Giza -20 cv. at recommended spacing of 10cm X 10cm. Each treatment was replicated 3 times in a randomized complete block design. Spraying was started 20 days after planting (before appearance of typical symptoms) and continued for a further 5 times at 10 - 15 day intervals by using a hand operated knapsack sprayer. Teepol was mixed with each fungicide spray solution at the rate of 1 ml/1 as a surfactant. Control plots were sprayed with 0.1 percent Teepol solution. Percent disease was taken at 15-day intervals just before each spraying. It was assessed visually according to the proportion of total leaves (foliage) affected due to the purple blotch disease. Crop was harvested after 11 weeks from planting. Marketable bulb yields were recorded. These parameters were taken as indices to evaluate the efficacy of treatments.

2) Effect of some antagonists fungi and bacteria:

This test was done to evaluate the efficacy of six bioagents; *T. harzianum*, *T. viride, T. hamatum, G. roseum* and *B. subtilis* and *P. fluorescens*. The methods for prepared inoclum and application as mentioned before greenhouse experiments, control treatment were done. Data were recorded as % of disease severity and disease incidence.

3) Effect of some essential oils

As described in green house experiment.

RESULTS AND DISCUSSION

I. Laboratory experiments

1) Effect of some fungicides on linear growth of *A. porri*.

Data in Table (1) show that the greatest inhibition of the mycelial growth of *A. porri* came from ridomil 72 which giving 79.62% reduction at 500 ppm concentrate followed by ridomil plus 50%, Galben cupper 46%, and ditheine M 45 that reduced the mycelial growth to 68.70, 65.04 and 63.18% at rate of 500, respectively. On the other hand, kocide 2000 had a slight inhibition which gave 36.82%. These results in harmony with results obtained by (Sastrahidayat, 1995 and Data, 1996)

2) Effect of some antagonistic fungi and bacteria on linear growth of *A. porri*.

Data in Table (2) illustrated that *T. hamatum* was the best antagonistic fungi in reducing the mycelial growth of *A. porri* with 58.57% reduction compared with control. This was followed by *T. harzianum* and *T. viride* with 55.36 and 50.00% inhibition, respectively. While, *G. roseum* gave a moderate inhibition rate giving 35.71%.On the other hand *B. subtilis* and *P. fluorescens* gave reduction in pathogenic fungus 59.11 and 21.86, respectively. These results in harmonay with the previously recorded by (Elad *et al*., 1995 and Khan and Khan, 2001)). This high antifungal activity of *Trichoderma* spp. may be attributed to some lytic enzymes, which act as fungal cell-well-degrading agents such as *N*-acetyl- ß-*D*-glucosedeaminidase, chitinase, ß–1,3 gluconase, chitobiosidase and protease (and Elad *et al.,* 1998). On the other hand, This inhibitory activity of antagonistic bacteria may be attributed in part to the production of antibiotic compounds, including peptides (Banerjee and Hansen 1988 and Paik *et al*., 1998), lipopeptides (Arima *et al*., 1968) and a novel phospholipid compound (Tamechiro *et al*., 2002). Also, These results are in agreement with those of Khan and Khan (2001) who found that *B. subtilis* reduced the linear growth of *R. solani, S*. *sclerotiorum, F. oxysporum* and *M. phaseolina*. This inhibitory activity may be attributed in part to the production of antibiotic compounds, including peptides.

Table (1): Effect of some fungicides on linear growth of *A. porri* after 5 days.

Conc. / Fungicides	Linear growth (mm)							
	0 ppm		125 ppm		250 ppm		500 ppm	
	L.G.	Inh.%	L.G.	Inh.%	L.G.	Inh.%	L.G.	Inh.%
Ridomil plus 50%	59.75a	0.00	25.54a	57.26	21.00a	64.85	18.70b	68.70
Ridomil M 72	59.75a	0.00	29.00b	51.46	20.00a	66.53	12.00a	79.62
Galben cupper 46%	59.75a	0.00	27.30ab	54.31	22.00a	63.18	20.89c	65.04
Ditheine M- 45	59.75a	0.00	30.00b	49.79	24.34ab	59.44	22.00d	63.18
Kocid 2000	59.75a	0.00	38.75c	35.15	38.00c	36.40	37.75e	36.82
LSD at 5%	1.01		2.33		4.02		0.98	

Inh.% = inhibition % L.G. = linear growth No. S. = number of germinated spore per 100 spore Inh.%= inhibition%

Table (2) Effect of some antagonistic fungi and bacteria on linear growth of *A. porri*.

Treatment	Linear growth	Inhibition%
T. harzianum	31.25[d]	55.36
T. viride	35.00[c]	50.00
T. hamatum	29.00[e]	58.57
G. roseum	45.00[b]	35.71
Control	70.00[a]	0.00
L.S.D at 5%	1.33	¯N.S
P. fluoroscens	48.25 [b]	21.86
B. subtilis	25.25[c]	59.11

Control	61.75[a]	0.00
L.S.D at 5%	2.88	

3) Effect of some essential oils on linear growth of *A. porri*.

Data in Table (3) show that the highest inhibition in pathogenic fungusgrowth came from cinnamon (*C. zeylanicum*), mint (*Mentha* spp.) and clove (*S. aromaticum*), which reduced the mycelial growth of *A. porri* by 100% at all concentrates used compared with control. This was followed by negilla (*N. sativum*) by 72.29% reduction in mycelia growth. On the other hand, camphor (*E. globulus*), thyme (*T. vulgaris*) gave a slight reduction in mycelial growth of *A. porri* giving 7.23 and 6.61% inhibition, respectively. This is in good agreement with the results of many authors who reported the antifungal activity of cinnamon oil against plant pathogenic fungi (Atta-Ur-Rahaman *et al*., 1999 and Ranasinghe *et al.*, 2002). The latter investigates found oil of cinnamon inhibited the linear growth and spore germination of *F. oxyasporum, A. flavus, Colletotrichum musae* and *F. proliferation*. This high antifungal activity of cinnamon oil may be attributed to be presence of some active compounds such as Eugenol (the main compound of cinnamon oil), benzyl alcohol, cinnamic acid, cinnamyl acetate, 4-hydroxybenzaldehyde and salicylaldehyde, as well as two d-phenothrin pyrethrum and cinnamaldhyde. Also, the antifungal activity of oil can be attributed to the presence of an aromatic nucleus and phenolic OH group, which is known to be reactive and can form hydrogen bounds with active sites target enzymes (Velluti *et al.*, 2003). It was also noticeable that clove (*S. aromaticum*) oil completely inhibited the mycelial growth and spore germination of *A. porri* giving complete inhibition on linear growth at all concentrates (Table 8). These results are in good agreement with those of Antonov *et al.* (1997); Walter *et al.* (2001) and El-Kaffash-Waffa. This high antimicrobial activity is probably related to Eugenol (hydroxy-3-methoxyallylbenzene) as a major compound which exhibits broad antimicrobial activities well as to caryophyllene, and tannins (Velluti, *et al.*, 2003). Rajkovic *et al*. (2005) found other compounds in clove oil which have antifungal and antibacterial especially carvacrol and thymol. El-Sherbieny *et al*. (2002) and Dawood *et al*. (2003) who tested the vapor of peppermint oil and two of its major constituents (menthol and menthone) against *S. sclerotiorum*, *Rhizopus stolonifer* and *Mucor* sp. in a closed system.

Table (3): Effect of some essential oils on linear growth and spore germination of *A. porri* after 5 days.

Con. / Oil	Linear growth (mm)							
	0.0%		0.5%		1.0%		1.5%	
	L.G.	Inh.%	L.G.	Inh.%	L.G.	Inh.%	L.G.	Inh.%
Cinnamon	55.33a	0.00	0.00a	100.00	0.00a	100.00	0.00a	100.00
Thyme	55.33a	0.00	54.01c	1.33	54.01c	1.33	51.67c	6.61
Mint.	55.33a	0.00	0.00a	100.00	0.00a	100.00	0.00a	100.00
Camphor	55.33a	0.00	54.77c	1.01	54.00c	2.40	51.33c	7.23
Clove	55.33a	0.00	0.00a	100.00	0.00a	100.00	0.00a	100.00

Nigilla	55.33a	0.00	22.00b	60.23	21.67b	60.83	15.33b	72.29
LSD at 5%	0.00		2.01		1.30		0.56	

L.G. = linear growth
No. S. = number of germinated spore per 100 spore
Inh.% = inhibition %

The latter investigates found that the essential oil of peppermint and its major individual aroma constituents at different ratios inhibited the growth of the tested fungi.

II- Greenhouse experiments

1) Effect of some fungicides

Results in Table (4) demonstrate that all fungicides gave highly inhibition in disease incidence caused by *A. porri*. The ridomil plus 50% was the best fungicides for reducing disease incidence and disease severity giving 14.33 and 10.67% when compared with untreated control (83.33 and 71.33%). However, Galben cupper 46% gave the second best result for reducing disease incidence disease severity by 16.33 12.67%. Conversely, the lowest value of disease incidence came from kocide 200 by 27.33% disease incidences and 22.67% disease severity.

2) Effect of some bioagents

Data in Table (5) reveal that, there were significant differences between control and all bio-agents treatment was tested. The highest effect on reducing disease incidence and disease severity came from *T. hamatum* and *B. subtilis* giving 27.67% disease incidence and gave 24.67 and 25.37 disease severity, respectively while the untreated control was 83.33% disease incidence and 71.33% disease severity, followed by *T. viride,* and *P. fluoroscens* giving the same result (36.33% disease incidence while gave 25.33 and 30.67% disease severity, respectively). Conversely, the lowest effect on suppressing the disease incidence and disease severity came from treated with *G. roseum* giving 42.00% and 35.67%. The results can be understood by synergistic involvement of a number of mechanisms, which may include activation of plant defense system (Kleifeld and Chet, 1992). The synthesis of pathogenesis-linked proteins is one of the most ordinary defense mechanisms triggered in plants following infection with inducing agents (Van Loon, 1985 and Dalisay and Kuc, 1995).

Table (4): Effect of some fungicides on disease incidence and disease severity caused by *A. porri.*

Treatments	Disease incidence%	Disease severity%
Ridomil plus 50%	14.33a	10.67a
Galben cupper 46%	16.33b	12.67b
Ridomil M 72 %	17.00b	12.67b
Dithein M 45	24.00c	19.33c
Kocide 200	27.33d	22.67d
Control	83.33e	71.33e
L.S.D at 5%	**1.33**	**1.45**

Also, This antifungal activity of *P. fluorescens* against *A. porri* is probably related to the degradation of chitin in hyphal and sclerotia cell by several hydrolyzing enzymes (Gooday, 1990) such as endochitinase (1,4-L-poly-*N*-acetyl-glucosaminidase)or,exochitinase(exo-N,NP-diacetylchitobiohydrolase), chitobiosidase and/or *N*-acetylglucosaminidase or NAGase.

Table (5): Effect of some bioagents on disease incidence and disease severity caused by *A. porri.*

Treatments	Disease incidence%	Disease severity%
T. viride	36.33c	25.33bc
T. harzainum	32.33b	22.67a
G. roseum	42.00d	35.67e
T. hamatum	27.67a	24.67b
P. fluoroscens	36.33c	30.67d
B. subtilis	27.67a	25.33bc
Control	83.33e	71.33f
L.S.D at 5%	**3.42**	**1.21**

3) Effect of some essential oils

Data in Table (6) reveal that all essential oils gave a significant reduction in disease incidence. The best reduction came from mint oil, which gave 51.67% disease incidence and 40.67% disease severity compared with untreated control. This was followed by clove oil that giving 52.33% disease incidence and 42.67% disease severity. Conversely, Negilla oil was the lowest oil for reducing disease incidence and disease severity giving 83.67 and 72.30% while control treatment was 83.33% disease incidence and 71.33% disease severity.

Table (6): Effect of some essential oils on disease incidence and disease severity caused by *A. porri.*

Treatments	Disease incidence%	Disease severity%
Cinnamon	80.67c	70.67d
Mint	51.67a	40.67a
Camphor	71.67b	66.00c
Clove	52.33a	42.67ab
Negilla	83.67d	72.33de
Control	83.33e	71.33f
L.S.D at 5%	**2.68**	**2.78**

III-Field experiments

1) Effect of some fungicides.

Results in Table (7) demonstrate that all fungicides gave extremely inhibition in disease incidence caused by *A. porri*. The ridomil plus 50% was the best fungicides for suppressing disease incidence which three years 17.89, 11.44 and 12.22% disease incidence, respectively compared with untreated control. However, Galben cupper 46% gave the second best result for reducing disease incidenc, disease severity and yield per feddan which

gave over three years 20.00, 13.78 and 12.7, respectively. The highest value of disease incidensce and disease severity was occurred with kocide 200 and lowest yield per feddan which gave average three seasons 34.8, 27.33 and 9.45, respectively.

Table (7): Effect of some fungicides on disease incidence and disease severity caused by *A. porri.*

Treatments	Disease incidence%			Mean	Disease severity%			Mean	Yield (ton fed.$^{-1}$)			Mean
	2008	2009	2010		2008	2009	2010		2008	2009	2010	
Ridomil plus 50%	19.00a	19.67a	15.00a	17.89	15.00a	11.00a	8.33a	11.44	12.50a	11.85a	12.30a	12.22
Galben cupper 46%	22.33b	20.33b	17.33b	20.00	19.00b	11.67a	10.67b	13.78	12.10b	11.50b	11.50b	12.70
Ridomil-M 72 %	2633c	25.33c	18.67c	23.44	21.33c	17.00b	13.00c	17.11	11.20c	10.60c	11.20c	11.00
Dithein-M 45	37.33d	34.00d	22.00d	31.11	26.00d	25.00c	17.00d	22.67	10.70d	9.55d	10.80d	10.35
Kocide 2000	41.67e	37.67e	25.33e	34.89	37.00e	27.00d	18.00e	27.33	9.75e	8.30e	10.30e	9.45
Control	60.00f	80.00f	50.00f	63.33	53.00f	71.67e	42.33f	55.67	9.00f	7.50f	9.40f	8.63
L.S.D at 5%	**1.97**	**1.56**	**1.26**		**1.51**	**1.68**	**1.39**		**0.22**	**0.24**	**0.26**	

2) Effect of some bioagents

Data in Table (8) reveal that the highest effect on reducing disease incidence, disease severity and highest yield per feddan in three season 27.22, 17.89 and 9.90 as average came with *B. subtilis* disease incidence at 2008, 2009 and 2010, respectively when compared with control. This was followed by *T. hamatum* giving 29.67, 24.55 and 9.90, respectively. In opposition, the lowest result on suppressing the disease incidence came from treated with *G*. *roseum* giving 42.22, 29.56 and 9.08, respectively. Induced resistance is recognized as an important mode of biocontrol in vegetative tissue (Kuc, 1987 and Sequeira, 1983). Induced systemic resistance (ISR) caused by *Trichoderma* spp. and various microorganisms can protect plants against soil or foliar pathogens (Paulitz and Mata, 2000). Salicylic acid produced by *Trichoderma* spp. induced resistance to *B. cinerea* in bean (De Meyer *et al*., 1998). Root colonization with *Trichoderma* induced increased peroxidase and chitinase activities in leaves of cucumber seedling (Yedidia *et al*., 1999). Similarly, *T. harzianum* induced plant defense against *B. cinerea* in tomato, lettuce, pepper, bean and tobacco.

Table (8): Effect of some bioagents on disease incidence, disease severity and yield

Treatments	Disease incidence%			Mean	Disease severity%			Mean	Yield (ton fed.$^{-1}$)			Mean
	2008	2009	2010		2008	2009	2010		2008	2009	2010	
T. viride	41.00d	36.33d	40.67f	39.33	31.67e	26.33d	29.00e	29.00	9.90c	7.65f	10.50c	9.35
T. harzianum	38.00c	35.33c	37.67d	37.00	28.67d	28.00e	28.33e	28.33	9.90c	7.90d	10.30d	9.37
G. roseum	45.67e	42.00e	39.00e	42.22	36.67f	31.00f	21.00c	29.56	9.35d	7.70e	10.20e	9.08
T. hamatum	34.00b	28.00ab	27.33b	29.67	25.33c	23.00c	25.33d	24.55	10.60a	8.20c	10.90a	9.90
P. fluoroscens	34.00b	28.67ab	34.67c	32.00	23.33b	20.33b	18.67b	20.78	10.25b	8.25b	10.60b	9.70

B. subtilus	29.67a	26.33a	25.67a	27.22	19.67a	17.67a	16.33a	17.89	10.60a	8.30a	10.90a	9.90
Control	64.00f	85.33f	56.00g	68.44	58.67g	78.67g	45.33f	36.96	8.80e	7.30g	9.30f	8.47
L.S.D 5%	**1.32**	**1.97**	**1.08**		0.94	**1.48**	**1.21**		**0.02**	0.02	**0.02**	

3) Effect of some essential oils

Data in Table (9) reveal that all essential oils gave a significant reduction in disease incidence, disease severity and yield per feddan. The best reduction came from cinnamon oil, which gave 44.44, 66.00 and 9.40 as the average of three years, respectively compared with untreated control. This was followed by clove oil which giving 45.89, 35.00 and 9.00. Conversely, Negilla oil was the lowest oil for reducing disease incidence, disease severity and yield per feddan 45.89, 44.00 and 8.73 as average of three years giving, respectively. This result is consistent with those of Marois and Mitchell (1981); Edris and Farrag (2003). This effect of essential oils in greenhouse may act as a general biocide to *A. porri* and it can be hypothesized that the essential oils may have a reducing effect on rapid colonization of the pathogens. When active ingredient in each essential oil are released in the plant they might be in direct contact with pathogens, so they could inhibit the activity of this pathogens away from host and its inoculum looses the ability to continue root infection.

Table (9): Effect of some essential oils on disease incidence, disease severity and yield

Treatments	Disease incidence%			Mean	Disease severity%			Mean	Yield (ton fed.$^{-1}$)			Mean
	2008	2009	2010		2008	2009	2010		2008	2009	2010	
Cinnamon	41.33a	60.00b	32.00b	44.44	31.00a	49.67a	17.33a	66.00	9.90a	8.10a	10.20a	9.40
Mint	54.67d	71.00e	40.67e	55.45	47.67d	55.00c	18.67b	40.45	8.85d	7.50d	9.70d	8.68
Camphor	44.67b	64.67c	31.67a	47.00	34.67b	52.33b	20.33d	35.76	9.40b	7.85b	10.00b	9.08
Clove	46.33c	56.00a	35.33c	45.89	34.00b	53.00b	18.00b	35.00	9.10c	8.10a	9.80c	9.00
Nigilla	58.67e	68.00d	38.00d	45.89	48.33c	56.33d	27.33e	44.00	8.80e	7.70c	9.69e	8.73
Control	62.00f	79.00f	53.00f	64.67	54.67e	72.67e	41.33f	65.22	8.50f	7.30e	9.00f	8.27
L.S.D at 5%	1.73	1.51	1.78		1.45	1.26	1.11		0.02	0.02	0.02	

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تأثير بعض المبيدات الفطرية والعوامل الحيوية والزيوت النباتية لمقاومة مرض اللطعة الإرجوانية فى البصل

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وجد أن النمو الطولي للفطر ألترناريا بورای تناقص بصورة معنوية بعد خمسة أيام من إستخدام مبيدات ريدوميل بلاس وريدوميل 72% على الترتيب عند إضافته للبيئة.

أيضاً وجد أن الفطر ترايكوديرما هاماتم كان الأفضل فى التضاد مع الفطر الممرض حيث ثبط نمو الفطر ألترناريا بورای مقارنة بالكنترول تلاها ترايكوديرما هاريزيانم وترايكوديرما فيردى بينما كان الجلايوكلاديم روزيم أقل قدره تثبيط على الفطر الممرض. أما التثبيط البكتيرى كان أعلى ولوحظ ذلك عند إستخدام باسيلس ساتلس مقارنة بالكنترول.على الجانب الآخر وجد أن الزيوت الطيارة ثبطت نمو الفطر مع كل المعاملات المختبرة مقارنة بالكنترول.

وجد أن معاملات زيت القرفة والنعناع والقرنفل أعطت أعلى تثبيط للنمو الطولي تلاها الكافور والزعتر على الترتيب مقارنة بالكنترول. أما بالنسبة للزيوت الطيارة أعطت أعلى نسبة تثبيط للمرض وزيادة فى المحصول مقارنة بالكنترول تلاها زيت الكافور والزعتر تحت ظروف الصوبة والحقل.

فى تجارب الصوبة والحقل، وجد أن مبيدات ريدوميل بلاس وريدوميل 72% أكثر تأثيراً فى مقاومة المرض مقارنة بالمبيدات الأخرى والكنترول. أما بالنسبة للعوامل الحيوية فكان الفطر تريكوديرما هاماتم والبكتريا باسيلس ساتلس هما الأفضل فى مقاومة المرض وزيادة المحصول (طن/فدان).

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