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MANAGEMENT OF POTATO EARLY BLIGHT

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ABSTRACT: *Potato early blight is one of serious diseases on potato plants in Egypt. This disease caused by Alternaria solani which could be very sever on the vegetative growth of the plants. It also infect the tubers and reduce their quality. In this research work, some chemicals and compost were tested on disease incidence and mycelial growth of the causal organism. The fungicides fenarimol 1.2% (Rubigan) and deconazole 10% (Topas) were more effective than the other chemicals and compost extract. In greenhouse experiments, results indicated that the most effective treatments were fungicides, compost extract followed by chemicals. Considerable increases in activity of the oxidative reductive enzymes (peroxidase and polyphenoloxidase) as well as chitinase enzyme were recorded in plants grown from treated potato tubers. In field experiments results indicated that the most effective treatments were the fungicides, compost extract and chemicals compared to the unntreated control. It could be suggested that a compost extract and chemicals i.e. Bion,salicylic acid,oxalic acid,Rubigan 12% and Topas could be used for controlling early blight of potato plants under field conditions.*

Key words: *Early blight, chemical inducer, fungicides and compost extract.*

INTRODUCTION

Potato (*Solamum tuberosum* L.) is one of the most important vegetable crops in Egypt. Early blight caused by *Alternaria solani* is one of the most important diseases attacking potato plants. (Pasche *et al.,* 2005 and El-Gamal *et al.,* 2007). Controlling this disease in Egypt depends mainly on fungicidal treatments (Pasche *et al.,* 2005). Salicylic acid is an important compound against some pathogens (Delaney *et al.,* 1995). Ziadi *et al.* (2001), Dmitrier *et al.* (2003) and Achuo *et al.* (2004) used several chemicals or natural compounds to induce plant resistance including salicylic, benzoic, citric and oxalic acids (Shi *et al.,* 2005). Dostendorp *et al.* (2001) found that Bion induced systemic acquired resistance (SAR) in plants. On the other hand, other disease management practices, e.g., plant extracts, antioxidants and agricultural practices were not enough to obtain efficient results, especially in the absence of the resistan genotypes (El-Shahawy, 2009). Systemic resistance occurs in plant after infection. This response include phytoalexin and phenols accumulation, lignifications and activation of many enzymes such as peroxidase, polyphenoloxidase and chitinase (Kuc, 1982; Metraux and Boller, 1986; Boller, 1991; Meena *et al.,* 2001; Mahmoud *et al.,* 2006 and Hussien, 2011). Fungicide applications may cause hazards to human health and increase environmental pollution. Therefore, alternatives, eco-friendly approach treatments for control of plant diseases are needed such as induced resistance (Abd El-Kareem, 2007; Rojo *et a.,* 2007; Mandal *et a.,* 2009). Compost or organic manure is a good fertilization method, and in addition decrease the incidence of many diseases. (Widmer and Graham, 1999; Dissanayake and Hoy, 1999; Matthew *et al.*, 2001), Applying the organic matters to the soil improve biological control, because of the increase of soil inhabitant antagonistic population (Ammar, 2003). The present studies were conducted to control the early blight disease on potato plants by using safe chemicals.

MATERIALS AND METHODS

A. The fungal pathogen:

The pathogenic isolate of ***Alternaria sol*ani** used in the present investigation was obtained from the Dept. Vegeta. Dis. .Plant Patho. Res. Instit., ARC.

B. Laboratory experiments:

The effect of different concentrations of some inducer resistance, fungicides and

compost extract on the linear growth of *A. solani* was tested. Four concentrations of Bion, salicylic acid and oxalic acid were prepared. Discs (5 mm in diameter), obtained from 6 days old culture of *A. solani* were placed in sterilized Petri dishes (9 mm). three ml of each concentration tested were added to 20 ml PDA medium in Petri dishes then, 5 mm fungal disc was placed in the center of each Petri dish. Three replicates were used for each concentration tested of each chemical.Laboratory study was directed to study the toxicity of Rrubigan 12% and Topas in PDA plates containing fungicides at rate of 25, 50, 100 and 200 ppm. Linear growth of fungi was measured when fungal growth filled up any control plate.

In vitro assay of compost extract against *A. solani*:

Compost extracted was mixed with tap water at the ratio 1 : 4 (v / v) and extracted at 24°C for 72 hr while stirred thoroughly. After extraction, the mixture was filtered through 3 layers of cheese cloth and the filtrates were sterilized by either filtration or by thermal treatment at 121°C for 30 min (Zhang *et al.,* 1998). Different dilutions of the compost extract were prepared, *i.e*., 0, 10, 20, 30, 40 and 50% and tested. Concentration of the tested compost extracted was poured in each sterilized Petri plate (9 cm), then followed by adding PDA medium. The plates were inoculated individually with an equal discs (5 mm) of *A. solani* and inoculated at 25°C. The control plates were supplied with 5 ml of sterilized distilled water. Three replicates were used for each treatment. Linear growth of developed colony of *the* tested fungus was measured when the fungus completely covered the surface of the plate in the control treatment.

C. Greenhouse experiments:

Chemical inducers *i.e*., bion, salicylic acid and oxalic acid,the fungicides , Rubigan 12% and Topas and compost extract were tested against the incidence early blight of potato.

Inoculum preparation of *A. solani*.

Preparation of *A. solani*. Spore suspensions of *A. solani* were prepared by inoculating sterilized PDA medium with disk (6 mm diameter) taken from ten day-old cultures of *A. solani*. Plates were incubated at 25°C and spore suspension (10^6 spore / ml) of *A. solani* was prepared. Potato tubers of cv. Nicola were grown in plastic pots (30 cm diameter) containing a sandy loam soil (25°C) when plants had 4-5 compound leaves. Three plants / pot and ten pots for each treatment were used. Chemicals *i.e*., bion, salicylic acid and oxalic acid at four concentrations, i.e., 31.25, 62.50, 125 and 250 ppm, salicylic acid at four concentrations, i.e., 2.5, 5.0, 7.5 and 10.0 mM and oxalic acid at four concentrations, i.e., 2.5, 5.0, 7.5 and 10.0 mM. Fungicides i.e., Rubigan 12% 25, 50, 100 and 200 ppm and Topas at four concentrations i.e., 25, 50, 100 and 200 ppm. Compost extract at four concentrations, i.e., 20, 30, 40 and 50% beside a untrated control treatments were applied as foliar spray to study their effects against early blight of potato plants, which had 4 – 5 compound leaves. Plant inoculation was carried out 5 after days of chemical treatments by spraying potato plants with spore suspensions (10^6 spores / ml/water) of *A. solani*. Plants sprayed with tap water served as a check. Treated inoculated potato plants were incubated at 25°C. The disease was recorded 20 days after inoculation following the early blight scale from 0 to 4 according to Cohen *et al.* (1991) based on the leaf area infected was used, as follows:

0 = No. leaf lesions, 1 = 25% or less of leaf area infected , 2 = 26 to 50%of leaf area infected , 3 = 51 to 75% and 4 = 76 to 100% infected leaf area.

Determination of the oxidative-reductive enzymes:

Extracts of the different plants were prepared by grinding the leaf sample in 0.1 M sodium phosphate buffer at pH 7.1 (2 ml buffer / g sample) in mortar and kept in the refrigerator until used. The extracts were used for assaying biochemical change associated with the tested treatments of chemical inducers, fungicides and compost extract, the activities of peroxides enzyme

(Allam and Hollis, 1972), poly phenoloxidase enzyme (Snell and Snell, 1953) and Chitinase activity (Tuzun *et al.,* 1989) were determined.

D. Field experiments:

The field experiments were carried out at Sers El-Layian ,Men ofyia governorat ,during autumn growing seasons of 2012 and 2013. Under natural inoculation in plots (4 × 8 m) each comprised 8 rows (32 hole / row) in a randomized complete block design with three replicates (plots) for each treatment. Six different treatments, *i.e*., Bion, salicylic acid, oxalic acid, Rubigan 12%, Topas and compost extract (1 kg / 20 liter water) were tested for their efficiency in controlling early blight of potato.

Disease assessment:

- Early blight scale was used as mentioned before and disease severity was recorded up to 90 days from planting.
- Number of tubers / plant.
- Average of fresh weight of a tuber / plant (g).
- Tuber yield of potato (g).
- Average yield (ton / feddan).

$$\%\text{Disease severity} = \frac{\sum (N * V)}{GN} * 100$$

Accordin to Kobriger *et al*., (1998)
N= Total number of the infected leaves
V =Numerical grade
G = Higher degree in the category

Statistical analysis

Obtained data were statically analyzed according to the standard procedures mentioned by snedecor and cochan (1976).The averages were compared at 5% level using the lest significant differences LSD according to Fisher (1948).

RESULTS AND DISCUSSION

Induction of resistance in potato plants to early blight disease:

Laboratory experiments:

Effect of chemical inducers and fungicides on the linear growth of *Alternaria solani*:

Data in Table (1) showed that, Bion licylic acid and oxalic acid beside untreatred plates (control) were tested to study their effect on linear growth of *Alternaria solani in vitro*. The linear growth of the causal organism were reduced by application of Salicylic acid which indicated that significant reduction on the linear growth was observed as compared to untreated plates (control) as shown in table (1). Different concentrations of each of Rubigan (12%) and Tapas, were tested against *Alternaria solani* in Petri dishes. Results indicated that Topas was the most effective fungicide followed by Rubigan 12% in reducing the fungal growth.Where as Salcilic acid gave highly significant effect at 7.5-10Mm.Whereas Rubigan and Topas gave highly significant effect at all conc.except at 25ppm as shown in the same table.

Effect of compost extract on mycelia growth of *Alternaria solani in vitro*:

Data in Table (2) indicated that compost extract treatment reduced linear growth of *Alternaria solani* compared to the control. Moreover, increasing the compost extract concentration increased gradually the reduction of linear growth.

Green house experiments:

The results given in Tables (3 and 4) revealed that the different concentrations of chemical inducers, fungicides and compost extract significantly reduced the severity early blight . The most effective treatments were the fungicides and compost extract compared to the control. In this respect, Topas was the best fungicide followed by Rubigan 12%. The compost extract treatment significantly minimized the early blight symptoms than the control.

Table (1). *In vitro*, the effect of different concentrations of the tested chemeicals on the linear growth of *Alternaria solani*.

Treatment	Concentration	Growth	
		Linear growth (cm)	Reduction (%)
Bion	31.25 ppm	8.07	10.33
	62.50 ppm	7.13	20.78
	125 ppm	5.24	41.78
	250 ppm	4.00	55.55
Salicylic acid	2.5 mM	7.00	22.22
	5.0 mM	3.12	65.33
	7.5 mM	1.00	88.89
	10.0 mM	0.00	100.00
Oxalic acid	2.5 mM	7.34	18.44
	5.0 mM	4.18	53.55
	7.5 mM	3.16	64.89
	10.0 mM	2.00	77.78
Rubigan 12%	25 ppm	3.25	63.88
	50 ppm	2.00	81.77
	100 ppm	1.25	94.45
	200 ppm	0.00	100.00
Topas	25 ppm	2.00	77.78
	50 ppm	1.25	84.22
	100 ppm	0.80	95.00
	200 ppm	0.00	100.00
Control (T.F.)	-	9.0	0.0

L.S.D. at 0.05% = 1.21 T.F.= treatment free

Table (2). Effect of different compost extracts on early blight pathogen, *Alternaria solani*, *in vitro*.

Compost extract (%)	Growth	
	Linear growth (cm)	Growth reduction (%)
10	7.60	15.55
20	5.40	40.00
30	4.70	47.77
40	4.00	55.55
50	3.20	57.77
60	0.00	72.33
0 (control)*treatment free	9.00	

L.S.D. at 0.05 = 0.88

* Colony diameters were measured when the growth covered the dish.

Table (3). Effect of different concentrations of some chemicals on early blight in potato under greenhouse condition.

Treatment	Concentration	Early blight incidence	
		Disease severity	Reduction (%)
Bion	31.25 ppm	32.0	57.12
	62.50 ppm	23.5	73.49
	125 ppm	20.0	85.33
	250 ppm	18.3	
Salicylic acid	2.5 mM	27.0	66.33
	5.0 mM	13.5	82.20
	7.5 mM	10.0	91.00
	10.0 mM	00.0	100.00
Oxalic acid	2.5 mM	30.0	57.00
	5.0 mM	22.0	74.73
	7.5 mM	18.7	81.77
	10.0 mM	10.0	90.60
Rubigan 12%	25 ppm	17.6	61.78
	50 ppm	12.3	79.11
	100 ppm	7.1	88.33
	200 ppm	00.0	100.00
Topas	25 ppm	12.0	77.12
	50 ppm	10.0	81.60
	100 ppm	6.0	90.00
	200 ppm	00.0	100.00
Control (T.F.)	-	36.5	

L.S.D. at 0.05% = 1.94 T.F.= treatment free

Early blight scale from 0 to 4 according to Cohen *et al.* (1991).

$$\%\text{Disease severity} = \frac{\sum (N * V) * 100}{GN}$$

Table (4). Early blight incidence on potato plants as affected with different concentration of compost extract under greenhouse condition.

Compost extract (%)	Early blight incidence	
	Disease severity	Reduction (%)
10	30.0	69.44
20	21.8	81.72
30	14.5	90.72
40	9.0	94.00
50	0.0	100.00
0 (control)	36.0	–

L.S.D.at0.05= 0.62

$$\%\text{Disease severity} = \frac{\sum (N * V) * 100}{GN}$$

Effect of some chemical inducers, fungicides and compost extract:

Data in Table (5) indicated that all treatments i.e., chemical inducers, fungicides and compost extract significantly increased the polyphenoloxidase activity, peroxidase and chitinase activities compared to the untreated control. The most effective treatment was compost extract increment in polyphenoloxidase activity (3.12) followed by salicylic acid (2.90) and Topas (2.50) compared to the control. Compost extract gave the highest increased in peroxidase and chitinase activity (4.00 – 3.50) followed by salicylic acid (3.27 – 3.25 activity) Topas (2.00 – 2.90), respectively compared to the untreated control.

Field experiments:

Data in Tables (6 and 7) showed the efficacy of some chemicals, fungicides and compost extract as foliar treatment on early blight disease, under field conditions. The resultsobtained in two growing seasons (2012 and 2013) revealed that the tested materials reduced significantly disease incidence of *Alternaria solani* compared to the untreated control. In this respect, Topas was the most effective treatment followed by Rubig an 12%. However, both chemical inducer and compost extract significant ly decreased the infection compared to control. The effect of chemical inducers, fungicides and compost extract on mean number of tuber, the average of a tuber / plant (Table 7). It is clear that the application all treatments increased the average of the tuber / plant than control. The highest yield of tubers / fed were obtained in the case of compost treatment.

Discussion

In Egypt, potato plants are liable to be attacked by several diseases of different causal organisms i.e.fungal ,bacterial,virus and nematode diseases. The fungal diseases can be considered the most dangerous diseases under field conditions causing considerable losses in tuber yield .Late blight and early blight diseases are the most sever diseases to potato plants causing severe losses in the tuber yield (Waals *et al.,*2004;Pasche *et al.,* 2005 and El-Gamal *et al.,* 2007).

Table (5). Determination of peroxidase, polypheloxidase and chitinase activity on potato plants inoculated with *Alternaria solani* as affected by chemical inducers, fungicides and compost extract under greenhouse conditions.

Treatment	Concentration	Peroxidase activity / acidity/min	% to control	Polyphenoxidase activity / activity/min	% to control	Chitinase / min activity	% to control
Bion	250 ppm	2.41	178	2.00	178	2.63	134
Salicylic acid	10 mM	3.27	242	2.90	258	3.25	166
Oxalic acid	10 mM	2.94	217	2.40	214	3.00	153
Rubigan 12%	100 ppm	2.90	214	2.34	208	2.75	141
Topas	100 ppm	3.00	222	2.50	223	2.90	148
Compost extract	50%	4.00	296	3.12	278	3.50	179
Control (T.F.)	-	1.35	-	1.12	-	1.95	-

T.F. = treatment free

Table (6). Effect of application some chemicals, fungicides and compost extract on the severity early blight under filed conditions during 2012-2013 growing seasons.

Treatments	Season 2012		Season 2013	
	Disease severity	Mean No. of tubers / plant	Disease severity	Mean No. of tubers / plant
Bion (250 ppm)	2.00	4.00	2.31	3.91
Salicylic acid (10 mM)	1.20	5.14	1.52	4.93
Oxalic acid (10 mM)	1.60	4.17	1.0	4.13
Rubigan 12% (20 ml / 100 water)	0.00	6.20	0.00	6.00
Topas (20 ml / 100 water)	0.00	6.32	0.00	6.19
Compost 50% extract	1.00	5.48	1.12	5.18
Control (T.F.)	3.40	3.00	3.23	2.57

L.S.D. at 0.05 = 1.01 in 2012 T.F. = treatment free
L.S.D.at 0.05 =1.04 in 2013

Table (7). Tuber yield of potato plants as affected by chemical inducers, fungicides and compost extract under field conditions during 2012 and 2013 growing seasons.

Treatments	Season 2012		Season 2013	
	Yield plant (g)	Yield / fed (ton)	Yield plant (g)	Yield / fed (ton)
Bion (250 ppm)	706	11.31	662	11.00
Salicylic acid (10mA)	870	12.53	820	11.72
Oxalic acid (10 mM)	800	12.00	773	11.32
Rubigan 12% (20 ml / 100 water)	900	13.50	850	13.00
Topas (20 ml / 100 water)	1000	14.00	980	13.20
Compost 50% extract	1135	15.00	1121	14.00
Control (T.F.)	570	8.00	530	7.31
L.S.D. at 0.05	3.19	2.14	2.90	2.10

T.F. = treatment free

Early blight causal organism (Alternaria Solani) is one of the most importan disease a tacking potato plants (Waals *et al.,* 2004; Pasche *et al.,* 2005 and El-Gamal *et al.,* 2007). In the present study, results indicated that chemical inducer of resistance , fungicides and compost extract showed high inhibitory effect to the linear growth of *A. solani*. It was demonstrated that the tested chemical inducer resistance were effective in reducing plant diseases (Ziadi *et al.,* 2001; Dmitrer *et al.,* 2003). The tested fungicides at all tested concentration affected significantly growth of *A. solani*, where Topas was the most effective fungicide followed by Rubigan 12%, respectively *in vitro* and *in vivo* (Kuc, 1982; Metraux and Boller, 1986; Boller, 1991 and Hussien, 2011)has been found that the tested chemical inducer resistance fungicides and compost extract might stimulate some defence mechanisms. In the present work, the activity of peroxides, polyphenoloxidase and chitinase enzymes was obviously higher

in plants grown from treated plants compared to the untreated one. In general compost extract application improved plant growth vigour and increased the broduced fruit yield. These results are promising controlling the disease. Integration of such treatments with fungicides can be considered for further research work.

REFERENCES

Abd El-Kareem, F. (2007). Induced resistance in bean plants against root-rot and Alternaria leaf spot diseases using biotic and abiotic inducers under field conditions. Research Journal of Agriculture and Biological Sciences, 3 (6): 767 – 774.

Achuo, E. A., K. Audenaer, H. Meziane and M. Hofle (2004). The salicylic acid dependent defence pathway is effective against different pathogens in tomato and tobacco. Plant Pathology, 53: 65 – 72.

Allam, A. I. and J. P. Hollis (1972). Sulfide inhibition of oxidase in rice roots. Phytopathology, 62: 634 – 639.

Ammar, M. M. (2003). Fungi second part. Physiology, reproduction and relations with Human and Environments. El-Dar El-Arabia for Puplication. Arabic Book, p. 597.

Boller, T. (1991). Ethylene in pathogenesis and disease resistance. In: The Plant Hormone Ethylene K. Mattoo and J. C. Suttle, eds. CRC Press, Inc., Boca Raton, Fl., U.S.A., pp. 293 – 314.

Cohen, Y., U. CIsi and E. Mosinger (1991). Systemic resistance of potato plants against phytophchora infestans induced by unsaturated fatty acids. Physiol. Mot. Plant Pathol., 38: 255 – 263.

Delaney, T. P., S. Uknes, B. Vernooij, L. Friedrich, K. Weymam, D. Negrotto, T. Gaffney, M. Gutt-Rella, H. Kessmann, E. Ward and J. Ryals (1995). A control role of salicylic acid in plant disease resistance. Science, 266: 1247 – 1250.

Dissanayake, N. and J. W. Hoy (1999). Orgnaic material soil amendment effect on root-rot and sugarcane growth and characterization of the materials. Plant Disease, 83 (11): 1039 – 1046.

Dmitrier, A., M. Tena and J. Jorrin (2003). Systemic acquired resistnace in sunflower (*Helianthus annuus* L.) Tsitologiya-I-Genetika, 37: 9 – 15.

El-Gamal, Nadia G., F. Abd El-Kareem, Y. O. Fotouh and Nehal S. El-Mougy (2007). Induction of systemic resistance in potato plant against late and early blight diseases using chemical inducers under greenhouse and field conditions. Res. J. Agric. & Biol. Sci., 3 (2): 73 – 81.

El-Shahawy, I. S. I. (2009). Untraditional control methods of white and gray moulds in green been pods in Egypt. M.Sc. Thesis, Fac. Agric., Cairo Univ.,

Hussein-Zeinab, N. E. (2011). New approaches for controlling peanut root and pod rots diseases caused by *Rhizoctonia solani*. Ph.D. Thesis, Inst. of African Res. And Studies, Cairo Univ., Egypt.

Kuc, J. (1982). The immunization of cucurbitsm against fungal, bacterial and viral disease. In: Plant Infection. The physiological and Biochemical Basis (Y. Asada, W. R. Buohnell, S. Ouchi and C. P. Vance) Ed. Japanese Science Society Press, Tokyo, pp. 137 – 155.

Mahmoud, E. Y., Samia Y. M. Shokry and Zeinab N. Hussin (2006). Induction of resistance in peanut plants against root rot diseases under greenhouse conditions by some chemical inducers. J. Agric. Sci. Mansoura Univ., 31 (6): 3511 – 3524.

Mandal, S., N.Mallicka and A. Mitraa (2009). Salicylic acid induced resistance to *Fusarium oxysporum* f.sp. *lycopersici* in tomato. Plant Physiology and Biochemistry, 47 (7): 642 – 649.

Mathew, S. Krause, Laurence, V. Madden and Harry, A. J. Hoitink (2001). Effect of potting mix microbial carring capacity on biological control of Rhizoctonia damping-off of radish and Rhizoctonia crown and root-rot of poinsettia. Phytopathology, 91 (11): 1116 – 1123.

Meena, B., T. Marimuthu and R. Velazhan (2001). Salicylic acid inducers systemic resistance in groundnut against late leaf spot caused by *Cercosporidium personatum*. J. Mycology Plant Path., 31: 139 – 145. (C.F. CAB Abstracts, 2003).

Metraux, J. P. and T. Boller (1986). Local and systemic induction of chitinase in cucumber plants in response to viral, bacterial and fungal infection. Physiol. Mol. Plant Pathol., 28: 161– 169.

Pasche, J. S., L. M. Piche and N. C. Gudmestad (2005). Effect of the Fl 29 Mutation in *Alternaria solani* on fungicides affecting mitochondrial reparation. Plant Dis., 89: 269 – 278.

Pasche, J. S., C. M. Wharam and N. C. Gudmestad (2004). Shift in sensitivity of *Alternaria solani* in response to Q (0) I fungicides. Plant Dis., 88: 181 – 187.

Rojo, F. G., M. M. Reynoso, M. F. Sofia and A. M. Torres (2007). Biological control by *Trichoderma* species of *Fusarium solani* causing peanut brown root-rot under field conditions. Crop Protection, 26: 549 – 555.

Shi, S., G. Wnag, Y. Wang and L. Zhang (2005). Protective effect of nitic oxide against oxidative stress under ultraviolet-B radiation. Nitricoxide, 13: 1 – 9.

Snell, F. D. and C. T. Snell (1953). Colorimetricmethods of analysis, including some turbidimetric and nephelometric methods. Duan Nostr and company Inc., Toronto, New York, London, 111: 606.

Tuzun, S., M. N. Rao, U. Vogli, C. L. Schardl and J. Kuc (1989). Induced systemic resistance to blue mould: Early induction and accumulation of B-I, 3-glucanase, chitinase and other pathogensis proteins in immunized tobacco. Phytopathology, 79: 979 – 983.

Waals, J. E., L. Korsten and B. Slippers (2004). Geneitc diversity among *Alternaria solani* from potatoes in south Africa. Plant Dis., 88: 959 – 961.

Widmer, T. L., J. H. Graham and D. J. Mitchell (1999). Coposted municipal solid wastes promote growth of young citrus trees infested with *phytophthora nicotianae*. Compost Sci., Uiliza., 7: 6 – 16.

Zhang, W., D. Han, W. Dick, R. Davis and H. Hoitink (1998). Compost and compost water extract induced systemic acquired resistance.

Ziadi, S., S. Barbedette, J. F. Godard, Monot, D. L. E. Corre, D. Silue and D. Le Corre (2001). Production of pathogenesis-related proteins in the cauliflower (*Brassica oleracea* var. *botrytis*) downy mildew (Peronospora parasitie pathosystem treated with acidbenzaolar-S-methyl. Plant Pathol., 50 (5): 579 – 58

مقاومه مرض اللفحة المبكرة في البطاطس

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الملخص العربى

تم اختبار فعالية كل من الكيماويات المستحثة والمبيدات والكمبوست على فطر اللترنارى سولانى المُسبب لمرض اللفحة المُبكرة فى نباتات البطاطس :

1- فى المعمل : أدت جميع المعاملات إلى اختزال النمو الميسليومى لفطر اللترنارى سولانى مقارنةً بالكنترول .

2- فى تجارب الصوبة أدى استخدام المبيدات إلى انخفاض ملحوظ فى شدة الإصابة وكذلك الكمبوست وكانت الكيماويات المستحثة أقل تأثيراً وكان المبيد توباس أكثر المعاملات فعالية . وعموماً فقد أدت جميع المعاملات إلى زيادة فى نشاط الإنزيمات البيروأوكسيديز والشيتنيز والبولى فينيل أوكسيديز مقارنةً بالكنترول .

3- فى تجارب الحقل أظهرت المبيدات تفوقاً ملحوظاً فى خفض نسبة حدوث مرض اللفحة المُبكرة خلال الموسمين ٢٠١٢ ، ٢٠١٣ . وبصفةٍ عامة ،فإن جميع المعاملات قد أدت إلى خفض شدة الإصابة بدرجة معنوية إذا ما قورنت بالكنترول الغير مُعامل .