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THE ROLE OF SOME SYSTEMIC FUNGICIDES AND RESISTANCE INDUCING CHEMICALS ON CONTROLLING PEA DOWNY MILDEW

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ABSTRACT

The efficacy of some systemic fungicides and inducing resistance chemicals (IRCs) was evaluated, *in vitro,* on suppressing the germination of *Peronospoa pisi* sporangia (conidiospores) as well as managing downy mildew of pea under greenhouse and field conditions.

The tested systemic fungicides, and the IRCs caused different inhibition degrees of *Peronospora. pisi* germinated sporangia.

Spraying pea plants with the tested fungicides and IRCs under greenhouse conditions significantly reduced disease severity, with considerable increase to the assesed crop parameters compared with the control.

Both the tested fungicides and IRCs caused considerable increase to the activity of oxidative – reductive enzymes, *i.e.* peroxidase, polyphenoloxidase and ascorbic acid oxidase compared with the control. In addition, IRCs were more efficient in this respect than fungicides application.

Under field conditions at Dakahlia governorate during 2008 / 2009 and 2009 /2010 growing seasons, spraying naturally infected mildewed pea plants with any of Folu Gold and Previcure-N fungicides as well as the IRCs Bion and Previcure-N, each alone or in alternation, resulted in a significant decrease of disease severity with significant increment of produced yield (green pods / plot compared with control treatment). On the other hand, the alternation between the tested fungicides and IRCs was more effective than spraying with the tested IRCs only.

Keywords: **Pea, downy mildew, systemic fungicides, resistant inducing chemicals and oxidative-reductive enzymes.**

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INTRODUCTION

Pea (*Pisium sativum* L.) is one of the most popular legumenous crops in Egypt for local consumption and exportation due to their high content from protein, minerals and vitamins. Pea plants are vulnerable to attack by bacterial, fungal and viral diseases in addition to nematode infection as well as physiological disorders (Abada, 1996; Abada *et al.*, 1996; 1997 and 2009 and Ahmed, 2009). Under Egyptian conditions, downy mildew disease caused by *Peronospora pisi* is one of the most serious diseases affecting pea production. The disease is very widespread and often economically important in semi-aried regions (Attia *et al.*, 1997). The best favorable conditions for the disease development are 15-25°C and over 70% RH during flowering and pod filling stages in the growing season. Heavy rainfall is not favorable for the disease, as it will actually wash spores off plants and night time dews are sufficient for the disease to develop (Richardson, 2006).

Chemical control is the short way to obtain sufficient control to plant pests including plant diseases. However, using of pesticides mostly cause environmental pollution and accumulated as toxic substances in human food chain, especially in case of fresh vegetables and fruits. On the other hand, using other trials of disease management, e.g., plant extracts, antioxidants, biological control and agricultural practices are not enough to obtain efficient results, especially under the absence of the resistant cultivars (El-Shahawy, 2009).

This work aimed to evaluate the inhibitory effect of some resistance inducing chemicals (IRCs) and systemic fungicides on the germinated sporangia of *P. pisi.* Also, studying their effect on the severity of pea downy mildew disease in greenhouse experiment to select the most efficient ones to apply them in alternation with fungicides, under field conditions. The work was expanded to evaluate the activity of oxidative reductive enzymes due to spraying the tested fungicides and IRCs.

MATERIALS AND METHODS

Effect of Some Different Fungicides and IRCs on Sporangial Germination

The effect of fungicides concentrations (0.0, 50, 100, 150, 200, 250, 300 and 400 ppm.) Folio-gold (Metenoxam +

chlorothalonil), Galben copper (Benalaxul + copper oxychoride) ,Previcure-N (Propamocarb hydrochloride) and Ridomil gold mancozeb (Mefenoxam + mancozeb) as well as the resistance inducer chemicals (IRCs), bion, potassium mono basic phosphate, salicylic acid and zinc sulphate at 0.0, 10, 25, 50, 75, 100, 125 and 150 mM on the *P. pisi* sporangial germination was studied *in vitro*. Pea leaves naturally infected by the disease were collected from a field located at Behera governorate and incubated at 18±1°C under humid conditions to encourage sporangial formation. Freshly collected sporangia by sterilized brush from the infected leaves were put in each concentration of the tested fungicides and IRCs. One ml of sporangial suspension (10^3 sporangium / ml water) was placed on two sterilized slides, placed over two glass rods in a sterilized Petri -dish containing a piece of wetted cotton by sterilized distilled water to provide suitable relative humidity. The same was made for a spore suspension in distilled sterilized only as control treatment. All slides were incubated in darkness at 18±1 °C for 24 hour (Richardson, 2006). One drop from lacto-phenol cotton blue stain was added at the time of slide examination to fix and kill the germinated sporangia. Percentage of sporangial germination was counted in a total of 100 sporangium treatment. Mean of germination percentages was calculated and recorded.

Greenhouse Experiment

The effect of some inducing resistance chemicals (IRCs), *i.e.* Bion, potassium monbasic phosphate, salicylic acid and zinc sulphate as well as the systemic fungicides: Folio-gold, Previcure-N and Ridomil gold mancozeb each alone, on the severity of pea downy mildew caused by *Peronospora pisi* was carried out using artificial inoculation under greenhouse conditions in order to select the most efficient IRCs and fungicides.

Pots (25 cm in diameter) containing disinfested soil (3 kg./ pot) by 5% formalin were sown with pea seeds. Seven seeds (cv Master pea) were sown in each pot, irrigated and left to grow then thinned, 2 weeks after sowing, into five plants. The tested fungicides and IRCs were sprayed to run-off before artificial inoculation. One week later, the causal pathogen *P.pisi* was used to spray the sporangial suspension (1000 sporangium / ml water) under humid conditions. Plants sprayed with sporangial suspension without any additional treatments were served as control treatment.

Five pots were used for each treatment. The grown plants were irrigated when it was necessary and fertilized by adding one gram for each pot from the Crystal on fertilizer compound (1:1:1; N:P:K), three weeks after sowing and two weeks later.

The severity of the disease was assessed weekly after artificial pathogen inoculation by the causal fungus and the average was recorded. Also, at the end of the experiment (100 days after sowing) plant foliage fresh weight (g), number and weight of green pods (g)/plant were estimated and recorded.

Field Experiment

Field experiments were conducted during 2008/ 2009 and 2009/ 2010 growing seasons at Behera governorate to evaluate the effect of spraying pea plants with the IRCs bion and salicylic acid two sprays after spraying the fungicides Folio-gold and Previcure-N , also, two sprays on controlling the natural infection by pea downy mildew.

Soil was prepared for sowing pea (Master pea cv.) at the end of November of 2008 and 2009 using Herati planting method on rows in plots of 42 m^2(8 rows). All agricultural practices, *i.e.* irrigation, weeds and pests control and fertilization were applied according to the standard recommendations of Ministry of Agriculture.

In this regard ,the grown plants were left to the natural infection by the causal fungus then sprayed at the first appearance of downy mildew symptoms by the two tested fungicides with 250 ml/100 l water twice at two weeks intervals (until flowering stage and beginning of forming small green pods). In addition, the two selected IRCs were also sprayed one week after the latter spray with the tested fungicides twice with 50 mM at 10 days interval in different combinations with the tested fungicides until harvesting the green pods. Unsprayed plants with the tested fungicides or IRCs were served as control treatment. Five plots were used for each treatment. The severity of the disease was assessed one week after each spray with any of the tested fungicides and IRCs and the average was recorded. Also, green pods of each plot were harvested 100 days after sowing and the average weight was recorded.

Determination of the Activity of Oxidative – Reductive Enzymes

The oxidative – reductive enzymes, *i.e* peroxidase, polyphenoloxidase and ascorbic acid oxidase were determined one week after the third spray with the fungicides and the IRCs .Leaf samples were taken. Both peroxidase and polyphenoloxidase were determined according to described method by Fehrman and Dimond (1967). Meanwhile, ascorbic acid oxidase was determined using the method described by Maxwell and Bateman (1967).

Disease Assessment

Both artificially and naturally inoculated plants were visually examined to estimate the severity of the infection by downy mildew depending on the devised and modified scale (0-5) by Townsend and Heuberger (1943) using the following formula:

$$\text{Disease severity } \% = \frac{\Sigma (n \times v) \times 100}{5N}$$

Where: n = number of infected leaves or plants in each category

v = numerical values of each category

N = total number of the infected leaves or plants

Statistical Analysis

The obtained data were statistically analyzed using the standard procedures for split designs as mentioned by Snedecor and Cochran (1967). The averages were compared at 5% level using least significant differences (L.S.D) according to Fisher (1948).

RESULTS

Effect of Different Fungicide Concentrations on Sporangial Germination of *Pernospora Pisi*

All the tested systemic fungicides, *i.e.* Folio-gold, Previcure-N, Ridomil gold mancozeb caused different inhibition degrees of *P. pisi* germinated sporangia compared with control treatment (Table1). This inhibition was gradually increased by increasing the fungicide concentration. In addition, Previcure-N was the most efficient fungicide, where no sporangium was germinated at 300 ppm. Meanwhile, Folio-Gold, Ridomil gold mancozeb recorded 8.0 ,15.0 and 3.2 % sporangial germination at 300 ppm and complete suppression was occurred at 400 ppm by these fungicides.

The percentages of sporangial germination at zero time of the experiment recorded 2.0 % and 92.4 % for control treatment.

Effect of Different IRCs Concentrations on Sporangial Germination of *Pernospora. pisi*

Data in Table 2 indicate that IRCs, *i.e.* bion, potassium monbasic phosphate, salicylic acid and zinc sulphate caused different degrees of suppression to the germinated sporania of the causal fungus compared with control treatment. This reduction was gradually increased by increasing the IRC_s concentration. Furthermore, bion only caused the complete suppression to the germinated sporangia at 150 mM .Meanwhile, potassium monbasic phosphate, salicylic acid and zinc sulphate recorded 12.2, 12.6 and 13.0 % sporangial germination, respectively.

Greenhouse Experiment

The tested fungicides and IRCs caused significant reduction in severity of downy mildew with significant increase to the plant height, number of green pods and weight of green pods / plant (Table 3). Moreover, the tested fungicides, *i.e.* Folu-gold, Previcure-N, Redomil gold mancozeb were more efficient in this regard , being 3.1,4.0,2.8 and 4.7% of disease severity, 54.7,53.2,55.0 and 54.0 cm for plant height, 16.2,15.8,16.4 and 15.4 for green pods / plant, 112.8,110.7,115.9 and 109.0 g. for green pods yield / plant, respectively than IRCs, *i.e.* bion, potassium monobasic phosphate, salicylic acid and zinc sulphate, being 17.8, 18,7, 15.8 and 16,3 % disease severity, 46.1,45.0,50.4 and 50.0 cm for plant height,11.0,12.0 and 12.4 for green pods / plant, 75.5,73.8,79.0 and 80.8 g. for green pods yield / plant ,respectively. In addition, control treatment recorded 47.9%, 39.7 cm, 9.4 pod and 55.4 g, respectively.

Control plants recorded 44.8%, 38.2 cm., 8.6 pod and 53.9 g., respectively.

Due to the high efficiency of the two fungicides Folu Gold and Previcure –N, and the two IRCs bion and salicylic acid , they were tested for their efficiency in managing the natural infection by the disease under field conditions

Table 1. Effect of different fungicides concentration on *Pernospora pisi* sporangial germination of 24 hours after incubation at 20±1°C

Fungicides	Average percentage of sporangial germination at (ppm.)							Mean
	50	100	150	200	250	300	400	
Folio gold	71.0	60.2	45.0	28.6	17.4	8.0	0.0	
Galben copper	73.2	63.4	49.6	33.6	21.2	15.0	6.2	13.1
Previcure-N	64.8	53.0	37.2	13.8	5.4	0.0	0.0	7.5
Ridomil gold mancozeb	68.0	56.6	42.8	17.4	10.0	3.2	0.0	16.4
Control*	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4
Mean	68.8	54.9	48.9	41.9	34.9	30.2	24.8	----

* The percentage of sporangial germination at zero time was 2.0 %.

L.S.D. at 5 % for Treatments (T) = 2.9, Concentrations (C) = 2.7 and TxC = 4.1

Table 2. Effect of different IRCs concentration on sporangial germination of *Pernospora pisi,* 24 hours after incubation at 20±1°C

Resistance inducers		Average percentage of sporangial germination at (mM)							Mean
		10	25	50	75	100	125	150	
IRCs	Bion	85.2	80.8	67.6	40.8	29.0	18.2	0.0	45.9
	Potassium mono basic phosphate	84.6	80.4	69.8	53.2	43.6	30.2	12.2	53.4
	Salicylic acid	83.8	79.8	67.2	55.6	44.8	31.4	12.6	53.6
	Zinc sulphate	85.0	79.6	67.0	52.8	41.6	32.0	13.0	53.0
Control*		91.8	91.8	91.8	91.8	91.8	91.8	91.8	91.8
Mean		86.1	82.5	61.1	58.8	50.2	40.7	25.9	----

* The percentage of sporangial germination at zero time was 2.4 %.

L.S.D. at 5 % for Treatments (T) = 3.5, Concentrations (C) = 2.3 and TxC = 3.1

Table 3. Effect of spraying of inducing resistance chemicals (IRCs) and fungicides on the severity of pea powdery mildew as well as some crop parameters, under greenhouse conditions

Treatments		Disease severity %	Average of plant height (cm)	Average number of pods / plant	Average weight of green pods (g) / plant
IRCs	Bion	17.8	46.1	11.0	75.5
	Potassium monobasic phosphate	18.7	45.0	10.0	73.8
	Salicylic acid	15.8	50.4	12.0	79.0
	Zinc sulphate	16.3	50.0	12.4	80.8
Fungicides	Folio gold	3.1	54.7	16.2	112.8
	Galben copper	4.0	53.2	15.8	110.7
	Previcure-N	2.8	55.0	16.4	115.9
	Ridomil gold mancozeb	4.7	54.0	15.4	109.0
Control		44.8	38.2	8.6	53.9
L.S.D at 5%		2.2	2.4	2.0	3.2

Determination of the Activity of Oxidative – Reductive Enzymes

The activity of oxidative–reductive enzymes, i.e. peroxidase, polyphenoloxidase and ascorbic acid oxidase were increased after spraying any of the tested fungicides and IRCs compared with control treatment (Table 4). In addition, the tested IRCs were more efficient in this regard, being 0.863, 0.840, 0.850 and 0.837 compared with the tested fungicides, being 0.724, 0.778, 0.763 and 0.718, respectively. In addition, the highest activity was recorded for polyphenoloxidase enzyme followed by peroxidae enzyme then ascorbic acid oxidase.

Greenhouse Experiment

Table 5 showes that all the tested fungcides and IRCs caused significant reduction to the severity of pea downy mildew with considerable increase in plant hight ,number of green pods and their weigh / plant compared with control treatment . In addition, the tested fungicides were more efficient in this regard than IRCs. however , Previcure-N was the most efficient fungicide, being 2.8% ,55.0 cm heigh ,16.4 pod and 115.9 g followed by Gabon copper , being 4.0 % 53.2 cm , 15.8 pod and 110.7g then Rrdomil Gold Mancozeb being 4.7 %, 54.0 cm, 15.4 pod and 109.0 g, respectively. Also, salicylic acid was the most efficient IRCs, being 15.8%, 50.4 cm, 12.0 pod and 89.0 g, respectively. Meanwhile, potassium monobasic phosphate was the lowest efficient one, being 18.7 %, 45.0 cm, 10.0 pod and 83.8g, respectively.

Field Experiment

The results of field study indicate that the two fungicides, *i.e.* Folio gold and Previcure-N on pea plants were more efficient in reducing the natural infection by pea downy mildew, being 2.2 and 2.1 % disease severity, on the average and resulted in producing the highest values of green pods yield, being 55.0 and 56.0 Kg/ plot (42 m^2) on the average, respectively (Table, 6). On the other hand, the sprayed IRCs, *i.e.* salicylic acid and zinc sulphate recorded low efficiency in reducing disease severity, being 14.0 and 13.4 % and low values of green pods yield, being 40.1 and 41.8 kg/ plot (42 m^2) on the average, respectively. Whereas, spraying these fungicides two times followed by spraying IRCs

Table 4. Effect of spraying pea plants with some fungicides and resistance inducers on the activity of oxidative reductive enzymes.

Treatments	Activity of enzymes *			Total
	Peroxidase	Polypenol oxidase	Ascorbic acid oxidase	
Fungicides: Folio Gold	0.210	0.341	0.173	0.724
Galben copper	0.214	0.341	0.223	0.778
Previcure-N	0.207	0.354	0.172	0.763
Ridomil Gold Mancozeb	0.202	0.317	0.199	0.718
IRCs: Bion	0.254	0.379	0.230	0.863
Potassium monobasic phosphate	0.233	0.359	0.218	0.840
Salicylic acid	0.252	0.365	0.233	0.850
Zinc sulphate	0.250	0.364	0.222	0.837
Control*	0.164	0.248	0.180	0.642
Total	1.956	3.329	1.794	------

*Expressed as absorbation after 30 sec. at appropriate wave length

Table 5. Effect of inducing resistance chemicals (IRCs) and fungicides applications on pea powdery mildew disease severity as well as some crop parameters, under greenhouse conditions

	Treatments	Disease severity %	Average of plant height (cm)	Average number of pods / plant	Average weight of green pods (g) / plant
IRCs	Bion	17.8	46.1	11.0	85.5
	Potassium monobasic phosphate	18.7	45.0	10.0	83.8
	Salicylic acid	15.8	50.4	12.0	89.0
	Zinc sulphate	16.3	50.0	12.4	90.8
Fungicides	Folio Gold	3.1	54.7	16.2	112.8
	Gaben Copper	4.0	53.2	15.8	110.7
	Previcure-N	2.8	55.0	16.4	115.9
	Ridomil Gold Mancozeb	4.7	54.0	15.4	109.0
Control		47.9	38.2	8.6	53.9
L.S.D at 5%		2.6	2.4	2.0	2.9

Table 6. Effect of spraying pea plants with two systemic fungicides and IRCs on pea downy mildew severity as well as pods yield (Master pea cv.) under field conditions during 2008 and 2009 growing seasons

Treatments	% Disease severity During		Mean	Average green pods yield (kg/ plot)* during		Mean
	2009	2010		2009	2010	
Bion (B)	13.8	14.1	14.0	40.2	40.0	40.1
Salicylic acid (SA)	13.1	13.6	13.4	42.0	41.6	41.8
Folio Gold (F)	2.1	2.3	2.2	55.8	54.2	55.0
Precivure-N (P)	2.0	2.1	2.1	56.6	55.4	56.0
B then F	4.4	4.3	4.4	46.7	46.0	46.4
B then P	3.9	3.9	3.9	47.1	46.8	47.0
SA then F	3.7	3.9	3.8	48.0	47.5	47.8
SA then P	3.6	3.7	3.7	48.8	48.0	48.4
Control *	53.4	53.0	53.2	33.1	32.3	32.7
Mean	7.6	7.3	------	217.7	219.5	------

* Each plot equal 42 m².

L.S.D. at 5% for: Treatment (T) =	2.3	2.5
son (S) =	n.s	n.s
T x S =		2.9

another two sprays in alternation resulted in intermediate values of disease severity and green pods yield. However, unsprayed plants (control) recorded 53.4 % disease severity and produced low yield of pods, being 32.7 kg/ plot (42 m^2).

No significant differences were detected in the values of disease severity and green pods yield due to the effect of the growing seasons.

DISCUSSION

Pea plants are vulnerable to infection by many fungal diseases. However, downy mildew disease is the most serious one, especially under low temperature and humid conditions and the peak of infection reaches its maximum at the time of harvesting pod yield .

Nowadays, the world is suffering from great pollution by many pollutants including agrochemicals such as pesticides. Therefore, the current strategy of management plant pests, especially of vegetables and fruits depends on using alternative methods rather than pesticides and/or using these chemicals at the first period of plant growth prior to fruit maturity (Abada, *et al.*,2009). Hence, this work aimed to using IRCs (safe chemicals) in alternation with systemic fungicides, in which the fungicides spray at the first period of plant growth and /or infection (at least one month before harvesting green pods) to minimize the infection to low level for a period of about 45 days (the time of flowering and green pods formation until pre-maturity) then spraying IRCs just before and during harvesting the green pods in order to obtain green pods of low fungicides residue of permitted ratio and / or free from fungicides residue.

All the tested fungicides and IRCs reduced sporangial germination of *P.pisi,* the causal fungus of pea downy mildew compared with control treatment. This inhibition was gradually increased by increasing the used concentration. However, fungicides were more efficient than IRCs in this regard, where none of the tested IRCs caused complete inhibition to the germinated conidia even at 250 mM.

The results of this study revealed that the tested fungicides were also more efficient than IRCs in reducing downy mildew severity under greenhouse conditions . It is well known that fungicides, especially systemic ones are more efficient in management of many fungal diseases including pea downy mildew (Attia,*et al.*,1997, Mc Grath, 2001 and Richardson, 2006). Also, IRCs were reported as alternative and/ or safe management of many diseases, especially those of vegetable crops

(Metranx and Boller, 1986; Abada *et al.*, 2009 and Ashour, 2009).

The obtained results revealed that the application of the tested fungicides and IRCs on peas plants resulted in considerable increase in the activity of the oxidative – reductive enzymes compared with control treatment. This increase was more pronounced in case of IRCs than the fungicides. Furthermore, the IRCs Bion and salicylic acid and the fungicides Folio Gold and Salicylic acid were the most activator chemicals. Farkas and Kiraly (1967) and Morkunas and Gemerek .(2007) reported that peroxidase enzyme oxidizes the phenolics to more fungal toxic compounds such as quinines, which inhibit both spore germination and fungal growth. Also, peroxidase was found to be participate in the synthesis of lignin. Moreover, Farkas and Kiraly (1967) and Melo, *et al.* (2006) declared that the participation of an endogenous supply of phenolic compound in the plant disease resistance is dependent upon active phenol oxidase system. Furthermore, Hulme (1972) mentioned that ascorbic acid plays a role in plant defense mechanism. Similar results were obtained by Ahmed (2009) when used some IRCs and the fungicide Topas on controlling pea powdery mildew.

The results of field experiments indicated that spraying pea plants twice with any of Folio gold and Previcure-N in alternation with another two sprays with any of bion and salicylic acid as IRCs resulted in significant reduction of disease severity with significant increase in the productivity of green pods yield compared with unsprayed (control) plants. In addition, these treatments showed low efficiency compared with spraying the tested fungicides only and still of high efficiency compared with spraying IRCs only. Although, the alternation between the tested fungicides and IRCs gave moderate disease reduction and the produced green pods yield, but it could be of great interest, where the produced green pods may be of low fungicides residue, which the long period after the latter fungicides spray is capable to cause metabolic changes to be another safe compounds or became unpoisoned.

The reduction in pea powdery mildew may be due to the effect of the tested fungicides and IRCs each alone or in alternation. In addition, the role of fungicides in reducing the disease is well known (Mc Grath, 2001 and Richardson, 2006) and the role of IRCs is explained by many hypothesis, where inducing acquired resistance was induced by restricted infection is not due to a specific component of the pathogen, but rather to gradual appearance and persistence of a level of metabolic disturbance leading to stress on the host.

Doubrava *et al.* (1988) mentioned that inducing acquired resistance is persistent and generally is pathogen nonspecific. Also, Larcke (1981) reported that phytoalexines accumulation, which are elicited at the site of application, may be responsible for localized protection and induces systemic acquired resistance that sensitizes the plant response rapidly after infection. These responses inducing phytoalexines accumulation and lignifications and induce enhance activities of chitinase and β-glucanase (Dean and Kuc, 1985 and Metranx and Boller, 1986, Abd El-Kareem *et al.,* 2001). Kessmann *et al.* (1994) reported that the mechanism of systemic acquired resistance is apparently multifaceted, likely resulting in stable broad spectrum disease control and they could be used preventatively to bolster general plant health, resulting in long lasting protection. In addition, Vernooij *et al.,* 1994 mentioned also that salicylic acid is not the translocated signal responsible for inducing systemic acquired resistance to plant pathogens, but is required in signal transduction. So, resistance might be correlated with the production of oxidative enzymes in the treated healthy and diseased plant tissues (Wen *et al.,* 2005). In this respect, Melo, *et al.* (2006) mentioned that polyphenoloxidase and peroxidase are enzymes of broad spectrum among plants catalyze the hydroxylation of monophenols to O-diphenols and their oxidation to o-diquinones. He added that quinines are highly reactive molecules that can spontaneously complex various types of molecules into large types.

The use of IRC_s were previously used as alternative method for controlling many fungal diseases (Larcke, 1981; Abada *et al.,* 2009; Ashour, 2009 and Ahmed, 2009).

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دور بعض المبيدات الفطرية الجهازية ومواد كيماوية مستحثة للمقاومة في مكافحة مرض البياض الزغبي في البسلة

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تم تقييم فعالية بعض المبيدات الفطرية الجهازية ومواد كيماوية مستحثة للمقاومة علي تثبيط إنبات الأكياس الاسبورانجية (الجراثيم الكونيدية) معمليا ومكافحة مرض البياض الزغبي في البسلة المتسبب عن الفطر بيرونوسبورا بيزي في تجارب أجريت بالصوبة والحقل.

أحدثت المبيدات الفطرية المختبرة والمواد الكيماوية المستحثة للمقاومة درجات مختلفة من التثبيط لإنبات الأكياس الاسبورانجية للفطر بيرونوسبورا بيزي.

أدى رش نباتات البسلة بأى من المبيدات الفطرية والكيماويات المستحثة للمقاومة إلى إحداث انخفاض معنوي لشدة الإصابة بالمرض مع حدوث زيادة ملحوظة في الصفات المحصولية مقارنة بنباتات المقارنة.

أحدثت المبيدات الفطرية والكيماويات المستحثة للمقاومة المختبرة زيادة ملحوظة في نشاط إنزيمات الأكسدة والاختزال وهى بولي فينوا أوكسيديز و بولي فينول أوكسيديز وأسكوبيك أسد اوكسيديز مقارنة بمعاملة المقارنة، وكانت المواد الكيماوية المستحثة للمقاومة أكثر فعالية في إحداث هذه الزيادة عن المبيدات الفطرية.

تحت ظروف الحقل بمحافظة الدقهلية، خلال موسمى ٢٠٠٨/٢٠٠٩، ٢٠٠٩/ ٢٠١٠ أدى رش نباتات البسلة بأى من المبيدين الفطريين فوليو جولد وبريفيكيور– إن متبوعا برش أى من البيون وحامض السالسيلك كل على حده أو بالتبادل ، إلى إحداث انخفاض معنوي لشدة الإصابة بالمرض مع حدوث زيادة معنوية لمحصول القرون الخضراء مقارنة بنباتات المقارنة، ومن ناحية أخرى، فقد كانت معاملات تبادل الرش بين المبيدين المختبرين والمواد الكيماوية المستحثة للمقاومة أكثر فعالية من رش المواد الكيماوية المستحثة للمقاومة بمفردها.