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In vitro Evaluation of Certain Fungicides Against *Botrytis cinerea* Isolates the Causal Pathogen of Gray Mold Disease on Tomato

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ABSTRACT

Efficiency of fungicides; Teldor 50%SC, Nowton 50% SC, Toledo 43% EC, Kenzo 50% WG and Suntop El-nasr 70% WP against tomato gray mold disease was conducted *In vitro* tests. The sensitivity of *Botrytis cinerea* isolates to tested fungicides differed significantly according to their aggressiveness. The lowest pathogenicity isolate BcI-3 ranked as the most susceptible isolate, while the highest pathogenicity isolate BcB-2 was the least susceptible isolate to the tested fungicides. Medium effective concentrations (EC_{50}) of the tested fungicides indicated that Teldor 50%SC was the superior fungicides against mycelial growth of the all tested isolates, while Suntop El-nasr 70% WP was the inferior one. The EC_{50} values of the tested fungicides for mycelial growth of the least aggressive isolate (BcI-3) were less than that of the other tested isolates. Under greenhouse condition, all tested fungicides were control gray mold disease on tomato. Data revealed that when tested fungicides treated as curative or protective, were effective in reducing the disease severity of gray mold produced from the most and least aggressive isolates. Tested fungicides Teldor 50% SC and Toledo 43% EC gave excellent control of gray mold disease when applied as protective or curative. All tested fungicides, expect Suntop El-nasr 70% WP, were effective in controlling gray mold as curative treatement.

Keywords: *Tomato gray mold disease, Fungicides, Mycelial growth, Greenhouse.*

INTRODUCTION

The control of gray mold disease is difficult due to the pathogen's variety of infection strategies, wide host range, genetic diversity, and survival as conidia, mycelia, and sclerotia (Williamson *et al*. 2007). Various fungicides use for controlling gray mold disease on the different crops.Until the mid-1990s, chemical control of gray mold was mainly depend on using fungicides such as dicarboximides, benzimidazoles and N-phenylcarbamates. The new fungicides *i.e*. hydroxyanilide derivative fenhexamid, anilinopyrimidine derivative pyrimethanil and cyprodinil and phenylpyrrole derivative fludioxonil with different modes of action were used in control program (Couderchet 2003). Hosen *et al*. (2010) investigated the efficiency of fungicides; CP-Zim 50%WP (carbendazim), Zhetalux 25%WP (metalaxyl), Bavistin 50%WP (carbendazim), Rovral 50%WP (iprodione), Agromil 72%WP (metalaxyl and mancozeb), Sunphanat 70%WP (thiophanat methyl) and Kafa 80%WP (mancozeb) on radial growth of *Botrytis cinerea* isolates *in vitro*. At 500 mg/l, the most antifungal activity against mycelial growth of tested isolates were Bavistin 50%WP, CP-Zim 50%WP, Sunphanat 70%WP and Rovral 50%WP. Strobilurin fungicides which inhibit complex III (Q_o site of cytochrome b), with broad spectrum fungicides controlling different diseases, control gray mold disease. (Leroux 2004). Serey *et al*. (2007) studied the efficacy of curative and protective activity of strobilourin fungicides; pyraclostrobin, boscalid and kresoxim methyl against gray mold on grapes. In protective treatment (spraying fungicides and after 48h inoculated plant with suspension spores), all tested fungicides management the disease (efficiencies more than 78.8%). Therefore, the current study was designed to investigate, *in vitro*, the antifungal activity of the tested fungicides; Teldor 50% SC (fenhexamid), Nowton 50% SC (iprodion), Toledo 43% EC (tebuconazole), Kenzo 50% WG (pyraclostrobin) and Suntop El-nasr 70% WP (thiophanate methyl) against mycelial growth of *B. cinerea* isolates and their controlling activity against tomato gray mold disease in greenhouse.

MATERIALS AND METHODS

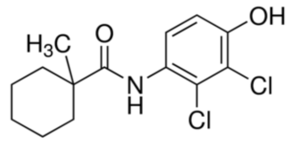
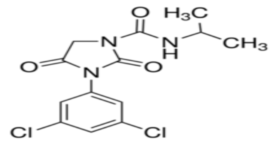
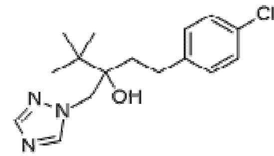
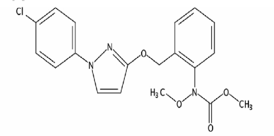
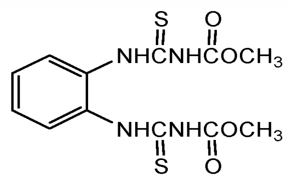
1. Tested fungicides

Five fungicides represent different chemical groups, were selected for conducting this study. The tested fungicides; Teldor 50% SC, Nowton 50% SC, Toledo 43% EC, Kenzo 50% WG and Suntop El-nasr 70% WP represent the chemical groups; Hydroxyanilide, Dicarboxamide, Triazole, Strobilurin type: Methoxycarbamate and Benzamidazole, respectively. The fungicides; Teldor 50% SC, Toledo 43% EC and Suntop El-nasr 70% WP were selected on the basis of their widely commercial use in Egypt for controlling gray mold disease. The both fungicides; Nowton 50% SC and Kenzo 50% WG are under recommendation and their samples were obtained from Plant Pathology Research Institute, ARC, Giza, Egypt. Commercial formulation of tested fungicides were used in this study. Each fungicide was diluted into a set of stock solution with sterile distilled water. These fungicides are listed in Table (1).

2. Growth inhibition measurement

The inhibitory effect of the tested fungicides on the mycelial growth of *B. cinerea* isolates (BcB-2, BcB-1, BcI-2, BcI-1 and BcI-3) was estimated on potato dextrose agar medium (PDA). A serial of concentrations for each tested fungicide were prepared using sterilized distilled water. Poison Food Technique (PFT) of Togeston (1957) was used for evaluation of the tested fungicides against mycelial growth of *B. cinerea* isolates (BcB-2, BcB-1, BcI-2, BcI-1 and BcI-3). Different quantities of the fungicides were mixed with the sterilized PDA medium after cooling at 45ºC before pouring. After mixing the fungicide, rotated gently to ensure equal distribution of fungicide and solidification of the medium. The isolates were seeded in the center of each Petri dish using 5 mm agar disc having active mycelial growth of the fungus.

Table 1. Trade names, common names, chemical structure and rates of application of the tested fungicides.

Trade name	Common name	Chemical structure	Rate/ 100 L water
Teldor 50% SC	Fenhexamid		50ml
Nowton 50% SC	Iprodion		90ml
Toledo **43% SC**	Tebuconazole		100ml
Kenzo 50% WG	Pyraclostrobin		50g
Suntop El-nasr 70% WP	Thiophanate methyl		80g

Each treatment was replicated three times. One treatment was maintained as check control (free from any fungicide). All inoculated plates were incubated at 20°C for 7 days (until the fungal growth was completely filled the fungicide-free plates). The inhibition of mycelial growth in the different concentrations was determined in relation to that of the control treatment using Abbot's formula (1925). The data were subjected to statistical analysis by applying the Software (Bakr 2007) to calculate probit analyses to calculate the regression equation, slope of regression lines, EC_{50} and EC_{90} values of the tested fungicides. The toxicity index (TI) of each fungicide was determined according to Sun (1950).

3. Greenhouse experiments

This experiment was carried out in the greenhouse of Vegetable Disease Research Department, Plant Pathology Institute, ARC. Tomato seedlings of cultivar super Strain B were used in this study. Three seedlings (30-days-old) were transplanted in each pot (20-cm-diam.) filled with sandy-clay soil (1:1 w/w). Growing seedlings were divided into two groups and applied according to the method of Rodríguez *et al*. (2014). In the first group, growing tomato plants (٥٠ days after transplanting) were applied with tested fungicides at their rates of application using hand atomizer, then after 24h sprayed with a suspension (٥X10^4 spores /ml) of *B. cinerea* isolates (the most aggressive isolate (BcB-2) and the least aggressive isolate (BcI-3)). On the other hand, growing tomato plants were sprayed with a suspension (٥X10^4 spores/ml) of *B. cinerea* isolates, then after 24h applied with the tested fungicides (second group). Three replicates of tomato plants inoculated with the tested pathogen and sprayed with water only were served as a check treatment. Treated and untreated plants were kept under controlled greenhouse conditions (20°C and 75-80% R.H.). Data were scored after 5 and 10 days of inoculation time as disease severity. The efficiency of each treatment was calculated using the equation of Derbalah *et al*. (2011).

RESULTS AND DISCUSSION

1. Effect on the mycelial growth

Sensitivity of *B. cinerea* isolates (BcB-2, BcB-1, BcI-2, BcI-1 and BcI-3) to the tested fungicides are presented in Table (2). The medium concentration (EC_{50}), EC_{25} and EC_{90} values were calculated for each tested fungicides against isolates of *B. cinerea* isolates according to Lpd line program. Inhibitory activity of tested fungicides for mycelial growth differed significantly between the five isolates at EC_{50} value. Previous pathogenicity study indicated that there were slight significant differences in pathogenicity between *B. cinerea* isolates (data unpublished). Based on the previous study of disease severity percentages on tomato cultivar Super Strain B, these isolates can be arranged descending to BcB-2, BcB-1, BcI-2, BcI-1 and BcI-3, respectively. Data in Table (2) indicated that sensitivity of *B. cinerea* isolates to tested fungicides differed significantly according to their aggressiveness. On the other side, efficiency of the tested fungicides was converse with the aggressiveness of the tested isolates. Accordingly, the lowest pathogenicity isolate BcI-3 arranged as the most susceptible isolates, while the the highest pathogenicity isolate BcB-2 was the least susceptible isolate to the tested fungicides. Data confirmed that increasing the pathogenicity of *B. cinerea* isolates resulted in decrease in the sensitivity to tested fungicides. Generally, the tested isolates can be arranged according to their tolerant to tested fungicides descending to BcB-2, BcB-1, BcI-2, BcI-1 and BcI-3. As an example, the EC_{50} values of Teldor 50% SC to the previous isolates were 0.223, 0.082, 0.074, 0.037 and 0.030 ppm, respectively. The same trend was found with the other fungicides; Nowton 50% SC, Toledo 43% EC, Kenzo 50% WG and Suntop El-nasr 70% WP. Medium effective concentrations of the candidate fungicides; Teldor 50% SC, Nowton 50% SC, Toledo 43% EC, Kenzo 50% WG and Suntop El-nasr 70% WP to the most aggressive isolate (BcB-2) isolate were 0.223, 1.835, 0.83, 47.841 and 653.316 ppm, respectively. Data indicated that Teldor 50% SC was the superior fungicide against the BcB-2 isolate, while Suntop El-nasr 70% WP was the inferior one. The toxicity indices of the tested fungicides; Nowton 50% SC, Toledo 43% EC, Kenzo 50% WG and Suntop El-nasr 70% WP were 12.152, 26.867, 0.466 and 0.034% as toxic as Teldor 50%SC. So, the fungicides were according to their efficiency based on Ec50 values in the following descending order; Teldor 50% SC, Toledo 43% EC, Nowton 50% SC, Kenzo 50% WG and Suntop El-nasr 70% WP. The same efficiency trend was found when the tested fungicides were evaluated against the isolates; BcB-1, BcI-2, BcI-1 and BcI-3 of *B. cinerea*. On the other hand, the same efficiency trend of the tested fungicides against mycelial growth of the BcB-2 isolate was found when EC_{25} was compared. Concerning the slope values of the toxicity lines for the tested fungicides against BcB-2 isolate, Suntop El-nasr 70% WP showed the sleeper toxicity line with slope value 5.19 followed by Nowton 50% SC (1.017), Teldor 50% SC (1.009), Toledo 43% EC (0.718), and Kenzo 50% WG (0.711).

Table 2. Inhibitory activity of tested fungicides against mycelial growth of *B. cinerea* isolates.

Tested fungicide	Isolate	EC level (ppm)			Slope	Toxicity index*
		EC_{25}	EC_{50}	EC_{90}		
Teldor 50% SC	BcB-2	0.048	0.223	4.146	1.009± 0.14	100.0
	BcB-1	0.015	0.082	2.018	0.922± 0.184	100.0
	BcI-2	0.015	0.074	1.609	0.957± 0.186	100.0
	BcI-1	0.0065	0.037	1.025	0.889± 0.195	100.0
	BcI-3	0.0052	0.03	0.849	0.885± 0.199	100.0
Nowton 50% SC	BcB-2	0.398	1.835	33.459	1.017± 0.126	12.152
	BcB-1	0.205	1.093	26.188	0.929± 0.189	7.502
	BcI-2	0.0059	0.154	75.355	0.477± 0.175	48.051
	BcI-1	0.016	0.132	7.263	0.737± 0.178	28.030
	BcI-3	0.0048	0.056	6.02	0.631± 0.181	53.571
Toledo 43% EC	BcB-2	0.096	0.83	50.559	0.718± 0.062	26.867
	BcB-1	0.037	0.364	28.427	0.677± 0.111	22.527
	BcI-2	0.022	0.163	7.359	0.774± 0.117	45.398
	BcI-1	0.024	0.153	5.302	0.832± 0.179	24.183
	BcI-3	0.023	0.13	3.586	0.889± 0.181	23.076
Kenzo 50% WG	BcB-2	5.385	47.841	3035.435	0.711± 0.071	0.466
	BcB-1	0.484	9.811	2982.609	0.516± 0.064	0.835
	BcI-2	0.259	4.937	1334.971	0.527± 0.064	1.498
	BcI-1	0.048	1.717	1553.526	0.433± 0.064	2.154
	BcI-3	0.0027	0.257	1455.676	0.341± 0.073	11.673
Suntop El-nasr 70% WP	BcB-2	484.341	653.316	1153.667	5.19± 0.607	0.034
	BcB-1	507.117	651.144	1047.047	6.213± 0.658	0.012
	BcI-2	414.107	615.781	1308.688	3.914± 0.551	0.012
	BcI-1	321.872	523.221	1317.054	3.197± 0.527	0.007
	BcI-3	241.564	442.344	1396.254	2.567± 0.521	0.006

***Toxicity index= (EC_{50} of the most effective pesticides/EC_{50} of the least effective pesticides) X100.**

The EC_{50} values of the tested fungicides for mycelial growth of the least aggressive isolate (BcI-3) were less than that of the other tested isolates. Data indicated that Teldor 50%SC was the superior fungicide, while Suntop El-nasr 70% WP was the inferior one. The toxicity indices of the tested pesticides; Nowton 50% SC, Toledo 43% EC, Kenzo 50% WG and Suntop El-nasr 70% WP were 53.571, 23.076, 11.673 and 0.006% as toxic as Teldor 50% SC. Concerning the slope values of the toxicity lines for the tested fungicides, Suntop El-nasr 70% WP showed the sleeper toxicity line with slope value 2.567 followed by Toledo 43% EC (0.889), Teldor 50% SC (0.885), Nowton 50% SC (0.631) and Kenzo 50% WG (0.341). The EC_{50} values of Teldor 50% SC against mycelial growth of the tested isolates ranged between 0.223 and 0.037 ppm. The corresponding values of Suntop El-nasr 70% WP ranged between 653.316 and 442.344 ppm. Data indicated that the tested isolates of *B. cinerea* were resistant to Suntop El-nasr 70% WP (thiophanate methyl).

The current study indicated that Teldor 50% SC (fenhexamid) and Toledo 43% EC (tebuconazole) were the most effective fungicides against mycelial growth of the tested *B. cinerea* isolates. These results agrees with Stehmann and de Waard (1996) who investigated the activity of triazole fungicides towards mycelial growth of *B. cinerea* isolates. In all experiments, tebuconazole proved to be the most active fungicide. Esterio *et al.* (2007) found that EC_{50} value of fenhexamid for mycelial growth was less than 0.1 μg/ml. In several survey studies EC_{50} values for fenhexamid-sensitive isolates, as defined using a mycelial growth test, ranged from less than 0.01 to 0.1 μg/ml. In the present study, EC_{50} values of Teldore 50% SC (fenhexamid) for mycelial growth of *B. cinerea* isolates ranged between

0.03 and 0.223 ppm. A discriminatory dose of fenhexamid (0.1 µg/ml) was used by different researchers to distinguish between resistant and sensitive isolates, the isolates with EC_{50} values of at least or more than 0.1 µg/ml being regared as resistant (Baroffio *et al*. 2003 and Esterio *et al*. 2007). Also, Panebianco (2012) found that EC_{50} values for 146 isolates of *B. cinerea* varied from 0.005 to 0.092 µg/ml and the majority of them had EC_{50} between 0.025 and 0.05 µg/ml.

Zhang *et al*. (2010) detected three different levels of carbendazim or thiophanate methyl resistance; isolates with a low resistance with EC_{50} values ranged from 1 to 8.2 µg/ml. Isolates with moderate resistance, the EC_{50} values ranged from 15.4 to 22.6 µg/ml. And isolates with high resistance with EC_{50} values > 50 µg/ml. This finding confirmed the results in the current study, which the tested isolates of *B. cinerea* were resistant to Suntop El-nasr 70% WP (thiophanate methyl).

Fernández-Ortuño *et al*. (2012) mentioned that 66.7% and 61.5% of collected isolates were resistant to pyraclostrobin and to both pyraclostrobin and boscalid, respectively. No isolates were identified that were resistant to boscalid but sensitive to pyraclostrobin. Data in the present study confirmed that increasing the pathogenicity of *B. cinerea* isolates resulted in decrease in the sensitivity to tested fungicides. This finding are compatible with Kadish and Cohen (1992) and Day and Shattock (1997) who reported that insensitive isolates of metalaxyl were more aggressive on foliage than the sensitive isolates.

2. Evaluation in greenhouse

This experiment was conducted under artificial inoculation with the *B. cinerea* isolates to evaluate the efficiency of the tested fungicides for controlling tomato gray mold disease. Disease severity in check treatments produced from the least and most aggressive isolates; BcI-3 and BcB-2 reached to 18.94 and 27.97% after 5 days of inoculation, while were 38.60 and 50.41% after 10 days of inoculation, respectively. Under the experimental conditions, the first incubation period (5 days) for inoculated plants with the both isolates was enough for appearance disease symptoms. Data indicated that disease severity percentage in all treatments were increased with elapse the incubation period from 5 to 10 days. Gray mold disease was developed extensively on tomato plants in the check treatment comparing with fungicides treatments. Percentages of disease severity differed significantly with the different tested fungicides at the same trend after 5 and 10 days of inoculation with the both isolates. Disease severity percentage in fungicides treatments against the most aggressive isolate (BcB-2) were more than those treated against the least aggressive isolate (BcI-3). Data presented in Tables (3 & 4) indicated that all the candidate fungicides when treated as protective or curative were effective in reducing the disease severity of gray mold produced from the most and least aggressive isolates. Generally, there were significant differences in efficiency between the tested fungicides against developed gray mold disease on tomato plants. Results indicated that efficiency of the tested fungicides against gray mold disease developed from the isolate BcI-3 (least aggressive) was more than that produced from the isolate BcB-2 (most aggressive). The tested fungicides Teldor 50% SC and Toledo 43% EC gave excellent control of gray mold disease when applied as protective or curative. On the contrary, the lowest level of disease control was found in the treatment of Suntop El-nasr 70% WP.

Table 3. Protective and curative effects of tested fungicides against tomato gray mold disease produced from the most aggressive isolate (BcB-2) of *B. cinerea* under greenhouse conditions.

Tested fungicides	Disease severity percentages (DSP) and efficiency (%)							
	Spraying before inoculation (Protective)				Spraying after inoculation (Curative)			
	5 days		10 days		5 days		10 days	
	DS%	Efficiency	DS%	Efficiency	DS%	Efficiency	DS%	Efficiency
Teldor 50% SC	1.21f	95.67	2.15f	95.73	5.21f	81.37	6.77f	86.57
Nowton 50% SC	5.08d	81.83	5.95d	88.19	10.24d	63.83	11.25d	77.68
Toledo 43% EC	3.96e	86.80	4.18e	91.80	7.81e	72.1	8.52e	83.10
Kenzo 50% WG	5.38c	80.76	6.19c	87.72	11.94c	57.31	12.49c	75.22
Suntop El-nasr 70% WP	8.53b	69.50	8.86b	82.42	17.69b	36.75	22.17b	56.02
Check	27.97a	-	50.41a	-	27.97a	-	50.41a	-

-Values within the same column with the same letter are not significantly different (P<0.05).
-Each figure represents mean of three replicates.

Table 4. Protective and curative effects of tested fungicides against tomato gray mold disease produced from the least aggressive isolate (BcI-3) of *B. cinerea* under greenhouse conditions.

Tested fungicides	Disease severity percentages (DSP) and efficiency (%)							
	Spraying before inoculation (Protective)				Spraying after inoculation (Curative)			
	5 days		10 days		5 days		10 days	
	DS%	Efficiency	DS%	Efficiency	DS%	Efficiency	DS%	Efficiency
Teldor 50% SC	0.0f	100	0.0f	100	2.98f	84.26	4.07f	89.45
Nowton 50% SC	3.34d	82.36	3.87c	89.97	6.33d	66.57	7.15d	81.47
Toledo 43% EC	2.19e	93.71	2.24e	94.20	5.07e	73.23	5.72e	85.18
Kenzo 50% WG	3.41c	81.99	4.19c	89.14	7.95c	58.02	7.32c	81.03
Suntop El-nasr 70% WP	5.55b	70.67	6.56b	83.00	8.38b	55.75	11.82b	69.37
Check	18.94a	-	38.60a	-	18.94a	-	38.60a	-

- Values within the same column with the same letter are not significantly different (P<0.05).
-Each figure represents mean of three replicates.

All candidate fungicides were more effective when applied 24 h before inoculation. In protective test, efficiency of the tested fungicides after 5 days of inoculation ranged between 69.50 and 95.67% against the isolate BcB-2, while was from 70.67 to 100% against the isolate BcI-3. The corresponding values after 10 days ranged between 82.42 and 95.73% with the isolate BcB-2, while were from 83.0 to 100% against the isolate BcI-3. Data indicated that Teldor 50% SC and Toledo 43% EC were high suppressed gray mold disease resulted from BcB-2 and BcI-3 isolates followed by Nowton 50% SC and Kenzo 50% WG, while Suntop El-nasr 70% WP was the inferior one.

The same trend in the efficiency of tested fungicides against gray mold disease was found when the fungicides were applied 12h after inoculation (Curative). Efficiency of the tested fungicides after 5 days of inoculation ranged between 36.75 and 81.37 % against the isolate BcB-2, while was from 55.75 to 84.26% against the isolate BcI-3. The corresponding values after 10 days ranged between 56.02 and 86.57% with the isolate BcB-2, while were from 69.37 to 89.45% against the isolate BcI-3. Also, Teldor 50% SC and Toledo 43% EC were high suppressed gray mold disease resulted from BcB-2 and BcI-3 isolates followed by Nowton 50% SC and Kenzo 50% WG, while Suntop El-nasr 70% WP was the inferior one.

Generally, decreasing in the efficiency of all tested fungicides against gray mold disease was occurred when they applying as curative. Efficiency of Teldor 50% SC and Toledo 43% EC against gray mold disease after 10 days of inoculation with BcB-2 decreased from 95.73 and 91.80% in protective test to 86.57 and 83.10% in case of curative test, respectively. In case of BcI-3 isolate, the efficiency of the both fungicides decreased from 100 and 94.20% in protective test to 89.45 and 85.18% in curative test, respectively. The tested fungicides when applied as protective or curative against gray mold disease resulted from the both isolates can be arranged according to their efficiency in the following descending order; Teldor 50% SC**,** Toledo 43% EC, Nowton 50% SC, Kenzo 50% WG and Suntop El-nasr 70% WP.

Under favorable condition, the gray mold cause intense damage on several crops pre and post-harvest. Microclimate on plant surfaces, high relative humidity, moderate temperature and free moisture, can lead to slightly conductive to disease development (O̍Neill *et al*. 1997). Couderchet (2003) reported that fenhexamid inhibites the spores' germination only at high concentrations, but it is highly effective in inhibiting follow up stages of infections. Latorre and Rioja (2002) mentioned that at the favorable temperature and humidity, the gray mold disease appeared after 12h to 1 days of inoculation. So the curative spraying are not control this disease under field condition. Smilanick *et al*. (2010) reported that the fungicides ewer effective when applied after 24 and 48h before inoculation and then, the efficiency decreased evidently when applied 2 days after inoculation. Similar results were obtained in the current study. Suzuki *et al*. (2011) found that treatment with fludioxonil, polyoxin, iprodion and azoxystrobin provided a slightly curative effect at 1 days after suspension spore inoculation. Fungicides were less effective when applied at 48 h after spore inoculation. After 21 days from fungicides application, the tested fungicides protected plant from spore inoculation. So the good way to control gray mold disease is using fungicides with long residual control effect as preventive spraying. Finally, there should be more support for research oriented toward alternative methods to control tomato gray mold disease. In the present study, it was found that the recent introduction of new chemical groups with different modes of action is highly effective against gray mold disease. Development of a management program employing the different groups of fungicides would be a reasonable approach when they are used in appropriate rotations.

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اختبار فعالية بعض المبيدات الفطرية ضد عزلات الفطر *B. cinerea* المسبب لمرض العفن الرمادي في نباتات الطماطم

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تم اختبار فعالية المبيدات الفطرية: تيلدور ٥٠%, نيوتون ٥٠%, توليدو ٤٣%, كينزو ٥٠% وسنتوب النصر ٧٠% المسبب لمرض العفن الرمادي في نباتات الطماطم معمليا وتحت ظروف الصوبة. اختلف عزلات الفطر *B. cinerea* في حساسيتها للمبيدات الفطرية المختبرة اعتمادا على قدرتها المرضية. كانت العزلة BcI-3 الأقل قدرة مرضية الأكثر حساسية للمبيدات المختبرة, في حين كانت العزلة BcB-2 الأكثر قدرة مرضية أقل العزلات المختبرة حساسية للمبيدات الفطرية المختبرة. بينت التركيزات النصفية القاتلة (EC_{50}) للمبيدات المختبرة بأن المبيد تيلدور ٥٠% أكثرها فعالية ضد النمو الميسليومي للعزلات المختبرة في حين كان المبيد سنتوب النصر أقلها فعالية على النمو الميسليومي لجميع العزلات المختبرة. كانت قيمة الـ EC_{50} للعزلة الفطرية BcB-2 أقل من قيمتها للعزلات الفطرية الأخرى. كانت المبيدات المختبرة فعالة في مكافحة مرض العفن الرمادي في الطماطم تحت ظروف الصوبة. اشارت النتائج الى فعالية كل المبيدات المختبرة في تقليل نسبة الإصابة بالعزلة الأكثر والأقل شراسة سواء تم رشها بصورة وقائية أو علاجية. كان المبيدين تيلدور ٥٠% وتوليدو ٤٣% أكثرها فعالية ضد العزلتين BcB-2 و BcI-3 سواء تم تطبيقهما وقائيا أوعلاجيا. كانت كل المبيدات المختبر فعالة في مكافحة الفطر المسبب لمرض العفن الرمادي في الطماكم ماعدا المبيد سنتوب النصر ٧٠%.