

REACTION OF SOME PEPPER CULTIVARS TO *Leveillula taurica* (Lev.) ARN. AND ITS CHEMICAL CONTROL

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ABSTRACT

All tested pepper cultivar differed in their response to powdery mildew infection. Gedion Cv. was very susceptible (76.92 %), while Atol Cv. was the least susceptible one (12.55 %). A positive correlation between cultivars susceptibility and the number of stomata on both leaf surface was noticed. Atol Cv. was the least susceptible, whereas the number of stomata on the upper surface (25.3) and the lower surface (149.4)/cm². Gedion Cv. was the highly susceptible, it was containing on the uppersurface (184.0) and the lower surface (390.7)/cm². Score at 800 ppm and Emininte at 1000 ppm were inhibited the conidial germination and germ tube elongation, whereas the fungicides were highly toxic, while Topsin M was the least effective one. Score followed by Emininte were most effective fungicides in controlling the disease severity of pepper powdery mildew from 49.4 to 8.1 and 5.8 % respectively. While Topsin M was less effective one (38.0 %), as improved the plant hight, fresh and dry weight and increased the yield from 35.6 to 62.3 and 66.6 kg respectively in comparison to Topsin M (41.7 kg).

Keywords: Pepper, powdery mildew, varital reaction chemical control, *Leveillula taurica*

INTRODUCTION

The powdery mildew of pepper is widely distributed all over the world and their host range includes a very large number of plant families and species (Tarr, 1955 and Natour *et al.*, 1971). The powdery mildew caused by *Oidiopsis taurica* (Lev.) Salmon and the conidial stage *Leveillula taurica* (Lev.) Arnaud is considered one of the most important disease of pepper and was found to attack the plants in open field and the greenhouse. It causes sever damage to the host and losses in yield Schickedanz (1989) and Amelung (1990).

Mones *et al.* (1984) found that, the 4 pepper cultivars, inoculated under glasshouse conditions and 7 in the field under plastic tunnels were all susceptible to *L. taurica*. Muneem *et al.* (1995) evaluated 150 indogenous and exotic capsicum collection against *L. taurica*. They found that 13 collections were free from powdery mildew infection and 19 were susceptible. Disease incidence was directly related to stomatal numbers, which were least resistance and higher in the susceptible cultivars, whereas the number of stomata were greater on the lower surface than the upper surface epiderms. Gill & Nandpuri (1978), Ammar *et al.* (1986) and Mohamed (1994).

Osman (1977) observed that, the inhibition power of each fungicide on conidia germination of *L. taurica* varied according to its concentration Acerex (200 ppm), Milgo (400 ppm) and Sofril (600 ppm) completely inhibited spore germination. Saroj-Singh and Ladho (1985) found that, in the

laboratory using slide-germination of fungal spores of *L. taurica*, Dinocap was superior to 6 other fungicides.

Jharia *et al.* (1978) found that, several fungicides compared in 2 year trails on the control of *L. taurica* on Bavistin and Calixin were the most effective and gave the highest yield. Pawar *et al.* (1985) stated that, among the 8 fungicides tested on *Capsicum annum*, Bayleton 25 % at 0.02 %, Saprol Ec 20 % at 0.15 % and Karathane Ec 48 % at 0.1 % proved most effective in controlling *L. taurica*, increasing yield and percentage montelary return. Mahajan *et al.* (1991) found that, Triforine was compared with sulphur w.p 0.25 % for the control of *L. taurica*. Triforine at 0.2 % was more effective than other treatments in controlling *L. taurica* and gave the highest yield of chilli. Negrón *et al.* (1992) stated, weekly applications of Benlate and Triadimefon reduced *L. taurita* on *Capsicum annum* and increased pepper yield. Mohamed (1994) noticed that, the disease severity reduced after 4 application with fungicides at 7 - 10 day intervals. Spraing Flandor and Bufidan was more effective than other fungicides.

The objective of the present work is to study the varietal resistance of pepper to powdery mildew under greenhouse condition as well as the effect of some fungicides on conidial germination at Lab. and in controlling powdery mildew disease under field conditions.

MATERIALS AND METHODS

Six pepper cultivars namely Atol, Parma, Red north, Zico, Capri and Gedion obtained from Horticulture Research Institute were used in this study. The experiment were carried out under greenhouse condition at Gemmeiza Research Station. 5 pots, 30 cm in diameter filled with clay soil for each particular cultivar, at the rate 4 transplants/pot. The plnts were inoculated and examined every three days for two months. Number of stomata on both leaf surface were also calculated, by using the following formula as described by Kreeb (1990).

$$\text{Stomatal frequency / 1 cm}^2 = \frac{\text{No. of stomatal at 40 x}}{0.00086}$$

Stock cultures

onidia of *L. taurica* were obtained from diseased leaves in pepper fields at Gemmeiza Research Station. The fungus was maintained on the susceptible cultivar California wonder grown in the greehouse for further studies.

Inoculation technique

Inoculation was accomplished by shaking diseased plants over healthy plants after 45 day from transplanting on both leaf sides at the late afternoon. The inoculated plants were placed in a moist chamber for 24 hours.

Disease assessment

The severity of powdery mildew infection was determined as described by Horsfall and Barratt (1945).

Chemical control

Effect of some fungicides on:

a) Conidial germination *in vitro*

The tested fungicides are presented in Table (1). 6 levels i.e. 100, 200, 400, 600, 800 and 1000 ppm based upon the active ingredient substance were used for each fungicide. Each fungicide solution was deposited by means of hand atomizer on clean dry glass slides. The deposited solution was air dried to a thin film and subsequently, the conidia were dusted on the slides with the aid of camel hair brush. Each two slides were placed on petridish containing moistened filter paper. Glass slides treated with distilled water left to dry and then dusted with conidia to serve as control. Three replicates were used for each particular concentration. All the slides were incubated for 24 hours at 25 °C. The germination of conidia and the germ tube length were calculated.

Table (1): Chemical structure, common name, percentage of active ingredient and recommended rate of the tested fungicides.

Common name	Chemical structure	Active ingredient AI %	Recommended rate
Score	3- chloro-4- (4-methyl-2- (1H-1, 2, 4Triazole-1-yl methyl) -1, 3 dioxolan-2, yLL phenyl 4-choloro phynyl ether.	12.5	10 cm / 10L
Eminte	2- (2-4-dichlorophenyl) -3- (1-H-1, 2, 4 triazole -1 4 L) propyl, 1, 1, 2, 2 tetrafluro ethyl	25	5 cm / 10L
Topase	1-(2-4 dichloro-B-propyl-phenethyl) - 1H-1-2-4 Triazole	100	25 cm / 10L
Punch	Bis [(4-fluorophenyl) methyl] 1H-1, 2, 4 Triazole-1- yL-methyl silane	40	25 g / 10L
Topsin M	Dimethyl, 4, 4, (O-phenylene) Bis (3-thioallo phanate	70	25 g / 10L

b) Disease severity

This experiment was carried out in field at Gemmeiza Research Station in 1998 and 1999. The tested fungicides were used at the recommended dose. Seedlings of the highest suseptible cultivar Gedion were transplanted in row (5m x 70 cm). Each plot had 3 rows. The plants recieved the first spray as soon as infection signs appeared then received another 3 application at 10 days intervals. Control plants were sprayed with water. A rondomized complete block design was used and all treatments were replicated four times. Disease severity, plant hight, fresh and dry weights and fruit yield were computed.

RESULTS AND DISCUSSION

Data presented in Table (2) indicate that, all the tested pepper cultivars differed in their response to powdery mildew infection. Gedion cv. showed the highest percentage of infection (76.92 %), while the lowest infection was observed on Atol cv. (12.55 %). The difference between the two cultivars was highly significant, the other tested fall in between. These results are in accordance with those obtained by Mones *et al.* (1984) and Muneem *et al.* (1995). Data also revealed that, a positive correlation was noticed between plant susceptibility and the number of stomata on both leaf surface. This may explain the highly susceptibility of Gedion cv. to powdery mildew infection. These results agreed with those obtained by Gill & Nandpuri (1978) and Ammar *et al.* (1986).

Table (2): Response of some cultivars to *L. taurica* infection in relation to the number of stomata / cm².

Cultivars	Company	Disease severity %	Aver. No. of stomata / cm ²	
			Upper surface	Lower surface
Atol	Enza zaden	12.55	25.26	149.38
Parma	Lee de Mos	27.18	63.84	174.67
Red north	Enza zaden	32.75	89.97	181.45
Zico	Nunhems	49.28	125.63	219.84
Capri	Lee de Mos	62.34	154.38	273.16
Gedion	Royal sluis	76.92	183.95	390.73
LSD at 5 %		8.54	28.41	91.60

The results in Table (3) show that, the highly Toxic fungicide, which inhibit the conidial germination and elongation of grew tube was Score at 600 ppm followed by Eminnite at 800 ppm while Topsin M was the least effective one. This results is in agreement with those obtained by (Osman, 1977) and Saroj-Singh & Lodho (1985).

Data obtained in Table (4) clear that, powdery mildew on pepper plants grow under natural infection in field decreased by spraying the plants with any of the tested fungicides in both growing seasons (1998) and (1999) compared with control. The disease severity was markedly reduced after 4 application with fungicides. Spring Score or Eminnite was more effective than other fungicides tested in controlling the disease. The results obtained by Negrón *et al.* (1992) and Mohamed (1994) support these results.

the results presented in Table (5) indicated that, reduction in percentage of powdery mildew infection due to the fungicidal action was correctly by substantial increase in the plant heights, dry and fresh weights as well as increase in the fruit yield. In general to percentage of podery mildew infection in treated and untreated plants.

The results presented in Table (5) found that, the fungicides tested improved the plant growth and increased the fruit yield in both growing seasons (1998) and (1999) compared with control. Score followed by Emininte were more effective than other fungicides tested in increasing the plant heights, fresh and dry weight, also the fruit yield. This results indicate that, the reduction in percentage of powderymildew infection due to the fungicidal action was correlated by substantial increase in plant growth and the fruit yield. These results are in line with those obtained by Pawar *et al.* (1985) and Mahajan *et al.* (1991).

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رد فعل بعض أصناف الفلفل لمرض البياض الدقيقي ومقاومتها كيمائياً
أحمد أبوريه الكفراوي، أمين على المغربي ، عبد الوهاب عنتر اسماعيل
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- كل أصناف الفلفل المختبرة اختلفت في درجة استجابتها وتحملها للإصابة بمرض البياض الدقيقي فقد وجد أن الصنف جديون Gedion كان أكثر قابلية للإصابة (76.92%) بينما الصنف أتول Atol كان أقل قابلية للإصابة (12.55%).
- وقد وجد أن هناك علاقة بين قابلية الأصناف للإصابة بمرض البياض الدقيقي وعدد الثغور على كلا سطحى الورقة فمثلاً صنف أتول Atol يحتوى على عدد أقل من الثغور على كلا سطحى الورقة حيث كان متوسط الثغور على السطح العلوى 25.3 /سم² ومتوسط عدد الثغور على السطح السفلى 149.4 /سم² بينما الصنف جديون Gedion (الصنف الحساس) كان متوسط عدد الثغور على السطح العلوى 184.0 /سم² ومتوسط عدد الثغور على السطح السفلى 390.7 /سم².
- أما بالنسبة لمقاومة المرض كيمائياً وجد أن أفضل المبيدات المستخدمة هو مبيد Score اسكور ثم Emininte امينيت بينما مبيد توبسن N فى المؤخرة فقد وجد أن شدة الإصابة عند استخدام اسكور 6% فى الموسم الأول و 5.75% فى الموسم الثانى بينما المبيد الثانى Emininte 8.74% فى الموسم الأول و 7.54% فى الموسم الثانى، بينما المبيد توبسن أعطى متوسط شدة إصابة 36.92% فى الموسم الأول و 39.19% فى الموسم الثانى . كما وجد أن استخدام اسكور بتركيز 8000 جزء فى المليون وامينيت بتركيز 1000 جزء فى المليون أدى إلى تثبيط انبات الجراثيم الكونيدية وكذلك أطوال أنابيب الإنبات.
- كما وجد أن المبيدين السابقين أديا إلى تحسين الصفات المحصولية وزيادة المحصول ولكن مبيد التوبسن كان أقل المبيد فعالية وتأثيراً.

Table (3): Effect of some fungicides at different concentration levels on the conidia germination (%) and grew tube length (M) after 24 hours at 25 °C.

Fungicides	0		100		200		400		600		800		1000		Mean	
	G.	GTL	G.	GTL	G.	GTL	G.	GTL	G.	GTL	G.	GTL	G.	GTL	G.	GTL
Score	76.0	148.4	30.0	42.3	21.0	37.8	9.0	12.5	3.0	3.5	---	---	---	---	19.9	34.9
Eminte	76.0	148.4	43.0	84.6	35.0	62.9	24.0	42.3	15.0	19.9	3.0	5.2	---	---	28.0	51.9
Topase	76.0	148.4	52.0	112.6	42.0	86.5	31.0	48.9	18.0	28.6	7.0	11.5	1.0	2.3	32.4	62.7
Punch	76.0	148.4	60.0	126.5	48.0	95.6	36.0	82.7	22.0	49.2	12.0	18.4	3.0	12.5	36.7	76.2
Topsim M	76.0	148.4	74.0	139.8	62.0	129.6	51.0	122.3	34.0	78.6	23.0	54.5	19.0	31.7	48.4	100.7

G. = Germination GTL = Germ tube length

Table (4): Effect of some fungicides on the diseaseseverity of pepper powdery mildew during 1998 and 1999.

Fungicides	Season 1998					Season 1999				
	Severity of infection (%)					Severity of infection (%)				
	1 st spray	2 nd spray	3 rd spray	4 th spray	Mean	1 st spray	2 nd spray	3 rd spray	4 th spray	Mean
Score	15.67	7.05	1.26	0.02	6.00	14.89	6.09	1.95	0.06	5.75
Eminte	16.39	11.64	5.98	0.85	8.74	15.42	9.85	3.67	1.2	7.54
Topase	17.95	15.20	10.85	5.38	12.35	15.35	13.67	9.20	6.75	11.24
Punch	17.98	17.42	14.83	9.16	14.85	16.24	14.38	13.76	10.68	13.77
Topsim M	23.06	29.18	36.05	59.38	36.92	20.64	27.95	39.80	68.37	39.19
Control	28.65	38.34	51.70	75.69	48.85	24.16	32.26	6.40	82.84	49.99

The percentage of infection before spraying during 1998 and 1999 (19.48%) & (17.85%) respectively.

			Season, 1998	Season, 1998
L.S.D. at 5% :	Fungicides	=	3.36	4.25
	Sprays	=	2.75	3.47
	Fungicides x Sprays	=	6.73	8.50

Table (5): Effect of some fungicides on pepper plant height, fresh, dry weight and yield during 1998 and 1999.

Fungicides	Season 1998				Season 1999			
	Plant height (cm)	Fresh weight (gm)	Dry weight (gm)	Yield (kg)	Plant height (cm)	Fresh weight(gm)	Dry weight (gm)	Yield (kg)
Score	55.0	625.3	139.9	64.6	59.5	695.2	165.4	68.5
Eminte	51.5	530.5	117.6	60.7	55.0	568.6	126.9	63.8
Topase	47.0	485.9	107.4	52.3	49.5	515.7	114.5	55.5
Punch	42.5	435.7	96.8	45.5	45.0	465.2	103.3	49.3
Topsim M	39.0	355.9	74.7	40.8	42.0	380.6	89.8	42.6
Control	31.5	275.6	60.2	33.9	34.5	290.8	66.3	37.4
LSD at 5 %	4.5	46.3	19.3	4.6	6.8	54.6	21.5	5.1