

CHEMICAL CONTROL OF GARLIC SOIL BORNE DISEASES IN EGYPT

S.A. KHALED, M.A. ABDEL-SATTAR, M.A. BARAKA
AND M.S. ABD EL-MEGID

1 Plant Pathology Research Institute, Agricultural Research Center, Giza, Egypt .

2 Faculty of Agriculture, Suez Canal University, Ismailia, Egypt.

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Abstract

Seven fungicides, i.e. Folicur, Ronilan, Sumisclex as dip treatment and Benlate, Monceren - Combi, Monceren-Euparen and Rizolex - T. as seed dressing, were tested for their effect on white rot, basal rot and blue mold diseases of garlic under greenhouse conditions. Benlate was the most effective fungicide. Folicur decreased percentage of infection with white rot and basal rot diseases compared with the control.

Daconil, Temik Brassicol and Basamid were evaluated as soil treatment against soil borne diseases of garlic at the rate of 10 and 20 kg/fed. Temik at 10 kg/fed. was the most effective against basal rot and blue mold diseases, while at 20 kg/fed. was the best for controlling white rot disease.

Folicur and Sumisclex as dip treatment and seed dressing with Benlate were the most effective against white rot disease in the field. Benlate as seed dressing and Sumisclex as dip treatment were effective to control basal rot and blue mold diseases and showed also, higher yield when compared with the other treatments and the check (control).

INTRODUCTION

Garlic (*Allium sativum* L.) is one of the very important vegetable crops in Egypt. Numerous soil borne disease-causing agents attack garlic plants causing decay resulting in considerable losses and decrease in quality (Leguizmon and Barriga 1976, Mention and Bouhot 1977 and Assdi and Behroozin 1987). Dipping and dressing garlic cloves in fungicides resulted in the control of soil borne diseases. Planting garlic cloves treated with PCNB or Agrosan GN (tolyl mercury acetate) at 6 g./kg

increased plant height and bulb weight from cloves infected with *Sclerotium cepivorum* (Patil and Rone 1973). Dipping garlic cloves in Ronilan (Vinclozlin) at 0.3 or 0.4 kg/quintal before planting resulted in 80% healthy plants compared with 44.3% for untreated control (Duchon 1979). Vinclozolin, Iprodione, Benomyl and Dicloran applied as bulb dust (2 or 4 g/kg) and as combination of bulb and soil dusting (2g/kg + 0.5 g/m²), reduced severity of infection and increased yield. Dust treatment of bulbs was the best method to control white rot disease of garlic (Tomietti 1979, Jennrich 1983 and Sinigaglia *et al.* 1986).

Dirigenta (1983) concluded that control of *S.cepivorum* by agricultural practices, as good drainage and the use of disease-free bulbs was recommended in field trials with Rovral (Iprodione) and Sumisclex (Procymidone) using Brassicol (Quintozene) as standard.

Ramadan (1986) reported that Benlate (2 g/L.) was the most effective fungicide for controlling basal rot disease, whereas Botran was the least. Iprodione and Procymidone were the most effective fungicides when applied only to garlic cloves. This work was carried out to study the effect of either seed dressing or dipping in fungicides, on garlic white rot, basal rot and blue mold diseases and to define the best method of application to control these diseases.

MATERIALS AND METHODS

A- Greenhouse experiments :

1- Seed dressing and dip treatments :

Seven fungicides, namely Benlate (benomyl) 2 g/kg (Methyl-1butyl carbamoyl 0-2-benzimidazolecarbamate), Monceren-Combi (pencycuron - captan) 3 g/kg (N-14-chlorophenylmethyl)- N cyclophenyl N-phenylurea + N-9 trichlor - 0 methylthio cyclohex - 4 cnc 1-2 dicarboximide), Monceren-Euparen (pencycurnthichlofuamid) 3 g/kg (N-14-chlorophenylmethyl) N-cyclophenyl N-phenylurea + N dichlorofluoro-methylthio N - dimethyl - N phenyl sulphamid), Rizolex-T (tolclofosmethyl 20% + thiram 30%) 3kg/ (0-2, 6- Dichloro - 4 - methyl - phenyl 0,0 dimethyl phosphorothioate + Thiram 30%), Folicur (tubuconazole) 25 cm/L (α(4-chlorophenyl ethyl) α (1,1 dimethyl ethyl). H,I, 2,4-triazole - 1-ethanol), Ronilan 20 g/L (3(3,5-dichloro-phenyl)- 5-ethyl-5methyl 2,4-oxazol-idinedine) and

Sumiscler (procymidone) 40 g/L (N-(3,5-dichlorophenyl 1,2 dimethylcyclo-propane dicarboximide), were used as seed dressing and dip treatments .

Seventy two pots (25 cm) were used in this experiments, divided into three groups. Pots in the first group were infested with *S.cepivorum*, the second with *F.oxysporum f.sp. cepae* and the third with *P.citrinum* (5 g./kg soil) .

Three pots with infested soil from each group, each planted with seven healthy Balady cloves, were left without fungicide treatment to serve as control for the group. Percentages of infection were recorded five months after planting .

2. Soil treatments :

Soil treatments with fungicides at 10 and 20 kg/fed. (0.04 and 0.08 g./pot) were made using Danconil (chlorothalonil) (Tetrachloroisophthalonitrate), Temik (aldicarb) (2 methyl-2) methylthio propinaldehyde O-(methyl carbonyl oxime)], Basamid (dozomet) [Tetrahydro 3,5 dimethyl 2 H-1,3,5 thiadiazine-2- thione], and Brassicol (PCNB) (pentachloronitro benzene). Fifteen healthy Balady cloves were planted per pot (35 cm diameter) containing sterilized clay loam soil. Eighty one pots were divided into three groups and were infested as mentioned before. Three infested pots from each group were left without fungicides to serve as control for the set. Soil treatments were made before transplanting. Percentages of infection were recorded five months after planting.

b- Field experiments : Effect of seed dressing and dip treatments

1- White rot disease :

Field experiments were carried out at the farm of Shandaweel Agric. Res. Sta., Sohag Governorate during two successive seasons, 1989-1990 and 1990-1991. Experiments were arranged in a completely randomized plot design (2x3 meters each) with 4 replicates for each treatment. Agricultural practices were applied as usual. Balady cloves were treated with the fungicides; Folicur (tebuconazole) (25 cc/L), Sumiscler (procymidone) (40 g/L), Ronilan (vinclozolin) (20 g/kg), Vitavax / Captan (carboxin + captan) (3 g/kg) [5,6 dihydro-2-methyl, N-phenyl 1-1,4 oxatiin-3-carboxamide] and Allisan (dicloran) (2g/kg) (2,6dichloro-nitro aniline] as seed dressing and planted in naturally infested soil. Percentages of infection were recorded at harvesting time, the yield was recorded in ton/fed .

2- Basal rot and blue mold diseases :

Experiments were carried out at the farm of El-Serw Agric. Res. Sta.

(Dakahlia governorate) and Mallawy Agric. Res. Sta. (El-Minia governorate) during the season 1992-1993. The experiments were arranged in a completely randomized plot design (2x3 meters) with four replicates for each treatment .

Fertilizers were added at the normal rate and other agricultural practices were applied as usual. Balady cloves were treated with fungicides Sumisclex (40 g/L), Ronilan (20 g/L), Folicur (25 cc/L) as dip treatment; and Rizolex-T (3 g/g), Benlate (2 g/L) and Monceren Euparen (3 g/kg) as seed dressing with 5 cc/kg cloves Triton-B 1956 as adhesive material before seed dressing .

Treated cloves were planted in naturally infested fields and percentage of infection as well as the yield (ton/fed) were recorded at harvesting time .

RESULTS AND DISCUSSION

Dipping garlic cloves in Folicur, Ronilan or Sumisclex suspensions or seed dressing with Monceren-Combi, Benlate, Monceren Euparen or Rizolex-T, resulted in reduction in the incidence of soil borne diseases, under greenhouse conditions. Dipping in Folicur and seed dressing with Benlate were the best treatments to control white rots, as percentage of infection decreased from 71% to 28.5%. However, dip treatment was more effective than seed dressing to control basal rot. Folicur, Ronilan reduced percentage of infection from 57 to 28.5%. On the other hand, seed dressing with Benlate and Monceren - Euparen decreased percentage of infection from 71% to 42.8 and seed dressing was the best treatment compared with dip treatment (Table 1). Similar results were reported by Greathead (1978), Buchon (1979), Tomiatti (1979) and Dirigenta (1983) .

Jennrich (1983) tested vinclozolin over several years in different counties using various rates and methods of application to control *S.cepivorum* in onion and garlic. Best results were obtained, in direct seeded onions, with a combination of seed dressing (using methyl cellulose to improve adherence). Vinclozolin rates higher than 1.5 g/kg were phytotoxic to garlic but lower rates showed satisfactory control. Treating soil with Daconil, Temik, Brassicol and Basamid to control soilborne fungi affecting garlic plants under greenhouse conditions, showed that Temik (10, 20 kg) was superior in controlling soil-borne fungi, resulting in lower percentage of infected plants; 13.3, 6.6; 6.6, 20;20 and 26.6% with white rot, basal rot and blue mold diseases, respectively, followed by Basamid and Brassicol. Daconil was the

Table 1. Effect of seed dressing and dip treatments on some soil borne diseases of balady garlic plants, under greenhouse conditions

Fungicides	Method and rate of application	% of infection		
		White rot	Basal rot	Bluemold
Folicur	25 cc/L (dipping)	28.5	28.5	57.0
Ronilan	20 g/L (dipping)	57.0	28.5	57.0
Sumisclex	40 g/L (dipping)	42.8	57.0	71.0
Benlate	2 g/kg (dipping)	28.5	42.8	42.8
Monceren combi	3 g/kg (dipping)	57.0	57.0	71.0
Monceren Ruparen	3 g/kg (dipping)	42.8	57.0	42.8
Rizolex	3 g/kg (dipping)	57.0	42.8	57.0
Control	-----	71.0	57.0	71.0

L.S.D. at 5 %

8.47

10.30

8.41

Table 2. Effect of some soil treatments on the severity of some soil-borne diseases affecting Balady garlic plants, under greenhouse conditions.

Fungicides	Rate of application (kg/fed.)	% of infection		
		White rot	Basal rot	Bluemold
Daconil	10	46.6	20.0	46.6
	20	40.0	33.3	33.3
Temik	10	13.3	6.6	20.0
	20	6.6	20.0	26.6
Brassicol	10	33.3	20.0	20.0
	20	26.6	33.3	33.3
Basamid	10	33.3	13.3	33.3
	20	13.3	26.6	33.3
Control		46.0	33.3	46.0

L.S.D. at 5 %

4.49

4.02

5.61

Table 3. Effect of seed dressing and dip treatments on white rot diseases and yield during two seasons 1990/1991, 1991/1992.

Fungicides	Method and rate of application	Season 1990/1991		Season 1991/1992	
		% Infection	Yield (T/fed.)	% Infection	% Infection
Folicur	25 cc/L (dipping)	7.2	9.13	6.3	9.50
Ronilan	40 g/L (dipping)	9.6	8.83	8.5	8.96
Sumisclex	20 g/L (dipping)	32.0	5.72	36.6	5.55
Benlate	2 g/kg (dipping)	8.4	8.74	8.9	8.80
Monceren combi	3 g/kg (dipping)	38.4	6.65	40.4	6.50
Monceren Ruparen	2 g/kg (dipping)	24.4	6.73	26.6	6.24
Rizolex		62.6	3.50	71.3	3.32
Control					
L.S.D. at 5 %		2.50	0.24	1.54	0.48

Table 4. Effect of some fungicides on basal rot and blue mold diseases and yield of Balady garlic grown in naturally infested field in El-Serw and Mallawy during season (1992-1993).

Fungicides	Method and rate of application	El-Serw			Mallawy		
		% Infection		Yield (T/fed.)	% Infection		Yield (T/fed.)
		Basal rot	Blue mold		Basal rot	Blue mold	
Sumisclex	40 g/L (dipping)	9.0	2.5	7.60	20.0	1.1	8.32
Ronilan	20 g/L (dipping)	16.0	6.0	6.60	27.0	1.7	7.74
Folicur	25 cc/L (dipping)	9.0	4.5	7.05	18.5	1.6	7.77
Rizolex-T	3 g/kg (dipping)	10.0	3.0	7.40	17.0	1.2	7.97
Benlate	2 g/kg (dipping)	7.0	1.5	7.80	12.0	1.0	8.45
Monceren	3 g/kg (dipping)	22.0	6.0	6.90	32.0	2.0	7.55
Euparen							
Control	-----	32.0	12.0	5.50	39.5	3.7	5.76
L.S.D. at 5 %							

least effective (Table 2). These results were in agreement with those obtained by Sinigaglia *et al.* (1986) who showed that treatment of garlic cloves with fungicides and as soil treatment at planting and 15 days later, gave better results than in cloves treatment alone. Iprodione and Procymidone were the most effective fungicides when applied only to the cloves. Procymidone recorded the highest yield increase when used treating cloves only or cloves + soil for control of white rot. Sandumiano (1984) indicated that Brassicol was effective against *Fusarium* basal rot during the early growth stage of garlic crop under field conditions.

Chemical control with seed dressing or dipping showed that the fungicides; Folicur, Sumisclex and Ronilan as dip treatment or Benlate, Vitavax / Captan and Allisan as seed dressing, reduced the incidence of soil-borne diseases. Significant reduction in percentage of infection with white rot and higher yield were obtained using Folicur, Benlate and Sumisclex (7.2, 6.3, 8.4, 8.9 and 9.6, 8.5%) during two seasons 1990-91, and 1992-92, respectively. Higher yields were recorded with Folicur, 9.1 ton/fed. during 1990-91 and 9.5 ton/fed. during 1991-92 (Table 3). On the other hand, all fungicides, used as clove dressing and dip treatment, significantly reduced basal rot and blue mold diseases of garlic grown in naturally infested soil.

Generally, the most effective control of both diseases was obtained by Benlate application (seed dressing) and Sumisclex (dip treatment) which resulted in higher yield (Table 4). These fungicides were in agreement with Greathead (1978), Ramadan (1980) and Jennrich (1983) working on *S.cepivorum* of onion and garlic. In this respect, Ramadan (1986) indicated that dipping onion transplants in Benlate (2 g/L), Ronilan (20 g/L), Sumisclex (20 g/L), Rovral (50 g/L) and Botran (150 g/L) reduced percentage of infection with basal rot disease. Benlate was the most effective fungicide, whereas Botran was the least. Onion yield increased especially by Sumisclex and Benlate treatment. Thus, it could be concluded that Benlate (seed dressing, 2 g/kg) was the most effective fungicide against basal rot and blue mold, and increased yield of garlic bulbs.

Folicur and Sumisclex (dip treatment, 25 cc/L and 40 g/L) and Benlate (seed dressing, 2 g/kg) were the most effective fungicides against white rot disease and increased yield. Temik (20 kg/fed.) was the best soil treatment which reduced percentage of infection with white rot. Moreover, Temik (10 kg/fed.) was the most effective soil treatment which decreased percentage of infection with basal rot and blue mold disease .

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المقاومة الكيماوية للأمراض الكامنة فى التربة والذى تصيب الثوم فى مصر

شعبان على خالد^١، محمد أنور عبد الستار^٢، متولى على بركة^٢،

مدحت عبد المجيد^١

^١ معهد بحوث امراض النبات - مركز البحوث الزراعية - الجيزة.

^٢ كلية الزراعة جامعة قناة السويس - الإسماعيلية .

تم اختبار سبعة مبيدات فطرية لمقاومة مرض العفن الأبيض وعفن القاعدة والعفن الأزرق فى الثوم تحت ظروف الصوبة.

تم استخدام مبيدات الفوليكور والرونيلان والسومسلكس لغمس فصوص الثوم، بينما استخدم البنليت والمونسرين كومبى والمونسرين ايوبارين والريزولكس T كمعاملة للفصوص.

كانت مبيد البنليت أكفأ المبيدات الفطرية المستخدمة ، بينما أنقص الفوليكور النسبة المئوية للإصابة بكل من مرض العفن الأبيض وعفن القاعدة مقارنة بالكنترول . وقد تم أيضا تقييم مبيدات الداكونيل والتيمك والبراسيكل والبازاميد كمعاملة للتربة لمقاومة الأمراض الكامنة فى التربة التى تصيب الثوم. وقد تم استخدام هذه المبيدات بمعدل ١٠ كجم أو ٢٠ كجم / فدان.

كان مبيد التيمك أكفأها بمعدل ١٠ كجم / فدان لمقاومة مرضى عفن القاعدة والعفن الأزرق، بينما كان معدل ٢٠ كجم/فدان ذو كفاءة عالية فى مقاومة مرض العفن الأبيض.

وكان لغمس الفصوص فى مبيد الفوليكور والسومسلكس او معاملة الفصوص بمبيد البنليت أكفأ النتائج لمقاومة العفن الأبيض فى الحقل وأعطى استخدام البنليت والسومسلكس كغمس للفصوص كفاءة عالية فى مقاومة مرضى عفن القاعدة الأزرق. وأدت أيضا الى زيادة فى المحصول بالمقارنة بالكنترول والمعاملات الأخرى.