

## REDUCTIONS GARLIC DISEASE BY MICRO-ELEMENT FOLIAR SPRAY

El-Sheheby, A.I.; M. S. Al-Ashaal and M.F.I. Tadrus  
Plant Pathology Research Institute, A.R.C. Giza , Egypt

### ABSTRACT

Foliar spray treatments with zinc, copper, manganese, iron and boron on Chinese garlic grown in a field at kaha, kalubia Gov. during 2005-2006 and 2006-2007 growing seasons was performed. All treatments significantly reduced downy mildew, purple blotch and rust foliar diseases of garlic. Highest disease reductions and increase in yield were mostly detected with zinc, manganese, iron and boron once sprayed at the rate of 100 g/fed 60 days after planting. While the most effective copper treatment for controlling diseases was detected at the rate of 50 g/fed twice sprayed 60 followed by 90 day intervals after planting. Mean percentages of diseases reduction obtained with the fore-mentioned treatments reached 36.3%, 60%, 65.5% for downy mildew, purple blotch and rust diseases, respectively. While mean increase in garlic yield reached 55% over control treatment. Other treatments were less effective.

### INTRODUCTION

Micronutrients regulate plant physiology and mobilize plant disease resistance and growth processes. Deficiency in micro- elements cause impact on growing crops exhibiting symptoms vary from crop to another and subsequently suppress growth and reduce yield .Therefore, many studies searched the efficacy of microelement treatments in controlling plant diseases. For instance, Mashaal and EL-Zewily,1984 reported that lettuce foliar spray with copper reduced downy mildew almost two times more than obtained with Zn , B , Mo and M. Plant fresh weight increased only with Fe, M, Zn and B. Mahnshi and Stradhaua, 1988 also reduced downy mildew on muskmelon by foliar spray with copper and zinc. Keel *et al*,1989, enhanced biocontrol potentiality of *Pseudomonas fluorescens* strain CHAO for controlling tobacco black root rot disease caused by *Thielaviopsis basicola* by addition of Fe cl3 to soil .El-Shehaby *et al*, 1990, reduced onion smut disease on growing onion seedlings by soaking onion seed in 25 ppm Zinc and Mn for two hours as well as iron at the rate of 50 ppm. El-Ghamrini,1991reported that foliar spray with boron and Zinc at the rate of 100 ppm on garlic increased growth parameters as plant heights, leaves dry weights and total garlic yield .Al-Ashaal, 1993 found zinc sulphate spray 50 day after onion transplanting at the rate of 1.5 g/L. resulted in 11.44% purple blotch disease reduction and 22.33% increase in yield. El- Sayed, 2000 recorded that copper sulphate spray three times 50.65 and 80 day After planting sugar beet at the rate of 1.0 g/L. decreased *Cercospora* leaf spot disease severity by 52.74% and increased yield by 33.2%.

The present research was planned to evaluate disease reduction in infections with downy mildew, purple blotch and rust on garlic as a result to foliar spray treatments with Zn, Mn, Cu, Fe and boron.

## **MATERIALS AND METHODS**

Copper sulfate (25.2% cu), Sod. borate 24.8% B (Borax produced by Elgomhoria chemical co.) , Rexene 12% Fe , Rexene 14% Zinc and Rexene 12% manganese chaelated micro-elements produced by Rexolin chemicals, Helsingberg, Swedish co. were foliar sprayed on Chinese garlic once at the rate of 100 g/fed 60 days compared with 75 days after planting. Two sprays at the rate of 50 g/fed tested at 60 followed by 90 day spray intervals compared by 75 followed by 105 day intervals after planting. Experiments were carried out in a field at Kaha, Kalubia Gov. During 2005-2006 and 2006-2007 successive garlic growing seasons. Percent average disease severity of each replicate was determined according to scale described by Townsend and Heuberger, 1943. Data were statistically analyzed according to complete block randomized design.

## **RESULTS AND DISCUSSION**

Field foliar spray with micro- elements on garlic in 2005-2006 planting season significantly increased yield and reduced infection with downy mildew, purple blotch and rust diseases, compared with non- treated control, (Table, 1).

Zinc at high rate (100 g/fed) sprayed one time at 60 or 75 day intervals after planting significantly reduced diseases infection except rust at 75 day interval which was insignificant compared with control .While 2 sprays at the rate of 50 g/fed applied 60 followed by 90 day intervals after planting performed values of disease reduction and yield were not significantly different than obtained with the previous 100 g/fed treatment. Spray of the lower rate (50 g/fed) at 60 followed by 90 day intervals after planting, significantly resulted in less infection values with purple blotch and rust than 50 g/fed Zinc treatment sprayed at longer periods (75 and 105 day intervals). It could be concluded that earlier spray with Zinc at the rate of 100 g/fed sprayed 60 days after planting was more effective for controlling diseases and increase in yield more than that sprayed at 75 day interval. Accordingly one spray on garlic 60 days after planting with Zinc at rate of 100 g/fed could be the most effective Zinc treatment for controlling diseases and increase in garlic yield.

Copper treatment foliar spray at the rate of 100 g/fed 60 days after planting significantly reduced infection with downy mildew and purple blotch more than that sprayed at 75 day interval. Both treatments significantly reduced diseases, but resulted in insignificant yield values. While the lower rate of copper (50 g/fed ) sprayed either at 60 and 90 or 75 and 105 day intervals resulted in disease reduction and increase in yield higher than those obtained with higher rate of copper (100 g/fed) . Accordingly, copper spray treatments at the rate of 50 g/fed could be more effective for controlling diseases and increase in yield more than higher copper rate treatment.

Manganese foliar spray treatment at the rate of 100 g/fed sprayed at 60 day after planting significantly reduced infection with downy mildew at level higher than the later spray applied at 75 day interval , and exhibited medium reduction in purple blotch and rust infection in addition to higher increase in garlic yield more than other manganese treatments therefore, the rate of 100 g/fed sprayed 60days after planting garlic could be recommended to control tested foliar disease and increase yield of garlic.

All iron spray treatments significantly reduced infection with downy mildew, purple blotch and rust diseases at different levels and highly increased garlic yield compared with control. The rate of 50 g/fed sprayed at 75 and 105 day interval was the most effective treatment, followed by the treatment of 100 g/fed sprayed only at 75 day interval after planting. Other treatments were slightly less effective. Accordingly, garlic foliar spray with ferrous at the rate of 50 g/fed applied at 75 and 105 day intervals after planting could be recommended for controlling tested diseases and to increase garlic yield.

Boron foliar spray treatments on garlic significantly reduced diseases infection and increased yield at different extents compared with control. The rate of 100 g/fed sprayed 75 days after planting garlic was the most effective treatment for controlling diseases and increase in yield. The treatment therefore could be recommended.

**Table (1): Effect of micro-element foliar spray on garlic foliar diseases during 2005/2006 growing seasons**

Elements	Sprays				% Disease infection			Yield in Kg / Plot
	Rate in g/fed	Count of sprays	Intervals by days after planting		Downy mildew	Purple blotch	Rust	
			1 st	2nd				
Zinc	100	1	60	-	50.9	6.7	2.4	8.8
	50	2	60	90	48.0	6.7	4.3	7.7
	100	1	75	-	50.0	4.6	13.4	7.0
	50	2	75	105	47.1	10.4	7.1	7.8
Copper	100	1	60	-	49.2	6.7	3.6	6.9
	50	2	60	90	49.2	6.3	4.4	7.5
	100	1	75	-	58.4	7.1	3.9	6.7
	50	2	75	105	44.6	8.0	7.4	8.2
Manganese	100	1	60	-	44.6	7.1	6.0	7.5
	50	2	60	90	55.8	5.9	3.7	6.7
	100	1	75	-	60.0	10.5	3.1	6.7
	50	2	75	105	48.4	4.2	5.0	7.1
Iron	100	1	60	-	46.3	5.9	3.5	7.5
	50	2	60	90	55.8	6.3	2.0	8.2
	100	1	75	-	44.2	3.4	7.5	7.3
	50	2	75	105	43.8	2.9	4.7	8.1
Boron	100	1	60	-	48.3	11.7	4.1	7.3
	50	2	60	90	58.0	5.5	2.3	7.1
	100	1	75	-	51.7	4.2	2.3	7.3
	50	2	75	105	55.0	5.4	6.2	7.1
Control	-	-	-	-	66.7	24.6	14.2	5.4
LSD at 0.05					7.3	2.7	2.9	1.6

Spray treatment with micro-elements on garlic was repeated in next 2006-2007 winter seasons also performed significant differences in diseases incidence and garlic yield (Table, 2). Zinc treatment at the rate of 100 g/fed highly reduced diseases infection and increased garlic yield more than other Zinc treatment, which were less effective compared with untreated control. Copper at the rate of 100 g/fed and 75 day spray interval and also the rate of 50 g/fed and 60 day followed by 90 day spray intervals were more effective in disease reductions and increase in yield than other copper treatments. Manganese at the rate of 100 g/fed sprayed 60 days after planting was more effective for disease control and increase in yield than other element treatments. Ferrous foliar spray treatments significantly increased yield and reduced disease infections except rust at the rate of 100 and 50 g/fed treatments sprayed at only 75 and also 75 followed by 105 day intervals, which were insignificant. However the rate of 100 g/fed sprayed 60 days after planting effectively reduced disease and increased yield more than other ferrous treatments tested.

**Table (2): Effect of micro -element foliar spray on garlic foliar diseases during 2006/2007 growing seasons.**

Elements	Sprays				% Disease infection			Yield in Km / Plot
	Rate g/fed	Count of sprays	Intervals by days after planting		Downy mildew	Purple blotch	Rust	
			1 st	2nd				
Zinc	100	1	60	-	38.4	7.5	1.5	7.8
	50	2	60	90	45.4	8.0	6.2	7.4
	100	1	75	-	36.3	9.2	4.8	7.0
	50	2	75	105	54.2	13.8	2.5	6.6
Copper	100	1	60	-	30.0	10.9	3.6	7.0
	50	2	60	90	38.0	10.0	4.9	9.0
	100	1	75	-	39.2	7.5	3.2	7.0
	50	2	75	105	51.7	11.7	9.9	9.2
Manganese	100	1	60	-	30.0	6.3	6.4	8.2
	50	2	60	90	40.0	8.4	6.7	5.2
	100	1	75	-	44.2	8.0	4.5	7.4
	50	2	75	105	59.2	10.9	8.8	7.2
Iron	100	1	60	-	37.1	5.4	3.5	8.0
	50	2	60	90	41.7	7.1	4.4	6.8
	100	1	75	-	42.9	7.5	6.9	7.4
	50	2	75	105	53.8	7.5	7.1	6.8
Boron	100	1	60	-	34.2	7.5	2.7	7.2
	50	2	60	90	41.7	7.9	4.9	6.6
	100	1	75	-	35.4	7.1	6.9	7.4
	50	2	75	105	51.3	8.4	6.1	7.2
Control	-	-	-	-	63.8	15.0	13.2	4.8
LSD at 0.05					13.3	2.9	3.4	1.6

Boron foliar spray treatments significantly increased yield and decreased percentage of diseases incidence compared with control except rust at 100 g/fed sprayed at 75 day interval after planting. The most effective boron treatment was 100 g/fed sprayed at 60 day interval which highly reduced diseases and significantly increased yield but at rate less than that obtained with Zinc, copper, manganese and ferrous

Same 2005-2006 trial treatments were greatly reduced most of tested diseases and highly increased yield compared with control, but exhibited levels of disease reductions and yield less than those obtained at next 2006-2007 planting season such as 50 g/fed Zinc treatment sprayed at 60 and 90 day interval, and copper at the rate of 50 g/fed sprayed at 75 and 105 day interval after planting, in addition to other 3 ferrous and 2 boron treatments. While some other treatments on contrast, performed low levels of disease control and yield in the first planting season (2005-2006) but their efficacy reversed in 2006-2007 season, such as copper at the rate of 100 g/fed with 60 day spray interval and also manganese with the rate of 100 g/fed at 75 day spray interval. Therefore, micro-element treatments displayed stability in the highest levels of disease reductions and increase in garlic yield during the two successive planting seasons can be categorized as the most effective treatments. Accordingly, one foliar spray with Zinc; manganese, boron and iron at the rate of 100 g/fed once sprayed 60 days after as well as copper at the rate of 50 g/fed sprayed at 60 and 90 day intervals after planting could be recommended to control downy mildew, purple blotch and rust diseases of garlic and subsequently to increase yield.

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### خفض الإصابة بأمراض المجموع الخضري للثوم بالرش بمحاليل العناصر المغذية الصغرى

عبد الله ابراهيم الشهابي ، محمد صديق الاشعل و ميشيل فؤاد ابراهيم تادروس .  
معهد بحوث أمراض النباتات - مركز البحوث الزراعية - الجيزة.

أدى الرش بالعناصر الصغرى زنك ، نحاس ، منجنيز ، حديد والبورون على المجموع الخضري للثوم الصيني والمنزوع في حقل قها قليوبية في موسمى ٢٠٠٥ / ٢٠٠٦ ، ٢٠٠٦ / ٢٠٠٧ الى انخفاض معنوى فى الإصابة بأمراض البياض الزغبي ، اللطعة الارجوانية ، الصدأ التى تصيب المجموع الخضري للثوم.

وكان أعلى انخفاض فى نسبة الإصابة بهذه الامراض مع أعلى زيادة فى المحصول بصفة عامة عند رش النباتات مرة واحدة بمعدل ١٠٠ جم/ فدان بعد ٦٠ يوم من الزراعة لكل من الزنك ، والمنجنيز ، الحديد والبورون أما النحاس فقد كان لكفا المعاملات هي عند تركيز ٥٠ جم/ فدان ترش مرتين عند ٦٠ ثم ٩٠ يوم بعد الزراعة .

وقد وجد أن متوسط الانخفاض فى الإصابة المرضية مع هذه المعاملات كان ٣٦,٣% ، ٦٠% ، ٦٥,٥% لكل من البياض الزغبي ، اللطعة الارجوانية ، الصدأ على التوالي . وكان متوسط الزيادة فى المحصول لهذه المعاملات ٥٥% .