

EVALUATION OF FUNGICIDES FOR CONTROLLING DOWNY MILDEW AND PURPLE BLOTCH DISEASES OF ONION

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Abstract

Efficacy of 10 fungicides was tested for controlling downy mildew caused by *Peronospora destructor* (Berk.) and purple blotch caused by *Alternaria porri* (Ellis) on onion. Seed onion trials were carried out at Kaha, Sids and Mallaay Experiment Stations from 1987 through 1989. Trials of bulb onion were done at Sakha and Mallaay Exp. Sta. from 1988 through 1990. Reduction in disease incidence and increase in seed and bulb yield over non-treated control were used to determine the efficacy of fungicides tested. All fungicides were foliar sprayed at the rate of 250 g / 100 L except Sandofan M8 (200 g/100 L) and Galben Mancozeb and Galben Copper (150 g/100 L). Fungicide sprays were started 45 days after planting and repeated every 15 days till harvesting.

Ridomil Mz 72% (metalaxyl 8% + mancozeb 64%) and Ridomil Mz 58 (metalaxyl 10% + mancozeb 48%) were the most effective fungicides reducing disease on seed and bulb onions by 86%, and increasing seed and bulb yield over control by 194% and 199%, respectively.

Sandofan M8 (oxadixyl 8% + mancozeb 56%) was also effective against these pathogens giving 76% and 79% reduction in disease severity on seed and bulb onions, respectively, and 137% increase in seed and bulb yields over control. Ripost M 67.2% (Oxadixyl 8% + mancozeb 56% + cymoxanil 3.2%). Galben Mancozeb 58% (benalaxyl 10% + mancozeb 48%) and Sandocur C (oxadixyl 6.9% + mancozeb 48% + cymoxanil 14.2%) exhibited 64-73% reduction in disease incidence and resulted in 82-111% increase in seed and bulb yield, except Ripost M 67.2% with seed onion which increased seed yield by 139% over non-treated control. Comaprop 50% (zineb 10 % + propineb 10% + copper oxychloride 30%), Comazin 50% (zineb 10 % + maneb 10% + copper oxychloride 30%), Galben Copper 46% (benalaxyl 11% + copper oxychloride 35%) and Mikal M 70% (Phosetyl - Al 44% + mancozeb 26%) were less effective and reduced disease by 47-58% on seed and bulb onions with up to 81% increase in yield over control.

INTRODUCTION

Infection of onion by downy mildew caused by *Peronospora destructor* (Berk), and purple blotch caused by *Alternaria porri* (Ellis) causes a great damage to onion foliage and stalks. Plants with severe and early infection may not produce seeds due to dryness and subsequent breakage of stalks before seed maturity. The infection also reduces yield of bulb onions. Biocontrol of *A. porri* was tried by spraying foliage with *Cladosporium herbarum* and *Penicillium* sp., which showed 66% and 54% reduction in disease incidence, respectively (Tyagi *et al.* 1990). However, fungicides are still the most effective tool for controlling foliar diseases of onion (Georgy *et al.* 1983, Rochecouste 1984, Ramos *et al.* 1984, Mir *et al.* 1989, and Tahir *et al.* 1990 and 1991).

The present research was carried out to evaluate the efficacy of 10 fungicides for controlling downy mildew and purple blotch diseases on seed and bulb onions at different locations in Egypt.

MATERIALS AND METHODS

The efficacy of 10 fungicides on controlling downy mildew and purple blotch diseases of onion was tested on seed onions during 1987-1989 at Kaha, Sids and Mallawy Research Stations. These fungicides were also evaluated on bulb onions during 1988-1990 seasons at Sakha and Mallawy Res. Sta. Foliar spray with fungicide suspensions in water started 45 days after planting onion bulbs and transplants at the rates shown in Tables 1-4. Treatments were repeated every 15 days and terminated 6 weeks before harvesting. Onion cultivar Giza - 6 was planted at Sids and Mallawy. The cultivar Giza - 20 was planted at Kaha and Sakha. Plots were 10.5 square meters and treatments were replicated four times. Experiments were arranged in complete randomized blocks. Infection on fifty random leaves or stalks in each plot was determined using a scale from zero to eight. Then, an average was calculated in percentage to give the disease severity of the plot where each unit was equal to 12.5%. Weights of bulbs and seeds of each plot were recorded at harvest. Data on infection and yield of each location were statistically analyzed and means were compared using LSD. Efficacy of fungicides and percentage of increase in yield

were determined according to the following equations : Efficacy of fungicide = $\frac{(\text{infection in non-treated plots} - \text{infection in fungicide treated plots})}{\text{infection in non-treated plots}} \times 100$; Percentage of increase in yield = $\frac{(\text{yield in fungicide treated plots} - \text{yield in non-treated plots})}{\text{yield in non-treated plots}} \times 100$.

Fungicides tested were : Ridomil Mz 58% (metalaxyl 10% + mancozeb 48%), Ridomil Mz 72% (metalaxyl 8 % + mancozeb 64%), Sandofan M8 (oxadixyl 8% + mancozeb 56%), Ripost M 67.2% (oxadixyl 8% + mancozeb 56% + cymoxanil 3.2%), Sandocur C 69.1% (oxadixyl 6.9 + mancozeb 48% + cymoxanil 14.2%), Galben Copper 46% (benalaxyl 11% + copper oxychloride 35%), Galben Mancozeb 58% (benalaxyl 10% + mancozeb 48%), Comaprop 50% (zineb 10% + propineb 10% + copper oxychloride 30%), Comazin 50% (zineb 10% + maneb 10% + copper oxychloride 30%), and Mikal M 70 % (Phosetyl - Al 44% + mancozeb 26%).

Ripost 67.2, Sandocur C 69.1%, compaprop 50% and comazin 50% were not tested on seed onion in 1987-1988 growing season at Sids or Mallawy.

RESULTS

Efficacy of fungicides tested for controlling downy mildew and purple blotch on onion plants grown for seed production varied greatly at all locations, except Kaha in 1987 - 1988, where differences in disease reduction between fungicides were not significant and Galben Copper was not significantly effective (Table 1). Ridomil Mz 72%, Rodomil Mz 58% and Sandofan M8 were the most effective fungicides exhibiting 86.05% , 85.68% and 76.68% reduction in disease incidence, respectively. Sandofan M8 was less effective than Ridomil, only at Mallawy in 1988-1989. Ripost M 67.2%, Galben Mancozeb 58% and Sandocur C 69.1% showed variable effect in disease reduction, particularly at Kaha and Sids in 1988-1989, resulting in 73-64 reduction efficacy. Mikal M, Comaprop 50%, Comazin 50%, and Galben Copper 46% were less effective in controlling these diseases showing only 56-49 % efficacy.

Yield of onion seed significantly increased with most fungicides (Table 2). Ridomil Mz 72% and Ridomil 58% resulted in the highest seed yield, showing 198.89% and 193.72% increase in yield, over non-treated. Sandocur C 69.1% and Sandofan

M8 showed 138.9% and 137.4% increase in seed yield over control. Therefore, Sandofan M8 and Sandocur were not as effective as the Ridomil group. Galben Mancozeb 58% and Ripost M generally showed 111.5% and 94.85% increase in seed yield. Mikal M 70%, Comazin 50%, Comaprop 50% and Galben Copper 46% were less effective.

Infection with *Peronospora destructor* (Bark) and *Alternaria porri* (Ellis) on bulb onion crops was greatly reduced with these fungicides (Table 3). Ridomil Mz 72% and Sandofan M8 resulted in the highest reduction in disease severity exhibiting 86.25%, 85.78% and 79.44% efficacy, respectively. Ripost M 67.2% showed 67.77% efficacy. Less reduction in disease severity was obtained with Galben Mancozeb 58%, Galben Copper 46%, Sandocur C 69.1% and Comaprop 50% which showed efficacy ranging between 54.68% and 59.62%. Mikal M 70% and Comazin 50% were the least effective fungicides tested on bulb onion showing 47.14% reduction in disease severity, respectively.

Yield of bulb onion was increased with the fungicide treatment (Table 4). Ridomil Mz 58% and Ridomil Mz 72% increased bulb yield by 222.12% and 215.83%, respectively, followed by Sandofan M8 which resulted in 148.59% increase. Galben Mancozeb 58% increased bulb yield and was significantly less than Sandofan M8 at Mallawy (Table 4). Ripost M 67.2% did not increase bulb yield at Sakha, while Galben Copper 50% was not effective at Sakha in 1988-1989 season only. Ripost M 67.2%, Galben Copper 50% and Mikal M 70% showed a little increase in bulb yield (82.21 - 80.91% over control). Comazin 50%, Comaprop 50% and Sandocur C 69.1% resulted in the lowest increase in bulb yield at 71.74%, 55.31%, 49.45, respectively over control.

DISCUSSION

Efficacy of fungicides was tested for controlling downy mildew and purple blotch diseases of onions throughout two successive years under field conditions. Ridomil Mz 58% (metalaxyl 10% + mancozeb 48%) and Ridomil Mz 72% (metalaxyl 8% + mancozeb 64%) followed by Sandofan M8 (oxadixyl 8% + mancozeb 56%) were the most effective fungicides tested. These results were in agreement with other investigators who recommended Metalaxyl and Mancozeb to control these diseases on onions (Geogy *et al.* 1984, Mir *et al.* 1987, Tahir *et al.* 1990 and 1991 and Mishra *et al.* 1989). Metalaxyl and Mancozeb (Ridomil Mz) also controlled downy mildew and purple blotch diseases on garlic in addition to rust caused by *Puccinia*

allii (Rochecouste 1984).

Ridomil Mz 58% was recommended in Egypt some years ago to control these diseases on onion, and was re-tested during this work. The change in proportion of Metalaxyl and Mancozeb to produce Ridomil Mz 72%, did not control these diseases or increase yield more than that obtained with Ridomil Mz 58%.

Formula of Ripost M exceeded cymoxanil than Sandofan M8. Nevertheless, less reduction in disease incidence was obtained with Ripost M, in addition to marked decrease in yield compared with Sandofan M8. The change of amounts of ingredients in the fungicide Sandocur C 69.1% raised seed yield to the same level obtained with Sandofan M8. However, Sandocur C did not increase bulb yield or reduce disease severity on bulb onion compared with Sandofan M8. This may show that introducing cymoxanil to the formula of Sandofan M8 was not effective against these diseases.

Galben Mancozeb showed better reduction in disease severity than Galben Copper and showed a marked increase in seed and bulb yield. Therefore, Mancozeb was more effective for controlling these diseases than copper oxychloride. However, Mancozeb with phosetyl-Al in the fungicide Mikal M 70% showed about half the effectiveness and 1/3 of the yield increase was obtained with Ridomil fungicides (Metalaxyl + mancozeb). This may be that the efficacy of any of these fungicides depends on the other chemical combined with Mancozeb in fungicide formula. Subsequently, metalaxyl and oxadixyl were more effective than benalaxyl and phosetyl-Al. However, metalaxyl and oxadixyl should be used carefully on onion to avoid the possibility of the build-up of metalaxyl and oxadixyl resistant strains which were reported with some Oomycetes pathogens such as *Phytophthora* on avocado which showed cross-tolerance to benalaxyl and oxadixyl (Joseph and Coffey 1984), *P.citrophthora* on citrus (Serrhini *et al.* 1985), *P.infestans* on tomato (Samoucha *et al.* 1987) and on potato (Kadish and Cohen 1992), *P.cactorum* on apple (Utkhede and Gupta 1988) and *Plasmopara viticola* on grapevine (Leraux and Clerjean 1985).

Therefore, use of metalaxyl (Ridomil Mz 58% and Ridomil Mz 72%) and oxadixyl (Sandofan M8) are recommended to control downy mildew and purple blotch diseases on onion as well as to increase seed bulb yield. However, study of the use of these chemicals in alternation with different chemical groups such as phostyl-Al would be one of the means to avoid or delay the buildup of metalaxyl - oxadixyl resistant strains on onion, if found.

Table 1 . Effect of fungicide foliar spray on infection with downy mildew and purple blotch diseases of seed onion.

Fungicides	Rates used g / 100 L	percentage of infection						Mean infection	Efficacy of fungicid
		1986 - 1988			1988 - 1989				
		Kaha	Sids	Mallawy	Kaha	Sids	Mallawy		
Ridomil Mz 72 % wp	250	3.17	12.5	12.5	7.81	5.0	5.82	7.8	86.05
Ridomil Mz 58 % wp	250	4.66	15.0	13.75	3.90	7.5	7.91	8.01	85.68
Sandofan M8 wp	200	6.55	18.75	16.25	5.15	12.0	19.56	13.04	76.68
Ripost M 67.2 % wp	250	6.63	*		8.43	32.0	12.5	14.89	73.38
Galben Mancozeb 58% wp	150	6.68	22.5	18.75	9.06	35.0	11.66	17.27	68.12
Sandocur C 69.1% Wp	250	6.43			38.90	18.75	15.0	19.77	64.65
Mikal M 70 % wp	250	12.95	28.75	30.0	37.03	22.5	15.82	24.50	56.20
Comparop 50 % wp	250	6.14			48.28	30.0	17.5	25.48	54.45
Comazin 50 % wp	250	11.45			53.12	26.25	15.82	26.66	52.34
Galben Copper 46 % wp	150	13.90	35.0	37.5	47.62	23.75	11.25	28.17	49.64
Control	0.0	13.58	90.0	80.	63.35	65.0	23.75	55.94	0.0
L.S.D. (P = 0.05)		5.81	5.87	4.96	15.85	7.24	2.24		

* not tested

Table 2 . Effect of fungicide foliar spray on yield of onion seeds.

Fungicides	Rates used g / 100 L	Seed yield by g per 3 x 3.5 m plot						Mean of seed yield	Percentage of increase in seed yield over control
		1986 - 1988			1988 - 1989				
		Kaha	Sids	Mallawy	Kaha	Sids	Mallawy		
Ridomil Mz 72 % wp	250	1286	748	1437.5	921.2	890	470	1003.79	198.89
Ridomil Mz 58 % wp	250	1231	650	1430	1040	820	747.5	986.41	193.72
Sandofan M8 wp	200	1038.75	575	987.5	790	750	642.5	797.29	137.40
Ripost M 67.2 % wp	250	1185.	*		237.5	320	875	654.37	94.85
Galben Mancozeb 58% wp	150	1021.25	493	880	635	670	562.5	710.29	111.5
Sandocur C 69.1% Wp	250	1095		1248	1002.5	832.5	280.	802.5	138.96
Mikal M 70 % wp	250	657.5	455	885	460.25	470	403.75	555.25	63.33
Comparop 50 % wp	250	651.25		893	131.5	333	950.	516.37	53.75
Comazin 50 % wp	250	701.25		921	220	345	880	536.56	59.77
Galben Copper 46 % wp	150	763.75	412	1020	166.25	280	342.5	497.41	48.11
Control *	0.0	630	150	825	143.75	120	146.25	335.83	00.00
L.S.D. (P = 0.05)		223.09	250	99.46	170.9	59.50	28.36		

* not tested

Table 3 . Effect of fungicide foliar spray on infection of bulb onion with downy mildew and purple blotch diseases

Fungicides	Rates used g / 100 L	Seed yield by g per 3 x 3.5 m plot				Mean of infection	Efficacy of fungicide %
		1988 - 1989		1989 - 1990			
		Sids	Mallawy	Sids	Mallawy		
Ridomil Mz 72 % wp	250	4.68	6.61	12.5	9.0	8.19	86.25
Ridomil Mz 58 % wp	250	6.56	6.83	8.75	11.75	8.47	85.78
Sandofan M8 wp	200	9.37	9.86	13.75	16.0	12.24	79.44
Ripost M 67.2 % wp	250	9.06	15.48	32.50	19.75	19.19	67.77
Galben Mancozeb 58% wp	150	30.62	19.11	18.75	27.75	24.05	59.62
Sandocur C 69.1% Wp	150	10.73	20.13	25.75	43.25	24.96	58.09
Mikal M 70 % wp	250	8.43	20.57	37.50	35.50	25.5	57.20
Comparop 50 % wp	250	15.0	21.78	30.	41.25	27.00	54.68
Comazin 50 % wp	250	40.93	25.36	28.75	30.75	31.44	47.23
Galben Copper 46 % wp	250	29.06	25.40	25.0	46.50	31.49	47.14
Control		56.25	34.85	60.0	87.25	59.58	
L.S.D. (P = 0.05)		7.95	5.21	6.26	12.87		

Table 4 . Yield of bulb onion as affected by fungicide foliar treatments.

Fungicides	Rates used g / 100 L	Yield (Kg / 3. x 3.5 m plot)				Mean of bulb infection	Percentage of increase in bulb yield over control
		1988 - 1989		1989 - 1990			
		Sids	Mallawy	Sids	Mallawy		
Ridomil Mz 72 % wp	250	9.9	15.4	18.0	16.12	14.85	222.12
Ridomil Mz 58 % wp	250	8.73	15.15	19.0	15.37	14.56	215.83
Sandofan M8 wp	200	8.37	12.40	12.0	13.10	11.46	148.59
Ripost M 67.2 % wp	250	7.0	9.10	7.0	10.50	8.4	82.21
Galben Mancozeb 58% wp	150	8.28	10.20	11.0	8.25	9.43	104.55
Sandocur C 69.1% Wp	150	6.85	9.10	8.15	9.37	8.36	81.34
Mikal M 70 % wp	250	7.12	7.45	6.25	6.75	6.89	49.45
Comparop 50 % wp	250	7.17	7.75	7.75	6.0	7.16	55.31
Comazin 50 % wp	250	8.37	9.0	8.25	7.75	8.34	80.91
Galben Copper 46 % wp	250	8.5	8.55	9.5	5.12	7.91	71.74
Control		6.32	5.0	3.75	3.37	4.61	00.00
L.S.D. (P = 0.05)		1.08	1.5	2.10	1.4		

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تقييم لبعض المبيدات الفطرية لمقاومة مرض البياض الزغبي واللطعة الارجوانية على البصل

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تم تقييم كفاءة عشرة مبيدات لمقاومة مرض البياض الزغبي واللطعة الارجوانية على البصل. وقد نفذت التجارب على البصل المعد لانتاج البذرة فى المحطات البحثية بقها، ملوى فى المواسم من ١٩٨٧ الى ١٩٨٩. بينما نفذت التجارب على محصول الابصال فى سخا وملوى فى المواسم من ١٩٨٨ الى ١٩٩٠. وقد قدرت كفاءة المبيدات بناء على قيمتى الانخفاض فى شدة الاصابة والزيادة فى المحصول الراجعتين لاستخدام المبيد. وكان المعدل المستخدم هو ٢٥٠ جرام - لكل ١٠٠ لتر باستثناء المبيدات ساندوفان م (٢٠٠ جرام / ١٠٠ لتر) وجالبين مانكوزيب وجالبين نحاس (١٥٠ جرام / ١٠٠ لتر). وقد بدأ الرش بعد ٤٥ يوم من الزراعه وتكرر كل خمسة عشر يوما ووقف ستة اسابيع من الحصاد.

وقد اتضح من النتائج ان مبيد الريدوميل م ز ٧٢٪ (ميتالاكسيل ٨٪ + مانكوزيب ٦٤٪) ومبيد ريدوميل م ز ٥٨٪ (ميتالاكسيل ١٠٪ + مانكوزيب ٤٨٪) كانا افضل المبيدات واعلاها كفاءة حيث انخفضت شدة الاصابة المرضية بمقدار ٨٦٪ وزاد محصولى البذرة والابصال بما مقداره ١٩٤٪. ١٩٩٪ على التوالى فوق المقارنة. وقد اظهرت مبيد ساندوفان م ٨ (اوكساديكسيل ٨٪ + مانكوزيب ٥٦٪) كفاءة ايضا فى مقاومة هذين المرضين حيث قلل من شدة الاصابة بنسبة ٧٦٪ على بصل انتاج البذرة و ٧٩٪ علي نباتات محصول الابصال بينما كانت الزيادة فى محصولى البذرة والابصال هى ١٣٧٪ فوق معاملة المقارنة. وقد اظهرت النتائج ايضا ان مبيد ريبوست م ٦٧,٢٪ (اوكساديكسيل ٨٪ + مانكوزيب ٥٦٪ + سيموكسانيل ٣,٢٪) ومبيو ساندوكور س ٦٩,١٪ (اوكساديكسيل ٦,٩٪ + مانكوزيب ٤٨٪ + سيموكسانيل ١٤,٢٪) اظهرت خفضا فى شدة الاصابة بنسبة ٦٤ - ٧٣٪، وزادت من محصولى البذرة والابصال بحوالى ٨٢ - ١١١٪ ولكن يستثنى من ذلك الريبوست م ٦٩,١٪ الذى زاد من محصولى البذرة بنسبة ١٣٩٪ فوق المقارنة اما المبيدات كومابروب ٥٠٪ (زينيب ١٠٪ + بروباينوب ١٠٪ + اوكسى كلوريد النحاس ٣٠٪) جالبين نحاس ٤٦٪ (بيتا لاكسيل ١١٪ + اوكسى كلوريد النحاس ٣٥٪) وميكا م ٧٠٪ (فوستيل الومنيوم ٤٤٪ + مانكوزيب ٢٦٪) فقد كانت اقل المبيدات المختبرة تأثيرا حيث انخفضت شدة الاصابة بنسبة ٤٧ - ٥٨٪ ولم تتجاوز الزيادة فى محصولى البذرة او الابصال ٨١٪ فوق معاملة المقارنة.