



EVALUATION OF DIFFERENT FUNGICIDES FOR THE MANAGEMENT OF DOWNY MILDEW (*PSEUDOPERONOSPORA CUBENSIS*) OF MUSKMELON

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ABSTRACT

Five fungicides namely, Ridomil Gold, Halonil, Alliet, Primacy and Cabrio top were used for the management of downy mildew on muskmelon during the years 2010 and 2011. All the fungicides proved effective against downy mildew. During 2010, Ridomil Gold gave 92.8% disease control, Alliet was at second place giving 91.70% disease control. Halonil, Cabrio top and Primacy gave 91.43%, 90.18% and 89.48% disease control respectively. Almost similar results were achieved during 2011, Ridomil was at top in reducing the disease severity and Cabrio top proved least effective.

Keywords: Fungicides, downy mildew, muskmelon.

INTRODUCTION

Muskmelon is an important crop of Pakistan. It is grown over an area of 48,214 thousand hectare with production of 710,326 thousand tons (Agricultural statistics of Pakistan, 2009-2010). Of all diseases, downy mildew (*Pseudoperonospora cubensis*) has been found to be most destructive, especially when there is more humidity during growing season. According to Rego (1995), wind, rain drops, and sprinkler irrigation are responsible for *P. cubensis* dissemination. Sporangia are driven far away by the wind. Under the Tocantins environmental conditions, the pathogen is challenging mainly in July, when the temperature falls from 35°C during the day to 25°C at night, and leaf wetting simultaneously takes place (Santos *et al.*, 2005). Disease plays an important role in reducing yield and quality of fruits, through destruction of leaves. The best strategy to combat a disease is to grow resistant varieties. In order to control a disease and help grower to save the crop, use of fungicides has been recommended in absence of resistant varieties.

Kuyucuklu and Ozer (1994) conducted an experiment to determine the efficacy of fungicides and concluded that Antracol 50 WP (propineb 70%), Polyram DF (metiram

complex 80%) and Curzeb 50 WP (mancozeb 45% + cymoxanil 5%) gave 61.8, 74.1 and 80.1% efficacy, respectively. Trajcevski conducted field study in the Republic of Macedonia, during 2004 and 2005, to evaluate the efficiency of fungicides for the protection of melon from the invasion of *P. cubensis*. Their results showed that the fungicide Aliette gave an index of efficiency of 87.64% in 2004 and 90.14% in 2005. The fungicide Ridomil Gold MZ 68 WP (mancozeb + metalaxyl) showed an index of 84.67% in 2004 and 86.36% in 2005. Fungicide Antracol combi (propineb) showed an index of efficiency of 81.19% in 2004 and 84.78% in 2005. Brunelli *et al.* (2008) conducted field trials in Italy, and various fungicides were evaluated against *P. cubensis* on melon directly sown in the field in the late season. The fungicides were applied weekly starting at the early growth stage. All the fungicides, including metalaxyl and fosetyl-aluminium [fosetyl] as controls, were generally effective. However, the greatest reduction in disease incidence was obtained with dimethomorph combined with copper or pyraclostrobin. Tarlazzi *et al.*, (2008) used Cabrio Duo fungicide composed of dimethomorph (72 g/litre) and pyraclostrobin (40 g/litre) were found effective against the causal agents of downy mildew of tomato.

Lazzari *et al.*, (2008) found that Fluopicolide provides excellent control against a range of oomycetes such as

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downy mildew in grapevine (*Plasmopara viticola*), late blight on potato, tomato and other solanaceous plants (*Phytophthora infestans*), as well as downy mildew on cucurbits (*Pseudoperonospora cubensis*) and lettuce (*Bremia lactucae*). Due to its mode of action, fluopicolide is effective on several stages of the fungal development cycle such as the release and the motility of zoospores, the germination of cysts as well as the growth of mycelium and sporulation. Field studies were conducted by Trajcevski (2008) in the Republic of Macedonia, during 2004 and 2005, to evaluate the efficiency of fungicides for the protection of melon from the invasion of *P. cubensis*. The results showed that the fungicide Aliette had an index of efficiency of 87.64% in 2004 and 90.14% in 2005. The fungicide Ridomil Gold MZ 68 WP (mancozeb + metalaxyl) showed an index of 84.67% in 2004 and 86.36% in 2005. Fungicide Antracol combi (propineb) showed an index of efficiency of 81.19% in 2004 and 84.78% in 2005. Gengotti *et al* (2006-08) conducted field trials to study the effect of fosetyl-aluminium, dimethomorph + pyraclostrobin, fenamidone + fosetyl-Al, cymoxanil + famoxadone, dimethomorph + copper oxychloride, iprovalicarb + copper oxychloride, azoxystrobin, propamocarb, cyazofamid, metalaxyl-M + copper oxychloride and propamocarb + fluopicolide on disease control. Evidence was obtained that fenamidone + fosetyl-Al, dimethomorph + copper oxychloride and cyazofamid gave the best disease control. Promising results were also obtained with propamocarb + fluopicolide and dimethomorph + pyraclostrobin. Fiori, and Peretto (2000) carried out field trials against *P. cubensis* and powdery mildew (*Sphaerotheca fuliginea/Erysiphe cichoracearum*) of melon. The strobirulin analogue azoxystrobin applied at different concentrations and times was compared with specific chemicals. Against downy mildew, azoxystrobin at 60 ml/hl applied every 10 days, and chlorothalonil + cymoxanil mixture showed

a comparable effectiveness. A lower protection was provided by azoxystrobin in different treatment schedules based on alternation of fungicides (azoxystrobin and chlorothalonil + cymoxanil + esaconazole). During a two-years of field trials against powdery mildew, azoxystrobin provided good control, while the reference penconazole gave unsatisfactory results.

MATERIALS AND METHODS

An experiment was conducted at research area of Plant Pathology Research Institute, Faisalabad during 2010 and repeated in 2011 at the same location. Experiments were sown in last week of February in randomized complete block design with three replications. Plot size was maintained at 8 × 8 ft², having two rows plot. The popular melon variety Ravi was sown during both years. Five fungicides namely, Ridomil gold, Halonil, Alliet, Primacy and Cabrio top were used for the management of downy mildew on muskmelon as treatments. Unsprayed plots served as control.

Collection of diseased samples: Leaves with typical symptoms of downy mildew were collected from the Vegetable Research Institute Faisalabad. The field samples were placed in plastic bags and stored in a cold container and transferred to the lower fungi laboratory, in Plant Pathology Research Institute, Faisalabad. The samples were then placed in moist conditions for sporulation in the dark at 14°C for 24 h.

Inoculum preparation: Sporangia were dislodged by spraying cool (4°C) purified water from the back of the infected leaves. The concentration of the sporangia was adjusted to 10⁵ sporangia ml⁻¹ and stored at 4°C before use. Diseases inoculum was sprayed on 29 March. First spray was done on 30 April. Second and third sprays were applied with 10 days interval. Disease data was taken 12 days after third spray. Disease intensity was recorded using the following scale (Sarwar & Aslam, 1968).

Table 1. Disease rating scale.

Rating scale	Symptoms
0.00	No symptoms visible
1.00	Only few leaves having 1-5 spots per plant
5.00	5-10 spots per plant
15.00	10-50 spots per plant
25.00	Nearly all leaves with lesions but plant still in normal form
50.00	Every plant effected, 1/2 of leaf area destroyed
75.00	Three quarters of leaf area destroyed
85.00	Little green area
100.00	No green area

RESULTS

All the fungicides used in this study proved effective in reducing the downy mildew disease during both years. During 2010 Alliet gave a mean value of disease severity of 3.83, thus reducing the disease percentage up to 91.70 over control. Ridomil Gold @ 2.5gm per litre of water gave 92.8% disease control and found the most

beneficial as compared to other fungicides but at par statistically. Halonil decrease the disease percentage up to 91.43%.

Cabriotop and Primacy remained at fourth and fifth place giving 90.18 and 89.48% disease control respectively. The results regarding the percentage decrease control over are shown in Figure No 1.

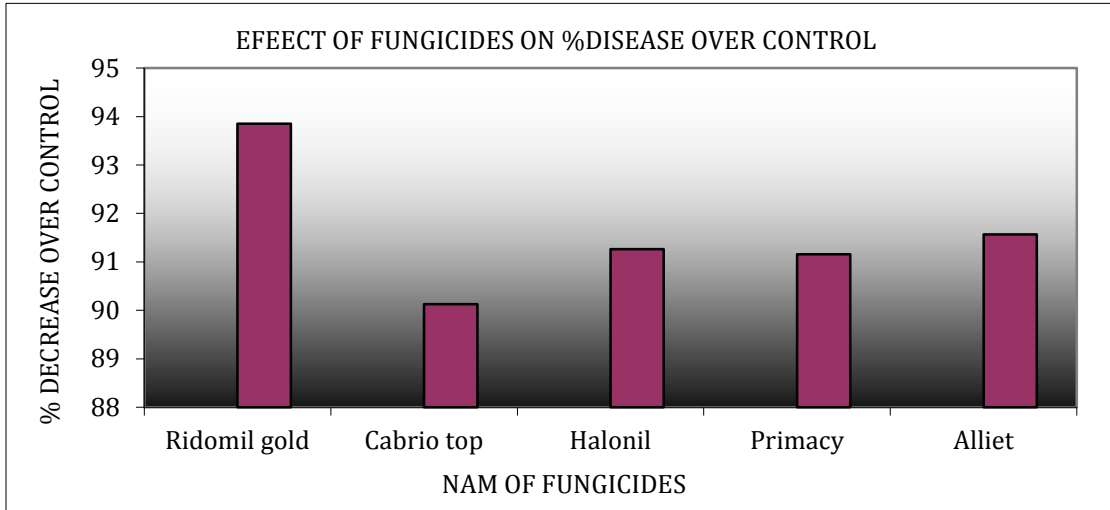


Figure 1. Effect of different fungicides on Downy Mildew incidence of muskmelon.

Results obtained during 2011 showed that Ridomil Gold gave excellent control of downy mildew reducing the disease incidence up to 93.85%.

severely up to 91.26%. Primacy and Cabrio top were at fourth and fifth place respectively giving 91.16 and 90.13% disease control as shown in Figure 2. Statistically all the fungicides were at par in reducing the disease severity.

Alliet proved second best giving 91.57% disease control. Halonil was at third place in reducing the disease

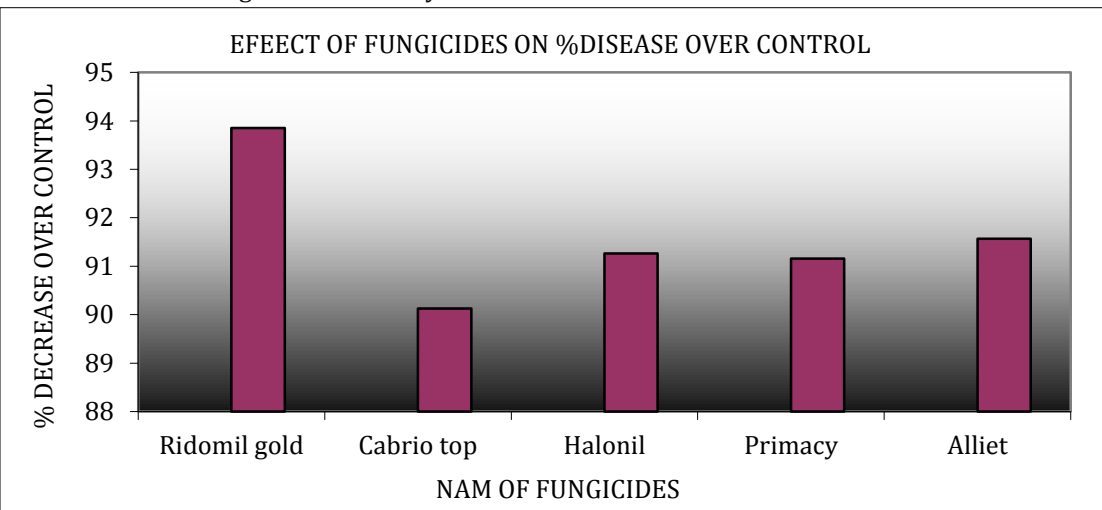


Figure 2. Effect of different fungicides on Downy Mildew incidence of muskmelon.

DISCUSSION

Our results support the findings of Kuyucuklu and Ozer (1994, they conducted an experiment to determine the efficacy of fungicides and concluded that Antracol 50 WP (propineb 70%), Polyram DF (metiram complex 80%)

and Curzeb 50 WP (mancozeb 45% + cymoxanil 5%) gave 61.8, 74.1 and 80.1% efficacy, respectively. Our results are also in line with the work done by Trajcevski. His research work results showed that the fungicide Alette Flash (fosetyl) gave an index of efficiency of

87.64% in 2004 and 90.14% in 2005. The fungicide Ridomil Gold MZ 68 WP (mancozeb + metalaxyl) showed an index of 84.67% in 2004 and 86.36% in 2005. Fungicide Antracol combi (propineb) showed an index of efficiency of 81.19% in 2004 and 84.78% in 2005. Our results also substantiate the findings of Tarlazzi *et al.*, (2008) who found that Cabrio Duo fungicide composed of dimethomorph (72 g/litre) and pyraclostrobin (40 g/litre) were effective against the causal agents of downy mildew of tomato (*Phytophthora infestans*) and several other vegetables (including *Pseudoperonospora cubensis* and *Bremia lactucae*). Trials carried out at rates

ranging from 2.0 to 2.5 litres/ha and with applications at 10-day intervals on potato, tomato, melon, cucumber, zucchini, onion and lettuce, showed its efficacy against downy mildew being equal or higher than that of the standards.

Treatments	Disease severity
1	3.357 B
2	4.587 B
3	4.003 B
4	4.910 B
5	3.830 B
6	46.597 A

Table 2. ANNOVA.

Source	DF	SS	MS	F	P
Replication	2	1.91	0.954	867.95	0.0000
Treatment	5	4511.55	902.310		
Error	10	10.40	1.040		
Total	17	4523.85			

CV = 9.09.

REFERENCES

- A. M. Rego. 1995. Doenças causadas por fungus cucurbitaceas. *Informe Agropecuário* 17: 48-54.
- Brunelli, P. Gianati, I. Portillo, G. Sedda and P. Flori. 2008. Field control trials against cucurbits downy mildew (*Pseudoperonospora cubensis*) on melon. *Giornate Fitopatologiche*, Volume 2.; 467-472.
- Agricultural Statistics of Pakistan, 2009-2010.
- G. R. Santos. A. C café-filho, L. M. F saboya. 2005. Controle químico do cretamento gomoso do caule na cultura da melancia. *Fitopatologia Brasileira* 30: 155-163.
- K. Kuyucuklu and N. Ozer. 1994. A research on downy mildew disease on melons in Corlu District and its surroundings. *Journal of Tekirdag Agricultural Faculty*. 1994; 3(1/2): 27-34.
- M. Sarwar and M. Aslam. 1968. Control of downy mildew of muskmelon. *Tech. Bull. No. 26*, Dept. Agri., Govt. West Pakistan. pp:1-6.
- M. Fiori and R. Peretto. 2000. Field trials to control cucurbit downy mildew and powdery mildew on melon in Sardinia. *Informatore-Fitopatologico*. 50(6): 21-25.
- S. Tarlazzi, A. Marchi and M. Manaresi. 2008. Cabrio Duo: a new formulation of dimethomorph and pyraclostrobin effective against the late blight of tomato and downy mildew of vegetable crops. *Giornate Fitopatologiche* 2008, Cervia RA, 12 14 marzo 2008, Volume 2. ; 149-153.
- S. Gengotti, C. Sbrighi and L. Antoniaci. 2009. New fungicides to control downy mildew on melon. *Informatore-Agrario*. 65(21): 50-52.
- T. Trajcevski. 2008. *Pseudoperonospora cubensis* (Berk. and Curt.) Rostov. on melon and efficiency of chemical protection. *Glasnik Zastite Bilja*. 2008; 31(3): 55-60.
- V. Lazzari, G. Arcangeli, A. Gualco, S. Lazzati, J. Meyer and A. Cantoni. 2008. Fluopicolide: A new effective active ingredient against oomycetes in grapes and vegetables. *Giornate Fitopatologiche*, Cervia RA, 12 14 marzo 2008, Volume 2. ; 135-140.