Official publication of Pakistan Phytopathological Society
Pakistan Journal of Phytopathology
ISSN: 1019-763X (Print), 2305-0284 (Online)
http://www.pakps.com

EFFECTIVENESS OF NEW FUNGICIDES AGAINST CUCUMBER DOWNY MILDEW UNDER TUNNEL CONDITIONS

[a]Muhammad Nasir*, [a]Babar Iqbal, [b]Muhammad Sajjad, [c]Muhammad Idrees, [a]Ghulam Mohy-Ud-Dina, [d]Iqra, [d]Waqas A. Khan, [e]Abdul Hannan

[a] *Plant Pathology Research Institute, AARI, Faisalabad, Pakistan.*
[b] *Regional Agricultural Research Institute, AARI, Bahawalpur, Pakistan.*
[c] *Vegetable Section, Horticultural Research Institute, NARC, Islamabad, Pakistan.*
[d] *Department Plant Pathology, University of Agriculture, Faisalabad, Pakistan.*
[e] *Department of Botany, Ghazi University, Dera Ghazi Khan, Pakistan.*

A B S T R A C T

Cucumber belongs to gourd family (*Cucurbitaceae*). It is cultivated throughout the world due to its high nutritional value. The crop has to face biotic and abiotic challenges that lower its yield annually. Among these downy mildew of cucumber caused by *Pseudoperenospora cubensis* is the most devastating. It causes 40% loss worldwide. So the present study was conducted for the management of the downy mildew of cucumber through fungicide under tunnal condition. For this purpose, cucumber variety, "Chairman" was grown at Hafiz Tunnel Farm, Gutwala, Faisalabad under RCBD design during 2012 and 2013. Chemicals were applied in five treatments. So, Champion 77 % WP (copper hydroxide) @ 5.00 gm, Champion 77 % WP (copper hydroxide) 2.00 gm, Cabriotop 60% WDG (pyraclostobin+matiram) @ 4.00 gm; Score 25 % EC (difenoconazole) @ 2.00 ml and Ridomil gold 68 WP (metalaxyl + mancozeb) @ 2.50 gm/liter water were sprayed seven to eight times according to disease prevailing conditions. Result showed that among all treatments, Ridomil gold 68 WP gave excellent control (88.56%) in which minimum disease incidence (7.33)% was recorded as compared to control (66.90%). Champion 77 % WP significantly reduced the disease at all concentrations. It reduced 86.95% disease @ 5.00 gm/lit water and 81.9% at 2.00 gm per liter water. Cabriotop 60% WDG reduced the disease level upto 9.71 with disease decrease percentage of 84.90 whereas Score 25% EC gave 80.91% control (disease incidence 12.14). All treatments significantly controlled the disease as compared to untreated control. Data was also recorded for the yield assessment of cucumber in response to application of fungicide. So, It is concluded that use of fungicides is compulsory in reducing the disease incidence and improving the crop yield.

Keywords: Cucumber, Downy mildew, *Pseudoperenospora cubensis*, Fungicide.

INTRODUCTION

Cucumber *(Cucumis sativus*) belongs to gourd family (Cucurbitaceae) and its genus is Cucumis. It is cultivated throughout the world due to its anti-oxidant and anti-inflammatory property. In Pakistan it is cultivated extensively in open fields as well as in high plastic tunnels. The fruit contains vitamins B and C (Bloach, 1994). Several diseases attack cucumber crop in field as well as in tunnels. Among these, downy mildew of cucumber caused by *Pseudoperenospora cubensis* is most devastating one (Wehner and Shetty, 1997) and causes 40% loss in yield (Colucci *et al.,* 2006).

Symptoms first appear as angular lesions on the older leave, after that these lesions/spots enlarges in size, turn into yellow colour and cover large areas of the leaves. Finally these spots become necrotic brown. The ventral side of the leaves also covers with light purple mycelium, bearing large lemon shaped sporangia. The pathogen also lessened the flower and fruit set by killing the foliage of the plant. The ideal temperature for sporulation and subsequent infection is 15°C (Shetty *et al.,* 2002).

Several management strategies are available against this disease like cultural technique, biological control, use of resistant cultivars, crop rotation and chemical control.

* Corresponding Author:
Email: dratiq1@yahoo.com
© 2015 Pak. J. Phytopathol. All rights reserved.

Resistant cultivars are the most effective strategy for controlling the downy mildew disease of cucumber but new races of the pathogen overcome resistance genes in currently grown cultivars. For effective management, fungicides must be used in combination with resistant cultivars. So the present study was planned to evaluate the effectiveness of new fungicides available in the market against cucumber downy mildew disease under tunnel conditions.

MATERIALS AND METHODS

Experiment was conducted at Hafiz Tunnel Farm, Gut wala Faisalabad during Rabi season from 2011-2012 and 2012-2013. For evaluation of fungicide, Cucumber variety "chairman" was grown under Randomized complete block (RCBD) design. Plot size was kept 220 x 2 ft^2 for each treatment with randomly tagging of seven plants/replication. Five chemicals (Champion 77 % WP (copper hydroxide) @ 5.00 gm, Champion 77 % WP (copper hydroxide) 2.00 gm, Cabriotop 60% WDG (pyraclostobin+matiram) @ 4.00 gm; Score 25 % EC (difenoconazole) @ 2.00 ml and Ridomil gold 68 WP (metalaxyl + mancozeb) @ 2.50 gm/liter water) were applied with un-treated control. The crop was carefully observed on weekly basis to monitor the disease attack. All the treatments were applied just after the appearance of disease. For validation of result the experiment was conducted for two years. During first year seven sprays of each treatment were carried out where as during second year trial eight sprays were applied up-to the maturity of the crop. Data on disease incidence was recorded before each treatment until completion of all sprays. For yield assessment, data based on number and weight of plant was also recorded. The data was statistically analyzed according to Steel *et al*., 1997. Since the mean differences for both years treatment was non-significant. So, the data was pooled for both years and subjected to analysis of variance. All other agronomic practices for the experimental units were kept uniform.

Pathogen was recognized for confirmation of disease. For this purpose cucumber plants infected with *Pseudoperenospora cubensis* were collected and critically examined under 20 X hand lens. After collection, samples were first washed with distilled water and then surface sterilized with Clorox 1%. Small pieces of diseased plant tissues were teased out and stained. Pathogen was identified microscopically in an Olympus Microscope Model BX50F-3 with ocular lens of 10 X and objective lens of 100 X (Total magnification of 1000 X). Diseased samples were studied by the methods as described by Bisby (1952), Barnett and Barry (1972) and Aileen (2006).

Table 1. List of chemicals with active ingredients used against downy mildew disease of cucumber.

Treatment	Formulation	Active ingredient	Conc./liter of water	Source
T1	Champion 77 % WP	Copper hydroxide	5.00 gm	Jafar Brothers Pakistan Pvt Ltd.
T2	Champion 77 % WP	Copper hydroxide	2.00gm	Jafar Brothers Pak. Pvt Ltd.
T3	Cabriotop 60% WDG	Metiram +Pyraclostrobin	4.00 gm	FMC, Pakistan Ltd.
T4	Score 25 % EC	Difenoconazole	2.00 ml	Syngenta, Pakistan Pvt Ltd.
T5	Ridomil gold 68 WP	Metalaxyl + Mancozeb	2.50gm	Syngenta, Pakistan Pvt Ltd.
T6	Untreated Control	-	-	-

RESULTS AND DISCUSSION

Effectiveness of fungicides against downy mildew disease of cucumber: All the fungicides expressed significant results as compared to untreated control. Among all treatments, Ridomil gold (68WP) gave excellent control (88.56%) with minimum disease incidence (7.33%) as compared to control (66.90). Ridomil was effective when used @ 0.1% and applied 3 to 4 times fortnightly as compared to the untreated control treatment. (Boyadzhiev *et al*., 1983). Champion 77 % WP when used @ 5.00 gm/lit. water gave 86.95% disease control with disease incidence of 8.19 and when this fungicide was sprayed at 2.00 gm per liter water, gave disease reduction up to 81.82% with incidence of 12.10. Cabriotop 60% WDG reduced the disease level to 9.71 with 84.90 disease percentage. Whereas Score 25% EC gave 80.91% control with 12.14 disease incidence. All the fungicides remarkably controlled the disease as compared to untreated control. These results agreed with those of Hashmi, (1994) and Anonymous (2004). In another study conducted by Jones (1978) and Timchenko (1979), downy mildew of cucurbits and onion was effectively controlled by the use of chlorothalonil @ 2.4 lbs per hectare. Furthermore, Katsube (2001) described in his studies that strobilurin resistant strains could be controlled by chlorothalonil,

mancozeb, oxadixyl and copper which were previously used for downy mildew control. Satou (2003) suggested various fungicides for the control of downy mildew in cucumber and other vegetables. Anonymous (2004) tested eleven fungicides for the control of muskmelon downy mildew (*Pseudoperenospora cubensis*) and reported that Mancozeb -72% WP stood first showing minimum disease incidence (3.16%) followed by Dolomite 80% WP and Score 250 EC (3.73%) in contrast with control (32.00%). Experiment conducted by Chaudhry *et al*., 2009 showed that minimum downy mildew incidence was recorded by spraying Success (9%), Ridomil gold (9%) and Alliet (11%) as compared to control (78%). Under tunnel conditions, fungicides along with along with proper ventilation of tunnel is necessary for lowering the humidity in order to minimize downy mildew of cucumber (Figure 1 & 2).

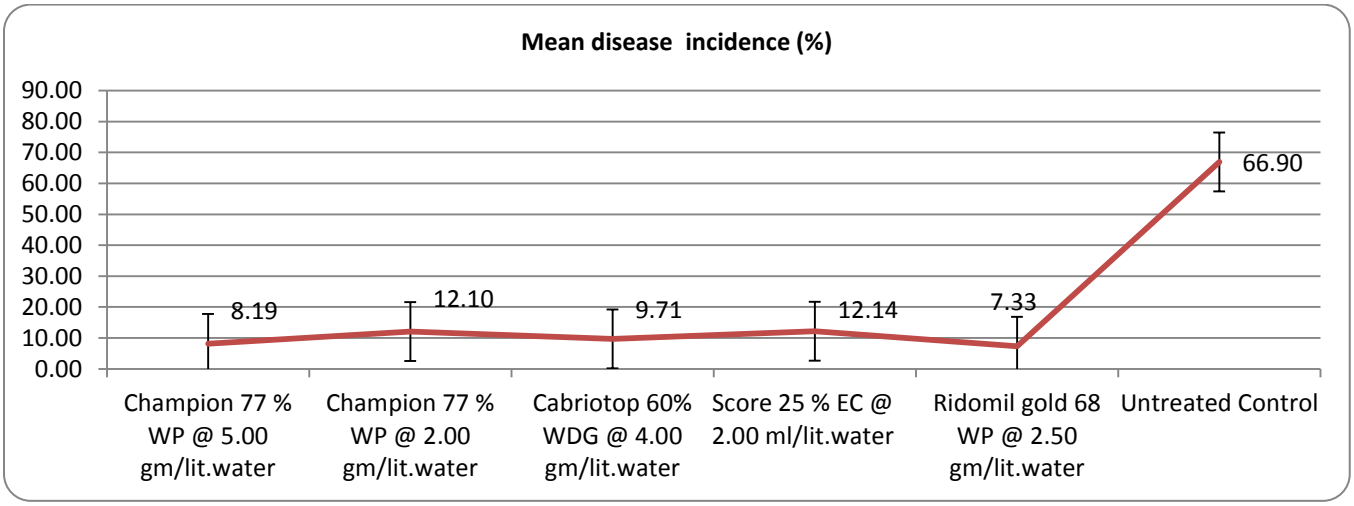

Figure1. Evaluation of different fungicides against downy mildew disease of cucumber.

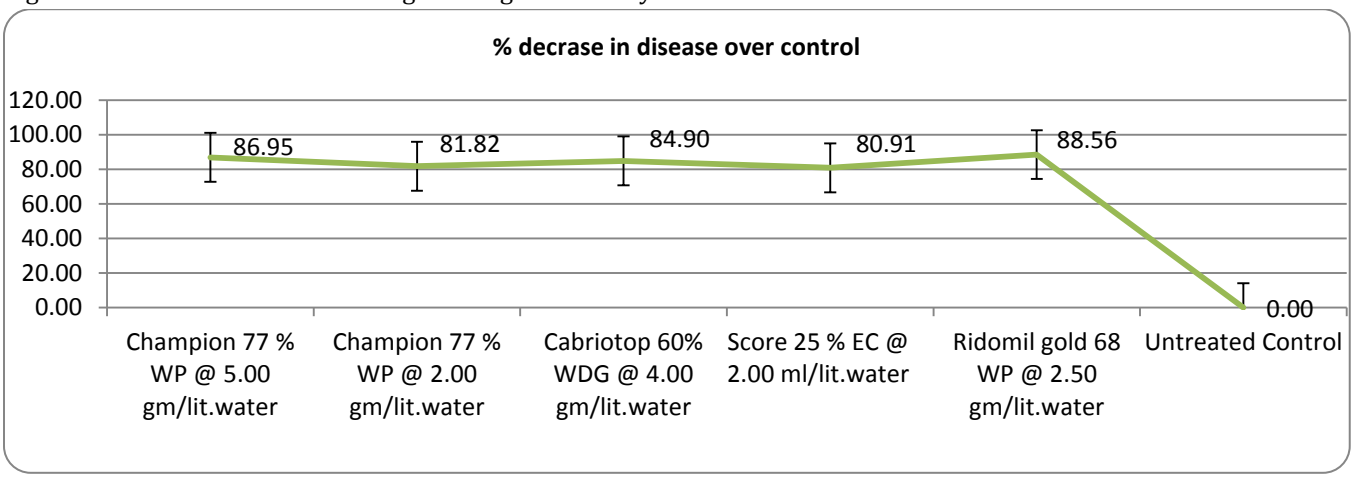

Figure 2. Percent (%) disease decrease over control expressed by different fungicides.

Effect of fungicides on number of fruits: Number of fruits/plant is a major part of yield and has momentous impact on cucumber production (Table-2). Ridomil gold 68 WP gave maximum number of fruits /plant (22.33) followed by Champion 77 % WP @ 5.00 gm/lit.water (21.50) and when this fungicide was used at 2.00 gm/lit. water gave 19.00 fruits/plant. Cabriotop 60% WDG gave 21.17 fruits where as in Score 25 % EC treatment 19.17 fruits per plant were produced. There was not significantly difference between these treatments. All the fungicides enhance the yield of of fruits/plant except untreated control (Figure3). According to the results, varying degree of competition between disease infection and cucumber plants is due to the damaging foliage, production of different number of fruits per plant. Same findings were described by Hashmi (1994) and Chaudhry *et al*., (2009).

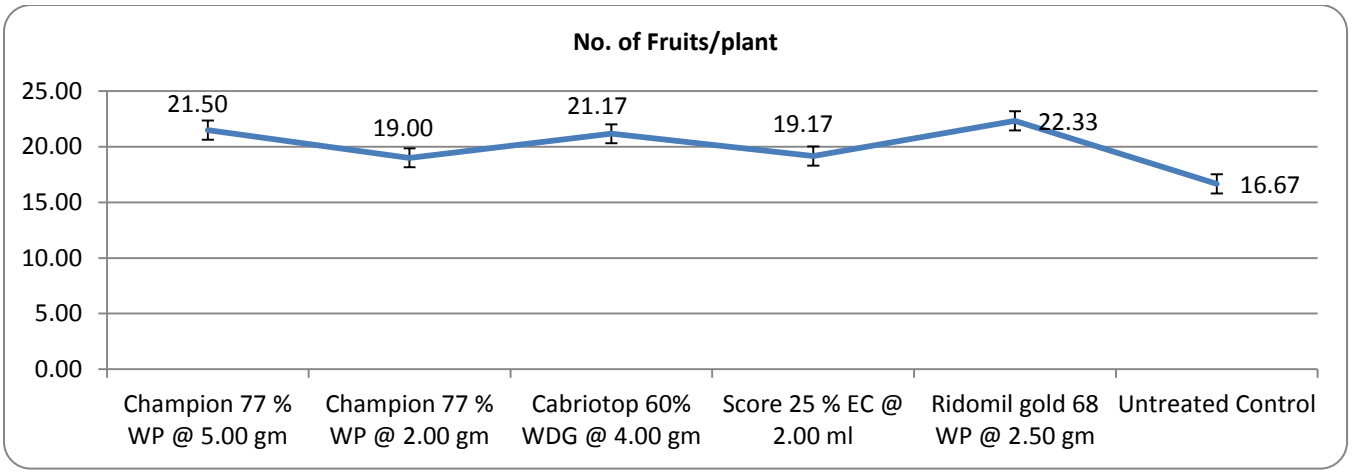

Figure 3. Number of fruits per plant after application of different fungicides against Downy mildew of Cucumber.

Impact of fungicides on weight of fruit: Application of fungicide remarkably increased the weight of fruit**.** Maximum fruit weight 4.08 Kg/plant was observed in Ridomil gold 68 WP treated plant while in case of Champion 77 WP @ 5.00 gm/lit.water treatment, fruit weight was remained to 4.03 Kg per plant but when the same fungicide Champion 77 WP was used @ 2.00 gm/lit water it gave 3.36 Kg fruit/plant. 3.98 Kg fruit/plant was found in Cabriotop 60% WDG treatment. In Score 25% EC treatment fruit weight/plant remained to 3.24 Kg whereas fruit weight in untreated control treatment was up to 2.65 Kg/plant (Figure4). Same results were reported by Boyadzhiev *et al*. (1983) and Khan (1999). In another study conducted by Chaudhry *et al*. (2009), highest weight of fruit per plant was recorded in the plots where spraying were carried out of Ridomil gold (3.28 Kg/plant) followed by Success (3.12 Kg/plant) and Alliet (2.93 Kg/plant).

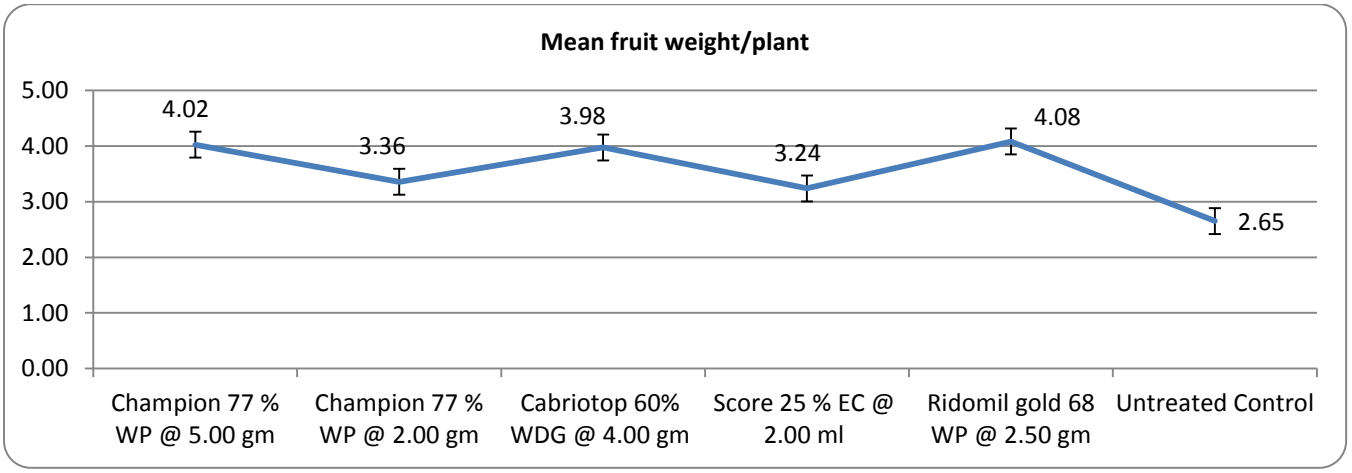

Figure 4. Impact on fruit weight / plant after application of fungicides against Downy mildew of Cucumber.

Therefore, it is concluded that the use of fungicides against cucumber downy mildew during disease prevailing conditions is compulsory in reducing the disease incidence and improving the crop yield.

REFERENCES

Aileen, R. 2006. Sampling and testing for plant pathogens. Bull. 4683. ISSN 1833-7236 (print), 1833-7244.

Anonymous. 2004. Annual Report (2003-2004), Ayub Agriculture Research Institute Faisalabad: pages 177-178.

Barnett, H. L. and B. H. Barry 1972. Illustrated genera of Imperfect fungi. Third edition. Burgess Publishing Company. P -200.

Bisby ,G. R. 1952. The name *Oidium*. Trans. Brit. Mycol. Soc. 35: 236-237.

Bloach, A. G. 1994. Horticulture, vegetables crops. Compiled by Elina Bashir, National Book Foundation of Pakistan PP- 633.

Boyadzhiev, K.H., D.Angelov and N. Vitanov 1983. Chemical control trial against Downy mildew, *Perenospora destructor*, Berk Rev. Plant Pathol.62:325.

Chaudhry, S. U., J. Iqbal and A. Mustafa. 2009. Efficacy of different fungicides for the control of downy mildew of cucumber. J. Animal & Plant. Sci. 19(4): 202-204.

Colucci, S.J., T.C. Wehner, and G.J. Holmes. 2006. The downy mildew epidemic of 2004 and 2005 in the Eastern United States. Proc. Cucurbitaceae 403–411.

Hashmi, A. A. 1994. Horticulture insect pest management of vegetables compiled by Elina Bashir, National Book Foundation of Pakistan PP-633.

Jones, J. P. 1978. Disease threshold for many downy mildew ans target leaf spot of cucurbits and late blight of tomato. Plant Dis. Reporter. 62: 689-802.

Katsube, K. 2001. Chemical control of downy mildew in cucumber. Tohoko Nogyo kenkyu Seika Joho: 183-184.

Khan, A. R. 1999. Evaluation of fungicides and time of application for controlling downy mildew of cucumber. Pakistan J. Phytopathology. 11(2):169-172.

Satou, M. 2003. Recent topics on Downy mildew of vegetables in Japan. A. J 8(82):8-1.

Steel, R. G. D., J. H. Torrie and D. A. Dickey. 1997. Principles and procedures of statistics: 3rd Ed. McGraw Hill Book Co., New York, USA.

Shetty, N.V., T. C. Wehner, C. E. Thomas, R.W. Doruchowski and V.K.P. Shetty. 2002. Evidence for downy mildew races in cucumber tested in Asia, Europe and North America. Sci. Hortic. (Amsterdam) 94:231-239.

Timchenko V. I. 1979. Disease of onion. Rev. Plant Pathol. 58:439. Smith, E.L. 1987.

Wehner, T. C. and N. V. Shetty. 1997. Downy mildew resistance of the cucumber germplasm collection in North Carolina field tests. Crop.Sci.37:1331-1340.