Int.J.Curr.Microbiol.App.Sci (2019) *8*(9): 2477-2481

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 11 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.811.285

In vitro Evaluation of Fungicides, Botanical and Organic Amendments against *Erysiphe polygoni* DC in Black Gram

Sakshi Meena*, R.N. Bunker, Laxmi Choudhary and Poonam Kumari

Department of Plant Pathology, MPUAT, Udaipur – 313001, India

**Corresponding author*

Keywords

Black gram, Powdery mildew, *Erysiphe polygoni* and *in vitro*

Article Info

Accepted:
26 October 2019
Available Online:
10 November 2019

A B S T R A C T

Powdery mildew of black gram incited by *Erysiphe polygoni* (De Candolle) is the major problem in black gram production; it causes both quantitative and qualitative losses of grains. *In vitro* experiment was conducted to evaluate the efficacy of different fungicides, botanical and organic amendments against powdery mildew of black gram caused by *Erysiphe polygoni* DC. Among all the fungicides new combi-fungicide Taspa 300 SC [Propiconazole (13.9%) 15% W/V + Difenconazole (13.9%) 15% W/V] significantly cause maximum 93.05, 92.1 and 89.23% inhibition of spore germination with minimum 5.32, 6.05 and 8.24 % spore germination at 0.2, 0.1 and 0.05% concentration. Among the botanical the Neem leaf extract was observed most effective with 28.32, 30.53, 32.85, 35.62 and 42.63% spore germination and 62.14, 59.18, 56.08, 52.38 and 43.01% inhibition of spore germination at 15, 10, 7, 5 and 2% concentration respectively and in the organic amendments Panchgavya was found most effective with 30.50, 32.15, 34.98, 39.36 and 45.51% spore germination and 59.22, 57.02, 53.24, 47.38 and 39.16% inhibition of spore germination at 15, 10, 7, 5 and 2% concentrations respectively.

Introduction

Black gram [*Vigna mungo* (L.) Hepper] is the most important grain legumes. It is from *Fabaceae* family with 2n=22 Chromosomes and it is believed to have originated in India (Chatterjee and Bhattacharya, 1986). Black gram cultivation is suitable for hot and moist weather condition where temperature remains between 25-35^{o}C. It is mainly a day neutral warm season crop commonly grown in semi-arid to sub-humid low land tropics and sub-tropics (Mane *et al.*, 2018)**.** Powdery mildew of black gram incited by *Erysiphe polygoni* (De Candolle) is the major problem in black gram production; it causes both quantitative and qualitative losses of grains. This disease has been observed severe mainly in late sown *kharif* crop and remains active throughout the year. The powdery mildew disease interferes

in photosynthetic activity and causes significant physiological changes in plants, which causes reduction in yield (20-40 per cent) depending on the stage and time at which the disease appears (Legapsi *et al.*, 1978; Singh, 1995).

Materials and Methods

Five fungicides, two botanicals and three organic amendments were evaluated *in vitro* at different concentrations against black gram powdery mildew pathogen (*E. polygoni*) by spore germination techniques (Anon., 1957). The efficiency was evaluated by their ability to inhibit spores (conidia) germination of *E. polygoni*. The fungicides were evaluated at 0.05, 0.1 and 0.2% concentrations, the botanicals and organic amendments were evaluated at 2, 5, 7, 10 and 15% concentrations. The fresh conidia were obtained in morning hours from the leaves of black gram field. The conidial suspension and the stock solution of required concentration of fungicides, botanicals and organic amendments were prepared in sterilized distilled water. For botanical suspension, fresh leaves were collected from the healthy plants, these were first washed in tap water and then in distilled water. The 100 gram healthy plant leaves were crushed in 100 ml of sterile water (1:1 w/v) and the material was homogenized for five minutes in mortar and pestle and then the mixture was filtered through two layers of muslin cloth (Sindhan *et al.*, 1999). The extract obtained was considered as a standard (100%) extract and used as a stock solution. To test the strength of suspension, number of conidia ml^{-1} was counted from the conidial suspension using haemocytometer. Then a drop of conidial suspension was placed in a glass cavity slide with the help of automatic micropipette simultaneously a drop of fungicides, botanicals and organic amendments solution was also separately placed in the cavity glass slide heaving conidial suspension as per treatments. In each treatment four replications were maintained. Control treatment was also maintained only with sterile water having conidial suspension. The slides were kept on tooth pick sticks in the Petri plates with moist blotter papers and incubated at the room temperature 25 ± 2^{o} C for 24 hrs. After 24 hrs of incubation, observation of spore germination in each treatment was recorded by counting the germinated conidia out of total conidia and per cent spore germination was calculated by using following formula.

$$\text{Per cent germination} = \frac{\text{Total number of conidia germinated}}{\text{Total number of conidia observed}} \times 100$$

The Per cent inhibition of conidia/spore germination was calculated by using the following formula given by Vincent (1927).

$$\text{Per cent inhibition of spore germination} = \frac{C - T}{C} \times 100$$

Where,

C- Number of spores germinated in control.

T- Number of spores germinated in treatment.

Results and Discussion

Five fungicides, two botanicals and three organic amendments were tested at various concentrations *in vitro* for their efficacy against black gram powdery mildew pathogen (*E. polygoni*), by spore germination technique.

In the present study five fungicides Taspa-300 SC (Propiconazole 13.9% + Difenconazole 13.9%), Mycobutanil, Hexaconazole, Karathane and Propiconazole were tested at three concentrations *viz*., 0.05%, 0.1% and 0.2% using spore germination technique against *E. polygoni in vitro*. Among the fungicides new combi-fungicide Taspa-300 SC significantly caused maximum 93.05, 92.1

and 89.23% inhibition of spore germination with minimum 5.32, 6.05 and 8.24 % spore germination at 0.2, 0.1 and 0.05% concentration. Hexaconazole was found effective at all concentrations and it caused 90.2 per cent inhibition with 7.50% spore germination at 0.2% concentration (Table 1 and 2).

Taspa-300 SC is a combi-fungicide of two fungicides Propiconazole and Difenconazole and both are extensively used to control many pathogens and foliar disease *in vitro* as well as *in vivo* condition (Channamma *et al.,* 2015; Chavan *et al.,* 2014 and Kumawat *et al.,* 2016).

These results of present study were also in agreement with the field results of Karmakar *et al.,* 2016 and Verma *et al.,* 2018 who reported that the Taspa (Propiconazole 13.9% + Difenconazole 13.9%) significantly controlled the grain discolouration disease of rice and spot blotch (*Bipolaris sorokiniana*) of wheat.

Two botanicals (Neem (*Azadiracta indica) and* Parthenium *(Parthenium hysterophorus*)) and three organic amendments/ bio-rationals (Panchgavya, Butter milk and Vermiwash) were tested *in vitro* at 2, 5, 7, 10 and 15% concentration using spore germination technique against *E. polygoni*.

In both botanicals, maximum inhibition of spore germination over control was recorded in Neem (*Azadiracta indica*) leaf extract at all concentration. Neem leaf extractat15% and 10% caused maximum 62.14 and 59.18 per cent spore inhibition with lowest 28.32 and 30.53 per cent spore germination respectively.

Similar, reports have been quoted by Jyothi (2012) that the Neem leaf extract caused maximum 49.42 % inhibition of conidial germination at 10 per cent concentration and found effective against powdery mildew of green gram followed by *Parthenium hysterophorus* at 10 % with 38.20 per cent inhibition of conidial germination. Khunt *et al.,* (2017) reported that the neem leaf extract (10%) was most effective in spore germination inhibition (83.05%) followed by Garlic @ 10% 81.21 per cent inhibition of spore germination against powdery mildew (*E. polygoni*) of cumin i*n vitro*.

In bio-rationals/organic amendments application of Panchgavya 15% diluted liquid suspension was caused maximum spore inhibition per cent (59.22) with 30.50 per cent spore germination followed by Vermiwash 15% inhibition (56.09%) with 32.86 per cent spore germination. Panchgavya at 10% concentration was also found superior among all bio-rationals with maximum (57.02%) spore inhibition and minimum 32.15% spore germination.

Antifungal potential of Panchgavya against many pathogens of various crops has been reported by several workers that were similer to the results obtained in present study (Sugha 2005; Sumangala and Patil 2009 and Ramya 2014). Sumangala and Patil (2009) evaluated Panchagavya *in vitro* against *Curvularia lunata* causing brown leaf spots in rice.

The results revealed that the Panchagavya inhibited 95.90 per cent spore germination and 86.30 per cent mycelial growth of *Curvularia lunata*. Sugha (2005) evaluated the antifungal potential of Panchgavya against *Sclerotium rolfsii, Fusarium solani, Sclerotinia sclerotiorum, Rhizoctonia solani* and *Phytophthora colocasiae* and advocated that the mycelial bits dipped for 6 hour in Panchgavya caused complete suppression of mycelial growth of *R. solani* and in other pathogens, the growth inhibition ranged between 88.1- 92.3 per cent.

Table.1 Effect of fungicides on spore germination of *Erysiphe polygoni* DC *in vitro*

Sr. No	Treatments	0.05% conc.		0.1% conc.		0.2% conc	
		% spore germination	% Inhibition	% spore germination	% Inhibition	% spore germination	% Inhibition
1	Taspa 300 SC [Propiconazole (13.9%) 15% W/V + Difenconazole (13.9%) 15% W/V]	8.24 (16.66)	89.23 (70.83)	6.05 (14.21)	92.1 (73.66)	5.32 (13.32)	93.05 (74.7)
2	Mycobutanil 10% WP	13.66 (21.68)	82.15 (64.97)	10.52 (18.90)	86.25 (68.22)	9.85 (18.27)	87.13 (68.96)
3	Hexaconazole 5% EC	14.03 (21.99)	81.66 (64.62)	9.05 (17.49)	88.18 (69.86)	7.50 (15.87)	90.2 (71.74)
4	Karathane 48% EC	28.16 (32.03)	63.2 (52.63)	25.78 (30.50)	66.3 (54.50)	22.84 (28.53)	70.15 (56.86)
5	Propiconazole 25% EC	15.20 (22.94)	80.13 (63.50)	12.07 (20.31)	84.23 (66.58)	10.65 (19.04)	86.08 (68.07)
6	Control	76.5 (60.98)	0	76.5 (60.98)	0	76.5 (60.98)	0
	SEm±	0.31	0.35	0.31	0.34	0.35	0.39
	CD (*P=0.05*)	0.94	1.04	0.93	1.03	1.05	1.17

*Mean of four replications; Figures given in parentheses are arcsine √ Per cent angular transformed values

Table.2 Effect of botanicals and organic amendments on spore germination of *Erysiphe polygoni* DC *in vitro*

S. No.	Treatments	2 % conc.		5 % conc.		7 % conc.		10 % conc.		15% conc.	
		% spore germination	% Inhibition	% spore germination	% Inhibition	% spore germination	% Inhibition	% spore germination	% Inhibition	% spore germination	% Inhibition
1	Neem leaf extract	42.63 (42.02)	43.01 (40.97)	35.62 (36.63)	52.38 (46.35)	32.85 (35.86)	56.08 (48.48)	30.53 (33.53)	59.18 (50.27)	28.32 (32.14)	62.14 (52.00)
2	*Parthenium* leaf extract	59.65 (50.55)	20.25 (26.73)	51.05 (45.59)	31.75 (34.28)	49.56 (44.73)	33.75 (35.50)	44.15 (41.62)	40.98 (39.78)	40.23 (39.35)	46.22 (42.82)
3	Panchgavya	45.51 (42.41)	39.16 (38.73)	39.36 (38.84)	47.38 (43.49)	34.98 (36.24)	53.24 (46.84)	32.15 (34.52)	57.02 (49.01)	30.50 (33.51)	59.22 (50.30)
4	Butter Milk	50.70 (45.38)	32.23 (34.57)	44.83 (42.02)	40.06 (39.25)	40.29 (39.38)	46.14 (42.77)	36.60 (37.21)	51.07 (45.60)	35.00 (36.26)	53.21 (46.82)
5	Vermiwash	46.94 (43.23)	37.25 (37.60)	41.85 (39.39)	44.05 (41.57)	36.53 (37.17)	51.16 (45.65)	34.32 (35.85)	54.12 (47.34)	32.86 (34.95)	56.09 (48.48)
6	Control	74.8 (59.85)	0	74.8 (59.85)	0	74.8 (58.84)	0	74.8 (59.85)	0	74.8 (59.85)	0
	SEm±	0.23	0.31	0.21	0.30	0.22	0.32	0.20	0.26	0.22	0.28
	CD (*P=0.05*)	0.67	0.95	0.64	0.92	0.66	0.99	0.61	0.80	0.67	0.86

Mean of four replications; Figures given in parentheses are arcsine √ Per cent angular transformed values

References

Anonymous, 1957. Manual of Microbiology Methods by American Society for Microbiology. Mc Grew Hill Book Co., New York, pp. 315.

Channamma, Sunkad, G., Mahesh, M., Arunkumar and Kushal. 2015. *In vitro* Evaluation of Fungicides against Spore Germination of *Leveillula taurica* causing Powdery Mildew in Guar. *International Journal of Therapeutic Applications*. 33: 3529- 3531.

Chatterjee, B. N. and Bhattacharya, K. K. 1986. Principles and Practices of Grain Legumes Production. Oxford and IBH Publication Company, New Delhi, pp. 434.

Chavan, S. S., Dhutraj, D. N., Thombre, P. A. and Dey, U. 2014. Evaluation of Fungicides, Botanicals and Bioagents against Powdery Mildew of Cowpea. *Journal of Plant Disease Science*. 9: 253–256.

De Candolle. 1802. History and Taxonomy. *The Powdery Mildew*. Ed. Spencer, D. M., Academic Press, London, pp. 3-15.

Jyothi, U. D. 2012. Epidemiology and Management of Powdery Mildew of Green Gram caused by *Erysiphe polygoni* DC. M.Sc. (Agri) Thesis, University of Agricultural Sciences, Dharwad, India.

Karmakar, S., Mondal, R., Dasgupta S., Roychoudhuri, U. K., Guha, P. and Mandal, A. K. 2016. Studies on the Efficacy of Some Newly Evolved Fungicides Against Grain Discolouration Disease of Rice (*Oryza sativa l.*) in West Bengal. *International Journal of Current Research.* 8: 33946-33948.

Khunt, A. R., Akbari, L. F., Bhaliya, C. M. and Goswami, G. J. 2017. Efficacy of Different Phytoextracts against *Erysiphe polygoni* DC Causing Powdery Mildew of Cumin. *Trends in Biosciences*. 10: 1096-1098.

Kumawat, R., Shekhawat, K. S. and Kumawat, K. 2016. Effect of Environment Factors on the Development of Powdery Mildew Disease of Fenugreek (*Trigonella foenum graecum* L.) Caused by *Erysiphe polygoni*. *Advances in Life Sciences.* 5: 11054- 11057.

Legapsi, B. M., Capiton, E. M. and Hubbell, J. N. 1978. AVRDC. Phillipines, programme studies. *First International Symposium on Mungbean*, 220-223.

Mane, R. B., Asewar, B. V., Kadam, Y. E. and Deshmukh, K. V. 2018. Correlation Studies in Weather Parameters and Yield of Black Gram Varieties Under Changing Weather Conditions. *Bulletin of Environment, Pharmacology and Life Sciences*.7: 37-42.

Ramya, T. S. 2014. Studies on Non-chemical Management of Major Fungal Foliar Diseases of Garden Pea (Pisum sativum L.). M.Sc. (Agri.) Thesis, University of Agricultural Sciences, Dharwad.

Sindhan, G. S., Hooda, I. and Parashar, R. D. 1999. Evaluation of plant extract for the control of powdery mildew of pea. *Journal of Mycology and Plant Pathology*, 29: 257-258.

Singh, D.P. 1995. Breeding for resistance in pulse crop. In Genetic Research and Education: Current Trends and Fifty Years (Sharma, B., ed.). *Indian Society of Genetics and Plant Breeding*, New Delhi, pp. 339-420.

Sugha, S. K. 2005. Antifungal Potential of Panchgavya. *Plant Disease Research*. 20: 156-158.

Sumangala, K. and Patil, M. B. 2009. Panchagavya–an Organic Weapon against Plant Pathogens. *Journal of Plant Disease Sciences*. 4: 147-151.

Verma, G., Kumar, S., Rajvansi N. K. and Kumar, S. 2018. Management of Spot Blotch (*Bipolaris sorokiniana*) of Wheat Using Systemic Fungicides. *International Journal of Current Microbiology and Applied Sciences. 7*: 4277-4281.

Vincent, J. M. 1927. Distortion of fungal hyphae in the presence of certain inhibitors. *Nature*, 159: 800.

How to cite this article:

Sakshi Meena, R.N. Bunker, Laxmi Choudhary and Poonam Kumari. 2019. *In vitro* Evaluation of Fungicides, Botanical and Organic Amendments against *Erysiphe polygoni* DC in Black Gram. *Int.J.Curr.Microbiol.App.Sci.* 8(11): 2477-2481.
doi: https://doi.org/10.20546/ijcmas.2019.811.285