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Field Screening of New Fungicide Molecules against Powdery Mildew of Green Gram caused by *Erysiphe polygoni* DC in India

Divyajyothi, U[1*]., Hundekar, A. R[1]., Lingaraju, S[1]., Shamarao Jahagirdar[1] Kajjidoni, S. T[2] and Matiwade P. S[3].

ABSTRACT: *Powdery mildew of green gram caused by* Erysiphe polygoni *DC has become major constraint in green gram growing areas Field screening of new fungicide molecules against Powdery mildew (* Erysiphe polygoni *DC) was taken up during* kharif *growing season 2011 at Agricultural Research Station, Nipani. Among the systemic fungicides tested, one spray with immediately after appearance of disease revealed that azoxystrobin 250%SC @0.1%, hexaconazole 5% EC @0.1% and difenconazole 25 EC @ 0.1% were effective in managing the disease. Significantly least PDI of 9.87 per cent was observed with azoxystrobin 250% SC @ 0.1% followed by hexaconazole 5% EC @ 0.1% (12.53PDI) and Difenconazole 25 EC @ 0.1% (13.33PDI). Significantly highest grain yield of 949 kg/ha was observed with azoxystrobin 250% SC @ 0.1% and it was on par with the yield noticed with hexaconazole 5% EC @ 0.1% (882 kg/ha). Significantly least yield of 443 kg/ha was observed with untreated control. Hundred seed weights noticed with the fungicides were significantly higher than the hundred seed weight observed with untreated control (3.10g). The highest gross returns of Rs.23726/ha was observed with azoxystrobin 250% SC @ 0.1% and it was followed by hexaconazole 5% EC @ 0.1% (Rs.22048/ha) and Difenconazole 25EC @ 0.1% (Rs.20416/ha).Thus, one spray with either azoxystrobin 250% SC @0.1% or hexaconazole 5% EC @0.1% or difenconazole 25 EC @ 0.1% be advocated for managing powdery mildew of green gram in India*

Keywords: *Green gram, Systemic fungicides, Powdery mildew, Management,* Erysiphe polygoni *DC*

INTRODUCTION

Pulses, best known as "poor man's meat", constitute a major source of dietary protein of the large section of vegetarian population of the world. Pulses have a unique characteristic of maintaining and restoring soil fertility through biological nitrogen fixation and thus play a vital role in sustainable agriculture (Asthana, 1998). Green gram is one of the most important pulse crops of leguminosae. It is the third most important pulse crop in India covering an area of 32.99 lakh ha with a total production of 13.74 lakh tonnes and an average productivity of 417 kg/ha (Anon, 2009). Important green gram growing states in India are Orissa, Andhra Pradesh, Maharashtra, Karnataka and Bihar. In Karnataka, it occupies an area of 4.9 lakh ha with production of 0.71 lakh tonnes and average yield of 399 kg/ha (Anon, 2009). The lower productivity in green gram is mainly attributed to low genetic yield potentiality, indeterminate growth habit, canopy architecture, low partitioning efficiency, cultivation in marginal land and due to biotic and abiotic stresses. Among biotic stresses powdery mildew, cercospora leaf spot and mungbean yellow mosaic virus (MYMV) are the major diseases of green gram. The powdery mildew caused by *Erysiphe polygoni* DC is one of the economically important diseases. It is more severe and symptoms of disease are usually observed on 35-40 days old crop (Khare *et al.*, 1998), i.e. during flowering and pod formation stage (Arjunan *et al.*, 1976). The disease usually covers host leaf surface area reducing photosynthetic activity and disease occurs in severe form in *kharif* season which is also the main season for green gram cultivation, particularly when temperature is low (20-25 °c) and humidity is high

[1] Department of Plant Pathology, University of Agricultural Sciences, Dharwad-580 005, India
[2] AICRP on Sorghum, MARS, Dharwad-580 005
[3] AINRP(T), ARS, Nipani
**for correspondence (e-mail: jyothi4291@gmail.com)*

(80-90 per cent) and yield reduction can range from 20 to 40 percent. Since there are no sources of resistance available for the cultivation, farmers are largely depended on use of fungicides to manage this disease. Looking in to these bottle necks and also to tackle the problem of fungicidal resistance the present investigation was undertaken to identify the new effective molecules which derive maximum benefit to the farmers.

MATERIAL AND METHODS

A field experiment was laid-out in Randomised Block Design with eleven treatments and replicated thrice. A susceptible variety Shiningmung variety was used in the present investigations. The variety was grown as per packages of practices for higher yields. Artificial disease pressure was created by spraying pathogen inoculums on 30th day after sowing (prepared by washing diseased leaves in the water). Treatments were imposed at 35 days after sowing by spraying fungicides. The Per cent disease index (PDI) was computed by selecting five plants at random and recording rust severity as per 0-5 scale of Gawande and Patil (2003).

Grade leaf area infection

0	No infection	Highly resistant
1	0.1-10.0%	Resistant
2	10.1-25.0%	Moderately resistant
3	25.1-50%	Susceptible
4	50.1-75%	
5	75.7-100%	Highly susceptible

The recorded grade values were converted into Percent Disease Index (PDI) by using following formula proposed by Wheeler (1969).

$$Per\ cent\ disease\ index\ (PDI) = \frac{Sum\ of\ the\ individual\ disease\ ratings}{Number\ of\ leaves\ observed \times Maxium\ disease\ grade} \times 100$$

The observations on number of pod per plant 100 seed weight (g), and seed yield expressed in terms of q/ha were also recorded**.** The economic analysis was done by working out net income, benefit cost ratio was also worked out taking into account total cost of cultivation in control and additional cost for fungicides and their sprays. The data was statistically analyzed after suitable transformations.

RESULTS AND DISCUSSION

The results on the field evaluation of systemic fungicides against powdery mildew are presented in Table 1. Fig. 1. Ten systemic fungicides were evaluated in the present study and all the fungicides were effective in reducing the severity of the disease and there by increased the seed yield compared to untreated check. The disease severity before treatment imposition was relatively consistent and all the treatments remained on par with each other. On the contrary treatments differed significantly after spray.

Azoxystrobin 250%SC, hexaconazole 5% EC, difenconazole 25 EC @ 0.1 per cent were found effective in reducing the severity of the disease and their by increasing the green gram yield. Out of these hexaconazole 5% EC @ 0.1 per cent was found most cost effective in managing the powdery mildew of green gram. Significantly least PDI of 9.87 per cent was observed with Azoxystrobin 250% SC @ 0.1% after spraying at maturity stage of the crop but it was on par with the PDI recorded with Hexaconazole 5% EC @ 0.1% (12.53%) and Difenconazole 25 EC @ 0.1% (13.33%). The PDI recorded with other fungicides were significantly lower than the PDI recorded with untreated control. Significantly highest PDI of 80.53 per cent was noticed with untreated control indicating sufficient disease pressure for drawing the conclusions. Significantly highest grain yield of 949 kg/ha was observed with Azoxystrobin 250% SC @ 0.1% and it was on par with the yield noticed with Hexaconazole 5% EC @ 0.1% (882 kg/ha). Significantly least yield of 443 kg/ha was observed with untreated control. Hundred seed weights noticed with the fungicides were significantly higher than the hundred seed weight observed with untreated control (3.10g). The highest gross returns of Rs.23726/ha was observed with Azoxystrobin 250% SC @ 0.1% and it was followed by Hexaconazole 5% EC @ 0.1% (Rs.22048/ ha) and Difenconazole 25EC @ 0.1% (Rs.20416/ ha). The highest benefit cost ratio of 1.74 was recorded with Hexaconazole 5% EC and it was followed by 1.62 with Azoxystrobin 250% SC indicating Hexaconazole 5% EC @ 0.1% was most cost effective in managing the powdery mildew of green gram. The results are in agreement with several workers who reported powdery mildew management in various crops through fungicide(Saxena and Moly Saxena, 2002, Upasana Rani *et al*., 2005, Shivanna *et al.,* 2006, Ashtaputre *et al*., 2007).

The results obtained brought new information an use of azoxystrobin a strobulin compound for the management of powdery mildew in Karnataka.

Difenconazole, propiconazole, hexaconazole, triadimefon and myclobutanil belongs to triazoles group. These fungicides interfere with the biosynthesis of fungal sterols and inhibit ergosterol biosynthesis (Rawal, 1993). Ergosterol is essential to

Table 1
Management of Powdery Mildew of Green Gram through Systemic Fungicides during *Kharif* 2011 at ARS, Nipani

Chemical name	*Concen-tration (%)*	*PDI Before spraying*	*After spraying at maturity stage*	*100 seed weight (g)*	*Yield kg/ha*	*Cost of cultivation (Rs/ha)*	*Gross returns (Rs/ha)*	*Net returns (Rs/ha)*	*B:C ratio*
Hexaconazole 5% EC	0.1	8.3 (16.70)*	12.53 (20.64)*	6.13	882	13010	22048	9038	1.74
Azoxystrobin 250% SC	0.1	8.3 (16.70)	9.87 (18.28)	6.67	949	14450	23726	9276	1.62
Kresoxinm methyl 50% WG	0.1	8.0 (16.41)	22.93 (28.57)	5.00	657	13550	16435	2885	1.23
Triadimefon 25% WP	0.1	8.0 (16.41)	18.40 (25.34)	5.13	681	13250	17013	3763	1.34
Difenconazole 25% EC	0.1	8.8 (17.24)	13.33 (21.32)	5.90	817	13310	20416	7106	1.52
Tridemorph 50EC	0.05	8.3 (16.70)	20.53 (26.92)	5.37	704	13550	17592	4042	1.30
Trifloxystrobin 50% WG	0.1	8.7(17.11)	17.87 (24.99)	5.53	723	13950	18067	4117	1.34
Myclobutanil 10% WP	0.05	8.3 (16.70)	23.73(29.13)	5.13	606	13170	15162	1992	1.23
Propiconazole 25% EC	0.1	8.7 (17.11)	16.53 (23.84)	5.77	782	13130	19560	6430	1.51
Carbendazim 50% WP	0.1	8.7 (17.11)	32.53 (34.76)	4.50	597	13020	15046	2026	1.22
Control	-	8.3 (16.70)	80.53 (63.61)	3.10	443	12950	10648	-2301.9	0.9
S.Em.±		0.37	1.21	0.27	37	-	921	921	-
C.D at 5%		NS	3.58	0.80	114	-	2718	2718	-

*Arcsine values

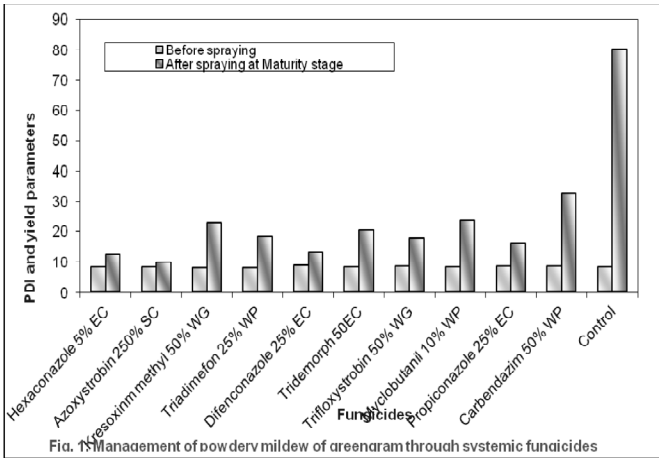

Fig. 1: Management of powdery mildew of greengram through systemic fungicides

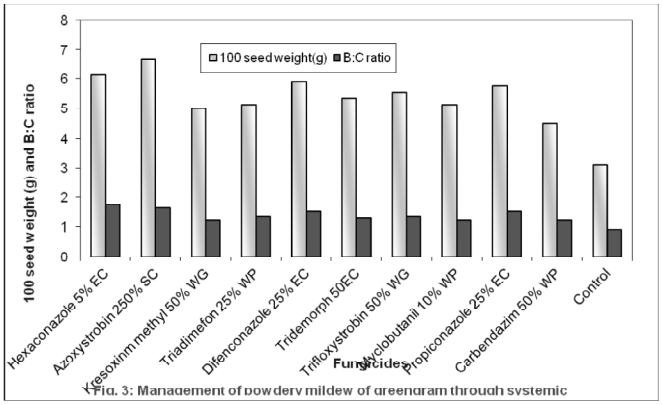

Fig. 3: Management of powdery mildew of greengram through systemic

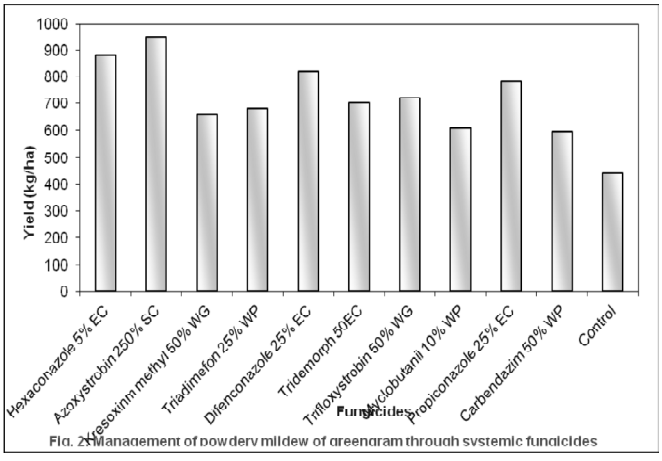

Fig. 2: Management of powdery mildew of greengram through systemic fungicides

the structure of cell wall and its absence causes irreparable damage to the cell wall and fungus dies. These will also interfere in conidia and haustoria formation. These change the sterol content and saturation of the polar fatty acids leading to alterations in membrane fluidity and behaviour of membrane bound enzymes (Nene and Thapliyal, 1993).

CONCLUSION

Thus, one spray with either azoxystrobin 250%SC @0.1% or hexaconazole 5% EC @ 0.1% or difenconazole 25 EC @ 0.1% be advocated for managing powdery mildew of green gram in India

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