Field Evaluation of Penconazole 10 EC (NS) against Powdery mildew in Urdbean

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ABSTRACT

A field experiment was conducted to evaluate the efficacy of Penconazole 10 EC (NS) against powdery mildew in Urdbean for two seasons at Regional Agricultural Research Station, Lam, Guntur, Andhra Pradesh. The experiment was laid out in RBD with three replications. The results showed that penconazole 10 EC (NS) at 1.0 mL/L was found significantly superior followed by penconazole 10 EC (NS) at 0.6 mL/L with low disease incidence of powdery mildew in blackgram. Further, phytotoxicity was not observed in penconazole treated plots even at higher dose in urdbean.

Keywords: Penconazole, Powdery mildew, urdbean

INTRODUCTION

India is one of the leading countries in pulse production as well as consumption which accounts for 33 per cent of world area and 24 per cent of world production. The production of blackgram in the country is 1.74 million tones from an area of 3.26 million hectares, with a productivity of 534 kg/ha (Anonymous, 2012). Urdbean is known to be affected by number of insect pests as well as diseases which cause major yield loss besides abiotic stresses. Among the diseases, powdery mildew caused by Erysiphe polygoni is one of the economically important diseases in blackgram which occur at later stages of crop growth. Grain yield losses have been reported up to 21% due to powdery mildew in green gram (Quebral and Cowel 1978).

Losses are much high when the pathogen infects the crop before flowering, however, it results in complete loss of the crop if disease occurs at seedling stage. Abbaiah (1993) reported that the powdery mildew in Urdbean was generally noticed in 45 days old crop. Similarly, Venkata Rao (1997) observed that 40 and 50 days old green gram plants were highly susceptible to powdery mildew. Since sources of complete resistance are not available in urd bean, powdery mildew has to be managed by chemical fungicides to avoid yield losses. Penconazole belongs to triazoles group, which interfere with the biosynthesis of fungal sterols and inhibit ergosterol biosynthesis. Ergosterol is essential to the structure of cell wall and its absence causes irrevocable damage to the cell wall which leads to the death of fungus. It will also interfere in conidia and haustoria formation in fungus and also 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). Several workers reported that, penconazole was found to be effective in reducing powdery mildew incidence in different crops (Singh, 2006; Pramod Prasad and Dwivedi, 2007).

Hence the present study was taken up to evaluate the bio efficacy of penconazole 10 EC (NS) in comparison with Penconazole 10 EC (ES) and standard check, Sulphur 3.1 @ against powdery mildew disease of urd bean.

MATERIALS AND METHODS

A field experiment was conducted at Regional Agricultural Research station, Lam, Guntur, Andhra Pradesh during Rabi 2009-2010 and 2010-2011 to evaluate the bio-efficacy of Penconazole 10 EC (NS) in Urdbean against powdery mildew. The trial was laid in Randomized Block Design with seven treatments including untreated control, replicated thrice during both the years. The crop was sown in first fortnight of December during both the seasons with a plot size of 20 sq.m and at a spacing of 30 cm and 10 cm between rows and plants respectively. The crop was grown under rainfed conditions by adopting all the agronomic

practices as per recommendations of ANGRAU, Hyderabad. The crop was protected from sucking pests such as thrips and whiteflies at initial stages and from maruca pod borer at flowering stage through blanket sprays of selective insecticides in all the experimental plots uniformly to avoid the yield losses due to insect pests. The first spray was given at 35 days after sowing and a total of three sprays during both the seasons at 10 days interval. The schedule spraying was given with knap-sack sprayer at the rate of 500 liters of spray fluid per hectare for thorough coverage of foliage with spray fluid. The bio-efficacy of Penconazole 10 EC (NS) of was evaluated at four different doses compared with Penconazole 10 EC (ES) @ 0.5 mL/L and standard check, Sulphur @ 3.1 g/L for bio efficacy studies against powdery mildew disease of Blackgram.

The phytotoxic effects such as injury on leaf tips, leaf surface, necrosis, epinasty, hyponasty, wilting and vein clearing was also recorded for the test chemical at its higher dose at 3rd, 7th and 10th day after spraying. The disease severity of powdery mildew and was recorded one day before the first spray and finally after 3 sprays using 0-5 scale (Anonymous, 2010) during both the seasons and percent disease index (PDI) was calculated using the formula given by wheeler (1969).

$$PDI = \frac{\text{Sum of individual disease ratings}}{\text{Total number of leaves observed}} \times \frac{100}{\text{Maximum disease rating}}$$

The yield was recorded from each net plot excluding border rows and computed to yield in quintal/ha. The data were subjected to statistical analysis after using suitable transformations.

Powdery mildew Disease rating scale (0-5 scale): 0 - Plants free from infection (highly resistant); 1 - Plant showing traces to 10% infection on leaves, stem free from infection (Resistant); 2 - Slight infection with thin coating of powdery growth on leaves covering l0.l - 25% of leaf area, slight infection on stem, pods usually free (Moderately resistant); 3 - Dense powdery coating covering 25.l to 50% of leaf area. Moderate infection on stems, slight infection on pods (Moderately susceptible); 4 - Dense powdery coating covering 50.l to 75% of leaf area, stem heavily and pods moderately infected. Infected Portion turns grayish (Susceptible); 5 - Severe infection with dense powdery growth, covering more than 75% area of the whole plant including pods, plants resulting in premature defoliation and drying (highly susceptible).

RESULTS AND DISCUSSION

Bioefficacy

In general the incidence of powdery mildew was high during Rabi 2010-2011 when compared to Rabi 2009-2010 in all the experimental plots. The per cent disease index was ranged from 1.60 to 94.4 during rabi 2009-2010, while it was 1.70 to 96.57 during rabi 2010-2011 in different experimental plots.

The results of the field experiment clearly indicated that the disease incidence was significantly low in all the treated plots compared to the unsprayed control plot after three sprays. The experimental plots treated with Penconazole 10 EC (NS) @ 1.0 mL/L were found almost free from powdery mildew with the lowest PDI of 1.60 and it was significantly superior over the rest of the treatments. The next best treatment was Penconazole 10 EC (NS) @ 0.6 mL/L (PDI – 7.46) which was significantly superior over the remaining treatments. The test chemical i.e. Penconazole 10 EC (NS) at its lower doses i.e at 0.5 mL/L and 0.4 mL/L was found statistically on par with Penconazole 10 EC (ES) @ 0.5 mL/L and also with standard check, sulphur 80 WP @ 3.1 g/Lt during both the seasons. However, all the treatments were found significantly superior over the untreated control in reducing the incidence of powdery mildew in blackgram during both the seasons. The incidence of powdery mildew was very high in untreated control with PDI of more than 94 during both the seasons.

The results obtained from the present study were in conformity with many of the earlier reports. Nagaraja and Naik (1998) evaluated the relative efficacy of triazoles such as propiconazole, penconazole and difenconazole against powdery mildew of pea and reported that penconazole was highly effective. Dhruj *et al*. (2000) reported that propiconazole, penconazole, hexaconazole,

Table 1. Evaluation of Penconazole 10 EC (NS) against powdery mildew disease of Urdbean during Rabi 2009-10 and 2010-11

Treatment	Mean PDI of powdery mildew		Yield Kg/ha	
	2009-10	2010-11	2009-10	2010-11
T1	18.66[c]	25.42[c]	947	328
T2	15.20[c]	20.23[c]	973	447
T3	7.46[b]	14.45[b]	1027	671
T4	1.60[a]	1.70[a]	1120	709
T5	17.06[c]	22.95[c]	920	427
T6	17.40[c]	21.84[c]	967	449
T7	94.40[d]	96.57[d]	467	165
SEM ±	1.332	1.637	30.48	8.52
CD	4.10	5.04	93.91	26.26
CV%	8.2	9.40	5.8	3.20

T1 Penconazole 10 EC (NS) @ 0.4 mL/L; T2 Penconazole 10 EC (NS) @ 0.5 mL/L; T3 Penconazole 10 EC (NS) @ 0.6 mL/L; T4 Penconazole 10 EC (NS) @ 1.0 mL/L; T5 Penconazole 10 EC (ES) @ 0.5 mL/L; T6 Sulphur 80 WP @ 3.1 g/L; T7 Check Untreated control

triadimefon, tridemorph, dinocap and sulphur significantly reduced powdery mildew in fenugreek and among all the fungicides, penconazole was the most effective followed by hexaconazole and propiconazole. Khunti *et al.* (2002) observed that penconazole and hexaconazole effectively minimized the disease intensity of powdery mildew and increased the yield to considerable extent in green gram. Saxena and Saxena (2002) also reported the efficacy of penconazole (0.05%) against powdery mildew (E.polygoni) of mungbean. Three sprays of penconazole (Topas) @ 0.1% at 15 days interval were most effective in controlling powdery mildew of okra (Naik and Nagaraja, 2003). Recently, Akhileswari *et al.* (2012) reported that systemic fungicides such as difenconazole (0.05 %), penconazole (0.1%) and propiconazole (0.1%) were found significantly superior over non systemic fungicides such as mancozeb at 0.2 percent and wettable sulphur at 0.3 per cent in reducing the incidence of powdery mildew in sunflower.

Phytotoxicity

The test chemical, penconazole 10 EC (NS) did not exerted any phytotoxicity even at its higher dose i.e. 1.0 mL/L on blcakgram crop. None of the phytotoxic symptoms such as injury on leaf tips, leaf surface, necrosis, epinasty, hyponasty, wilting and vein clearing was observed in the crop till the end of the experiment. The present results are in concordance with Saxena and Saxena (2002) who reported that penconazole did not have any phytotoxicity on green gram.

Yield

All the treatments significantly increased the yield over the untreated check. However, highest grain yield was recorded from the experimental plots treated with Penconazole 10 EC (NS) @ 1.0 mL/L (1120 kg/ha) which was statistically on par with Penconazole 10 EC (NS) @ 0.6 mL/L (1027 kg/ha) during rabi 2009-2010 season. These two treatments were found significantly over the rest of the treatments which were failed to differ significantly with each other. The similar trend was observed among the treatments during rabi 2010-2011 season also, though the yield levels were low in all the treatmental plots due to heavy rains at the time of harvesting. The present results were in conformity with Rakhonde *et al.* (2011) who reported that maximum grain yield (556 kg/ha) was obtained with 0.05% penconazole in green gram. Saxena and Saxena (2002) reported that fungicidal sprays not only control the disease but also had significant influence on the yield components in green gram.

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REFERENCES

Abbaiah, K. 1993. Development of powdery mildew epidemics in urd beanin relation to weather factors. *Indian Journal of pulse Research*, **6**(2): 186-188.

Akhileshwari, S. V., Amaresh, Y. S., Naik, M. K., Kantharaju, V., Shankergoud, I. and Ravi, M. V. 2012. Field evaluation of fungicides against powdery mildew of sunflower. *Karnataka Journal Agricultural Science*, **25**(2): 278-280.

Anonymous. 2012. Project coordinator's Report of AICRP on MULLARP. Indian Institute of Pulses Research, Kanpur, India.

Desai, S.A., Nagaraj, M.S. and Naik, K.S. 2002. A note on Penconazole-A new triazole

molecule in the control of powdery mildew of chilli and grapevine. *Karnataka Journal of Agricultural Sciences*, **15**: 386.

Dhruj, I.V., Akbari, R.R., Khandar and Jadeja, K.B. 2000. Field evaluation of fungicides against powdery mildew of fenugreek. *Journal of Mycology and Plant Pathology*, **30**: 98-99.

Khunti, J. P., Bhoraniya, M. F. and Vora, V. D. 2002. Management of powdery mildew and Cercospora leaf spot of mung bean by some systemic fungicides. *Journal of Mycology and Plant Pathology*, **32**(1): 103-105.

Nagaraja, A. and Naik, K.S. 1998. Chemical control of powdery mildew and Choanephora rot of peas. *Pestology*, **22**: 5-7.

Naik, K.S. and Nagaraja, A. 2003. Chemical control of powdery mildew of okra. *Agricultural Science Digest*, **23**(4): 305-306.

Nene, Y. L. and Thapliyal, P. N. 1993. Fungicides in plant disease control. Third Edition, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India, 311-348 **PP.**.

Pramod Prasad and Dwivedi, S. N. 2007. Fungicidal management of field pea (*Pisum sativum* L.) powdery mildew caused by *Erysiphe polygoni* DC. *Progress Research*, **2**: 116-118.

Quebral, F.C. and Cowell, R. 1978. Powdery mildew and Cercospora leaf spot of green gram in philippines. First International Green gram Symposium, Philippines. 147-148 **PP**.

Rakhonde, P.N., Koche Mina, D. and Harne, A.D. 2011. Management of powdery mildew of green gram. *Journal of Food Legumes*, **24**(2): 120-122.

Saxena, D. R. and Saxena, M. 2002. Influence of fungicidal spray on powdery mildew epidemics and major yield attributing characters of green gram. *Journal of Plant Pathology*, **18**: 68-73.

Singh, A. K. 2006. Evaluation of fungicides for the control of powdery mildew disease in coriander (*Coriandrum sativum* L.). *Journal of Spices and Aromatic Crops*, **15**(2): 123-124.

Singh, U.P., Pritviraj, B., Aust, H.J. and Sarma, B.K. 1999. Control of powdery mildew (*Erysiphe pisi*) of pea (*Pisium sativum*) with rhizome powder of *Zingiber officinale* and *Acarys calamus*. *Zeitschrift fur pflanzenkrankheiten und pflanzenschutz*, **106**: 590-597.

Venkata Rao, M. 1997. Studies on powdery mildew of green gram (*Vigna radiata* L.) caused by *Erysiphe polygoni* DC. M. Sc. (Agri.) Thesis, University of Agricultural Science, Dharwad, India.

Wheeler, B. E. J. 1969. An Introduction to Plant Disease. John Wiley Sons Ltd., London, 301 **P**.

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