The Andhra Agric. J 61(4): 885-889, 2014

Efficacy of New Fungicides and Essential Oils Against Powdery Mildew and Corynespora Leaf Spot of Blackgram

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ABSTRACT

A field experiment was conducted to evaluate the efficacy of new fungicide molecules and two essential oils against powdery mildew and corynespora leaf spot in blackgram for two consecutive seasons i.e. during Rabi 2009-10 and 2010-11 at Regional Agricultural Research Station, Lam, Guntur, Andhra Pradesh. The results showed difenconazole @ 0.5 ml/lt or carbendazim @ 1.0 g/lt were highly effective against powdery mildew in blackgram, while hexaconazole @ 2.0 ml/lt, propiconazole @ 1.0 ml/lt and mancozeb @ 2.5 g/lt found highly effective against corynespora leaf spot in blackgram. But essential oils such as winter green oil and Eucalyptus oil were failed in suppressing both the diseases in blackgram. The seed yield was highest from the plots treated with hexaconazole @ 2.0 ml/lt during both the years of experimentation.

Key words : Corynespora leaf spot, Essential oils, New fungicide molecules, Powdery mildew, Urdbean.

Blackgram, *Vigna mungo* (L.) Hepper, is an important short duration pulse crop grown throughout the year in India under different agroclimatic conditions, such as *kharif* (rainy), *rabi* (winter) and summer both in uplands and rice fallows. In Andhra Pradesh, the total production of blackgram is 1.85 lakh tonnes from an area of 4.29 lakh ha with a productivity of 525 kg/ha (Anonymous, 2012). Though, it is being grown in large area, the productivity was low due to various biotic and abiotic stresses. Among the biotic stresses, diseases are responsible for an estimated yield loss of 20 to 30 per cent (Singh, 1995). Among them, powdery mildew and leaf spots are the more prevalent diseases on urdbean in Andhra Pradesh. Powdery mildew (*Erysiphe polygoni*) is most serious disease of cowpea, mungbean, urdbean and horsegram particularly in Southern India. Grain yield losses have been reported up to 21% (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. Warm temperature (> 33^{o}C), low humidity (< 75%) and bright sunshine are congenial for spread of this disease (Munshi and Sokhi, 1992). Powdery mildew disease initially appears as white minute patches on the upper surface of lower leaves or older leaves and then spread to younger ones. Later grayish powdery coating is visible on severely affected leaves. Leaves finally show necrosis resulting in withering, drying and defoliation. Among the leaf spots,corynespora leaf spot caused by *Corynespora cassiicola* is an economically important disease in blackgram. Symptoms of this disease develop on leaves when the crop reaches flowering stage. Lesions begin as dark reddish brown circular spots usually on the upper surface of the leaf and they expand to become larger spots. In advanced stages the spots coalesce to form patches. Shot-holing and severe defoliation is a marked symptom in advanced stages of infection. Due to lack of suitable resistant cultivars, the use of fungicides has become inevitable in controlling these diseases in blackgram.

MATERIAL AND METHODS:

A field experiment was conducted during Rabi 2009-10 and 2010-11 at Regional Agricultural Research Station, Lam, Guntur to evaluate the bio-efficacy of different new fungicides and two essential oils against powdery mildew and corynespora leaf spot in blackgram. The trial was laid out in Randomized Block Design with nine treatments including untreated control, each replicated three times with a plot size of 25 sq.m

during both the years. The blackgram variety, LBG 645 which is susceptible to powdery mildew and leaf spots was selected for the study and sowing was done during second fortnight of November at a spacing of 30 cm and 10 cm between rows and plants respectively. The crop was grown under rainfed conditions by adopting all agronomic practices as per the recommendations of ANGRAU, Hyderabad. The crop was protected from infestation of both sucking pests and pod borers 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 taken up after initial appearance of the diseases on the crop and further sprays were given at 15 days interval with knap-sack sprayer at the rate of 500 liters of spray fluid per hectare for thorough coverage of foliage with spray fluid. The severity of corynespora leaf spot and powdery mildew were recorded one day before the first spray and finally after three sprays using standard disease rating scales (Alice and Nadarajan, 2007) during both the seasons. Percent disease index (PDI) was calculated using Wheelers formula (1969) for both leaf spot and powdery mildew.

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

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

RESULTS AND DISCUSSION

Powdery mildew:

Among all the treatments, the experimental plots sprayed with Difenconazole @ 0.5 ml/lt were found almost free from powdery mildew with lowest disease incidence (< 2 PDI) and found significantly superior over the rest of the treatments during both the seasons. Carbendazim @ 1 g/lt was found as the next best treatment which recorded approximately 5 PDI during both the seasons and found statistically superior over the remaining treatments. The remaining fungicides such as propiconazole @ 1.0 ml/lt, hexaconazole @ 2.0 ml/lt and chlorothalonil @ 1.0 ml/lt were found statistically on par with each other in reducing the disease incidence of powdery mildew in blackgram during 2009-10, but during 2010-11, chlorothalonil @ 1.0 ml/lt (PDI – 17.99) was found statistically superior over propiconazole @ 1.0 ml/lt and hexaconazole @ 2.0 ml/lt which were found on par with each other. Mancozeb @ 2.5 g/lt was less effective against powdery mildew with PDI more than 30 per cent during both the seasons. However it was found significantly superior over the essential oils and untreated control in reducing the incidence of powdery mildew in blackgram. Among all the treatments, essential oils such as winter green oil 30 EC @ 5.0 ml/lt and eucalyptus oil 30 EC @ 5.0 ml/lt were found ineffective against powdery mildew which were statistically and numerically at par with untreated control with more than 90 PDI during both the seasons.

Corynespora leaf spot:

The fungicides which were found very effective against powdery mildew were less effective against corynespora leaf spot and vice versa. Among the different treatments, hexaconazole @ 2.0 ml/lt was found highly effective in reducing the disease incidence with lowest PDI during both the seasons. However, it was found statistically on par with propiconazole @ 1.0 ml/lt but significantly superior over the remaining treatments. Among the remaining treatments, mancozeb @ 2.5 g/lt which included as standard check was found significantly superior over the remaining treatments with a PDI of around 10 per cent during both the seasons. Difenconazole @ 0.5 ml/lt was found as the next best treatment followed by chlorothalonil @ 1.0 ml/lt which were found to differ significantly among themselves and superior over the remaining treatments. Among the chemical fungicides, carbendazim @ 1.0 g/lt and both the essential oils, winter green oil 30 EC @ 5.0 ml/lt and eucalyptus oil 30 EC @ 5.0 ml/lt were found ineffective against corynespora leaf spot in blackgram and were on par with untreated control with highest disease incidence.

Table.1. Efficacy of fungicides on incidence and severity of Powdery mildew and Corynespora leaf spot and grain yield during *rabi* 2009-10 and 2010-11 in blackgram.

S.No.	Treatment	Mean percent disease index				Yield (kg/ha)	
		Powdery mildew		Corynespora leaf spot			
		2009-10	2010-11	2009-10	2010-11	2009-10	2010-11
T1	Difenconazole @ 0.5 ml/lt	1.38 (6.40)[a]	1.98 (7.95)[a]	14.92 (22.69)[c]	19.37 (26.17)[c]	1020[b]	920[b]
T2	Propiconazole @ 1.0 ml/lt	26.72 (31.11)[c]	24.61 (29.73)[d]	6.51 (14.70)[a]	8.66 (17.05)[ab]	1113[ab]	980[b]
T3	Hexaconazole @ 2.0 ml/lt	25.57 (30.32)[c]	22.88 (28.50)[d]	4.51 (12.18)[a]	7.04 (15.29)[a]	1160[a]	1080[a]
T4	Chlorothalonil @ 1.0 ml/lt	19.87 (29.71)[c]	17.99 (24.95)[c]	19.01 (25.78)[d]	24.41 (29.57)[d]	840[c]	783[c]
T5	Winter green oil @ 5.0 ml/lt	91.02 (72.61)[e]	90.41 (71.90)[f]	89.03 (70.79)[e]	86.86 (68.74)[e]	420[d]	386[d]
T6	Euclyptus oil @ 5.0 ml/lt	91.03 (71.52)[e]	89.68 (71.26)[f]	88.60 (70.24)[e]	87.51 (69.35)[e]	460[d]	380[d]
T7	Carbendazim @ 1.0 g/lt	4.86 (12.60)[b]	5.29 (13.18)[b]	89.31 (70.88)[e]	85.41 (67.57)[e]	880[c]	776[c]
T8	Mancozeb @ 2.5 g/lt	34.22 (35.78)[d]	32.97 (35.19)[e]	9.69 (18.04)[b]	10.42 (18.78)[b]	1090[ab]	963[b]
T9	Control	91.59 (73.25)[e]	90.71 (72.28)[f]	89.32 (70.92)[e]	88.68 (70.39)[e]	440[d]	360[d]
	SEM ±	1.34	1.04	1.88	1.13	26.94	20.50
	CD (p=0.05%)	4.00	3.12	2.66	3.06	80.75	61.46
	CV %	5.7	4.6	3.7	4.1	5.7	4.8

Figures in parenthesis are arc sine transformed values ( )
Values followed by the same letter are not significantly different

Yield:

In general, the seed yield was high during 2009-10 when compared to 2010-11 from the experimental plots. Among all the treatments, the seed yield was highest from the plots treated with hexaconazole @ 2.0 ml/lt which was found significantly superior over the other treatments during rabi 2010-11, and at par with propiconazole and mancozeb during rabi 2009-10. The next best treatment which recorded the higher yield was difenconazole @ 0.5 ml/lt during both the years.

The results obtained in the present study were in accordance with the earlier reports by many of the researchers. Nagaraja and Naik (1998) reported the efficacy of triazoles such as propiconazole, penconazole and difenconazole against powdery mildew of pea. The higher efficacy of difenconazole 0.0125 % followed by thiophanate methyl 0.07 % and carbendazim 0.05 % against cercospora leaf spot in greengram was reported by Kapadiya and Dhruj, (1999). Similarly, Khunti *et al*. (2002) observed the low disease intensity of powdery mildew and increased yield with penconazole and hexaconazole in greengram. The present studies clearly indicated that chlorothalonil was less effective compared to triazole compounds in reducing both powdery mildew and corynespora leaf spot in blackgram. Earlier, Kulkarni (2003) reported that hexaconazole 5EC at 0.2 per cent was found most effective than chlorothalonil in controlling the leaf spots and rust disease of groundnut. Similarly, less efficacy of chlorothalonil compared to hexaconazole and propiconazole against soybean rust was reported by Patil and Anahosur (1998) which are in accordance with present results. Though mancozeb was found significantly superior over unprotected control, it was less effective when compared to the other fungicides in reducing the powdery mildew incidence. Similar results were obtained by Sharma (1991), who observed that mancozeb and wettable sulfur were least effective in managing the powdery mildew in sugar beet. The results obtained in the present study clearly indicated that carbendazim was highly effective against powdery mildew but ineffective against corynespora leaf spot. The essential oils such as winter green oil and eucalyptus oil were found ineffective against both the diseases. Less efficacy of essential oils when compared to propiconazole (1.0 ml/lt) and hexaconazole (2.0 ml/lt) against brown spot of rice was reported by Sunder *et al.,* (2010).

Conclusion:

Foliar application of hexaconazole @ 2.0 ml/lt followed by propiconazole @ 1.0 ml/lt or mancozeb @ 2.5 g/lt will be the better option if both powdery mildew and corynespora leaf spots were observed in blckgram crop by considering the disease suppression efficacy as well as yield. Foliar application of either difenconazole @ 0.5 ml/lt or carbendazim @ 1.0 g/lt can be used if only powdery mildew incidence was severe in blackgram crop. Where as chlorothalonil @ 1.0 ml/lt was found moderately effective against both powdery mildew and corynespora leaf spot

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(Received on 26.02.2013 and revised on 18.03.2013)