SHORT COMMUNICATION

Influence of sowing time on efficiency of chemical and biological management of anthracnose of cowpea

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ABSTRACT: Cowpea is grown in various agro-climatic zones of India for seed and fodder purposes. Anthracnose caused by *Colletotrichum dematium* (Pers.) Grove is the most devastating and causes substantial yield losses in this crop. Anthracnose severity was maximum in the early sown, while minimum in late sown crop irrespective of all the treatments. In the interaction analyses, all the biological and chemical treatments were significantly superior at Palampur location irrespective of date of sowing. On the basis of pooled average at Jhansi, the disease incidence ranged from 10.5-22.9% compared to Palampur where it ranged from 3.7-22.7%. The influence of sowing date on incidence of anthracnose was significant at both the locations. Early sowing leads to higher disease incidence than late sowing.

Keywords: *Colletotrichum lindemuthenum*, neem seed kernel powder, propiconazole, tebuconazole

Cowpea (*Vigna unguiculata* (L.) Walp) is grown in various agro-climatic zones of India like northern hills, north east, central and north west zone for seed and fodder purposes. The crop is economically damaged by various foliar diseases like anthracnose, *Cercospora* leaf spot, bacterial and viral diseases (Pandey *et al.*, 2009). Anthracnose caused by *Colletotrichum dematium* (Pers.) Grove is the most devastating and causes substantial yield losses (Emechie and Florini, 1997). It often causes severe economic losses under favourable environmental conditions and grain yield losses goes up to 50% (Sharma *et al.*, 2008). Various chemical, biological and cultural approaches have been advocated to manage this disease. However, information on common management approaches for different agro-climatic zones particularly hill and central zone and their interaction with time of sowing was found limited and hard to be traced. Such information will help cowpea farmers to plan time of sowing in order to get maximum effectiveness of chemical and biological management approaches. In the present work, combined effects of chemical, botanical and biological seed treatments and sprays at different time of sowing were studied at Palampur and Jhansi locations.

The field experiments were conducted in the rainy seasons (July-October) of 2013 and 2014 at ICAR-Indian Grassland and Fodder Research Institute, Jhansi, and CSK Himachal Pradesh Agricultural University, Palampur. The cowpea seeds were sown at three sowing dates i.e. 15 days before normal date of sowing (D-1 25th June),

normal (D-29th July) and 15 days after normal (D-3 24th July) during both the years adopting standard agronomic practices in split-split plot design in 4x3 m plot size with three replications to assess efficacy of chemical and biological control measures against anthracnose incidence. Four treatments comprised of 1. No treatment (Control), 2. Seed treatment with *Trichoderma viride* + *Paecilomyces lilacinus* (Trichoxp) @ 5 g/kg seed each followed by two foliar sprays of propiconazole @ 1ml/l commencing from 15 DAS at an interval of 15 days, 3. Seed treatment with tebuconazole 2DS @ 1g/kg seed + Neem Seed Kernel Powder (NSKP, 50 g/kg seed) followed by two foliar sprays of propiconazole @ 1ml/l commencing from 15 DAS at an interval of 15 days and 4. Seed treatment with metalaxyl 8% + Mancozeb 64% @ 2.5g/kg seed + NSKP (50 g/kg seed) followed by two foliar sprays of propiconazole @ 1ml/l commencing from 15 DAS at an interval of 15 days, were taken. Disease incidence was recorded at vegetative and flowering stage at each cut. Data on disease indices were pooled for each location and then for both the locations. Disease incidence data were transformed angularly before analysis to improve interpretability as study has wide range of treatments, location and different sowing dates. The angular transformation of data helps to set the relative conclusion among pooled percent disease incidence at different location and various climatic factors on different sowing dates. Three factors - factorial analysis was carried out to determine the effect of date of sowing, treatment and locations in split plot design (Snedecor and Cochran, 1967).

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Table 1. Effect of date of sowing on anthracnose disease (pooled average % incidence) of forage cowpea in the year 2013 and 2014 at Jhansi and Palampur locations

Sowing Schedule	Location	Treatments			
		Control	Seed treatment (ST) with Trichoxp + two foliar sprays of propiconazole	ST with tebuconazole + NSKP + two foliar sprays of propiconazole	ST with metalaxyl+ Mancozeb + NSKP + two foliar sprays of propiconazole
DOS* 1	Palampur	20.1 (26.4)	8.2 (16.5)**	7.9 (16.1)	7.5 (15.8)
	Jhansi	22.9 (25.5)	19.1 (23.5)	13.6 (19.6)	15.6 (20.9)
DOS 2	Palampur	22.7 (28.2)	6.3 (14.2)	5.7 (13.9)	5.7 (13.6)
	Jhansi	14.9 (22.7)	11.7 (19.1)	11.6 (19.4)	13.7 (20.6)
DOS 3	Palampur	12.1 (20.2)	4.1 (11.5)	3.7 (10.5)	3.5 (10.5)
	Jhansi	13.4 (21.3)	10.9 (18.9)	10.5 (18.8)	13.3 (20.9)

LSD (P=0.5): Location 4.7; Time of sowing 2.7 ; treatments 6.1

Date of sowing x location 1.4; date of sowing x treatments 1.2; date of sowing x location x treatment 0.9

*Date of sowing, **Angular transformed values

All the biological and chemical treatments on three sowing dates were found significantly superior than control in reducing anthracnose incidence at both the locations. However, all these treatments were significantly equal in reducing disease severity irrespective of location and time of sowing. Anthracnose severity was maximum in the early sown, while minimum in late sown crop irrespective of all the treatments. In the interaction analyses, all the biological and chemical treatments were significantly superior at Palampur location irrespective of date of sowing. Seed treatment (ST) with Trichoxp + two foliar sprays of propiconazole was not found significantly superior at later two sowing dates. However, ST with tebuconazole + NSKP + two foliar sprays of propiconazole was found significantly better in late sown crop compared to other date of sowing. ST with metalaxyl + Mancozeb + NSKP + two foliar sprays of propiconazole was found significantly equal in early and late sown crops. In interaction studies, date of sowing x location indicated that late sowing was significantly superior in all the treatments at Palampur location where good rainfall (183.4 mm) was received at the time of sowing as compared to Jhansi (58.4 mm). Various systemic and contact fungicides have been found effective as seed treatment and spray against anthracnose, Seeds treated with Apron plus 50DS and Super homai 70% WP produced plants, which had significantly lower severity of leaf anthracnose than plants from un-treated seeds (Gwary, 2008). Gwary and Asala (2006) made similar observation and reported that plants grown from seeds treated with Apron plus or Thiram along with foliar applied fungicides had an incidence of anthracnose as high as 75% but the severity did not exceed 22%. In the present study, combinations of chemical and botanical were found effective indicating that this is providing multifarious action in reducing anthracnose disease. Mahapatra *et al.* (2011) reported that combination treatments of fungicides and botanical oils were found better in reducing chilli anthracnose incidence, application of neem oil (0.1%) and tricyclazole (225g a.i./ha) in an

alternate manner caused maximum reduction in disease incidence. Neem products are having antifungal activity due to azadirachtin content and their role in control of various fungal diseases is well documented (Lokanadhan *et al.*, 2012). At both the locations, disease pressure was high in the year 2013 compared to 2014. On the basis of pooled average at Jhansi, the disease incidence ranged from 10.5-22.9% compared to Palampur where it ranged from 3.7-22.7%. This indicated that environmental condition at Palampur were more favourable during both the crop growing seasons for occurrence of anthracnose compared to those of Jhansi. The data on disease severity (Table 1) showed that seed treatment either with biocontrol or botanicals followed by two sprays of propiconazole @ 0.1% were very effective for the management of anthracnose. Control of Lychee anthracnose by foliar application tebuconazole has also been found effective (Crane *et al.*, 1997). In the same manner, application at 0.1% propiconazole cause a dramatic reduction in anthracnose incidence on chillies caused by *C. capsici* (Gopinath *et al.*, 2006). Ngugi *et al.* (2000) reported reduced incidence of anthracnose and attributed it to delayed onset of disease and prevailing climatic conditions. A negative correlation was observed between disease severity and mean temperature in 2007 and 2008 at all the sowing dates (Banyal *et al.*, 2012). Minimum temperature (19°C) was recorded at palampur during early planting which favours anthracnose incidence. In our study also, climatic conditions were not favourable for the development of disease in the late sown crop, hence low disease severity was observed during both the years at Jhansi. The influence of sowing date on incidence of anthracnose was significant at both the location. Early sowing leads to higher disease incidence than late sowing. Our studies, therefore, demonstrate that change in time of sowing is considered a crucial factor that determines where and when the crop can be grown in influencing incidence of anthracnose irrespective of location and treatments. However, this is more important for hill regions of the country where the disease occurs

in severe form. Alternation in date of sowing has great impact on the occurrence of plant diseases. This study provides an approach for farmers to manipulate the date of sowing to manage anthracnose in cowpea growing regions of India.

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