The Andhra Agric. J 65 (3): 591-593, 2018

Field Evaluation of Fungicides, Biocontrol Agents and Botanicals Against Alternaria Leaf Spot of Cotton

B Mohan Venkata Siva Prasad, S L Bhattiprolu, V Prasanna Kumari and K Jayalalitha

Department of Plant Pathology, Agricultural College, Bapatla, A.P.

ABSTRACT

A field trial was conducted to test the efficacy of four fungicides, three biocontrol agents and two plant extracts against the Alternaria leaf spot on cotton at Regional Agricultural Research Station, Lam, Guntur, during *kharif,* 2016-2017. The chemical and biological treatments were applied as sprays at 90, 105 and 110 DAS i.e., at flowering, boll formation and boll maturity stages. Seed treatment with carboxin + thiram at 2 g kg^{-1} of seed and foliar spray with carbendazim + mancozeb significantly reduced intensity of disease to 6.82% with 80.6% disease control and yield of 1571 kg ha^{-1}. An increased yield of 55% and benefit cost ratio of 1.61 was recorded. Seed treatment with carboxin + thiram at 2 g kg^{-1} of seed and foliar spray with *Pseudomonas fluorescens* at 5% and *Bacillus subtilis* at 5% were on a par with ST with carboxin + thiram at 2 g kg^{-1} of seed and FS with captan and hexaconazole at 0.1%.

Key words: *Alternaria macrospora*, *Biocontrol agents and Botanicals, Cotton leaf spot, Fungicides.*

India is the largest cotton growing country in the world with an area around 10.5 M ha followed by United States and China. The cotton production of India is 35.1 million bales and productivity is 568 kg ha^{-1}. India's share in global cotton exports is around 25%. In India, Andhra Pradesh stands seventh in area with 4.49 lakh ha, eighth in production of 13.10 lakh bales and second in productivity with 719 kg ha^{-1} during 2016-17 (AICCIP, 2017).

Cotton crop is affected by fungal, bacterial and viral diseases. Among fungal diseases, leaf spot/blight caused by *Alternaria macrospora* Zimm., is the most commonly occurring disease in the Andhra Pradesh.

Under congenial conditions, the disease causes severe defoliation, cracking and breaking of stems and reduction in boll formation. The disease caused losses to the tune of 38.23% (Bhattiprolu and Prasada Rao, 2009) and 33.43% in Jayadhar (Chattannavar *et al*, 2010).

MATERIAL AND METHODS

Field experiment was conducted during *kharif,* 2016-17 at the Regional Agricultural Research Station, Lam, Guntur, Andhra Pradesh. The experiment was laid out in a Randomized Block Design. Susceptible hybrid Jadoo BG II was sown at a spacing of 105x60 cm (common seed treatment was imposed using carboxin 37.5% + thiram 37.5% at 2 g kg^{-1} of seed at the time of sowing). Natural disease pressure was supplemented with artificial inoculation of *A. macrospora* spore suspension containing 10^{-6} conidia ml^{-1} applied in field. The chemical treatments were applied as sprays to run off at fifteen days interval starting from 90 DAS (Flowering stage) and subsequent sprays at 105 and 110 DAS. Seven days after last spraying, the disease in different treatments was recorded using 0-4 scale (Sheo Raj, 1988) and per cent disease index (PDI) was calculated by using the formula given by Wheeler (1969).

Preparation of leaf extracts:

Fresh material of neem leaves and garlic cloves was thoroughly cleaned, surface sterilized with ethanol and washed well with sterile water. The plant tissue was ground with sterile water at the rate of 1 g/ ml of plant tissue using a pestle and mortor, and the macerate was filtered through a muslin cloth to get the crude extract (Meena and Ratnoo, 2013). The extracts of plant species at 15 per cent was tested in field against the *A. macrospora* .

Preparation of bioagents:

Mass multiplication of *Trichoderma harzianum* was done in Potato dextrose broth while *P. fluorescens* and *B. subtilis* in Nutrient broth under aseptic conditions in BOD incubator at 25^0C. After 10 days of inoculation the culture filtrates were collected and were used for foliar spray at 5% (Hosagoudar and Chattannavar, 2013).

Ten treatments, *viz*., foliar spray with 0.2% carbendazim + mancozeb (T1), 0.2% hexaconazole (T2), 0.1% propiconazole (T3), 0.1% captan + hexaconazole (T4), 5% (10^7 CFU ml^{-1}) *T. harzianum* spore suspension (T5), 5% *P. fluorescens* suspension (T6), 5% *B. subtilis* suspension (T7),15% neem leaf extract (T8), 15% garlic clove extract (T9) and untreated control (T10) were imposed with three replications. Treatment wise yield data was recorded and benefit cost ratio was calculated.

Table 1: Field evaluation of selected fungicides, biocontrol agents and plant extracts against *A. macrospora*

Tr. No.	Treatments	Percent Disease Index (PDI)			Per cent Decrease over Control (PDC)			Yield (kg ha $^{-1}$)	Per cent increase in yield over control	BCR
		After 1st spray (90 DAS)	After 2nd spray (105 DAS)	After 3rd spray (120 DAS)	After 1st spray	After 2nd spray	After 3rd spray			
T1	ST with carboxin+thiram and FS with carbendazim + mancozeb @0.1%	9.7 (18.0)^{a}	8.2 (16.5)^{a}	6.8 (15.1)^{a}	69.4	76.0	80.6	1571.4^{a}	55.0	1.61
T2	ST with carboxin+thiram and FS with hexaconazole @ 0.2%	10.2 (18.6)^{ba}	12.2 (20.4)^{cb}	10.7 (19.1)^{b}	67.8	64.3	69.4	1539.5^{b}	52.0	1.56
T3	ST with carboxin+thiram and FS with propiconazole @ 0.1%	11.0 (19.2)^{ba}	11.2 (19.3)^{cb}	10.3 (18.7)^{b}	65.3	67.2	70.6	1550.2^{b}	53.0	1.57
T4	ST with carboxin+thiram and FS with captan + hexaconazole @ 0.1%	11.5 (19.7)^{ba}	10.0 (18.4)^{ba}	11.7 (19.9)^{b}	63.7	70.7	66.6	1550.4^{b}	53.0	1.57
T5	ST with carboxin+thiram and FS with *Trichoderm harzinum*	12.7 (20.8)^{cb}	14.8 (22.6)^{dc}	15.3 (23.0)^{dc}	59.9	56.7	56.3	1479.5^{cb}	46.0	1.46
T6	ST with carboxin+thiram and FS with *Pseudomonas flourescens*	13.7 (21.7)^{cb}	14.5 (22.4)^{dc}	13.3 (21.4)^{cb}	56.8	57.1	62	1476.2^{cb}	46.2	1.46
T7	ST with carboxin+thiram and FS with *Bacillus subtilis*	14.8 (22.7)^{dc}	14.3 (22.2)^{dc}	13.0 (21.1)^{cb}	53.3	58.2	62.8	1483.3^{cb}	46.3	1.47
T8	ST with carboxin+thiram and FS with neem leaf extract @ 10%	21.3 (27.4)^{e}	20.7 (26.9)^{e}	19.3 (26.1)^{e}	32.8	39.5	44.8	1391.5^{d}	37.22	1.32
T9	ST with carboxin+thiram and FS with garlic bulbil extract @ 10%	22.8 (28.4)^{fe}	21.5 (27.6)^{fe}	33.3 (35.2)^{f}	28.1	37.1	4.8	1347.2^{d}	33.1	1.24
T10	Control	31.7 (34.3)^{g}	34.2 (35.8)^{g}	35.0 (36.2)^{g}				1013.7^{e}		0.69
	SEm ±	0.71	0.79	0.65				24.01		
	CD (P ≤ 0.05)	2.11	2.35	1.93				71.34		
	CV (%)	5.34	5.89	4.77				2.88		

ST – Seed Treatment FS – Foliar Spray

Figures in parentheses are arc sine transformed values
Treatment means with same alphabet do not differ significantly

RESULTS AND DISCUSSION

Data on disease intensity after first spray (90 DAS) and second spray (105 DAS) revealed that seed treatment with carboxin + thiram at 2 g kg^{-1}seed and foliar spray with carbendazim + mancozeb at 0.1 g ml^{-1} were significantly superior to other treatments with lower per cent disease index (PDI = 9.7 and 8.2) respectively, compared with other treatments. At 120 DAS, Alternaria leaf spot disease intensity after a week of third spray disease was found to reduce in all the treatments (Table 1). Seed treatment with carboxin + thiram 2 g kg^{-1} seed and foliar spray with carbendazim + mancozeb at 0.1% showed significantly lower disease (PDI = 6.8) compared to other treatments and recorded highest yield 1571.4 kg ha^{-1} with highest benefit cost ratio (BCR) 1.61 respectively. Seed treatment with carboxin + thiram at 2 g kg^{-1} seed and foliar spray with hexaconazole at 0.2%, propiconazole at 0.1% and captan and hexaconazole at 0.1% treatments were statistically on a par in reducing the disease. Foliar spray with *P. fluorescens* at 5 % and *B. subtilis* 5% were on a par with ST with carboxin + thiram 2 g kg^{-1} seed and FS with captan and hexaconazole at 0.1%.

Bhaskaran and Shanmugam (1973) and Desai (1979) found that mancozeb was effective in reducing the infection of *A. macrospora*. Propiconazole 0.1% lowered Alternaria blight severity and increased cotton yield (Chattannavar *et al*., 2010). Meena and Ratnoo (2013) reported that mancozeb and hexaconazole significantly controlled the alternaria leaf spot in field experiments. Venkatesh *et al*. (2015) obtained 43% control of Alternaria leaf spot using mancozeb at 3 g kg^{-1} seed treatrment and foliar spray of 0.1% propiconazole. Sunita and Srikanta (2016) reported that seed treatment with salicylic acid, foliar spray with mancozeb at 45 DAS and garlic bulb extract at 75 DAS statistically on a par with seed treatment with salicylic acid and two mancozeb foliar sprays at 45 DAS and 75 DAS. Kuldeep *et al*. (2017) reported that foliar spray with mancozeb at 0.25% significantly reduced the Alternaria blight in mustard.

CONCLUSION

Based on the present studies it is concluded that seed treatment with carboxin + thiram 2 g kg^{-1} of seed and foliar spray of 0.1% carbendazim+ mancozeb at 15 days interval significantly reduced the disease severity.

LITERATURE CITED

AICCIP 2017 Annual Report (2016-17) *All India Coordinated Cotton Improvement Project,* Coimbatore, Tamil Nadu, 2-5.

Bhaskaran R and Shanmugam N 1973 Laboratory evaluation of some fungicides against *Alternaria macrospora* Zimm. *Madras Agricultural Journal*, 60: 646-647.

Bhattiprolu S L and Prasada Rao M P 2009 Estimation of crop losses due to Alternaria leaf spot in cotton. *Journal of Indian Society for Cotton Improvement*, 14: 151-154.

Chattannavar S N, Hosagoudar G N and Ashtaputre 2010 Crop loss estimation due to foliar diseases in cotton. *Karnataka Journal of Agricultural Sciences*, 23: 559 – 601.

Desai S A 1979 Studies on Alternaria leaf and twig blight of cotton in Karnataka. *M. Sc*. (*Ag*) *Thesis*, University of Agricultural Sciences, Bangalore, Karnataka.

Hosagoudar G N and Chattannavar S N 2013 Mnagement of Alternaria leaf spot on Bt cotton through Bioagents and Botaniclas. *Bioinfolet*, 10: 774-778

Kuldeep S, Abhilasha A L, Dinesh K and Neeraj K M 2017 Evaluation of selected bio agents, plant extracts and fungicides for the management of *Alternaria* leaf blight of Indian mustard. *International Journal of Current Microbiology and Applied Sciences*, 6 (2): 26-31.

Meena P K and Ratnoo R S 2013 Efficacy of fungicides and phyto-extracts for suppression on leaf spot of cotton caused by *Alternaria* spp. *International Journal of Plant Protection*, 6 (2): 271-274.

Received on 19.06.2017 and revised on 21.08.2018