INTERNATIONAL JOURNAL OF PLANT PROTECTION
VOLUME 8 | ISSUE 2 | OCTOBER, 2015 | 261-264

● e ISSN-0976-6855 | Visit us : *www.researchjournal.co.in*

IJPP

RESEARCH PAPER

DOI : 10.15740/HAS/IJPP/8.2/261-264

Integrated disease management of anthracnose of cowpea caused by *Colletotrichum lindemuthianum*

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ARITCLE INFO

Received : 25.06.2015
Revised : 03.08.2015
Accepted : 18.08.2015

KEY WORDS :
Thiophanate methyl, Difenaconazole, *Pseudomonas fluroscens*, *Trichoderma viride.*

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ABSTRACT

Cowpea (*Vigna unguiculata* L.) is the most important legume and vegetable crop grown in India. Most of the promising cowpea cultivars are under a great threat for profitable cultivation due to the attack of several abiotic and biotic factors *viz.*, Fungi, bacteria, virus and nematodes. The major losses of cowpea are covered by fungi, in which anthracnose caused by *Colletotrichum lindemuthianum* is more important. The experiment on integrated disease management of cowpea anthracnose disease under field conditions with twelve treatments and three replications using fungicides and bio-agent formulations was conducted during 2013-14 and 2014-15. The mean of analysis of two years data revealed that the three foliar sprays of Thiophenate methyl (0.1%) at 10 days interval from initiation of the disease gave average minimum disease intensity (10.63%) and maximum edible pod yield (11.34 q/ha). This was followed by foliar sprays of Difenaconazole (0.06%) which gave average 16.94 per cent disease intensity and pod yield 9.99 q/ha. From the table it is cleared that the fungicides belonging to Trizole groups are more effective.

How to view point the article : Dabbas, M.R., Kumar, Shrawan, Tiwari, Priti and Dutta, S.D. (2015). Integrated disease management of anthracnose of cowpea caused by *Colletotrichum lindemuthianum*. *Internat. J. Plant Protec.*, **8**(2) : 261-264.

INTRODUCTION

Cowpea (*Vigna unguiculata* L.) is a good source of food, forage, fodder, vegetable and certain snacks (Nirmal *et al*., 2001). Grain legumes play an important role in improving livelihood, nutritional security of farmers and populations in less developed countries as well as sustainability of agriculture in dry areas worldwide. Cowpea is the most important legume and vegetable grown in India and to a limited extent in Nepal (Pande and Joshi, 1995) and Bangladesh (BARI, 1991). Trend in the production of pulses had adversely affected the per capita availability of pulses. In India per capita/day availability of pulses had decreased from 69 g during sixties to 35 g, as against the FAO / WHO's current recommendation of 80 grams per day (Ali and Gupta, 2012). Cowpea originated in Africa and is widely grown in Africa, Latin America, and South East Asia and in the southern United States (FAOSTAT, 2010; Shaw, 2007). The largest producer is Africa, with Nigeria and Niger predominating, however Brazil, Haiti, India, Myanmar,

Sri Lanka, Australia, Bosnia and Herzegovina also have significant production. Worldwide cowpeas are cultivated in approximately 8 million hectares. Area under cowpea in India is 3.9 million hectares with a production of 2.21 million tonnes with the national productivity of 683 kg per ha. Productivity of cowpea in the state of Bihar is further low (591 kg/ha) than national average (Mandal *et al*., 2009).

However promising cowpea cultivars are under a great threat for profitable cultivation due to the attack of biotic factors *viz.*, Fungi, bacteria, virus, nematode etc and abiotic factors like nutritional deficiency toxicity water stress, temperature etc. Anthracnose characterized by sunken, black lesion is one of the major fungal diseases of cowpea which constrain its economic production (Enyiukwu and Awurum, 2013b). In affected cowpea plant, up to 50 per cent yield reduction occurs. Its causal agent has been a subject of much scientific debate. It has been variously advanced and reported as a form of *Colletotrichum lindemuthianum* (Masangwa *et al*., 2013). The management of the disease can be done through cultural practice, chemical, biological pestices and use of resistant variety. But there is no doubt that application of chemicals pestices for management of anthracnose is the most effective and widely recommended method of disease management.

MATERIAL AND METHODS

The experiment was conducted at Vegetable Research Farm, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur during two consecutive year *i.e.* 2013-14 to 2014-15. The experiment was laid out on Randomised Block Design (RBD) with three replications. The soil of experimental plot was sandy loam in nature, well drained with low C:N ratio. The plot size was 2.5m x 2.5m. The seed of cowpea variety "K-5269" was used for this experiment. The recommended agronomical practice was followed to raise the crop healthy. Foliar spray of chemicals and bio-agents were started at onset of the disease and repeated three times at 10 days intervals. The twelve treatments were taken as : Thiophenate methyl (0.1%), Flusilazole (0.1%), Copper hydroxide (0.2%), Azoxystrobin (0.03%), Mancozeb (0.2%), Propiconazole (0.1%). Difenaconazole (0.06%), Penconazole (0.01%), Tebuconazole (0.1%), *Pseudomonas flouroscens* (2.0%), *Trichoderma viride* (2.0%) and T_{12} control were used for management of disease. PDI was calculated at every 10 days after each spray using following formula (Bliss, 1934).

$$\text{Disease incidence \%} = \frac{\text{Total number of diseased plant / plot}}{\text{Total plant population / plot}} \text{ x 100}$$

Data on disease intensity and yield was taken also calculated.

RESULTS AND DISCUSSION

The experiment on integrated disease management of cowpea anthracnose disease under field conditions

Table 1 : Evaluation of different fungicides against anthracnose of cowpea

Treatments	Disease intensity			Pod yield q/ha		
	2013-14	2014-15	Mean	2013-14	2014-15	Mean
1. Thiophenate methyl (0.1%)	8.25	13.00	10.63	11.75	10.93	11.34
2. Flusilazole (0.1%)	21.29	29.04	25.17	8.23	7.28	7.76
3. Copper hydroxide (0.2%)	19.45	30.41	24.93	7.92	6.96	7.80
4. Azoxystrobin (0.03%)	16.20	22.28	19.24	9.43	8.39	9.07
5. Mancozeb (0.2%)	22.00	29.22	25.61	8.23	7.36	7.44
6. Propiconazole (0.1%)	16.72	22.25	19.49	9.59	8.55	8.91
7. Difenaconazole (0.06%)	14.20	19.67	16.94	10.55	9.43	9.99
8. Penconazole (0.01%)	15.35	20.67	18.01	9.67	8.63	9.15
9. Tebuconazole (0.1%)	17.15	22.81	19.98	9.35	8.16	8.76
10. *Pseudomonas flouroscens* (2.0%)	26.21	31.24	28.73	6.16	6.88	6.52
11. *Trichoderma viride* (2.0%)	27.15	32.20	29.68	5.86	6.64	6.25
12. Control	34.65	41.03	37.84	4.53	5.86	5.20
C.D. (P=0.05)	2.41	2.52	-	1.64	1.50	-
C.V.%	4.00	3.59	-	8.38	8.23	-

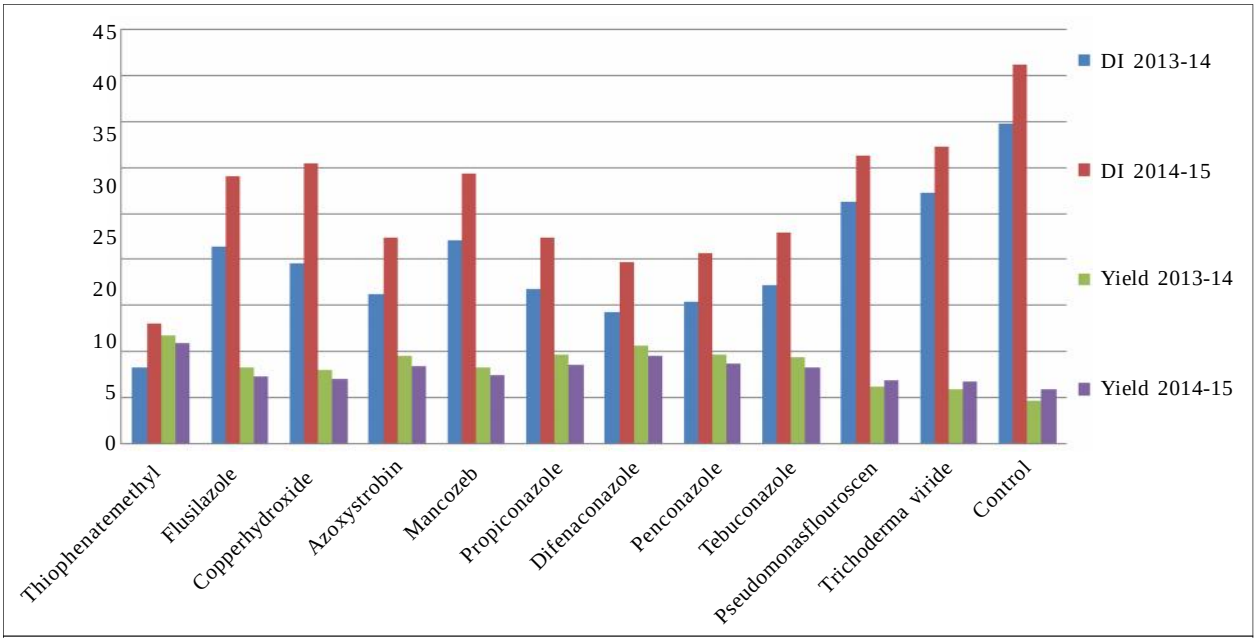

Fig. 1 : Effect of different fungicides against anthracnose of cowpea

revealed that out of 12 treatments using fungicides and bio-agent formulations was conducted during 2013-14 and 2014-15. The results revealed that, all the treatments were significantly superior over untreated control. Deeksha and Tripathi (2002c) and Laxman (2006) reported propiconazole, hexaconazole and carbendazim were effective fungicides against anthracnose of blackgram and greengram, respectively. The mean of analysis of two years' data revealed that the minimum disease intensity (10.63%) anthracnose of cowpea was recorded in the treatment where foliar sprays of Thiophenate methyl (0.1%). This was followed by foliar sprays of Difenaconazole @ (0.06%) 16.94 per cent, Penconazole @ (0.01%) 18.01 per cent, Azoxystobin@ (0.03%) 19.24 per cent, Propiconazole @ (0.1%) 19.49 per cent, Tebuconazole @ (0.1%) 19.98 per cent and Copper hydroxide @ (0.2%) 24.93 per cent. Among the fungicides foliar sprays Mancozeb @ 0.2 per cent was found least effective showing 25.61 per cent disease intensity. From the Table 1, it has been found that foliar spray with bio-agent was least effective against anthracnose disease of cowpea. The data presented in the Table 1 shown that foliar spray with *Pseudomonas fluorscens* and *Trichoderma viride* at 10 days interval from initiation of disease showing 28.73 and 29.68 per cent disease intensity respectively. As per yield is concerned the maximum pod yield 11.34 q/ha was recorded in foliar sprays of Thiophenate methyl (0.1%) and next best effective fungicides were Difenaconazole @ (0.06%) 9.99 q/ha, Penconazole @ (0.01%) 9.15 q/ha and Azoxystobin @ (0.03%) 9.07 q/ha, which were statistically at par in case of pod yield. From the Table 1, it is cleared that the fungicides belonging to Trizole groups are more effective. Similar results have also been reported by Amin *et al*. (2013); Mohammed *et al*. (2014); Padder *et al*. (2010) and Tesfaye and Pretorius (2005).

Acknowledgement :

The authors deeply acknowledge to the Officer-in-Charge, Vegetable Section, Kalyanpur, C.S. Azad University of Agriculture and Technology, Kanpur (U.P.) India for providing the experiment facilities.

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