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Eco-friendly Management of Anthracnose Disease of Cowpea (*Vigna unguiculata*) Sacc. & Magn

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A B S T R A C T

An experiment was conducted at experimental field of Plant Pathology, Sam Higginbottom University of Agricultural, Technology and Sciences, Allahabad, during the *kharif* season 2017 to evaluate the effect of botanicals and bio-agents against Anthracnose of Cowpea caused by *Colletotrichum lindemuthianum*. Eight treatments including control replicated thrice in Randomized block design. In field experiments, the highest reduction of disease intensity was achieved by *Trichoderma viride* (23.703) and *Pseudomonas fluorescens* (25.550) @ 2% at 30, 60, 90 DAS. Under *invitro* condition Eucalyptus oil @ 5% was found most effective inhibiting mycelial growth (100%) followed by *Trichoderma viride* (68.82%). All the treatments significantly reduced the Anthracnose disease under field conditions.

Introduction

The first written reference of the word 'cowpea' appeared in 1798 in the United States (Small, Ernest 2009). The name was most likely acquired due to their use as a fodder crop for cows (Timko *et al*., 2007). The cowpea (*Vigna unguiculata*) is an annual herbaceous legume from the genus *Vigna*. Cultivated cowpeas are known by the common names black-eyed pea, southern pea, yardlong bean, catjang, and crowder pea. It belongs to the family Fabaceae and probably a native of Central Africa.

Cowpea is also a *kharif* legume crop and is grown across India for seeds, green pods, animal fodder, and organic green manure. It is called as vegetable meat due to high nutritious constitutions with high protein 23-24%, carbohydrate 60.3%, minerals and vitamins and also rich source of iron and calcium. The size and shape of the leaves varies greatly, making this an important feature for

classifying and distinguishing cowpea varieties. Flower colour varies through different shades of purple, pink, yellow and white and blue (National Research Council 2006).

The term 'Anthracnose' literally means 'like coal' and was first used by Fabre and Dunal to describe a disease of grapes in which blackening of tissue was a characteristic feature. In Nigeria, the disease is one of the major fungal diseases of cowpea crop. The fungus overwinters in the previous crop debris, and can also be seed-borne as dormant mycelia within the seed coat or as spores between the cotyledons; from where it initiates infection of hypocotyls and young leaves in the field.

The management of plant diseases generally include strategies such as physical and cultural control, resistant cultivars, chemical and biological control. The integration of different management practices has the potential to provide an effective strategy for the control of Anthracnose of Cowpea. Some bio-control agents have been reported as a promising disease management tool.

Materials and Methods

The experiments were carried out during *kharif* season of 2017-2018 at Department of Plant Pathology, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad**.** The experiment was conducted in randomized block design with seven treatments and one control (untreated). The fields were made weed free, ploughed and pulverised. Further, the plots were divided into 24 sub plots. The bunds and irrigation channels were made. The seed were sown @ of 20-25 kg/ha by the method of line sowing with the spacing of 30 cm between row to row and 15 cm between plant to plant. Observations recorded were disease severity and plant height at 30, 60 and 90 DAS. After harvesting yield were also recorded.

Results and Discussion

Study entitled, "Eco-friendly management of Anthracnose disease of Cowpea (*Vigna unguiculata*) Sacc. & Magn" was conducted at the Central Research Farm, Department of Plant pathology, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh during the *Rabi* season of 2017-18 in randomized block design having seven treatments and one control (T_0).

The data of 30 DAS shows that the control (39.92) has the highest disease intensity. Minimum disease intensity was recorded in *Trichoderma viride* @ 2% (12.72), followed by *Pseudomonas fluorecsens* @ 2% (15.81), Eucalyptus oil @ 5% (18.33), Neem oil @ 5% (22.336), garlic bulb extract @ 5% (24.103),Tulsi leaf extract @ 5% (25.866) and Datura leaf extract @ 5% (29.263). *Trichoderma viride* shows the best result when it was checked 30 DAS. The statistical analysis of data showed that all treatments were found significantly effective and significant over control.

These results were observed *invitro* conditions. As we can clearly see from Table 2, that only one botanical exhibits the inhibition of *Colletotrichum lindemuthianum* completely which is Eucalyptus oil with Radial Growth of 0.00 mm,with 100 percent inhibition followed by *Trichoderma viride* with 68.82 inhibition per cent, Neem oil with 62 inhibition per cent, Datura 61.17 inhibition percent, Tulsi leaf extract with 59.81 per cent, Garlic bulb extract with 56.87 per cent and *Pseudomonas fluorecsens* with least inhibition percent i.e. 53.34 %. The statistical analysis of data showed that all treatments were found significantly effective and significant over control.

Table.1 Cowpea at different days of interval

Tr. No.	TREATMENT NAME	DISEASE INTENSITY		
		30 DAS	60DAS	90DAS
T_0	Control	39.926	54.730	67.070
T_1	Datura leaf extract	29.263	36.313	45.810
T_2	Tulsi leaf extract	25.866	32.666	43.086
T_3	Garlic bulb extract	24.103	28.326	38.576
T_4	Neem oil	22.336	27.613	32.753
T_5	Eucalyptus oil	18.333	26.936	30.020
T_6	*Trichoderma viride*	12.720	20.706	23.703
T_7	*Pseudomonas fluorescens*	15.810	25.333	25.550
F Test		S	S	S
S. Ed. (±)		0.34	1.42	2.31
CD (0.05%)		1.49	3.04	3.88

Table.2 *Invitro* evaluations of botanicals and bio-agents against *Colletotrichum lindemuthianum*

Treatment	Radial growth (mm)	%Growth inhibition
T_0 Control	85	0.00
T_1 Datura leaf extract	33	61.17
T_2 Tulsi leaf extract	34.16	59.81
T_3Garlic bulb extract	36.66	56.87
T_4Neem oil	32.33	62
T_5 Eucalyptus oil	0.00	100
T_6*Trichoderma viride*	26.50	68.82
T_7*Pseudomonas fluorescens*	39.66	53.34
F Test	S	-
Sem	0.12	-
CD (0.05%)	0.88	-

Fig.1 Symptoms on pods

Fig.2 Symptoms on leaves

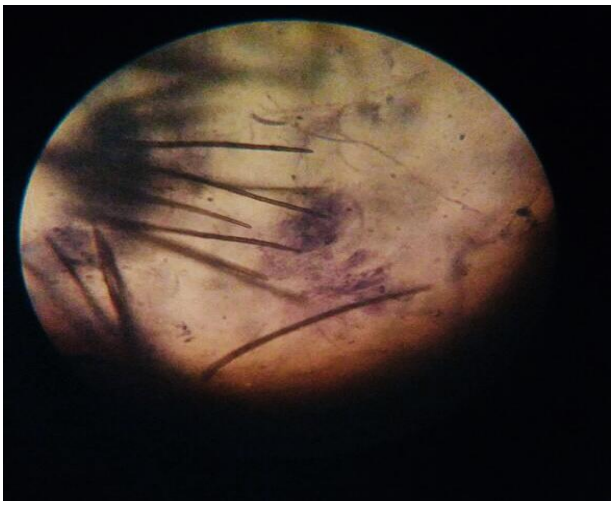

Fig.3 Photomicrograph of *Colletotrichum lindemuthianum*

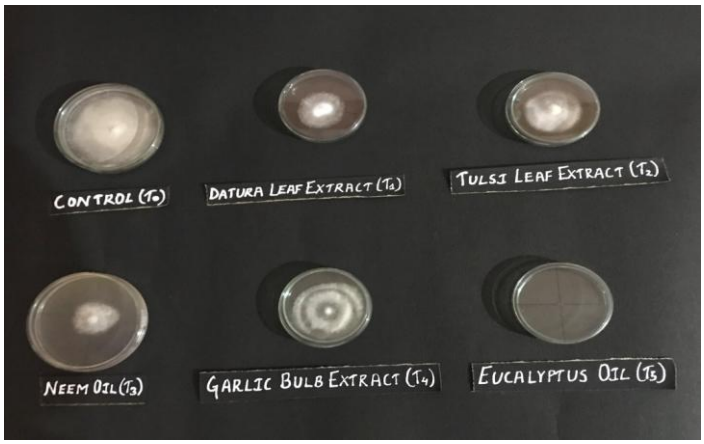

Fig.4 Poisoned Food technique of Botanical against *Colletotrichum lindemuthi*

Fig.5 Dual culture technique of Biagents

It is seen from my trials that foliar spray of *Trichoderma viride* @ 2% were most effective in decreasing the disease intensity of Anthracnose of cowpea followed by *Pseudomonas fluorescens* @ 2% .

Hence, this results were similar to the results of ofHegde *et al.,* (2002). Under lab condition Eucalyptus oil @ 5% gave the best result in inhibiting mycelial growth and hence this results were same as the results of Ramezani *et al.*, (2002).

From the present studies it can be concluded that Eco-friendly management of Anthracnose disease of cowpea can be done by both botanicals as well as bio-agents as biological control is an important and integral part of integrated plant disease management system, especially against seed borne plant pathogens.

Bio-agents were more effective than the plant extracts. *Trichoderma viride* @ 2% plays a important role in the growth of plant height as well as management of this disease both in the *insitu* as well as *exsitu*. But *Pseudomonas fluorescens* @ 2% fails in the *invitro* condition with least inhibition per cent.

The Eucalyptus oil @ 5% plays a major role in *invitro* condition with 100 per cent inhibition per cent as compared to other. All other plant extracts @ 5% also played a major role in management of Anthracnose disease of cowpea.

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