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IDM approach for control of anthracnose in cowpea by *Colletotrichum lindemuthianum*

Manas Ranjan SatpathyDOI: <https://doi.org/10.22271/foodsci.2024.v5.i2a.151>**Abstract**

Anthracnose is a severe disease occurring in Cowpea (*Vigna unguiculata*) which hampers its productivity to a larger extent. Tests were conducted against the seed borne fungi by employing bio agents, botanicals and different antifungals for the integrated disease management (IDM). Carbendazim 12% + Mancozeb 63% (SAAF) @ 0.2% recorded the lowest average disease incidence as well as the highest percentage of increase of grain yield over control. Applications of *Trichoderma* and *Ajwain*, independently also gave better control and increased yield over control.

Keywords: IDM, Anthracnose, *Colletotrichum lindemuthianum*, antifungals**Introduction**

Cowpea is a member of food legumes which plays a pivotal role in the agriculture systems of the drier regions of the tropics covering parts of Middle East, Southern Europe, African territories, Southern USA, other parts of America and Asia. Legumes being the rich sources of proteins, minerals, vitamins, etc., is considered as the good source of nutrition for humankind and also known as poor man's meat. Comparatively lower economy class population prefer cowpea as a best alternative source for protein, minerals, ash, etc. in comparison to other fabaceous grains (Satpathy and Beura, 2020) ^[10]. Since the dry seeds of cowpea contain comfortable quantity of proteins (23-33%), this is considered as a good compliment to the staple cereals, starchy roots and tubers of most African diets. The total carbohydrate content of the seed ranges between 56-68% but the percentage of fat is 1.4-2.7%. In India, the total area, production and average yield of Cowpea during 2013-14 was 3569 hectare, 2993 tonnes and 607Kg/hectare, respectively (Source: IIPR,2013-14). Cowpeas are one of the best natural sources of Folic acid. Cowpea diseases are induced by different pathogens and among the fungal diseases, anthracnose is one of the most dreaded one which is incited by *Colletotrichum lindemuthianum* perfect stage-*Glomerella lindemuthianum* Shear. The disease is characterized by sunken, black lesions which creates disturbances in production economics (Enyiukwu and Awurum, 2013b) ^[3]. Anthracnose disease is considered dangerous for cowpea because it is known to cause economic loss in tropical regions where conditions are wet and humid for the main part of the growing season more particularly in Africa, Latin America and Asia. The loss is about 50% of the cowpea productivity due to anthracnose, has been a major bottleneck for its cultivation.

Methodology

In extension to the published report of Satpathy and Beura (2020) ^[10], another study was also made by taking different combinations of treatments which are given as under:

In order to study the synergistic effect of seed treatment with fungicides and bio-control agent and foliar spray with fungicide on control of this disease, conduct of field trials were made with Cowpea (*Vigna unguiculata*) variety Utkal Manika for three consecutive seasons at the fields of a farmer at Ghatikia area in Bhubaneswar as per the details given below:

Combination of various amendments

Number of treatments = 10

Names of the treatments and their applied concentrations are given below:

T₁ = Carbendazim 12% + Mancozeb 63% (SAAF)-0.2%T₂ = *Trichoderma* ST + FS-2.0 & 5.0%**Correspondence****Manas Ranjan Satpathy**

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- T₃ = Ajwain seed extract ST + FS-5.0%
 T₄ = Ajwain extract ST+ Chlorothalonil FS-5.0%
 T₅ = Copper oxy chloride FS-0.2%
 T₆ = Captan ST+ Eucalyptus FS-0.5
 T₇ = Hexaconazole spray-0.05%
 T₈ = *Trichoderma* ST + Mancozeb FS-2.0%
 T₉ = Tebuconazole FS-0.05%
 T₁₀ = Control

The seed treatment (ST) was done 24 hours before sowing. First foliar treatment (FT) and soil drenching were applied immediately after the observation of the disease followed by repeat spray and soil drenching at 10days intervals. For soil application of the bio-agent, powdered *Trichoderma* (02 Kg) was rigorously mixed with FYM (25Kg) independently, seven days prior to application.

Experimental Materials

Utkal Manika is a Cowpea variety released by the Odisha University of Agriculture and Technology, Bhubaneswar, Odisha.

Trichoderma viride is a bio-fungicide available commercially in solid formulation which is highly effective in controlling some devastating crop diseases

Mancozeb is well known for being a contact fungicide having preventive activity. Its role is to inhibit enzymatic activity of the fungi by making a complex with metal-containing enzymes including those that are involved in the production of ATP.

Captan 50 W/P is one of the non-systemic fungicide having protective and curative property.

Chlorothalonil is a protectant fungicide, non-systemic applied before infection occurs. It is best applied as a foliar treatment.

Copper oxychloride (50 W/P) known as a broad spectrum copper based antifungal which has the capacity to check the bacterial and fungal diseases through its contact action. The fine particles of this sticks to the surface of leaf thereby restricting the growth of the fungus.

Hexaconazole a known broad-spectrum systemic triazole antifungal agent which can control many ascomycetous and basidiomycetous fungi.

Tebuconazole is one of the broad spectrum antifungal which is systemic, curative protective and can uproot the causatives. This can rapidly penetrated into the vegetative organs of the plant.

Carbendazim 50% W/P is a broad spectrum known systemic antifungal capable of efficaciously controlling disease of caused by fungus.

Mancozeb 75% W/P an effective contact antifungal of Dithiocarbamate group that can reduce the growth and spread of fungal diseases.

Designing of the Experimental Field:

Design of the experiment-R. B. D. Replications-Three Plot Size-2.5 m x2.4m, Spacing-45 cm x 25 cm, Dose of Fertilizer-Kg N:P₂O₅:K₂O/ha in 30:60:30 proportion Prescribed cultivation exercises were followed. The healthy plants were manually inoculated on 18th day of sowing by spraying with spore suspension (5 x 10⁵ spores / ml) of *C. lindemuthianum* to create heavy density of pathogen on the explant in the field.

Observations were recorded to note % of disease occurrence in the 0-5 scale just before the date of each spraying and

then after 7 days. Based on the data, incidence of anthracnose and cumulative cowpea green yield was worked out.

Computations

Ten plants of each plot were selected and tagged for observations about the disease occurrence and calculated by applying the formula:

$$\text{Incidence of Disease} = \frac{\text{Number of infected plants}}{\text{Total number of plants}} \times 100$$

Similarly, Per cent Disease Incidence (PDI) was calculated as.

$$\text{PDI} = \frac{\text{Sum of all numerical ratings}}{\text{Total number of observations} \times \text{maximum disease rating}} \times 100$$

For recording the disease incidence both on leaves and stems of the test samples, the standard scale of 0-5 point (Satpathy and Beura, 2020) ^[10] was followed as indicated below.

| Scale | Disease incidence |
|--------------------------|--------------------------|
| (Immune) | No Disease |
| (Resistant) | 1-5 per cent incidence |
| (Moderately Resistant) | 6-10 per cent incidence |
| (Moderately susceptible) | 11-25 per cent incidence |
| (Susceptible) | 26-50 per cent incidence |
| (Highly susceptible) | > 50 per cent incidence |

Results and Discussions

Integrated disease management approach had been tried using fungicides, botanicals and bio-agents either alone or in combinations under field conditions to find out the best method of control of anthracnose of cowpea and reduction of disease intensity *in vivo*. Fungicides such as Carbendazim 12% + Mancozeb 63% found most effective in controlling the disease severity i.e., 13.63% followed by Copper oxychloride foliar application i.e., 14.61%, Tebuconazole i.e. 15.05% and Hexaconazole i.e. 15.43%. The other treatment combinations such as Ajwain extract + Chlorothalonil recorded 29.33% whereas Captan + Eucalyptus 35.33%. In contrast, the treatments with *Trichoderma* recorded 17.26% and *Trichoderma* + Mancozeb showed 23.28%. However, the maximum disease incidence of 29.33% was recorded when Ajwain extract + Chlorothalonil were treated.

In the earlier studies of this author, Satpathy and Beura, 2020 ^[10] reported that the fungicides in different combinations were found effective in controlling the disease incidence by about 94% and increase of yield by about 162%. Similar observations were also found in these experiments where fungicides do play a vital role in controlling the incidence and increase of yield which are in agreement with Ahmad *et al.* (2018) ^[1], Singh (2010) ^[11], Gawande *et al.* (2009) ^[4], Mittal (2001) ^[7]. Previous reports of Satpathy and Beura (2020) ^[10], Satpathy and Beura (2015) ^[9], Santra *et al.* (2008) ^[8], Gawande *et al.* (2009) ^[4], Gupta *et al.* (2005) ^[5], Chandrasekharan *et al.* (2000) ^[2] confirming the efficacy of *Trichoderma* corroborated with the present studies where such treatments involving *Trichoderma* alone recorded 17.14% disease incidence over control (39.62%).

Similarly, the incidence of disease were studied *in vivo* and observed that foliar application of Carbendazim + Mancozeb @ 0.2% was quite effective in reducing the appearance of anthracnose i.e. 71.82%. The same treatment also proved effective in enhancing the yield by 78.23% over the control. The foliar application of copper oxy chloride resulted in the 56.70% reduction in disease incidence whereas 72.20% increase in the yield. Application of Tebuconazole in the foliar parts decreased the disease incidence by 56.70% and increased the yield by 72.20%. On

the other hand, the foliar spraying and seed treatment with ajwain seed extract could be able to reduce the disease incidence by 43.10% and increase of yield by 58.11% followed by treatment with *Trichoderma* ST and FS obtained 39.00% disease reduction and 52.19% increase of yield over control. This results corroborates with the studies made by Satpathy and Beura (2020) ^[10] where the application of some fungicides showed remarkable reduction of anthracnose incidence followed by the treatments with *Trichoderma*.

Table 1: Effect of integrated disease management on incidence of anthracnose on *Colletotrichum lindemuthianum*

| Sl. No. | Treatments | Concentration | PDI Before I Spray | After I Spray | After II Spray | AV. Disease Incidence (%) | Reduction in disease incidence (%) | 1000-Grain Weight (gm) | Yield (q/ha.) | Increase in grain yield (%) |
|---------|--------------------------------------|---------------|--------------------|---------------|----------------|---------------------------|------------------------------------|------------------------|---------------|-----------------------------|
| 1. | <i>Trichoderma</i> ST + Mancozeb FS | 2.0% | 26.48 | 24.48 | 23.28 | 36.66 | 35.29 | 135.0 | 9.72 | 35.00 |
| 2. | Captan ST+ Eucalyptus FS | 0.5% | 23.00 | 19.14 | 18.05 | 35.33 | 37.66 | 140.23 | 10.08 | 40.00 |
| 3. | Ajwain extract ST+ Chlorothalonil FS | 5.0% | 30.98 | 30.50 | 29.33 | 37.00 | 34.69 | 134.93 | 9.72 | 34.86 |
| 4. | Copper oxy chloride FS | 0.2% | 18.00 | 15.65 | 14.61 | 23.33 | 58.82 | 169.23 | 12.18 | 69.16 |
| 5. | Hexaconazole spray | 0.05% | 20.05 | 16.43 | 15.43 | 30.00 | 47.05 | 160.00 | 11.52 | 60.00 |
| 6. | <i>Trichoderma</i> ST + FS | 2.0 & 5.0% | 22.26 | 19.26 | 17.26 | 34.56 | 39.00 | 150.00 | 10.80 | 50.00 |
| 7. | Ajwain seed extract ST + FS | 5.0 & 5% | 20.43 | 17.92 | 17.14 | 32.31 | 42.97 | 150.54 | 11.15 | 54.86 |
| 8. | Tebuconazole FS | 0.05% | 19.61 | 15.95 | 15.05 | 29.95 | 47.14 | 165.00 | 11.88 | 65.00 |
| 9. | Carbendazim 12%+Mancozeb 63% | 0.2% | 17.05 | 15.00 | 13.63 | 16.67 | 70.57 | 174.00 | 12.52 | 73.88 |
| 10. | Control | | 30.83 | 34.21 | 39.62 | 56.66 | 0.0 | 100.00 | 7.200 | 0.0 |
| | C.D. at 5% | | 2.28 | 2.58 | 2.38 | 2.92 | | 4.06 | 1.421 | |
| | SE(m) | | 0.76 | 0.86 | 0.79 | 0.97 | | 1.35 | 0.47 | |

Conclusion

The role of Carbendazim in combination with Mancozeb clearly indicates that these two have significant role and very effective in both reduction of disease incidence and increase of yield over all other treatments which is found to be more suitable for the use of farmers in the agriculture field.

References

- Ahmad S, Mishra P, Kumar S, Ali M. Integrated approach for the management of *Colletotrichum lindemuthianum* (L.) Savi causing anthracnose of cowpea. *Int J Curr Microbiol Appl Sci.* 2018;7(6):1113-1118.
- Chandrasekaran A, Narasimhan V, Rajappan K. Integrated management of anthracnose and pod blight of soybean. *Ann Plant Prot Sci.* 2000;8:163-165.
- Enyiukwu DN, Awurum AN. Fungi toxic effects of *Carica papaya* and *Piper guineense* extracts against *Colletotrichum destructivum* in the glasshouse. *Cont J Agric Sci.* 2013;7(1):23-28.
- Gawande DB, Suryawanshi AP, Pawar AK, Apet KT, Devgire SS. Field evaluation of fungicides, botanicals and bioagents against anthracnose of soybean. *Agric Sci Digest.* 2009;29(3):174-177.
- Gupta S, Kalha CS, Valid A, Rizvi SEH. Integrated management of anthracnose of French bean caused by *C. lindemuthianum*. *J Mycol Plant Pathol.* 2005;35(3):432-436.
- IIPR. Vision 2030 Document. Indian Institute of Pulses Research (IIPR), ICAR, Kanpur, India. 2011.
- Mittal RK. Yield losses by frog eye leaf spot and anthracnose disease in soybean under different sowing dates in the hills. *Indian Phytopathol.* 2001;54(1):32-34.
- Santra S, Chatterjee NC, Dutta S. Integrated approach to control anthracnose (*Colletotrichum gleosporioides*) disease of *Saraca asoca*. *J Mycol Plant Pathol.* 2008;38(3):639-642.
- Satpathy MR, Beura SK. Integrated management of *Colletotrichum lindemuthianum*, the incitant of anthracnose in Cowpea. *Veg Sci.* 2015;42(1):94-95.
- Satpathy MR, Beura SK. Management of *Colletotrichum lindemuthianum* (Sacc. & Magn.) Scribner, the incitant of Cowpea anthracnose: An integrated approach. *Adv Plant Sci.* 2020;33(I-II):95-97.
- Singh AK. Integrated management of *Cercospora* leaf spot of URD bean (*Vigna mungo*). *J Mycol Plant Pathol.* 2010;40(4):595.