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# Management of leaf spot of *Centella asiatica* (Thankuni) caused by *Alternaria* sp. and target leaf spot of *Rauvolfia serpentina* (Sarpagandha) caused by *Corynespora cassicola*

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**A B S T R A C T**

A field trail was conducted at 'C' Block farm, Kalyani for the control of leaf spot of *Centella asiatica* (Thankuni) caused by *Alternaria* sp. and target leaf spot of *Rauvolfia serpentina* (Sarpagandha) caused by *Corynespora cassicola* by spraying three fungicides (carbendazim at 0.1%, mancozeb at 0.025% and blitox at 0.25%) and four biocontrol agents (*Trichoderma viride* at $10^7$ cfu / ml, *T. harzianum* at $10^7$ cfu / ml, *Pseudomonas fluorescens* at $10^8$ cell / ml and Biomonas-a formulated product of *P. fluorescens* preparation at 0.15% for three times at an interval of 15 days. The results revealed that the lowest percent disease incidence (PDI) of leaf spot of Thankuni caused by *Alternaria* sp. and highest yield in number of leaves per sq.M was recorded where carbendazim was sprayed. The highest yield in fresh weight, dry weight of leaves, fresh weight and dry weight of 1000 leaves was recorded. Application of mancozeb resulted in the lowest PDI of target spot of Sarpagandha, increased the yield (both fresh weight and dry weight of the plant per sq.M) and increased the fresh weight and dry weight of plants.

***Keywords:*** Target leaf spot, *Alternaria* sp., *Corynespora cassicola, Trichoderma viride, Trichoderma harzianum, Pseudomonas fluorescens,* Biomonas.

## Introduction

Pathogenic diseases cause significant damage to the crops and reduce the quality of the produce and acceptability to the market. The disease(s) may reduce the active chemical components in plant parts used for medicinal purpose. Thankuni (*Centella asiatica*) suffers from fungal diseases caused by *Cercospora centellae*, leaf spot caused by *Alternaria* sp. and bacterial disease like bacterial wilt caused by *Pseudomonas solanacearum*. The avoidable yield loss due to leaf spot caused by *Alternaria* sp. was recorded at ca. 17-34% (Chowdhury 2011). Sarpagandha (*Rauvolfia serpentina*) suffers from many diseases (Momin *et al*. 2010). They, in a survey conducted throughout the year, recorded ca. 19–85% disease of target leaf spot caused by *Corynespora cassicola*.

Very little work has been done on management of diseases of Thankuni and Sarpagandha. In this presentation, attempts have been made to find suitable management prescription for leaf spot of Thankuni and caused by *Alternaria* sp. and target leaf spot of Sarpagandha caused by *C. cassicola* using biocontrol agents and some safer fungicides.

## Materials and Methods

Field trial was conducted at Instructional Farm, Bidhan Chandra Krishi Viswavidyalaya (BCKV). All standard and recommended agronomic packages of practices such as tillage, spacing, manuring, irrigation and insect control for cultivation of the crop was followed. The chemicals and bioagents were sprayed thrice at 15 days interval. The treatments were sprayings of $T_1$ = blitox at 0.25%; $T_2$ = carbendazim at 0.1%; $T_3$ = mancozeb at 0.25%; $T_4$ = *T. viride* at $10^7$ cfu per ml; $T_5$ = *T. harzianum* at $10^7$ cfu per ml; $T_6$ = *P. fluorescens* $10^8$ per ml; $T_7$ = Biomonas [(*P. fluorescens*) 1.5% W.P. (Strain no. BIL-331; CFU count: $2x10^9$/gm. min.)] at 0.15% and $T_8$ =

Control. Spraying was done as per treatment schedule. Before starting the experiment all the infected plants in treatment rows were removed. Last application of chemicals was done in the month of June. For leaf spot disease the number of infected and healthy leaves in treatments was counted.

Per cent disease incidence (PDI) was calculated as using the following formula:

$$PDI = \frac{\text{No. of leaves infected}}{\text{Total no. of leaves observed}} X\ 100$$

The PDI was angular transformed and analyzed statistically. Fresh weight of leaves and yield per sq. M for each treatment were recorded. All results obtained were subject to analysis of variance.

## Results and Discussion

### Management of leaf spot of thankuni (*Centella asiatica*) caused by *Alternaria* sp.

***Percent disease Incidence***

Highest disease (32.5%) was recorded in control treatment and it was statistically higher than all other treatments at 1% level of significance. Lowest disease was recorded where carbendazim was sprayed and was statistically at par with Blitox sprayed at 5% level of significance. At 1% level of significance it was statistically at par with the above treatment and where mancozeb was sprayed (Table 1).

***Yield parameters***

*In number of leaves per square M:*

Highest yield was recorded in treatment where carbendazim @ 0.1% was sprayed (Table 1) though it was statistically at par with the treatments where *T. harzianum*, *P. fluorescens* and Biomonas were sprayed at 5% level of significance. At 1% level of significance it was statistically at par with all the above treatments and where spraying of mancozeb was made. The lowest yield was recorded in control treatment. At 1% level of significance it was statistically at par with all the above treatments and when sprayed with mancozeb. This showed that statistically there was no significant increase in number of leaves.

*In fresh weight of leaves per square M (g):*

Highest yield at 5% level of significance was recorded in treatment where carbendazim at 0.1% was sprayed, being statistically at par with the treatments of mancozeb, *T. harzianum* and *P. fluorescens* sprays. At 1% level of significance it was statistically at par with all the above treatments and where sprayed with *T. viride*. The lowest yield in fresh weight of leaves was recorded in control treatment, being statistically inferior to all other treatments at even 1% level of significance (Table 1).

*In dry weight of leaves per square M (g):*

The lowest yield (33.7g) was recorded in control treatment but was statistically at par with the treatment where *T. viride* was sprayed even at 1% level of significance (Table 1). Highest yield (71g) in dry weight of leaves at 5% level of significance was recorded in treatment where mancozeb at 0.2% was sprayed and it was statistically at par with the treatments where carbendazim and *P. fluorescens* were sprayed. At 1% level of significance it was statistically at par with all the above treatments and where spraying of Biomonas, Blitox and *T. harzianum* were made.

*Fresh weight of 1000 leaves:*

The results (Table 1) revealed that highest fresh weight of 1000 leaves was recorded where mancozeb was sprayed, being statistically superior to all other treatments at 1% level of significance. In control treatment lowest fresh weight was recorded and it was statistically inferior to all other treatment at even 1% level of significance.

*Dry weight of 1000 leaves:*

Highest dry weight of 1000 leaves was in treatment where mancozeb was sprayed but statistically at par with all the treatments except control and *T. harzianum* treatment at 1% level of significance.

These results thus revealed that spraying of carbendazim resulted in highest disease control and increase in yield and other yield related parameters. Other test fungicides were also significantly effective in reducing the disease intensity and increasing the yield and weight of leaves. The bioagents applied as spraying did not show any promising results in reducing the disease intensity and increasing the yield and other yield parameters. These results need confirmatory repetition in wider field trials before final recommendation to the farmers.

**Management of target spot of Sarpagandha (*Rauvolfia serpentina*) caused by *Corynespora cassicola***

***Percent disease Incidence***

Highest disease (29.4%) was recorded in control treatment and it was statistically more than all other treatments at 5% level of significance. At 1% level of significance it was statistically at par with the treatments where *T. harzianum, P. fluorescens* and Biomonas were sprayed. Lowest disease (10.2%) was recorded where mancozeb was sprayed though it was statistically at par where carbendazim, Blitox and *T. viride* were sprayed at 5% level of significance. At 1% level of significance it was statistically at par with all the treatments except control (Table 2).

***Yield parameters***

*In fresh weight of leaves per square M (g):*

Highest yield in fresh weight of leaves per square M at 1% level of significance was recorded in treatment where mancozeb at 0.25% was sprayed.. The lowest yield in fresh weight of leaves per square M was recorded in control treatment though it was statistically at par with the treatments where *T. harzianum*, *T. viride*, *P. fluorescens* and Biomonas were sprayed at 1% level of significance (Table 2 ).

*In dry weight of leaves per square M (g):*

The results (Table 2) showed that the highest yield in dry weight of leaves per square M at 1% level of significance was recorded in treatment where mancozeb at 0.25% was sprayed being statistically superior to all other treatments. The lowest yield in dry weight was recorded in control treatment and though statistically at par with the treatments where Biomonas were sprayed at 5% level of significance. At 1% level of significance, it was statistically at par with the treatments where *T. harzianum*, and *P. fluorescens* were sprayed.

*Fresh weight in g per plant:*

The results (Table 2) revealed that lowest fresh weight was recorded in control treatment, statistically at par with the treatments where *T. viride*, *P. fluorescens* and Biomonas were sprayed at 1% level of significance. The highest fresh weight was recorded in treatment where mancozeb was sprayed though statistically at par with treatments where carbendazim, Blitox and *T. harzianum* were sprayed at 1% level of significance.

*Dry weight of in g per plant:*

The highest dry weight was recorded in treatment where mancozeb was sprayed, being statistically superior to all other treatments at 1% level of significance. Lowest dry weight was recorded in control treatment being statistically at par with the treatments where *T. viride* was sprayed at 1% level of significance.

These results thus revealed that spraying of mancozeb was best of the tested options

resulting in highest disease control (65.5%) and increasing the plant weight when tested by different yield parameters. Other test fungicides were also equally effective. The bioagents applied as spraying did not show any promise in reducing the disease intensity and increasing the yield and other yield parameters. However among the bioagents *T. viride* was better. The results thus obtained need to be repeated before recommendation to the farmers.

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**Table 1.**

Management of leaf spot of *Thankuni* (*Centella asiatica*) caused by *Alternaria* sp.

| Spray Treatments | Percent Disease Incidence | Percent Disease Control | Yield (no. of leaves / sq.M) | Yield (Fresh wt. of leaves in g / sq.M) | Yield (Dry wt. of leaves in g / sq.M) | Fresh wt of 1000 leaves in g | Dry wt of 1000 leaves in g |
|---|---|---|---|---|---|---|---|
| 1. Blitox (0.25%) | 15.20 (22.94)* | 29.48 | 1624.33 | 216.94 | 54.31 | 133.33 | 33.33 |
| 2. Carbendazim (0.1%) | 13.48 (21.54) | 33.78 | 2126.33 | 290.51 | 67.39 | 136.67 | 31.67 |
| 3. Mancozeb (0.2%) | 16.75 (24.12) | 25.85 | 1850.00 | 289.37 | 71.15 | 156.67 | 38.33 |
| 4. *Trichoderma viride* at$10^7$ cfu/ml | 20.64 (26.99) | 17.03 | 1742.67 | 243.97 | 37.63 | 140.00 | 21.67 |
| 5. *T. harzianum* at$10^7$ cfu/ml | 20.08 (26.37) | 18.94 | 1975.67 | 273.15 | 53.82 | 136.67 | 27.67 |
| 6. *P. fluorescens* at$10^8$ per ml | 18.07 (25.16) | 22.66 | 1904.67 | 260.13 | 63.67 | 126.67 | 33.33 |
| 7. Biomonas at 0.15% | 18.00 (25.10) | 22.84 | 1893.33 | 239.64 | 56.69 | 138.33 | 30.00 |
| 8. Control | 28.92 (32.53) | - | 1549.67 | 166.97 | 33.74 | 98.33 | 21.67 |
| SEm± | 0.84 | | 78.61 | 11.31 | 4.33 | 2.92 | 2.86 |
| CD at 5% | 2.54 | | 238.46 | 34.28 | 13.13 | 8.86 | 8.67 |
| CD at1% | 3.49 | | 330.96 | 47.62 | 18.23 | 12.29 | 12.04 |
| CV% | 5.67 | | 0.48 | 1.36 | 3.79 | 3.79 | 16.67 |

* Figures in parentheses are the angular transformed values of percent diseases incidence

**Table 2.**

Management of target spot of Sarpagandha (*Rauvolfia serpentine*) caused by *Corynespora cassicola*

| Spray Treatments | Percent Disease Incidence | Percent Disease Control | Yield (Fresh wt. of plant in g / sq.M) | Yield (Dry wt. of plants in g / sq.M) | Fresh wt in g per plant | Dry wt of in g per plant |
|---|---|---|---|---|---|---|
| 1. Blitox (0.25%) | 8.84 (17.03) | 42.13 | 465.68 | 117.02 | 127.33 | 32.00 |
| 2. Carbendazim (0.1%) | 4.60 (11.79) | 59.94 | 463.24 | 132.26 | 123.33 | 36.17 |
| 3. Mancozeb (0.2%) | 8.65 (16.81) | 42.88 | 560.76 | 191.62 | 153.33 | 52.40 |
| 4. *T. viride* at $10^7$ cfu/ml | 3.26 (10.16) | 65.48 | 429.10 | 128.09 | 117.33 | 26.00 |
| 5. *T. harzianum* at$10^7$ cfu/ml | 12.93 (20.94) | 28.85 | 524.19 | 141.41 | 143.33 | 38.67 |
| 6. *P. fluorescens* at $10^8$ per ml | 11.40 (19.67) | 33.16 | 505.90 | 153.59 | 138.33 | 42.00 |
| 7. Biomonas at 0.15% | 12.89 (20.58) | 30.07 | 451.05 | 141.16 | 123.33 | 38.60 |
| 8. Control | 23.25 (29.43) | -- | 402.28 | 104.83 | 110.00 | 25.33 |
| SEm± | 2.62 | | 21.56 | 7.37 | 5.83 | 1.75 |
| CD at 5% | 7.96 | | 65.40 | 22.35 | 17.68 | 5.31 |
| CD at1% | 11.04 | | 90.77 | 31.03 | 24.54 | 7.37 |
| CV% | 24.83 | | 0.97 | 9.20 | 1.86 | 8.34 |

*Figures in parentheses are the angular transformed values of percent diseases incidence