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# Assessment of Root Rot Disease in Green Gram (*Vigna radiata L.*) Caused by *Rhizoctonia bataticola* Under Controlled Pot Culture Conditions

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***Abstract***— *Root rot caused by Rhizoctonia bataticola is a major constraint in green gram (Vigna radiata L.) cultivation, especially under high temperature and low soil moisture. This study assessed the severity of root rot and the associated impact on plant growth under pot culture. Green gram plants (variety CO 8) were grown in nine pots under three treatments: uninoculated control, low, and high inoculum doses of R. bataticola. Disease incidence, severity, plant height, biomass, and yield were measured. Results showed that higher inoculum loads significantly increased disease severity and reduced growth and yield parameters. This study reinforces the destructive potential of R. bataticola in mungbean and highlights the need for integrated disease management strategies, including host resistance and soil health maintenance.*

***Keywords***— ***Disease severity, Green gram, Mungbean pathology, Pot culture, Rhizoctonia bataticola***

## I. INTRODUCTION

Green gram (*Vigna radiata* L.), also known as mungbean, is a short-duration pulse crop valued for its protein content and soil-enriching nitrogen-fixation ability. However, diseases like root rot significantly affect its productivity. Among these, dry root rot caused by *Rhizoctonia bataticola* (syn. *Macrophomina phaseolina*) is one of the most destructive, especially in regions with high temperatures and low soil moisture (Ghosh et al., 2013; Sharma et al., 2012).

*R. bataticola* is a necrotrophic soil-borne fungus that survives in the form of microsclerotia and infects host plants through roots. It causes browning of root tissues, leading to collapse of vascular bundles and wilting (Lal et al., 2017). Although many field reports exist, controlled studies under pot culture to quantify disease effects are limited. This study aims to evaluate the effect of varying inoculum levels of *R. bataticola* on green gram root rot incidence and plant performance under pot conditions.

## II. MATERIALS AND METHODS

### 2.1 Experimental Setup

Design: Completely Randomized Design (CRD)

Location: Plant Pathology Lab, Jaya Agricultural College, Vyasapuram
Number of Pots: 9 (3 treatments × 3 replicates)

Pot Size: 30 cm diameter

Soil: Sterile loamy soil mixed with compost (3:1)

### 2.2 Pathogen Inoculation

*R. bataticola* was isolated from diseased roots (Sinha & Singh, 2015) and cultured on Potato Dextrose Agar (PDA). The pathogen was mass-multiplied on sorghum grains for 15 days (Prasad et al., 2002). Pots were inoculated by mixing:

T2: 5 g inoculum/pot (low dose)

T3: 10 g inoculum/pot (high dose)

Control pots received sterile grain (see Table 1).

*Table 1: Treatment Codes and Descriptions for Rhizoctonia bataticola Inoculation in CO 8 Green Gram under Pot Culture Conditions*

| Treatment Code | Description |
|---|---|
| T1 | Control (no inoculation) |
| T2 | Inoculated with low dose of *R. bataticola* (5 g/pot) |
| T3 | Inoculated with high dose of *R. bataticola* (10 g/pot) |

### 2.3 Crop Management

Seed Variety: CO 8

Seed Rate: 5 seeds per pot, thinned to 3 plants

Irrigation: Uniform, minimal to simulate field stress

Fertilization: Uniform application of NPK

### 2.4 Data Collection

At 30 and 45 days after sowing:

- Disease Incidence (%): Infected plants / Total plants × 100
- Disease Severity Index (DSI): Rated on 0–5 scale (Meena & Gangopadhyay, 2016)
- Plant Parameters: Height, root length, fresh and dry weight
- Yield Parameters: Pods/plant, 100-seed weight

### 2.5 Statistical Analysis

Data were analyzed using ANOVA, and treatment means were compared using LSD at $p \leq 0.05$ (Sharma et al., 2012).

## III. RESULTS

### 3.1 Symptomatology

Inoculated plants showed chlorosis, wilting, and brown necrotic lesions at the root-shoot junction. T3 (high inoculum) resulted in early senescence and some plant death, consistent with previous reports (Rathi et al., 2020).

### 3.2 Disease Incidence and Severity

Significant differences were observed ($p < 0.05$). Control showed zero incidence and severity, while the low dose treatment recorded moderate disease. High-dose (T3) resulted in 88.9 % incidence and a DSI of 4.3 (see Table 2).

### 3.3 Growth and Yield Impacts

Increased inoculum led to progressive declines in plant height, root length, biomass, pods per plant, and seed yield. The high-dose treatment drastically suppressed growth and productivity compared to control (see Table 3).

*Table 2: Disease Incidence and Severity (Mean DSI) of CO 8 Green Gram Inoculated with Rhizoctonia bataticola*

| Treatment | Disease Incidence (%) | Mean DSI |
|---|---|---|
| T1 (Control) | 0.0 | 0.0 |
| T2 (Low dose) | 55.6 | 2.1 |
| T3 (High dose) | 88.9 | 4.3 |

Significant differences were observed between T3 and the other treatments ($p < 0.05$).

*Table 3: Effect of Rhizoctonia bataticola Inoculum Levels on Disease Incidence, Severity, Growth, and Yield Parameters in CO 8 Green Gram (Vigna radiata L.) under Controlled Pot Culture at Jaya Agricultural College, Vyasapuram*

| Treatment | Inoculum Dose (g/pot) | Disease Incidence (%) | Mean DSI | Plant Height (cm) | Root Length (cm) | Fresh Biomass (g) | Dry Biomass (g) | Pods/Plant | Seed Yield/Plant (g) |
|---|---|---|---|---|---|---|---|---|---|
| T1 Control | 0 g | 0.0 | 0.0 | 38.3 | 14.5 | 6.7 | 2.9 | 11.6 | 5.3 |
| T2 Low Dose | 5 g | 55.6 | 2.1 | 32.1 | 11.2 | 4.3 | 1.7 | 8.2 | 3.4 |
| T3 High Dose | 10 g | 88.9 | 4.3 | 24.7 | 8.3 | 2.1 | 0.8 | 4.7 | 1.6 |

T3 showed significant suppression of growth and yield, confirming high virulence of the pathogen (Prasad et al., 2018).

## IV. DISCUSSION

The results confirm that increasing inoculum levels of *Rhizoctonia bataticola* correspond to higher disease incidence and plant damage in green gram, consistent with findings by Ghosh et al. (2013) and Sharma et al. (2012). The pathogen's ability to survive in soil and rapidly colonize host roots makes it particularly dangerous during drought or heat stress conditions, as highlighted by Upadhyay & Dwivedi (1987).

Under high inoculum, severe root decay limited water uptake, leading to early senescence – a trend also noted in Prasad et al. (2010). The pot culture system provided clear, quantifiable observations of symptom development and yield loss, mirroring conclusions drawn by Pande et al. (2010). Finally, screening for resistance in mungbean genotypes under such controlled conditions is effective in earlier studies by Prasad et al. (2018).

## V. CONCLUSION

This study demonstrates the pathogenic impact of *Rhizoctonia bataticola* on green gram under pot culture. Root rot severity and yield losses increased significantly with inoculum concentration. Controlled pot experiments such as this provide valuable insights for evaluating disease management strategies and resistant cultivars. Integrated approaches involving resistant genotypes, organic amendments, and biocontrol agents are necessary to curb this pathogen in the field.

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