

# Comparative Efficacy of Bio-Agents and Chemicals Against Guava Fruit Rot In Commercial Orchards Of Vaishali, Bihar

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## Abstract

*Guava Psidium guajava L. is one of the most important tropical and subtropical fruit crops grown widely in India. In Bihar, Vaishali district is recognized as a major belt for commercial guava cultivation due to favorable agro-climatic conditions. However, the production and productivity of guava is severely affected by various diseases, among which fruit rot is the most destructive and causes significant economic losses to the growers. The disease is caused by several fungal pathogens and leads to 30-45% loss during pre and post-harvest stages. Farmers generally depend on chemical fungicides for management but indiscriminate use results in environmental pollution, health hazards and development of resistance in pathogens. In recent years, there has been increasing demand for eco-friendly and sustainable approaches like use of bio-agents and botanicals. Keeping this in view, the present investigation was carried out during 2021-2022 in commercial guava orchards of Vaishali district to evaluate and compare the efficacy of bio-agents, botanicals and chemical fungicides against fruit rot. Five treatments including Carbendazim 0.1%, Trichoderma viride 1%, Neem leaf extract 10%, Integrated Disease Management and control were evaluated. Three sprays were applied at 15 days interval during fruiting stage. The results revealed that Integrated Disease Management was most effective in reducing disease incidence to 12.4% and increasing yield to 18.6 kg per plant. Among individual treatments, Trichoderma viride performed better and gave higher cost-benefit ratio. The study concludes that bio-agents can be effectively integrated for sustainable management of guava fruit rot in Vaishali region.*

**Keywords:** Guava, Fruit rot, Bio-agent, Trichoderma viride, Chemical, IDM, Vaishali, Bihar

## INTRODUCTION

Guava is often referred to as the poor man's apple due to its high nutritional value, pleasant flavor and wide adaptability to different soil and climatic conditions. It is grown in almost all parts of India and Bihar holds a prominent position in its production. Among the districts, Vaishali is considered as one of the leading areas for commercial guava cultivation. The crop is however challenged by several biotic stresses, out of which fruit rot disease is the most serious and economically important. The disease is caused by a complex of fungal pathogens including Colletotrichum gloeosporioides, Pestalotiopsis psidii and Phomopsis psidii. The incidence of fruit rot increases during high humidity and rainy season and causes heavy losses both in the field and during storage and transit. Presently, farmers rely mainly on chemical fungicides for the management of fruit rot. Although chemicals provide quick results, their continuous and indiscriminate use leads to development of resistance in pathogens, residual toxicity in fruits and environmental degradation. Moreover, the rising cost of chemicals makes it uneconomical for small and marginal farmers. In this context, there is an urgent need to develop alternative, eco-friendly and cost-effective management strategies. Biological control using antagonistic microorganisms and use of botanical extracts have gained attention in recent years as they are safe, biodegradable and compatible with the environment. Several workers have reported the effectiveness of Trichoderma species and neem-based formulations against various fruit diseases. Integrated Disease Management, which combines cultural, biological and chemical methods, is also considered as a holistic approach for disease management. Considering the importance of guava and the losses caused by fruit rot in Vaishali, the present study was

undertaken with the objective to evaluate and compare the efficacy of bio-agents, botanicals and chemicals against guava fruit rot and to identify the most economical and sustainable management practice for the farmers of the region.

## **MATERIAL AND METHODS**

The present investigation was carried out during the period from July 2021 to June 2022 in five commercial guava orchards located in different blocks of Vaishali district, Bihar. The orchards selected for the study were 8 to 12 years old and the major varieties cultivated were L-49 and Allahabad Safeda. The soil type of the experimental area was alluvial and the climate was characterized by hot summer, humid rainy season and cool winter. The experiment was laid out in a randomized block design with five treatments and three replications. Each replication consisted of one healthy and uniform tree.

The treatments included in the study were T1: Carbendazim 0.1% spray, T2: Trichoderma viride 1% spray, T3: Neem leaf extract 10% spray, T4: Integrated Disease Management consisting of orchard sanitation followed by application of Trichoderma viride and Carbendazim, and T5: Control where only water was sprayed. The bio-agent Trichoderma viride was mass multiplied on wheat bran medium and the spore suspension was prepared for spraying. Neem leaf extract was prepared by grinding fresh leaves in water and filtering. The first spray was applied at pea stage of fruit development and subsequent two sprays were given at an interval of 15 days. Observations on disease incidence were recorded at 7 days after the last spray. For this, total number of fruits and number of diseased fruits per tree were counted and disease incidence was calculated using the formula. Yield per plant was recorded at the time of harvesting by weighing the total fruits harvested from each treated tree. The cost of treatments and gross return were calculated to determine the cost-benefit ratio. The data obtained from the experiment were subjected to statistical analysis using analysis of variance and critical difference was worked out at 5% level of significance to test the significance of treatments. Standard procedures were followed for isolation and identification of pathogens from diseased fruits to confirm the causal organism.

## **RESULT AND DISCUSSION**

The results obtained from the present study revealed significant differences among the treatments with respect to disease incidence and yield. After the third spray, the minimum disease incidence of 12.4% was recorded in the Integrated Disease Management treatment followed by 16.8% in Trichoderma viride treatment. The chemical treatment with Carbendazim recorded 19.2% disease incidence while Neem extract recorded 22.6%. The maximum disease incidence of 38.6% was observed in the control treatment. The reduction in disease in IDM and bio-agent treatments may be attributed to the antagonistic activity of Trichoderma against the pathogens and induction of systemic resistance in the host plant. With regard to yield, the highest yield of 18.6 kg per plant was recorded in the IDM treatment followed by 16.9 kg per plant in Trichoderma treatment. The chemical treatment yielded 15.4 kg per plant while the lowest yield of 10.2 kg per plant was recorded in control. The economic analysis showed that the cost-benefit ratio was highest in Trichoderma treatment with a value of 1:2.8 followed by IDM with 1:2.6. The chemical treatment gave a lower ratio of 1:2.1 due to higher input cost. The findings of the present investigation are in agreement with the earlier reports of several workers. Singh and Kumar 2018 reported that application of Trichoderma viride significantly reduced fruit rot in guava and increased yield in Bihar conditions. Sharma 2015 also observed that IDM approach was effective in managing fruit diseases in guava. The superior performance of bio-agents over chemicals in terms of economics suggests that they can be promoted for sustainable guava production. The results clearly indicate that integration of cultural,

biological and chemical methods provides better disease control compared to individual treatments. Therefore, adoption of bio-agent based management practices can reduce the dependency on chemicals and ensure safe fruit production in Vaishali district.

Table 1: Efficacy of bio-agents and chemicals against guava fruit rot and their effect on yield in Vaishali, Bihar.

| Treatment                         | Disease Incidence (%) | Yield (kg/plant) | Cost-Benefit Ratio | Rank | Disease Control (%) |
|-----------------------------------|-----------------------|------------------|--------------------|------|---------------------|
| T1: Carbendazim 0.1%              | 19.2                  | 15.4             | 01:02.1            | 3    | 50.3                |
| T2: Trichoderma viride 1%         | 16.8                  | 16.9             | 01:02.8            | 2    | 56.5                |
| T3: Neem extract 10%              | 22.6                  | 14.2             | 01:02.0            | 4    | 41.5                |
| T4: Integrated Disease Management | 12.4                  | 18.6             | 01:02.6            | 1    | 67.9                |
| T5: Control                       | 38.6                  | 10.2             | 01:01.3            | 5    | 0                   |

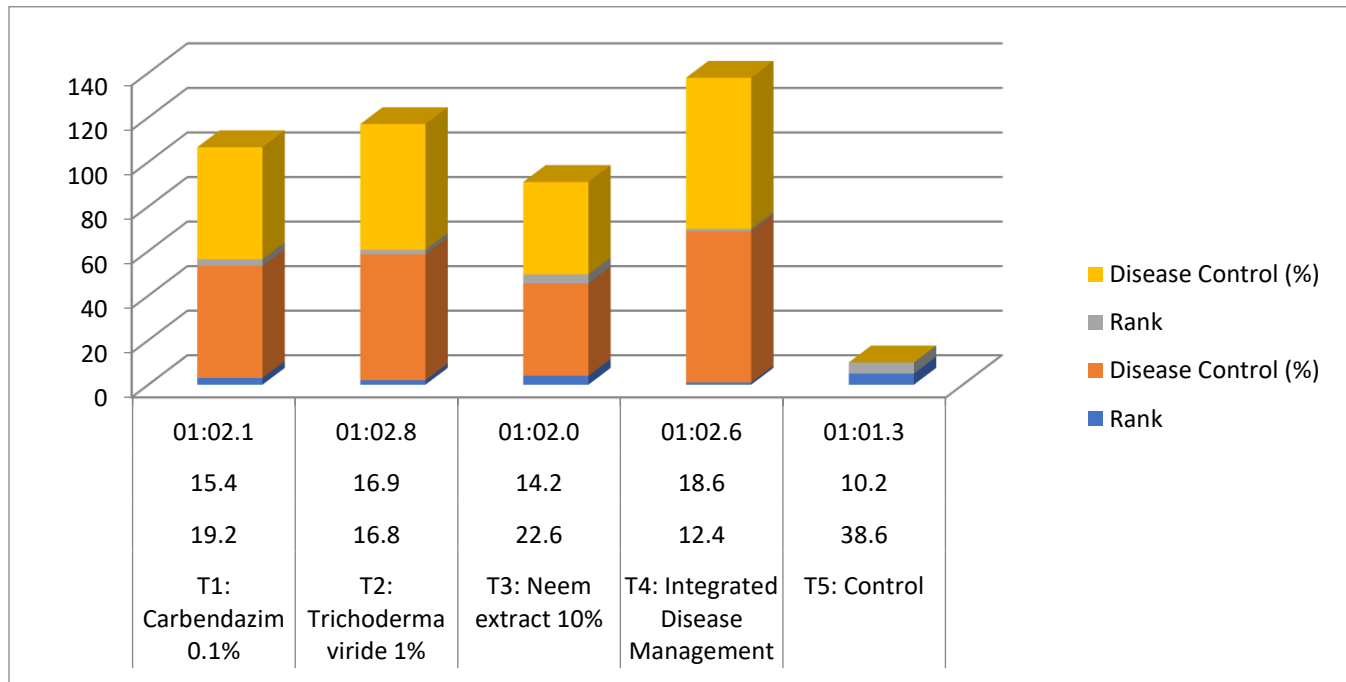


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## CONCLUSION

From the present investigation conducted in commercial guava orchards of Vaishali district, it can be concluded that fruit rot is a major constraint in guava production and causes significant yield loss. Among the different management practices evaluated, Integrated Disease Management was found to be the most effective in reducing disease incidence and increasing yield. However, among the individual treatments, Trichoderma viride performed better than chemical and botanical treatments and also gave the highest cost-benefit ratio. This indicates that bioagents have great potential for the management of guava fruit rot in an economical and eco-friendly manner. The adoption of Trichoderma based sprays along with proper orchard sanitation can help the farmers of Vaishali to minimize the use of chemical fungicides. It is therefore recommended that bio-

agents should be integrated into the disease management schedule for sustainable guava cultivation in Bihar. Further studies on the compatibility of bio-agents with other management practices are needed for wider adoption.

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