

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 7; July 2026; Page No. 618-622

Received: 19-05-2026
Accepted: 23-06-2026

Indexed Journal
Peer Reviewed Journal

Impact of IDM practice on soil borne disease management in Bengalgram

D Vijay Kumar Naik, GL Shiva Jyothi, K Kiran Kumar Reddy, S Lokesh Babu, Hari Sadu and R Sujatha

Krishi Vigyan Kendra, ANGRAU, Nellore, Andhra Pradesh, India

DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i7h.3926>

Corresponding Author: D Vijay Kumar Naik

Abstract

Frontline Demonstrations (FLDs) were conducted during Rabi 2024-25 and 2025-26 to evaluate the effectiveness of recommended integrated disease management (IDM) technologies in reducing dry root rot and wilt incidence under field conditions. The demonstrated technology package included seed treatment, soil application of biocontrol agents, and soil drenching with fungicides, while farmers' practice plots followed conventional management practices. During Rabi 2024-25, dry root rot and wilt incidence in demonstrated plots were 1.56% and 4.80%, respectively, compared to 4.55% and 11.26% in farmers' practice plots. Similarly, during Rabi 2025-26, demonstrated plots recorded lower incidences of dry root rot (2.31%) and wilt (1.01%) than farmers' practice plots (6.37% and 3.38%, respectively). Pooled analysis over two years revealed that dry root rot incidence was reduced from 5.46% under farmers' practices to 1.93% in demonstrated plots, representing a 64.7% reduction. Wilt incidence declined from 7.32% to 2.90%, resulting in a 60.4% reduction. The substantial and consistent decrease in disease incidence across years highlights the effectiveness of the demonstrated IDM technologies in suppressing soil-borne pathogens and improving crop health. The study emphasizes the importance of wider dissemination and adoption of these technologies for sustainable disease management, enhanced productivity, and improved farm profitability.

Keywords: Bengalgram, IDM practices, Soil borne diseases, front line demonstration and Nellore district

Introduction

Bengal gram (chickpea) is one of the most important pulse crops cultivated in India, contributing significantly to nutritional security and farm income. However, the area and productivity of Bengal gram are increasingly threatened by several factors, including low profitability, unpredictable weather conditions, prolonged dry spells, and various biotic and abiotic stresses. Among these constraints, plant diseases remain a major challenge, causing substantial yield losses and reducing farmers' returns. Soil-borne diseases, particularly dry root rot and wilt, have serious threats to Bengal gram cultivation (Khaliq *et al.*, 2020). The problem is more severe in regions where monocropping systems involving black gram and Bengal gram are commonly practiced. These diseases survive in the soil for long periods and spread rapidly under favorable conditions, resulting in poor plant growth, reduced yield, and sometimes complete crop failure. Traditionally, farmers have relied heavily on chemical fungicides to manage these diseases. While chemical control provides quick results, its continuous and indiscriminate use has created several concerns. The repeated application of fungicides has led to the development of resistant pathogen strains, making disease management increasingly difficult. In addition, excessive pesticide use poses risks to human health, contaminates the environment, and affects beneficial soil microorganisms.

In recent years, Integrated Disease Management (IDM) has gained importance as a sustainable and eco-friendly approach to disease control. IDM involves the integration of multiple disease management practices, including cultural, biological,

physical, and chemical methods, to reduce disease incidence while minimizing dependence on pesticides (Rasool *et al.*, 2018). The adoption of IDM offers several advantages. It reduces crop losses, lowers production costs, improves soil health, minimizes environmental pollution, and delays the development of fungicide resistance. Most importantly, IDM promotes sustainable agriculture by balancing productivity with environmental conservation. As the challenges of climate variability and emerging plant diseases continue to grow, the adoption of IDM practices in Bengal gram cultivation is essential. By combining scientific knowledge with sustainable farming practices, farmers can effectively manage soil-borne diseases, improve crop productivity, and secure better economic returns while protecting the environment for future generations.

Biological control agents play a vital role in the integrated management of soil-borne diseases as part of IDM practices. For effective soil application, biocontrol agents play important role for soil borne disease management in Bengalgram and generally multiplied, applied along with well-decomposed farmyard manure (FYM) and neem cake. The *Trichoderma asperellum* suppresses pathogens through multiple mechanisms, including competition for nutrients and space, mycoparasitism, and the production of antifungal metabolites. FYM serves as an excellent carrier material and enhances the effectiveness of *Trichoderma* by improving soil structure, moisture retention, aeration, and overall microbial activity. Neem cake further complements this approach by providing both nutritional and protective benefits. Its pesticidal and antifungal properties help reduce

pathogen populations and nematode infestations, while its organic matter content contributes to soil fertility and microbial growth. This integrated strategy effectively suppresses soil-borne pathogens, reduces disease incidence, enhances root growth and nutrient uptake, and improves plant vigor. Consequently, it contributes to sustainable crop production, higher yields, and improved soil health while reducing dependence on chemical pesticides (Pullamraju., 2019).

Keeping this in view, we conducted demonstration on IDM practices for management of soil borne diseases in bengalgram at different locations across the Nellore district of Andhra Pradesh.

Materials and Methods

Experimental Site and Demonstrations

Frontline Demonstrations (FLDs) on Integrated Disease Management (IDM) practices for the management of soil-borne diseases in Bengal gram (chickpea) were conducted by Krishi Vigyan Kendra (KVK), Nellore, Andhra Pradesh, during two consecutive rabi seasons, 2024-25 and 2025-26. The demonstrations were carried out at farmers' fields located in different villages across Nellore district under real farming conditions.

A total of 10 FLDs were conducted during the study period. Each demonstration comprised two treatments: (i) TO1 - Demonstration of IDM practices and (ii) TO2 - Farmers' practice (control). Each treatment was implemented in an area of 0.4 ha at each demonstration site.

Treatments

TO1: Demonstration of Integrated Disease Management (IDM) Practices

The IDM package for the management of soil-borne diseases in Bengal gram consisted of the following interventions:

1. Deep summer ploughing before sowing to reduce soil-borne inoculum.
2. Soil application of *Trichoderma viride* enriched farmyard manure (FYM) along with neem cake at the time of field preparation.
3. Seed treatment with Vitavax Power (Carboxin 37.5% + Thiram 37.5% DS) @ 1.5 g kg⁻¹ seed before sowing.
4. Soil drenching with Carbendazim @ 1 g L⁻¹ + Mancozeb @ 3 g L⁻¹ of water at 10-15 days after sowing (DAS).

The recommended IDM schedule was provided to participating farmers and was strictly followed in the demonstration plots.

TO2: Farmers' Practice (Control)

In the control plots, farmers followed their existing crop management practices. Generally, farmers relied on repeated spraying of insecticides and did not adopt seed treatment, application of biocontrol agents, or integrated disease management measures for the control of soil-borne diseases.

Statistical analysis

The incidence of dry root rot and wilt disease was recorded in both demonstration plots and farmers' practice fields. Disease incidence was calculated using the following

formula:]

$$\text{Percent Disease Incidence(PDI)} = \frac{\text{Number of diseased plant per sq.m.}}{\text{Total number of plants per sq.m.}} \times 100$$

The PDI of dry root rot and wilt was assessed by counting the total number of diseased plants per square meter from five randomly selected one-square-meter areas in both demonstration and farmers' practice fields. Yield data were also recorded from both types of fields. Economic parameters, including cost of cultivation, gross returns, net returns, and benefit-cost (B:C) ratio, were computed to evaluate the profitability of the demonstrated technology. In addition, the extension gap was calculated to assess the difference in yield performance between the demonstration plots and farmers' practice fields.

Results and Discussion

Dry root rot and wilt incidence: The Frontline Demonstrations conducted during Rabi 2024-25 and 2025-26 revealed a substantial reduction in the incidence of dry root rot and wilt diseases in the demonstrated plots compared to the farmers' practice plots. The lower disease incidence observed in the demonstrated plots highlights the effectiveness of the recommended production and plant protection technologies in managing soil-borne diseases under field conditions.

During Rabi 2024-25, dry root rot incidence was recorded at only 1.56% in the demonstrated plots, whereas the farmers' practice plots exhibited a significantly higher incidence of 4.55%. Similarly, wilt incidence was reduced to 4.80% in the demonstrated plots compared to 11.26% under farmers' practices. The reduction in disease incidence may be attributed to the adoption of IDM practices, including the used seed treatment, soil application of biocontrol agent and soil drenching with fungicide. These practices likely improved plant vigor and reduced the susceptibility of plants to soil-borne pathogens.

A similar trend was observed during Rabi 2025-26. Dry root rot incidence in the demonstrated plots was 2.31%, which was considerably lower than the 6.37% recorded in the farmers' practice plots. Wilt incidence was also markedly reduced, with only 1.01% incidence in the demonstrated plots compared to 3.38% in the farmers' practice plots (Table.1). The consistent reduction in disease incidence across locations and years indicates the reliability and effectiveness of the demonstrated technologies in suppressing pathogen development and minimizing disease spread.

The pooled analysis of two years further confirmed the superiority of the demonstrated technology package. On average, dry root rot incidence was reduced to 1.93% in the demonstrated plots, while farmers' practice plots recorded 5.46% incidence. This represents a reduction of approximately 64.7% over the farmers' practice. Likewise, wilt incidence averaged 2.90% in the demonstrated plots against 7.32% in the farmers' practice plots (Table.2), resulting in a reduction of about 60.4%. The significant reduction in both diseases can be attributed to the integrated disease management practices followed in the FLDs. Seed treatment and bio-control measures may have reduced the initial inoculum load in the soil, enhanced plant health and resistance against infection.

Overall, the results demonstrate that the adoption of

recommended technologies under FLDs effectively minimized the incidence of dry root rot and wilt diseases compared to conventional farmers' practices. Reduced disease pressure not only improves crop health but also contributes to higher productivity and profitability. Therefore, wider dissemination and adoption of these demonstrated technologies among farmers can play a crucial role in sustainable disease management and increasing crop yields in the region.

The results of the present demonstration clearly indicate that the integrated disease management (IDM) approach was effective in reducing the incidence of dry root rot and wilt diseases in chickpea compared to the farmers' practice. Similar findings have been reported by previous researchers, emphasizing the importance of integrating host plant resistance, biological control agents, and improved crop management practices for sustainable disease management. Apart from IDM practices, the cultivation of resistant cultivars plays a crucial role in managing soil-borne diseases. Khaliq *et al.* (2020) reported that the chickpea cultivar Karak-1 exhibited resistance to dry root rot under field conditions in Pakistan, resulting in lower disease incidence and improved crop performance. Their study highlighted that the integration of resistant cultivars with suitable fungicidal treatments provided a reliable and effective strategy for controlling dry root rot and enhancing chickpea yield. Rana *et al.* (2025) conducted a study on the integrated disease management of chickpea dry root rot during the rabi season of 2023-24 at Kanpur and reported the lowest disease incidence in the treatment consisting of Carbendazim (3 g kg⁻¹ seed) + *Trichoderma harzianum* (10 g kg⁻¹ seed) + safflower seed cake (50 g pot⁻¹). These findings are in

agreement with the results obtained in the present study. Biological management through the application of beneficial microorganisms and organic amendments has also shown promising results. Pullamraju *et al.* (2019) demonstrated that soil application of *Trichoderma asperellum* along with farmyard manure (FYM) and neem cake significantly reduced dry root rot incidence in chickpea in Nellore district of Andhra Pradesh. The demonstration recorded a 36.36% increase in yield over the farmers' practice, highlighting the practical importance of combining biological control agents with organic amendments for disease suppression and yield improvement. Furthermore, an integrated pest and disease management (IPDM) approach has been found to be highly effective in minimizing both pest and disease incidence. Vijay Kumar *et al.* (2024) reported lower incidences of gram pod borer, dry root rot (0.4%), and Fusarium wilt (1.8%) in IPDM plots compared to conventional farmer-managed fields. The adoption of preventive and holistic management practices under IPDM not only reduced pest and disease pressure but also resulted in higher seed yields.

The findings of the present demonstration are in close agreement with these earlier reports. The lower incidence of dry root rot and wilt diseases observed in the demonstrated plots compared to the farmers' practice confirms the effectiveness of integrated management strategies involving biological agents, organic amendments, and improved crop management practices. These results suggest that the adoption of IDM/IPDM technologies can significantly contribute to sustainable chickpea production by reducing disease incidence and improving productivity under farmers' field conditions.

Table 1: Percent Disease Incidence of dry root rot and wilt disease recorded during two years from demonstrated and farmer plots.

PDI	Rabi, 2024-25		Rabi, 2025-26	
	Demonstrated Plot	Farmers' Practice	Demonstrated Plot	Farmers' Practice
Dry Root Rot	1.56	4.55	2.31	6.37
Wilt	4.8	11.26	1.01	3.38

Table. 2: Two years (2024-25 and 2025-26) mean data of dry root rot and wilt disease in Bengal gram

Disease	Percent Disease Incidence (PDI)		Reduction over Farmers' Practice
	Demonstrated Plot	Farmers' Practice	
Dry Root Rot	1.93	5.46	64.7
Wilt	2.9	7.32	60.4

Conclusion

The Frontline Demonstrations conducted during Rabi 2024-25 and 2025-26 clearly showed that integrated disease management (IDM) practices were highly effective in reducing dry root rot and wilt incidence in chickpea compared to farmers' practices. Across both years, the demonstrated plots consistently recorded lower disease incidence, with pooled reductions of 64.7% in dry root rot and 60.4% in wilt. The results indicate that seed treatment, biocontrol application, and soil drenching effectively reduced soil-borne pathogen load and improved plant health. Overall, the study confirms that adoption of IDM practices can significantly suppress disease incidence and enhance sustainable chickpea production.

Acknowledgment

The authors are thankful to Associate Director of Research, www.extensionjournal.com

RARS, Tirupati and ANGRAU, Lam, Guntur for providing the necessary facilities and the Director, ATARI zone X, Hyderabad for providing financial support in carrying out the present investigation. And also thankful to farmer's who are accepted to conduct the trial at their fields.

References

1. Khaliq A, Alam S, Ullah Khan I, Khan D, Naz S, Zhang Y, Ali Shah S. Integrated control of dry root rot of chickpea caused by *Rhizoctonia bataticola* under natural field conditions. Biotechnology Reports. 2020;25:e00423.

2. Pullamraju K, Obaiah MC, Sandhya M. Management of root rot in Bengal gram with soil application of *Trichoderma viride* in Nellore District of Andhra Pradesh. International Journal of Pure and Applied Bioscience. 2019;7(1):585-587.

3. Rana D, Bisen K, Kumar A, Pandey S. Integrated disease management of chickpea dry root rot caused by *Rhizoctonia bataticola* (Taub.) Butler. International Journal of Advanced Biochemistry Research. 2025;9(10):1230-1233.
4. Rasool K, Rasool F, Bhat NA, Mushtaq N, Wani TA, Alam S, Kumar S, Saxena A, Bhat S, Yousuf S. IDM: A new approach to disease management. 2018;2(2):7-11.
5. Vijay Kumar P, Suresh M, Srilaxmi B, Rajkumar BV, Swetha MS, Naveen Kumar. Impact of integrated pest and disease management (IPDM) module in Bengal gram for enhancing yields. Agriculture Association of Textile Chemical and Critical Reviews Journal. 2024;12(2):290-292.