Front Line Demonstration on Management of Fruit Rot in Chilli

Abstract

The Krishi Vigyan Kendra (KVK) in Bhadradri Kothagudem conducted Front Line Demonstrations (FLD) on management of fruit rot in chilli during 2019-20, 2020-21, and 2021-22. These demonstrations compared the effectiveness of technology-demonstrated (seed treatment and rotation of the fungicides) with traditional farmer practices at plots sized of 0.4 hectares across ten locations for each treatment. The results showed that the technology-demonstrated plots had higher cost-benefit ratios (BC Ratio) of 2.49:1, 2.53:1, and 2.32:1 compared to the BC ratios of 1.96:1, 1.91:1, and 1.90:1 in the farmers' practice plots during the corresponding years. Additionally, farmers practiced plots typically sprayed fungicide mixtures after noticing disease.

Key words: Chilli, seed treatment, fungicides

Introduction

Chilli (*Capsicum annuum* L.) is one of the most important spice crops in India, primarily cultivated for its fruit. It is a crucial ingredient in Indian cuisine, valued for its pungency, spice, taste, aroma, and flavor. Chilli fruits are an excellent source of Vitamins C, A, and E. Despite the rising demand, the yield is insufficient to meet domestic needs. The main reasons for low yield in chillies include limited adoption of high-yielding varieties and hybrids, heavy pest and disease infestations, and a lack of adherence to scientific agricultural practices (Indira *et al*., 2001). Chilli is susceptible to over 40 fungal species, with *Colletotrichum capsici* being one of the most damaging. This pathogen causes leaf spot or dieback during various growth stages and fruit rot or anthracnose during the fruiting stage, leading to lower yields and reduced marketability. While infected fruits are not harmful to humans or animals, severely affected fruits, with blemishes, are typically deemed unfit for consumption due to their unpleasant color and taste (Akhilesh *et al.,* 2020). Although research institutes have developed improved technologies that are financially viable, adoption of these technologies remains low, highlighting the need for better dissemination (Kiresur *et al.,* 2001). Biotic, abiotic, and socio-economic constraints hinder the full potential of chilli production. To address these challenges, location-specific integrated disease management strategies are required, which are economically viable, socially acceptable, and environmentally sustainable. Unfortunately, farmers often lack the knowledge and support necessary to implement effective disease management practices. In Bhadradri Kothagudem district, a major chilli-growing region, farmers face significant disease pressures but lack an understanding of their impact and suitable management strategies. Therefore, Front Line Demonstrations (FLDs) were organized to illustrate the potential damage and effective management approaches for these agricultural challenges.

Materials and Methods

The present study was undertaken at ten different farmers fields of Bhadradri Kothagudem district of Telangana with two treatments *viz.*, technology demonstration and check (farmers practice) (Table 1). The experiment was conducted consecutively for three years i.e. during 2019-20, 2020-21, and 2021-22 within its operational area.

Table. 1 Details of treatments followed in farmers fields

Treatment 1 (Technology demonstration)	Treatment 2 (Farmers Practice)
1. Seed treatment with *Trichoderma viride*@10g/kg. 2. Rotation of the chemicals copper oxychloride @3g or Propiconazole @1ml or Difenconazole @0.5ml or Azoxystrobin @1ml or Tebuconazole + Trifloxystrobin @ 0.8 g/l. (The first spraying should be given just before flowering and the second at the time of fruit formation. Third spraying may be given a fortnight after second spraying)	1. Spraying carbendazim + mancozeb @2.5 gm/l after noticing the symptom

The methodology for the Front Line Demonstrations (FLD) followed guidelines outlined by Choudhary (1999), including experimental design, site selection, farmer selection, demonstration layout, and farmer participation. Agronomic practices were rigorously applied, with cultivated in plots sized at 0.4 hectares across ten locations for each treatment. Affected plants were observed in each plot by recording total number of plants as well as diseased plants. The data was collected at fortnightly intervals on incidence. Percent disease incidence was calculated by following formula.

$$\text{Disease Incidence} = \frac{\text{Number of diseased fruits}}{\text{Total number of fruits assessed}} \times 100$$

Yield data were collected from both technology-assessed plots and farmers' practice plots. Using parameters such as extension gap, technology gap, yield gap, and technology index, as outlined by Rajashekhar *et al.* (2022), Samui *et al*. (2000), and Lakshmi Narayanamma *et al.* (2023), the economic impact of treatments was assessed through benefit-cost ratio calculations.

Extension gap (Kg/ha) = Demonstrations yield –Yield under existing farmer's practice

Technology gap (Kg/ha) = Potential Yield – Demo Yield

Additional return = Demonstration return – farmer's practice return

$$\text{Yield gap (\%)} = \frac{\text{Extension gap}}{\text{Yield under farmers practice}} \times 100$$

$$\text{Technology gap (\%)} = \frac{\text{Technology gap}}{\text{Potential yield}} \times 100$$

$$\text{Technology index (\%)} = \frac{\text{Potential yield - Demonstration yield}}{\text{Potential yield}} \times 100$$

Results and Discussion

Based on the current findings and subsequent data analysis over three consecutive years, it was observed that disease incidences were lower in the technology-demonstrated plots compared to farmers' practice plots. This reduction can be attributed to regular monitoring of disease incidence and the judicious use of integrated disease management strategies, resulting in a reduced disease load. Disease incidence was higher in farmers' practice plots, with percentages of 19.4, 18.0, and 12.0 during 2019, 2020, and 2021, respectively, while technology-demonstrated plots had lower incidences of 12.6, 12.0, and 9.1during the corresponding years (Table 2).

Regarding yields, technology-demonstrated plots recorded higher yields (4867, 5202, and 4935 Kg/ha) compared to farmers' practice plots (4329, 4822, and 4385 Kg/ha) during 2019, 2020, and 2021, respectively (Table 3). This translated into higher net returns for technology-demonstrated plots (Rs 1,77,910/-, Rs 1,73,630/-, and Rs 1,82,595/ha) compared to farmers' practice plots (Rs 1,28,920/-, Rs 1,48,430/-, and Rs 1,62,245/-) during the same periods. Overall, the benefit-cost ratio was higher in the treatment plots compared to the control plots throughout the experimentation period, indicating the effectiveness of the technology in reducing disease incidences, increasing yields, and improving economic returns (Table 4).

Table 2. Per cent fruit rot incidence at different locations

	Per cent incidence / locations										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Mean**
Farmers Practice	15.4	21.3	17.2	21.2	20.1	18.5	21.3	22.3	24.2	12.3	19.4
Demo	10.2	12.2	13.2	10.5	16.2	12.3	13.5	11.5	16.2	10.5	12.6
Farmers Practice	19.5	12.3	22.3	15.6	12.3	20.5	19.2	18.2	19.5	20.5	18.0
Demo	12.5	10.5	12.8	10.9	8.9	11.3	15.6	12.5	13.9	10.9	12.0
Farmers Practice	15.3	14.2	11	12	14.2	12.3	10.2	9.6	10.5	11.2	12.0
Demo	8.5	9.6	10.5	11.2	9.2	8.5	8.5	7.2	9.3	8.8	9.1

Table 3. Economic impact of experiment

Year	Yield (Kg/ha)		Net returns (Rs. /ha)		B:C Ratio	
	Demo	Farmers Practice	Demo	Farmers Practice	Demo	Farmers Practice
2019-20	4867	4329	1,77,910	1,28,920	2.47:1	1.91:1
2020-21	5202	4822	1,73,630	1,48,430	2.53:1	1.91:1
2021-22	4935	4385	1,82,595	1,62,245	2.32:1	1.90:1

Table 4. Grain yield and gap analysis

Year	Yield gap (%)	Extension gap (Q/ha)	Technology gap (Q/ha)	Technology index (%)	Additional returns (Rs.)
2019-20	11.00	538	633	11.50	48,990
2020-21	10.89	380	298	5.40	25,200
2021-22	12.06	550	565	10.27	20,350

The findings align with prior studies, showing higher incidences of disease incidence in farmers' practice plots compared to those implementing the technology resulting in a lower benefit-cost ratio (BC Ratio) for the farmer. Similar results were reported by several earlier workers. Fungicides are most commonly used to reduce the economic losses caused by diseases. Their ease of application and effectiveness has made them the most common mean to combat many fungal diseases (Dias, 2012).These results are in conformity with the findings of Hiremath et al. (2009) and Mokidue *et al*. (2011) and fungicides application increases the yield was further confirmed by Bag, *et al* 2016 and Bhuvaneswari, *et al* 2012.

Conclusion

Based on the findings of this study, it can be inferred that location-specific management have become crucial due to the dynamic virus patterns across seasons and agro-ecosystems. The noticeable yield disparity between farmers' practices and technology-demonstrated plots underscores the urgent necessity for robust extension services to educate farmers on adopting improved technologies. Furthermore, the lower yield levels observed in local practices indicate room for improvement through the adoption of recommended strategies.

The Front Line Demonstration (FLD) intervention has proven highly effective in enhancing net returns among farmers. The positive outcomes observed in technology-demonstrated plots warrant wider implementation across the Bhadradri Kothagudem district. These results can be leveraged to encourage farmers to adopt these practices, thereby reducing unnecessary and unwarranted usage of insecticides and fungicides.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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