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Frontline demonstration on effect of use of banana bunch covers and bunch management for quality blemish-free fingers

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Abstract
Banana is the 4th most important staple crop in the world after wheat, maize and rice produced in more than 135 countries in tropical and sub-tropical regions globally. In spite of major contributor to worlds production, the productivity is lower (35.1 MTha^{-1}) with minimal exports for various reasons like external appearance, internal quality and market quality of bananas are influenced by several factors, including pre-harvest production practices. The present study was conducted in Hunsa village Bodhan Mandal, Nizamabad district of Telangana State during 2019-20 to 2021-22 to address the problems associated with damage to fruit bunches resulting in low quality fruits with less yields realizing low market price. During the demonstration period farmers were able to obtain quality blemish free banana bunches owing to the use of bunch covers and bunch management which helped in protecting the fruits from pest attack and external damage resulting in slightly higher yields (655.33 qha^{-1}) over check (643.83 qha^{-1}). The average extension gap and average technology gap are 11.5 q ha^{-1}and 94.67 q ha^{-1} respectively with the average technology index of 8.42 per cent during the demonstration years. It was revealed from the above experiment that banana bunch cover with white non-woven polypropylene skirt bag was very much effective to protect banana fruit from dust, heat and sucking pest infestation.

Keywords: Bunch covers, bunch management, frontline demonstration, polypropylene skirt bag, B:C ratio

Introduction
Banana is the 4th most important staple crop in the world after wheat, maize and rice. It is produced in more than 135 countries in tropical and sub-tropical regions globally. World-wide the total production of banana exceeded 116 Million MT for the year 2019 across an area of 5.15 Million ha (Anon., 2020) [1]. India is the largest producer with 27% share in global production with total production of 31.50 million MT. It is cheap and excellent source of energy, rich source of vitamins, minerals like potassium, phosphorus, calcium and magnesium and adds upto a healthy diet. The plant referred as *Kalpatharu* (a plant of virtues) owing to its multifaceted uses of its underground stem to male flower buds in various forms of foods.

In spite of major contributor to worlds production, the productivity is lower (35.1 MTha^{-1}) with minimal exports for various reasons. External appearance, internal quality and market quality of bananas are influenced by several factors, including pre-harvest production practices. The external appearance includes key attributes such as colour, shape, size and free from defects. The internal attributes such as taste, texture, sweetness, aroma, acidity, flavour, shelf life and presumed nutritional values of the fruit are important in ensuring repeat buys for sustained repeat purchase (Hewett, 2006; Shewfelt, 2009) [6, 12].

It takes around 11-13 months to harvest for delicious banana fruits and insects or birds, elemental damage by winds is constant threat causing blowing dust and debris result in cellular damage and subsequent fruit scarring. Also, the blowing of adjacent leaves and rubbing of leaf petioles onto the developing bunch can impart considerable physical injury and abrasion damage to the fruit peels (Anon, 2003) [2]. Improper nutrient and bunch management also results in poor quality fruits and lower yields. The farmers of this region were experiencing damage to fruit bunches resulting in low quality fruits with less yields realizing low market price.

Keeping the above constraints in mind in banana cultivation Frontline demonstration was conducted to showcase the effect of use of banana bunch covers and bunch management for quality blemish-free fingers and reinforce the confidence of farmers in getting increased profitability with better productivity.

Materials and Methodology

The present study was conducted in Hunsa village Bodhan Mandal, Nizamabad district of Telangana State during 2019-20 to 2021-22 in a cluster.

The healthy tissue cultured banana suckers of cultivar Grand Naine was cultivated by the farmers. All the farmers were trained on the bunch management practices in Banana and use of bunch covers. The field was prepared by deep ploughing during summer and final field preparation was done using tractor operated Rotovator. The suckers were planted in main field after marking the pits in at a spacing of 165 cm between rows as well as plants in a row. Recommended dose of farm yard manure was incorporated during the final land preparation. Weed management, need based plant protection chemicals were used to manage the problems.

Bunch management

- Covering of bunches with non-woven white polypropylene skirt bag with 17 GSM, 31.5 inch Diameter
- Practicing bunch management (Sulphate of Potash @ 5 g/l of water after 5 and 15 days after opening of last bunch of fingers for good growth of fingers and the bunch) for quality fingers development.

Being a demonstration the treatment of covering the bunch with nonwoven polypropylene skirt bag and bunch management was compared against the normal farmers' practice of without covering the bunch and no bunch management. The bunches under the demonstration were covered at the time of opening of first hand. Both ends of the bag were tied with a thread. At the interval of 3-4 days, lower end of the cover was opened to clean opened bract, dried flower remnants, and male flower bud gradually. Randomly selected 10 bunches of each plot were selected and recorded the bunch yield per ha, Cost of sultivation, Net retuns, Benefit to cost ratio and quality parameters like percent damage by pest and mechanical injuries (blemishes) under cover and check. They were also checked for general visual appearance.

In the present study, technology index was operationally defined as the technical feasibility obtained due to implementation of Front line Demonstrations in Banana to estimate the technology gap, extension gap and technology index following formulae used by Samui *et al.*, (2000) [11], Sagar and Chandra (2004) [10] have been used.

The data of adoption and horizontal spread of technologies were collected from the farmers with the interaction. The following formulae were used to assess the impact on different parameters of banana crop.

$$\textbf{Per cent increase in yield}\ (\%) = \left\{\frac{\text{Demonstration yield} - \text{farmers practice yield}}{\text{Farmers practice yield}}\right\} \text{x } 100$$

$$\textbf{Extension Gap (ha)} = \text{Di (Demonstration Yield)} - \text{Fi (Farmers yield)}$$

$$\textbf{Technology Gap (ha)} = \text{Pi (Potential Yield)} - \text{Di (Demonstration Yield)}$$

$$\textbf{Technology index}\ (\%) = \left\{\frac{\text{Potential Yield} - \text{Demonstration yield}}{\text{potential yield}}\right\} \text{x } 100$$

$$\textbf{Impact on horizontal Spread (ha)} = \text{After area (ha)} - \text{Before area (ha)}$$

$$\textbf{Impact on adoption (\% change)} = \left\{\frac{\text{No. of adopters after demonstration} - \text{No. of adopters before demonstration}}{\text{No. of adopters before demonstration}}\right\} \text{x } 100$$

Results and Discussion

The present demonstration was conducted to demonstrate the effect of use of white non-woven polypropylene banana bunch covers and bunch management for quality blemish-free fingers. These covers were tied after the opening of first hand in a bunch.

Extension Gap

The average extension gap (11.5 q ha^{-1}) between demonstrated technology and check was mostly due to the lack of adoption of improved production technology (Table 1). The results are in conformity with the findings of Teggelli *et al.* (2015) [15], who stated the progressive use of improved crop production technologies with high yielding varieties will subsequently change this alarming trend of galloping extension gap. It is directed to educate and emphasise the farmers for the adoption of demonstrated technologies so as to bridge the extension gap by planning and implementation of technologies through various means of extension. The results are in agreement with the research worker Mukharjee (2003), who stated that, location based problem identification and thereby specific interventions may have great implications in the enhancement of crop productivity

Technology Gap

As per the observation recorded (Table 1), the technology gap was 94.67 q ha^{-1}. Depicting the yield gap between demonstrated technology and potential yield which needs to be minimized by conducting large scale FLDs. The variation if any in technology gap during the demonstration years may vary due to soil fertility, climatic condition of the area and management practices implemented by the farmers. Hence, more location specific recommendations and precise use of technology in the fields are necessary to bridge the technology gap as supported by Balai *et al.* (2013) [3]. Similarly yield enhancement Temperature may increase inside the cover, leading to changes in yield-related components and overall yield. Banana bunch covers acted as a physical barrier between the fruits and insects, helping to prevent fruit scarring caused by beetles and also reducing the incidence of Fusarium wilt and in confirmation to the studies conducted by Purnima *et al.*, (2017) [9].

Technology Index

The average technology index reported was 12.62% (Table 1). This actually depicts the feasibility in conducting a demonstration. However farmer perception towards the technology involving high initial costs and adverse climatic conditions resulted in the increasing trend of technology index values during the demonstration years. This in a long run over the years and with more penetration at field level may result in decreasing trend of the technology index with précised use of demonstrated technologies in the field and narrowing the gap to potential yields. As technology index denotes the gap between technology generated at research farm and farmer's field, lower the technology index more feasible will be the technology (Hiremath and Nagraju, 2010, Sagar and Chandra, 2004) [5, 10].

Table 1: Productivity, extension gap, technology gap and technology index in effect of bunch covers and bunch management in banana.

Year	Area (ha)	No. of farmers	Yield (q/ha)			% Increase in yield over check	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
			Potential	Demonstration	Check				
2019-20	4	10	750.00	660.00	652.50	1.15	7.50	90.00	12.00
2020-21	4	10	750.00	635.00	630.00	0.79	5.00	115.00	15.33
2021-22	2	5	750.00	671.00	649.00	3.39	22.00	79.00	10.53
Average			750.00	655.33	643.83	1.78	11.50	94.67	12.62

Economic Analysis

The data obtained regarding the economic analysis for the demonstrated technology was presented in Table 2. The data revealed that, monetary returns were directly influenced by the market price of Banana and cost of production during the successive years of demonstrations. During all the years of demonstrations, the increased gross monetary return and net monetary returns was obtained in the demonstrated technology over check. An average net monetary returns of Rs 1,40,600 and B:C ratio of 1.49 was obtained in the demonstrated technology over check with net monetary returns of Rs 1,03,476.67 and B:C ratio 1.40. The returns were moderate and this was due to lower market prices than normal. But the overall returns were higher in demonstration is due to higher price realization, higher yields with attractive fruit size and superior fruit quality over fruits from check plots. The results are in confirmation with the findings of Tandel (2014) [14] and Singh (2017) [13].

Table 2: Comparative B:C analysis in effect of bunch covers and bunch management in banana and farmers practice

Year	Cost of Cultivation		Gross return (Rs./ha)		Net Returns (Rs./ha)		B:C Ratio	
	Demo.	Check*	Demo.	Check*	Demo.	Check*	Demo.	Check*
2019-20	279360	252200	402600	342560	123240	90360	1.44:1	1.36:1
2020-21	281250	258500	393700	333900	112450	75400	1.39:1	1.29:1
2021-22	290300	264200	460080	396270	169780	132070	1.58:1	1.50:1
Average	283636.67	258300.00	424236.67	361776.67	140600.00	103476.67	1.49:1	1.40:1

Table 3: Impact of Front Line Demonstration (FLDs) on horizontal spread with use of bunch covers and bunch management in banana

Variety	Area (ha)		Change in area (ha)	Impact (% Change)
	Before demonstration	After demonstration		
Bunch covers and Bunch management	1	7	6	600

Conclusion

It was revealed from the above experiment that banana bunch cover with white non-woven polypropylene skirt bag was very much effective to protect banana fruit from dust, heat and sucking pest infestation. The major problem of banana cultivation was due to climatic condition of this region. Hence, it can be concluded that the practice of covering banana bunches resulted in more visually appealing fruits, improved appearance, uniform maturity, and increased productivity, which led to higher market prices and significantly higher net profit for farmers compared to the Check.

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