J Krishi Vigyan 2023, 11 (2) : 269-273 10.5958/2349-4433.2023.00050.8

Performance of Bio Fertilizers on Yield of Mango and Sapota in Navsari District of Gujarat

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ABSTRACT

To create awareness for use of bio fertilizers and the adoption of new input in mango var. Kesar and sapota var. Kalipatti, demonstrations were conducted during the year 2021-22 in different blocks of Navsari district *viz*., Navsari, Jalalpore and Gandevi. Use of bio fertilizer in soil resulted in higher yield (93.5 and 128.0 q/ha) compared to control plots (85.0 and 112.0 q/ha) in mango and sapota fruit crops, respectively. The yield increase compared to check field plots was 10.0 and 14.3 per cent in mango and sapota crops, respectively. The extension gap was recorded in mango and sapota was 8.5 q/ha and 16.0 q/ha. Similarly, the technical gap was recorded 11.5 q/ha in mango and 22.0 q/ha in sapota. The technology index recorded 10.95 per cent in mango and 14.67 per cent in sapota. The benefit-cost ratio was recorded higher in the demonstrated plot of mango (3.59) and sapota (3.47) fruit crops compared to the check plot. Moreover, net return in mango was also recorded 11.99 per cent and 19.19 per cent in sapota.

Key Words: Biofertilizers, Extension gap, Mango, Sapota, Technical gap, Technology index Yield.

INTRODUCTION

The fruit production sector is a grass root sector which impacts on environment, ecology, economy and sustainability for livelihoods of farmers and employees operating along the value chains. Due to challenges in production, for example, scientific-technical knowledge transport and trade, and high prices for quality products make fruit inaccessible to many, especially in developing countries like India.

India has become the world's third-largest economy after the US and China. India is the largest producer of fruits, the country ranks first in the production of Banana (26.08%), Papaya (44.05%), and Mango (45.89%). India is the second largest producer of fruits in the world. Its share in the world's fruit production is 11 per cent. The per capita availability of fruits in the country is only 46 g/d against the requirement of 92 g as prescribed by the Indian Council of Medical Research, this may be due to the very low productivity of the large unproductive old orchard, the small size of land holding and poor management of the orchards, especially in the rain-fed area which constitutes area over 60 per cent of the total areas under fruits. Thus, there is a great scope for increasing fruit production by increasing productivity besides bringing more area under fruit crops (Tala, 2020).

South Gujarat is known as a bowl of horticultural crops. Mango (*Mangifera indica* L.) and sapota [*Manilkara acharas* (Mill.)] are main fruit crops grown in Navsari district of Gujarat (Bhalekar and Chalak, 2016). Mango fruit is rightly known as the National fruit of India and is known as the King of Fruits. Mango occupies unique importance in the tropics, as that apple in temperate zones. Similarly, sapota is also delicious fruit and famous for milkshake ingredient (Gurjar *et al,* 2022). It gives regular income to the farmer for 5 to 6 m in a year. The medium black soil, warm and moist

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Table 1. FLDs organized, area, participation and the average yield of district state and national yield in mango and sapota during the year 2021-22.

Sr. No.	FLD organized			Area (ha)	Total Participant	National average yield (q/ha)	State average yield (q/ha)	District average yield (q/ha)
	Crop	Variety	Season					
1	Mango	Kesar	Kharif	66.40	166	96.64	74.20	91.92
2	Sapota	Kalipatti	Kharif	31.20	78	121.24	110.44	126.90

Average yield is taken from Horticultural statistics at a glance. (Anonymous, 2018).

Table 2. Yield performances of FLDs organized on scientific cultivation practices during the year 2021-22

Sr. No.	Name of crop and variety demonstrated	Yield obtained (q/ha)		Yield increase (%)	Potential yield of the demo variety (q/ha)	Extension gap (q/ha)	Technical gap (q/ha)	Technical index (%)
		Demo Average	Check Average					
1	PSB, KMB and Azotobacter in mango	93.50	85.00	10.00	105.00	8.50	11.50	10.95
2	PSB, KMB and Azotobacter in sapota	128.00	112.00	14.29	150.00	16.00	22.00	14.67

Table 3. Expenditure and return performances of FLDs organized on scientific cultivation practices during year 2021-22

Sr. No.	Demonstration detail	Expenditure and Returns (Rs./ha)								
		Demo				Check				
		Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B: C ratio	Gross Cost (Rs/ ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B: C ratio	Net Return increase percent
1	PSB, KMB and Azotobacter in Mango	65200	233750	168550	3.59	62000	212500	150500	3.43	11.99
2	PSB, KMB and Azotobacter in sapota	83000	288000	205000	3.47	80000	252000	172000	3.15	19.19

climate prevailing in Navsari district is well suited for mango and sapota fruit crops.

Less use of well-decomposed farm yard manure (FYM) and higher use of chemical fertilizers has given hazardous effects on overall soil health. This resulted in the deterioration of the soil's physical and chemical properties resulting in stagnation in the yield of the crop and if the trend continues, it will have disastrous consequences (Hiwale *et al*, 2010). The use of organic matter along with bio-fertilizer improves the availability of nutrients from the soil. (Ram and Rajput, 2000). Hence, to find out the effect of azotobacter, phosphorus solubilizing bacteria (PSB) and potash mobilizing bacteria (KMB) in the farmer's field, KVK Navsari organized demonstrations in the farmer's field to study the effect of bio fertilizers on the yield, economics of the use of bio fertilizers and productivity of mango and sapota

MATERIALS AND METHODS

Krishi Vigyan Kendra, Navsari conducted the front-line demonstration (FLD) on scientific cultivation practices of major fruit crops of Navsari district *viz*., mango var. Kesar and sapota var. Kalipatti in the *Kharif* season during the year 2021-22. A total of 166 FLDs in an area of 66.40 ha for mango and 78 FLDs in an area of 31.20 ha for sapota crop in irrigated condition with good drainage facility were conducted on scientific cultivation practices of mango and sapota on farmer's field of Navsari, Jalalpore, and Gandevi taluka (Block) of Navsari district. The necessary step for the selection of the site, farmers and layout of the demonstration were followed as suggested by Choudhary (1999). Before conducting the FLDs, a list of the farmer of the different village were prepared through survey of farmer meeting and specific skill training were given at the KVK campus regarding the different aspect of scientific cultivation practices and plant protection measures. Navsari Agricultural University made bio-fertilizers (2 L) quanty (50 ml per plant) *viz*., azotobacter, phosphorus solubilizing bacteria and potash mobilizing bacteria were demonstrated to each farmer. Moreover, farmers used recommended dose of fertilizers and manure (750-160-750 g NPK/plant/year in mango with 20 t/ha well-decomposed Farm Yard Manure) and (1000-500-500 g NPK/plant/year in sapota with 20 t/ha well-decomposed FYM) for the demonstration plot. The traditional practices followed by farmers were maintained in the case of local checks. The yield data were collected from FLD plots as well as check plots and finally, the benefit-cost ratio was worked out. The data on production cost and monetary returns were collected from a demonstration plot for the economic feasibility of sapota and mango cultivation. The technology gap, extension gap, and technology index were calculated as suggested by Samui *et al* (2000).

RESULTS AND DISCUSSION

It was observed that yield of mango was influenced by the use of different bio fertilizers viz., PSB, KMB and Azotobacter. The maximum yield (Table 2) was recorded in the demonstration field plot (93.50 and 128.00 q/ha) compared to the check field plot (85.0 and 112.0 q/ha) in mango and sapota crops, respectively. The yield increase percent was 10.0 and 14.3 per cent by use of bio fertilizers in mango and sapota crops, respectively. Similar results were recorded by Meena *et al* (2013). The yield of the mango demonstration plot (93.5 q/ha) recorded a very less difference (Table 1) compared to the national average (96.64 q/ha) (Anonymous, 2018). However, the demonstration plot yield was recorded higher than the state average (74.20 q/ha) as well as the district average (91.92 q/ha). Sapota demonstration plots recorded a higher yield (128.0 q/ha) compared to the national (121.24 q/ha), state (110.44 q/ha) and district average (126.90 q/ha). The reason for the higher yield in the demonstration plot was the use of bio fertilizers and farm yard manure which enhanced the nutrient availability by enhancing the capacity of plants. Similar findings were obtained by Kapur *et al* (2020) in brinjal, Patel

and Naik (2010) Gawande *et al* (1998) in sapota and Shaktawat and Chundawat (2021) in oilseeds crop

The potential yield (Table 2) recorded in Kesar Mango is 105.0 q/ha and 150.0 q/ha for sapota in the Navsari district by Gurjar *et al* (2022). The yield of the demonstration was further categorized into technology and extension gaps. The extension gap recorded in mango was 8.50 q/ha and in sapota crop, it was recorded 16.00 q/ha. This could be due to a lack of awareness about the scientific management of orchards, the use of organic manure and bio fertilizers. Farmers are not aware of the use of bio-fertilizers and their usefulness in increasing crop yield sustainability. Therefore, it is needed to train the farmers regarding proper scientific cultivation methods through farmers' meet, training as well as diagnostic visits and concept clearance. As far as the technical gap is concerned, it was recorded 11.50 q/ha in mango and 22.00 q/ha in sapota, which emphasized the need to educate the farmers through various extension means for the adoption of the scientific use of production technology. Moreover, the technology index illustrates the practicability of demonstration provided among the farmers. It was recorded 10.95 per cent in mango and 14.67 per cent in sapota. However, the sapota crop showed more feasibility compared to the mango.

Economic analysis

The data (Table 3) revealed that the gross cost recorded in bio fertilizers demonstrated plot was 65,200 Rs/ha and 62,000 Rs/ha in the check plot of mango. The increase in gross cost in the demonstration plot is due to the cost of biofertilizer and its charges of application in the field. The gross return recorded in the mango demonstration plot was Rs 2,33,750/ha whereas in the check plot it was recorded Rs2,12,500 /ha. The net return in the demonstration plot was Rs 1,68,550 /ha compared to the check plot which was Rs 1,50,500 /ha. Similarly, the benefit-cost ratio was recorded higher (3.59) compared to the check plot (3.43). It may be due to better absorption of nutrients from the soil.

In the case of sapota fruit crop data revealed that the gross cost recorded in bio fertilizers demonstrated plot was Rs 83,000 /ha and Rs 80,000 /ha in check plot. The increase in the gross cost of demonstration plots is due to the cost of demonstration and its charges of application in the field. The gross return recorded in the sapota demonstration plot was Rs 2,88,000 /ha. Whereas, in the check plot it was recorded Rs 2,52,000 /ha. The net return in the demonstration plot was Rs 2,05,000 /ha compared to check plot which was Rs 1,72,000 /ha. Similarly, the benefit-cost ratio was recorded as higher (3.47) compared to the check plot (3.15) of the sapota fruit crop. The better performance may be due to better absorption of nutrients from the soil which might have given better yield performance.

CONCLUSION

The present study revealed that the use of bio fertilizers with well-decomposed FYM increased 10.00 and 14.29 per cent yield as well as net return increase percent in the demonstration plot with 11.99 and 19.19 per cent in mango and sapota fruit crops, respectively. Technical gaps and extension gaps existed between the use of demonstration and farmer's practices. It can be said that by application of technical knowledge adopting recommended practices and by improvement of extension activities farmers can reach up to potential yield.

ACKNOWLEDGEMENT

Authors feel thankful to farmers and staff members, Bio Fertilizer Unit, Dept. of Plant Pathology, NMCA, NAU, Navsari, Gujarat. We are also thankful to the Senior Scientist and Head KVK, Navsari and the Director of Extension for permission, admiration and facilities provided during the demonstration.

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Received on 16/1/2023 *Accepted on 22/4/2023*