



Research Article

IMPACT OF FRONT LINE DEMONSTRATIONS ON PRODUCTIVITY OF FENNEL (*Foeniculum vulgare* Mill) IN BHARATPUR DISTRICT OF EASTERN RAJASTHAN

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Abstract: India is the largest producer of fennel which is cultivated in 0.76 lakh hectare with a production of 1.2935 lakh tonnes and productivity of 17.02 q/ha. with the 4.26% share in area and 8.75% share in production of seed spices during 2015-16 [1]. This study was conducted on fennel crop during the *rabi* season of year 2017-118 under the scheme Mission for Integrated Development of Horticulture (MIDH). Out of total 39 Demonstrations 29 demonstrations using improved variety RF-205 with full package of practices recommended for the district were conducted in one village and 10 demonstrations using variety RF-125 in another village of Bayana tehsil of Bharatpur district of Eastern Rajasthan. The need-based plant protection chemicals were used to control the insect-pests. The study indicated that under diversified agro-climatic conditions, both varieties of fennel have given encouraging results over farmers practice at both locations and have potential to perform well in flood prone eastern plain zone 3B of Rajasthan with timely management practices and mitigate the extension gap. Simultaneously, efforts need to be made to reduce the technology gap described in this paper. In economic terms, an additional cost mainly for inputs was increased slightly in frontline demonstrations over local check (farmers practices). However, it was recovered by increasing gross and net return substantially and resulted in more benefits cost ratio than the local check. The use of improved production technologies with timely systematic management would increase productivity of fennel. This will substantially increase the income as well as the livelihood of the farming community who are mainly associated with this crop.

Keywords: Front Line Demonstration, Fennel technologies and farmers practices

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Introduction

India is well-known as "Land of Spices" across the world since long back. We have been cultivating these precious spices for fulfilling our various needs since ages. Our ancestors have been using these spices for adding taste and flavour in edibles and beverages. These spices possess many medicinal properties. Fennel (*Foeniculum vulgare* mill) is one of the most important seed spice crops grown in India. The plants are annual, biennial or perennial aromatic herb. Fennel seeds are aromatic with a pleasant taste and widely used for flavouring and garnishing material in culinary preparation. It is also used for chewing. Fennel is used against the diseases like cholera, biliousness, dysentery, diarrhoea, cough, cold, constipation. They are used against diseases affecting chest, spleen, kidney and cure of cholic pain. Seeds are rich in protein (9.5 %), minerals (13.4%) and vitamins such as vitamin A, C, Thiamin, Riboflavin, and Niacin. The seeds contain essential oil, which is used as flavouring agent in manufacturing of pickles, cakes, perfumes, soap, liquors and cough drop. It's seeds contain 0.7 to 1.9 % volatile oil. The chief constituents of oil are an ethanol (50-70%). The volatile oil is used for manufacturing cordials and fennel water which is given to infants as medicine. Fennel and its oil both stimulate aromatic and stop flatulence. It's decoction is given to women for blood purification and uterus clearing. It requires dry and cool climate for better seed production with quality. It is susceptible to frost particularly at flowering stage. It can be grown on wide varieties of soil (except sandy soil). A well-drained loamy and black cotton soil containing lime is preferred [9]. India is the largest producer of fennel which is cultivated in 0.76 lakh hectare with a production of 1.2935 lakh tonnes and productivity of 17.02 q/ha.) with the 4.26% share in area and 8.75% share in production of seed spices during 2015-16 [1].

The fennel seeds were exported to the tune of 15320 tonnes values worth Rs.17240 lakh with the 5.59 % share in quantity and 3.19 % share in values of seed spices exported from India during 2015-16 [1]. The major markets for export are The U.S.A. The U.K., the U.A.E., South Africa, Malaysia etc. Rajasthan and Gujarat are also known as 'Seed Spices Bowl' and contributes more than 80% of the total seed spices produced in India. Rajasthan is the second largest producer of fennel after Gujarat. Rajasthan produced 30720 tonnes fennel from 27590 ha area during 2015-16 [1]. But the average productivity of fennel crop (1130 kg/ha) in the Rajasthan is very low as compared to other parts of the country. Fennel producing other states are Madhya Pradesh, Haryana, Punjab and Uttar Pradesh. In Rajasthan major fennel growing districts are Tonk, Sirohi Jodhpur, Ajmer, Udaipur, Pali, Sawai Madhopur and Bharatpur. India is exporting only 10.80% of its seed spice production. Keeping this in view, seed spices are considered not only cash crops but also, they can be termed as "dynamic crop commodities" particularly in the view of their great export potential. Therefore, there is an emerging need not only to increase the productivity but also to improve the quality and other related parameters for gaining more foreign exchange to the national wealth. The shift or increase in average productivity has remained low for seed spices crop like fennel mainly due to lack of sufficient number of improved varieties suitable for different regions with higher yield, resistant to different biotic and abiotic stresses with better quality attributes. Therefore, improved varieties with desired attributes are the need of the day. Both National Research Centre on Seed Spices, Tabiji, Ajmer and Sri Karan Narendra Agriculture University Jobner-Jaipur have done remarkable work in the direction of variety and agro-technique development of various seed spices crops.

Table-1 Productivity of fennel variety, yield gap and technology index

SN	Variety	No. FLDs	Area (ha)	Potential yield (q/ha)	FLD Yield (q/ha)	Local check yield (q/ha)	% increase over local check	Technology Gap (q/ha)	Extension gap (q/ha)	Technology Index (%)
Location 1	Farmers Practice	29	10							
	RF-205	29	10	25	20.20	17.50	15.43	4.8	2.70	19.2
Location 2	Farmers Practice	10	3							
	RF-125	10	3	25	18.80	16.50	13.93	6.2	2.30	24.8

Table-2 Economics of cultivation of fennel

SN	Variety	Yield q/ha	Cost of cultivation (Rs./ha)	Gross return (Rs/ha)	Net return (Rs./ha)	B:C ratio
Location 1	Farmers Practice	17.50	28000	122500	94500	1:4.38
	RF-205	20.20	30000	141400	111400	1:4.71
	Additional in demonstration	2.70	2000	18900	16900	8.45*
Location 2	Farmers Practice	16.50	28000	115500	87500	1:4.13
	RF-125	18.80	30000	131600	101600	1:4.39
	Additional in demonstration	2.30	2000	16100	14100	7.05*

*Incremental benefit: cost ratio

This is a great challenge for as other country like Egypt for fennel is competing with higher yield per unit area. Most of the seed spices are severely damaged by soil borne fungus like *Fusarium* or *Pythium*. If the farmers are going for deep summer ploughing in the month of May or June or if they are using the soil solarisation process then we can certainly reduce the acute problem of wilt and other soil borne fungus, additionally solarisation reduces the weed populations by deactivating the weed seed bank in the soil. For solarisation transparent plastic sheet probably having thickness of 20-25 micron is used at least for a period of three weeks during May or June. Similarly, two-three ploughing upto 30-40 centimetre are effective for reducing the incidence of wilt during the ensuing season of its cultivation. Integrated approach taking into account degradable chemicals and bio-agents is very much required to raise a healthy crop with required standards. Therefore, a proper standardization of available Integrated Pest Management and Integrated Disease Management packages is needed that can be made readily available to farmers for increasing our export potential. While demonstrating the technologies in the farmers field, the scientist is required to study the factor contributing higher crop production, field constraints of production and thereby generate production data and feedback information. If there is facility of irrigation then fennel crop is proving more profitable than other traditional crops like mustard and wheat. There is no damage by stray animals (a major problem now a days), higher yield potential and attractive market price is encouraging farmers to adopt fennel cultivation to increase their socio economic condition. There is lot of scope of fennel growing in winter season under assured irrigation facility. FLDs are organized in a block of 2 to 5 hectares involving all those farmers whose plots fall in the identified demonstration block. Only critical inputs and training are provided from the scheme budget, remaining inputs are supplied by the farmers themselves. The present study was carried to study impact of front line demonstrations on productivity of fennel.

Materials and Methods

This study was conducted during the Rabi Season of year 2017-18 under the Scheme Mission for Integrated Development of Horticulture (MIDH). A total of 39 farmers from different categories were selected purposively from adopted two villages (Sheedpur-29 demonstrations using variety RF-205 and Birampura -10 demonstrations using variety RF-125) of Bayana tehsil of Bharatpur district of Eastern Rajasthan for conducting 39 frontline demonstrations on their field (13 ha area). Bharatpur District of Rajasthan comes in Agro-climatic zone of Rajasthan III B Flood Prone Eastern Plain. Here, generally in winters minimum temp. goes to 2-3o and in summer maximum temp. reaches to 47°C., annual rainfall is 600-650 mm per year. But due to very low rainfall during last two years farmers are suffering a lot. The study comprised of two high yielding fennel varieties viz, RF-205 and RF-125 (developed by the SKNAU Jobner, Jaipur) with the recommended package of practices. Sowing was done in the last week of October, while

harvesting in the last week of April. Fertilizer schedule was N: 90, P₂O₅:40, K 20:0 kg/ha for all the varieties. The need-based plant protection chemicals were used to control the insect-pests. Locally cultivated variety procured from private sector as practiced by the farmers with their own management system was taken as local check. In the present study, the data were collected through personal interviews, group discussion and empirical observations with the help of semi-structured interview schedule and field record of front line demonstration plots and farmers practices. To estimate the technology gap, extension gap and technology index, the following formula were used after Samui, *et al.*[6] and Sagar and Chandra [5].

1. Technology gap: Potential Yield—Demonstration yield
2. Extension gap: Demonstration yield—Farmers yield
3. Technology index: [(Potential yield—Demonstration yield) / Potential yield] X 100

Results and Discussion

The potential and field performance of the newly released fennel varieties along with the local check were evaluated and data are presented in [Table-1]. The percentage increase in the seed yield over the farmers practice was 15.43 and 13.93 for RF-205 and RF-125, respectively. Which need some more efforts from the extension agencies to bridge the gap. Though the technology among the varieties did not vary widely, development of location specific technology appears to be necessary to achieve the expected yields from different fennel varieties. Comparatively higher extension gap (2.70 q/ha) was recorded for variety RF-205, and for RF-125 (2.30q/ha). It is indicated that there is need to educate the farmers through various means for optimizing the seed yield by adopting the improved fennel technology practices as technology gap is realizable under on-farm conditions. More use of newly released high yielding varieties by the farmers will subsequently change existing trend of extension gap as to reverse. The new technology will eventually motivate the farmers to adopt the promising technology with use of proper management practices for increasing the profitability. The technology index shows the feasibility of the evolved technology at the farmer's field. The lower value of technology index more is the feasibility of the technology. The technology index was 19.20% and 24.80 % for the varieties RF-205 and RF-125 respectively. Which need some more efforts from the extension agencies to bridge the gap. The higher technology index indicates existence of a considerable gap between the technology performance at research station and the farmer's field. The technology index of Two fennel varieties RF-205 and RF-125 point that these varieties are performing quite well in the irrigated condition of Flood Prone Eastern Plain Zone 3B of Rajasthan and will help to increase the productivity of fennel in this area through the adoption of improved practices. The difference in yield between two varieties may be due effect of location; otherwise both varieties have good yield potential. The findings are in line with the findings of Meena and Singh [4].

Economics of the Front-Line Demonstrations

It is important to know the economical yard stick of the demonstrated fennel technology as compared to the existing practices of the farmers. All the input-output cost data, except fixed cost were recorded during the season and analyzed. The comparative benefit cost analysis data are presented in [Table-2]. The highest net return was obtained from RF-205 variety (Rs. 111400 /ha) in comparison to local check (Rs.94500/ha.) and for RF-125 (Rs. 101600/ha). In comparison to Local check (Rs.87500/ha). In terms of benefit-cost ratio, at first location the variety RF-205 gave 4.71 and at another location variety RF-125 gave 4.39. These ratios were higher than local checks at both locations. The Local Check did not give comparatively encouraging results in terms of benefit cost and net return. Variety-wise comparison of additional gain showed that the demonstrated improved varieties gave more yield under FLDs that ranged from 15.43 per cent from the variety RF-205 to 13.93 per cent from the variety RF-125 over farmers' practice. Besides that, the additional net economic return obtained ranged from Rs. 169000/ha from the variety RF-205 to Rs./ha 14100 from the variety RF-125. Above data showed that at both locations improved varieties RF-205 and RF-125 gave more benefit under recommended package of practices due to more yield than the farmers practice as the varieties and the technologies are well fitted under the agro-climatic conditions. The findings are confirmed with the findings of Khan, *et al.* [2], Meena, *et al.* [3], Singh, *et al.* [7] and Singh, [10-13].

Conclusion

These varieties may be popularized with full package of practices to explore the potential in field conditions and mitigate the extension gap, simultaneously efforts need to be made to reduce the large technology gap described in this paper. In economic view, an additional cost mainly for inputs was increased slightly in FLDs over local check. However, it was recovered by increasing gross and net return substantially and resulted in more benefits cost ratio than the local check. The use of latest production technologies with timely systematic management would increase productivity of fennel and income of the farmers who are mainly associated with this crop. There is need to implement multi-pronged strategy, which includes vertical and horizontal productivity growth through better adoption.

Application of research: There is continuous demand for the seed spices like fennel. Farmers are getting profit by growing this crop because of suitability of the crop in their locality. But by making them aware about the improved technologies like improved varieties and their availability, package of practices, farmers will be able to increase their profit. Crop Diversification by encouraging farmers to grow profitable crops which are suitable for the local agro-ecological situations like fennel for partial replacement of traditional crops like wheat and mustard *etc.* with use of improved technologies to increase production and livelihood.

Research Category: Frontline demonstrations

Abbreviations:

FLD-Front line demonstrations

RF-Rajasthan Fennel

MIDH-Mission for Integrated Development of Horticulture.

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