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Performance of front line demonstrations of fenugreek on yield and farmers' returns in Kukanwali area of Rajasthan

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Abstract

Twenty seven Front Line Demonstrations (FLDs) on fenugreek with three interventions (improved varieties, seed treatment and recommended dose of fertilizers) were conducted at Farmers' fields of Kukanwali area in district Nagaur (Rajasthan) during winter season of the years 2012-13, 2013-14 and 2014-15. On the basis of three years' overall average, it is attributed that about 24.84% higher grain yield was recorded in FLDs than that of the farmers' traditional check/ practices. The study exhibited mean extension gap of 331 kg ha^{-1}, technology gap of 812 kg ha^{-1} with mean technology index of 32.48%. An additional investment of Rs. 2100/ha coupled with recommended nutrients, water management, plant protection measures, scientific monitoring and non-monetary factors resulted in additional mean returns of Rs. 17329/ha. On the basis of mean data of three years, overall average Incremental benefit: Cost ration was calculated as 8.25.

Key words: Fenugreek, transfer of technology, yield, yield gaps, economic returns

Introduction

Fenugreek (*Trigonella foenum graecum* L.), an important self pollinated legume crop, commonly known as *Methi,* is mainly grown in the states of Rajasthan, Madhya Pradesh, Maharashtra, Punjab, Gujarat and Uttar Pradesh. The major districts growing fenugreek in Rajasthan are Sikar, Nagaur, Chittorgharh, Jaipur, Pali, and Alwar. The average productivity of fenugreek in the country seems to be very low (1215 kg ha^{-1}) as its total annual production is 113000 tonnes from 93000 ha area (Tiwari *et al*., 7), which required to be increased (Lal *et al*., 4). The main factors responsible for low productivity are less awareness among the farming community about area specific recommended package of practices, less availability of high yielding and resistant varieties, lower adoption of recommended plant production and protection technologies besides persistence of several biotic and abiotic stresses. Introduction of high yielding varieties, farm mechanization and appropriate plant protection measure with the recommended package of practices (nutrition, irrigation and intercultural operations etc.) play a crucial role with respect to the productivity of fenugreek. Effective management of biotic and a-biotic stresses at right time with the help of available chemicals and organic means is also very important to increase the productivity and production of the crop, which ultimately enhanced the growers' returns and benefit cost ratio.

Many varieties developed and technologies generated by ICAR institutes, SAUs are lying unused due to poor transfer of technology to the end user leads to a sizable gap between development and utilization. Hence, concentrate efforts on scientific cultivation of fenugreek are necessary to achieve higher productivity and production of quality produce. Front line demonstrations (FLD) on farmers' field may be helpful to establish the technology at farming community (Dayanad *et al*., 1 and Lal *et al*., 2). With the above background and facts, three high yielding varieties of fenugreek with the scientific interventions like seed treatment and recommended doses of fertilizers were tested on the farmer's fields through front line demonstrations by National Research Centre on Seed Spices in Transfer of Technology Project under Mission for Integrated Development of Horticulture (MIDH) earlier National Horticulture Mission (NHM) with the objectives to exhibit the performance of high yielding fenugreek varieties with scientific interventions, to compare the yield levels of local (checks) cultivar with farmers practice and FLD fields with scientific interventions and to calculate and compare their economic returns.

Materials and methods

The present study was carried out by the ICAR-National Research Centre on Seed Spices, Ajmer in Transfer of Technology Project under Mission for Integrated Development of Horticulture (MIDH) during Rabi season from 2012-13 to 2014-15 (03 years) on the farmers' fields of Kukanwali area of Nagaur district of Rajasthan

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having arid climate. About 09 front line demonstrations per year in about 4.5 ha area on the fields of different farmers were conducted every year. Each demonstration is of 0.5 ha in area. The soils of the working area is sandy in texture, contains low nitrogen, low to medium phosphorus and medium to high potash having low organic carbon and water holding capacity.

Three varieties of fenugreek *viz*., Afg 1, Afg 2 and Afg 3 were tested through front line demonstrations (FLDs) with seed treatment and recommended doses of fertilizers and interventions compared with local variety grown with farmer's practices. The materials and inputs required under the study with respect to front line demonstrations (technologies demonstrated) and farmers' practice are given in Table 1.

Table 1: Details of scientific interventions and farmers' practices for fenugreek cultivation

S. No.	Intervention	Farmers' practice	Scientific proven technology demonstrated
1.	Use of seed	Locally available seed	AFg-1, AFg-2 and AFg-3 as improved varieties from NRCSS, Ajmer
2.	Seed treatment	No seed treatment	Seed treatment by Bavistin (2.5g/kg seed) and *Trchoderma viride* (6g/kg seed)
3.	Fertilizer application	Application of DAP (50 kg/ha)	Application of nitrogen (30 kg/ha), phosphorus (40 kg/ha) and potassium (20 kg/ha)

Critical inputs namely quality seed, fertilizers, agro-chemicals for plant protection measures were provided in demonstration plots, and non-monetary inputs like timely sowing in lines and timely weeding and irrigation were also performed. Whereas, traditional practices were maintained in case of local practices or local checks. The demonstration farmers were facilitated by the NRCSS scientists in performing field operations during the course of trainings and visits. Two On-campus and three Off-campus trainings have been organized for the group of beneficiaries.

Seed treatment was done with *Trichoderma viride* (6 g/kg) and Bavistin (2.5 g/kg) in a closed container and then shade dried for some time before sowing. For balanced nutrition, 30 kg ha^{-1} N, 40 kg ha^{-1} P_2O_5 and 20 kg ha^{-1} potassium through urea (46% N), DAP (18 % N and 46% P_2O_5) and Muriate of Potash (60% K_2O) were applied as recommended doses of fertilizers to the crop. Half dose of nitrogen and full dose of phosphorous and potassium applied at the time of seed sowing. The remaining half dose of nitrogen was given in standing crop after 30 days of sowing as top dressing. Two sprays of malathion (0.05%) at 15 days interval for the control of aphids (with the incidence) and one spray of dinocap (0.1%) for the control of powdery mildew (with the initial appearance of symptoms) were given. Growing of locally available seed of fenugreek without seed treatment and only 50 kg ha^{-1} DAP application with indiscriminate use of pesticides and fungicides is the farmer's practice prevailing in the area. The sowing was done during third week of October. The demonstrations were conducted to study the gaps between the potential and demonstration yield, extension gap and technology index. Data with respect to yield and output for demonstration plots and on local practices commonly adopted by the farmers of the area under study were collected and evaluated.

The grain yields of demonstration units were recorded and analyzed. Different parameters as suggested by Yadav *et al*., (8) were used for gap analysis, and calculating economics. The details of different parameters and formulae adopted for analysis are as under:

Extension Gap = Demonstration Yield (DY) – Farmers' Practice Yield (FPY)

Technology Gap = Potential Yield (PY) – Demonstration Yield (DY)

$$\text{Technology Index} = \frac{PY - DY}{PY} \times 100$$

Additional Cost = Demonstration Cost – Farmers' Practice Cost

Effective Gain = Additional Returns – Additional Cost

Additional Returns = Demonstration Returns – Farmers' Practice Return

Incremental B: C Ratio = Additional Returns / Additional Cost

Results and discussion

Grain yield

Performance of the study revealed that significant increase in the yield was recorded in all the FLDs in all the years of the study period (Table 2). The factors responsible to exploit higher yields over traditional checks/ practices are scientific interventions with improved varieties and recommended package of practices. Further, this study revealed that, significant improvement was recorded in fenugreek grain yield with the interventions given in demonstrations as compared to farmers' existing practices. Maximum yield (1755 kg ha^{-1}) under FLDs was recorded in the year 2014-15, which was 21.45 per cent higher than the yield (1445 kg ha^{-1}) obtained under farmers' practice. The increase in grain yield under demonstrations was 20.35% to 32.73% higher than farmers' local practices/ checks. An overall yield advantage of 24.84 per cent over farmers' practices was recorded with the yield of 1688 kg ha^{-1} under demonstrations carried out with improved varieties and scientific cultivation practices (Table 2). Similar findings have also been reported by Lal *et al.,* (3) and Singh *et al.,* (6).

Gap analysis

Evaluation of findings of the study (Table 2) stated that an extension gap of 288 – 396 kg ha^{-1} was found between demonstrated technology and farmers' practice and on average basis the extension gap was 331 kg ha^{-1}. The extension gap was highest (396 kg ha^{-1}) during 2013-14 and lowest (288 kg ha^{-1}) during 2012-13. Such gap might be attributed to adoption of improved technology especially high yielding varieties sown with the help of seed cum fertilizer drill with balanced nutrition and appropriate plant protection measures in demonstrations which resulted in higher grain yield than the traditional farmers' practices.

The study further exhibited a considerable technology gap during different years. It was lowest (745 kg ha^{-1}) during 2014-15 and highest (894 kg ha^{-1}) during 2013-14. The average technology gap of all the years was 812 kg ha^{-1}. The difference in technology gap in different years is due to better performance of recommended varieties with different interventions and more feasibility of recommended technologies during the course of study. Similarly, the technology index for all demonstrations in the study was in accordance with technology gap. Higher technology index reflected the inadequate proven technology for transferring to growers and insufficient extension services for transfer of technology. On the basis of three years study, overall 32.48% technology index was recorded, which was reduced from 35.76% (2013-14) to 29.80% (2014-15). Hence, it can be inferred that the awareness and adoption of improved varieties with recommended scientific package of practices have increased during the advancement of study period. These findings are in the conformity of the results of study carried out by Meena and Singh (5) and Lal *et al.,* (2).

Economic analysis

Components like seed, fertilizers and pesticides were considered as cash inputs for the demonstrations as well as farmers' practices. Data of economic analysis presented in Table 3 revealed that, an average additional amount of Rs. 2100/ha was incurred under demonstrations (FLDs) than FP. Economic yield as a function of grain yield and sale price were taken into consideration. Maximum additional returns (Rs. 22176/ha) were obtained in the year 2013-14 due to lower grain yield recorded under farmers practices with local check. The higher additional returns and effective yield obtained under demonstrations could be due to improved variety, scientific proven technology, non-monetary factors, timely operations of crop cultivation and scientific monitoring. The lowest and highest incremental benefit: cost ratio (IBCR) was 5.48 and 10.56 in the year 2012-13 and 2013-14, respectively depends on produced grain yield. Overall average IBCR was found as 8.25. The results of the study corroborate the findings of front line demonstrations carried out by Lal *et al*., (3) and Lal *et al*., (2) on cumin and Singh *et al*., (6) on seed spices.

Conclusion

It is revealed from the above study that, adoption of high yielding varieties with scientific recommended package of practices through front line demonstrations gave 24.84% higher yield and ₹ 17329 ha^{-1} more returns to the growers over local checks/ practices on the extra expenditure of merely ₹ 2100 ha^{-1}. This very small amount can be borne by small and marginal farmers. Hence, it is clear from the study that unawareness and ignorance is the basic reason/ constraint (not the cost) called extension gap with respect to the adoption of

technology. The average extension gap recorded in the study was 331 kg ha^{-1}. The incremental benefit cost ratio (IBCR) was sufficiently high to motivate the growers for technology adoption. The programme of front line demonstration on fenugreek was quite effective in changing knowledge, skill and attitude of growers for scientific cultivation practices. It has been verified that the yield advantage can be attained by the use of improved varieties, seed treatment, application of balanced nutrition with appropriate plant protection measures on farmer's fields. All three varieties of fenugreek (Afg 1, Afg 2 and Afg 3) can be recommended for central arid Rajasthan with technological interventions like seed treatment with *Trichoderma* viride (6g kg^{-1}) and/or bavistin (2.5g kg^{-1}) and with recommended dose of fertilizers.

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Table 2: Analysis of technological gap, extension gap and Technological index of front line demonstrations on fenugreek at farmers' fields

Year	No. of FLDs	Potential yield (kg ha^{-1})	FLD yield (kg ha^{-1})	Farmers' practice yield (kg ha^{-1})	Yield increase (%)	Extension gap (kg ha^{-1})	Technology gap (kg ha^{-1})	Technology index (%)
2012-13	09	2500	1703	1415	20.35	288	797	31.88
2013_14	10	2500	1606	1210	32.73	396	894	35.76
2014-15	08	2500	1755	1445	21.45	310	745	29.80
mean	09	2500	1688	1357	24.84	331	812	32.48

Table 3: Economic analysis of front line demonstrations on fenugreek at farmers' field

Year	Cost of cash input (₹ ha^{-1})		Add. cost in FLD (₹ ha^{-1})	Sale price of grain (₹ Kg^{-1})	Total returns (₹ ha^{-1})		Add. returns in FLD (₹ ha^{-1})	Effective gain (₹ ha^{-1})	INC B:C ratio (IBCR)
	FLD	FP			FLD	FP			
2012-13	5100	3000	2100	40	68120	56600	11520	9420	5.48
2013-14	5100	3000	2100	56	89936	67760	22176	20076	10.56
2014_15	5100	3000	2100	59	103545	85255	18290	16190	8.71
average	5100	3000	2100	48	87200	69872	17329	15229	8.25

FLD: Front Line Demonstration, FP: Farmers' Practice, INC: Incremental

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