International J. Seed Spices 9(2), July 2019:6-11

Popularization of cumin cv. GC-4 through frontline demonstrations in Pali district of Rajasthan, India

***M.L. Meena, Dheeraj Singh and M.K. Chaudhary**

ICAR-CAZRI, Krishi Vigyan Kendra, Pali-Marwar- 306 401, Rajasthan, India

Abstract

Cumin is one of the important major seed spice crops, considered to be a remunerative cash crop mainly grown in western part of the country particularly in Rajasthan and Gujarat occupying about 8.8 lakh hectares area with annual production of about 4.9 lakh tonnes. Frontline demonstration is one of the most important and powerful tool for transfer of technology. Keeping in view the effective extension approach of FLDs for dissemination of technology FLDs on cumin conducted by KVK, Pali, Rajasthan was assessed. It was observed from the study that there was 27.3 to 41.3 per cent increase in seed yield of cumin over local check and the average benefit cost ratio was higher under demonstration as compared to control plots (farmer practices) during all the years of the study. It was estimated that the horizontal spread of cumin cv. GC-4 was about 150 ha during 2011-12 to 5100 ha during the year 2017-18. The findings of the study also revealed that they had been increase in adoption level ranging from 9 .4 per cent of sowing time and method to 46.9 percent of improved and quality seed after conducting the FLD programmes. The majority of the respondent farmers expressed high level (51.2%) to the medium (34.4%) level of satisfaction for extension services and performance of technology under demonstrations. It can be concluded that the improved variety GC-4 with recommended package of practices can be recommended in western Rajasthan for successful cultivation of cumin for fulfilling the demand of domestic and export markets.

Key words : Adoption, cumin, economic analysis, frontline demonstrations, farmers' satisfaction.

Introduction

Indian spices and spicy food are popular world over since ancient time. Traders from across the world have visited our sub-continent for spices; nearly 76 spices are grown in India. Seed spices are annual crops whose seeds are consumed as spice, *viz*. coriander, cumin, fenugreek, fennel, ajwain, dill, anise, nigella, caraway celery etc. These seed spices improve the taste and also bear medicinal value. Interestingly, these crops are predominantly grown in semi-arid and arid zones of the country having dry or wet cool weather conditions. Rajasthan, Gujarat and some parts of Madhya Pradesh can be called as the "bowl of seed spices" contributing more than 80% of the country's annual production. Seed spices possess significant importance as domestic and export commodity. There has been a gradual rise in area and production of these crops, emphasizing more on the major crops like cumin, coriander, fennel and fenugreek a clear enhancement is visible both in area and production including productivity in the last 25 years (Singh and Solanki 2015). The global demands for Indian spices are increasing day by day. In terms of export, there is increase of 29% in coriander, 70% in cumin, 58% in fennel and 49% in fenugreek respectively.

Amongst seed spices, cumin (*Cuminum cyminum* L.) is considered as most important seed spices crop, belonging to family Apiaceae, it is growing mainly in Rajasthan and Gujarat. The average national productivity of this crop is very less (596 kg ha^{-1}) due to low level of 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. Introduction of high yielding varieties tolerant to diseases can do the wonders in the growing area. Application of appropriate doses of fertilizers at right time with other recommended practices (irrigation and intercultural operations etc.) also play a crucial role with respect to the productivity of cumin (Lal 2014).

Besides these, effective management of biotic and a-biotic stresses at crucial time with the help of available chemicals and organic means is also very important to increase the productivity and production of the crop. The farmers of the district are trying to adopt the improved varieties and scientific technologies, however many of them still doing the farming with available local varieties and conventional practices. The main objective of front line demonstrations is to demonstrate newly released crop production and protection technologies and its

*Corresponding author email: mlmeenacazri@gmail.com

management practices at the farmers' field under different agro-climatic regions and farming situations. While demonstrating the technologies at the farmers' field, the scientist are required to study the factors contributing higher crop production, field constraints of production and thereby generate production data and feedback information. Realizing the importance of FLDs in transfer of latest technologies, CAZRI, Krishi Vigyan Kendra, Pali have regularly been conducting FLDs on cumin at farmers field in different villages of Pali district of Rajasthan with the objective of convincing farmers and extension functionaries together about the production potentialities of production technologies for further wide scale diffusion. Keeping in view, an effective extension approach of FLDs was conducted by KVK, Pali for dissemination of cumin production and production technologies for impact assessment.

Materials and methods

The frontline demonstrations on cumin were conducted by several institutes or organizations in Rajasthan but due to paucity of time and proximity, study was confined to Front Line Demonstrations (FLD) conducted by KVK in Pali district of Rajasthan. Pali, situated in the arid fringes of Rajasthan, represented by sandy loam to loamy silt soil with temperature range from 2 to 48° C and about 420 mm rainfall annually. The data on output were collected from FLDs plots and finally the grain yield; cost of cultivation, net returns with the benefit cost ratio were work out. For the purpose of investigation, 20 villages from 4 blocks (each block 5 villages) leading cumin production of Pali district where FLDs on cumin were conducted during preceding seven years (Rabi 2011-12 to 2017-18) were selected. A comprehensive list of FLD farmers was prepared. Out of this, 8 beneficiaries from each selected village were randomly selected. Thus, a total sample of 160 respondents was taken for the study. The adoption level of the farmers about improved production practices of cumin before conducting and after conducting FLD was measured. Further, the satisfaction level of respondent farmers about extension services provided was also measured based on various dimensions like training of participating farmers, timeliness of services, supply of inputs, solving field problems and advisory services, fairness of scientists, performance of variety demonstrated and overall impact of FLDs. The data were collected through personal contacts with the help of well structured interview schedule. The gathered data were processed, tabulated, classified and analyzed in terms of mean percent score and ranks etc. in the light of objectives of the study. The Client Satisfaction Index was calculated as developed by Kumaran and Vijayaragavan (2005).

$$\text{Client Satisfaction Index} = \frac{\textit{The individual obtained score}}{\textit{Maximum score possible}}$$

Results and discussion

Yield performance of cumin (GC- 4)

During 2011-12 to 2017-18, result of cumin variety GC-4 demonstrations conducted at farmers' field revealed that there was 27.3 to 41.3 percent increase in seed yield over local check. Table-1 shows that average yield in demonstrations varied from 630 kg to 790 kg ha^{-1} during all seven years and highest yield in demonstration was recorded during 2014-15 followed by 2011-12 (630 kg ha^{-1}), 2012-13 (700 kg ha^{-1}), 2013-14 (650 kg ha^{-1}), 2015-16 (720kg ha^{-1}), 2016-171 (760 kg ha^{-1}) and 2017-18 (650 kg ha^{-1}) respectively. In local checks (Table1), the same trend was found *i.e.,* maximum average grain yield (580 kg ha^{-1}) was recorded during 2016-17 and lowest seed yield (450 kg ha^{-1}) was observed during 2011-12. The overall average yield in demonstration plots (700 kg ha^{-1}) was higher as compared to local plots (547 kg ha^{-1}) which increased by 35.9 percent over local checks during the study period (2011-12 to 2017-18). It might be due the soil type and its

Table 1. Yield performance of frontline demonstrations on cumin variety GC-4

Year	No. of demonstrations	Area (ha)	Average yield (kg ha^{-1})		Increase in yield (%) over local checks
			Demo.	Local check	
2011-12	30	12	630	450	40.0
2012-13	40	16	700	550	27.3
2013-14	35	14	650	460	41.3
2014-15	30	12	790	570	38.5
2015-16	40	16	720	530	35.8
2016-17	50	20	760	580	31.0
2017-18	50	20	650	490	32.7
Average	**275 (39.3)**	**56 (15.7)**	**1280**	**547.1**	**35.9**

moisture availability, rainfall and weather conditions as well as the change in the locations of demonstration plots every year. In general, in all the years seed yield of FLD plots was higher as compared to local check which was due to good variety, seed treatment, recommended fertilizer doses, plant protection measures were followed by the demonstrators and scientists in the demonstrations plots. Similar results were also observed by Dayanand *et al.,* (2012), Lal (2014), Meena and Singh (2013) and Sharma and Choudhary (2014) which support the present findings.

Economic performance of cumin (GC-4)

The year wise economics of cumin production under demonstrations were estimated and the result has been presented in Table 2. The economic analysis of the data over all the years revealed that cumin variety (GC-4) recorded higher gross returns (₹ 86607), net returns (₹ 59543) and B: C ratio (2.4) as compared to local check. The cost of cultivation increased successively of the years of study in demonstration and local plots due to hike in prices of inputs. The data in table 2 clearly explained the significance of cumin (GC-4) demonstration at farmers' field during seven years of study in which greater net returns (₹ 59543) were obtained under demonstration plots than local checks (₹ 38429). The highest net return was received in the year of 2014-15 (₹ 71850) and lowest during 2011-12 (₹ 47750). The Benefit cost ratio was higher under cumin demonstration as compared to control plots during the all years of study (Table 2). The higher net returns and B: C ratio in cumin demonstration might be due to the higher seed yield and better pricing of the produce in the market. The overall average additional net return was ₹ 21114 over local plots. These results are in line with the findings of Meena *et al.,* (2012), Meena *et al.,* (2013), Singh (2013), Meena and Gupta 2013), Chaudhary *et al.,* (2015), Mehrya and Ramesh (2018), Singh and Sharma (2018), Sharma and Choudhary (2014) and Morwal *et al.,* (2018).

Increase in area under improved variety of cumin (GC-4)

The estimated data regarding increase in area under improved variety GC-4 in the Pali district of Rajasthan two presented in table 3. It was observed that the area under improved variety GC-4 was estimated only 150 ha during the year 2011-12 which horizontally increased to 500 ha (2012-13), 1200 ha (2013-14), 2200 ha (2014-15),

Table 2. Economic performance of frontline demonstrations on cumin variety GC 4

Year (Rabi)	Cost of cultivation (₹ ha^{-1})		Gross return (₹ ha^{-1})		Net return (₹ ha^{-1})		Additional return (₹ ha^{-1})	Benefit cost ratio	
	IP	FP	IP	FP	IP	FP		IP	FP
2011-12	24700	23500	72450	51750	47750	28250	19500	2.9	2.2
2012-13	25200	24500	80500	63250	55300	38750	16550	3.2	2.5
2013-14	26800	25300	81250	57500	54400	32200	22200	3.0	2.3
2014-15	26900	25100	98750	71250	71850	46150	25700	3.7	2.8
2015-16	27800	26500	90000	66250	62200	39750	22450	3.2	2.5
2016-17	28600	27400	98800	75400	70200	48800	21400	3.5	2.7
2017-18	29400	28600	84500	63700	55100	35100	20000	2.9	2.2
Average	**27057**	**25843**	**86607**	**64157**	**59543**	**38429**	**21114**	**3.2**	**2.4**

IP= Improved practice; FP= Farmer practice

Table 3. Increase in area under improved variety of cumin GC-4 in Pali district of Rajasthan

Year (Rabi)	Total area of cumin in Pali district (ha)	Estimated area under improved variety GC-4 in Pali district (ha)
2011-12	14664	150
2012-13	15341	500
2013-14	12511	1200
2014-15	16180	2200
2015-16	20426	3500
2016-17	13114	4500
2017-18	16121	5100
Average	**15480**	**2450**

3500 ha (2015-16), 4500 ha (2016-17) and 5100 ha (2017-18) respectively, in the Pali district of Rajasthan. This clearly shows that the horizontal spread of GC-4 was about 150 ha during 2011-12 to 5100 ha during the year 2017-18 and after introduction of cumin cv. GC-4, it was covered more than 76.5 percent area of the total cumin area in the Pali district during the year 2017-158. It might be due to the fact that the variety GC-4 was superior in term of productivity, no yellowing problem, no powdery mildew attack, no scattering at the time of harvesting and good quality of seeds compared to RZ-19 and RZ-209. The findings confirm with the finding of Lal *et al*., (2013), Narappa *et al.,* (2018) and Singh *et al.,* (2018).

Extent of adoption level of farmers

The data regarding adoption of the improved cumin production technologies were also recorded under two heads like; adoption before and after conducting frontline demonstrations. The data in Table 4 revealed that they followed improved practices of cumin production like; sowing time and method (81.3%), land preparation (78.1%), irrigation scheduling (70.6%), harvesting (68.8%), seed treatment (65.6%), scientific weed management (59.4%), storage (56.3%), improved and quality seed (40.6%), fertilizer application (37.5%) and plant protection (31.3%) before conducting programmes while other farmers were started adopting the improved practices like; improved and quality seed (46.9 %), fertilizer application (38.8%), plant protection (36.3%), seed treatment (33.1%), weeding (29.4%), seed rate and spacing (26.9 %), irrigation scheduling (25.0%), storage (21.3%), land preparation (18.8 %), harvesting (16.3%) and sowing time and method (09.4%), respectively. The low level of adoption was found in sowing time and method and storage due to the farmers practices of late sowing and high seed rate with close spacing and over doses of fertilizers in cumin cultivation. The findings of the study also revealed that there was increase in adoption ranging from 9.4% of sowing time and method to 46.9 percent of improved and quality seed after conducting the training and FLD programmes. This might be due the fact that increasing in knowledge, skills and confidence level of farmers through training programmes on production and production technologies of cumin crop like; high yielding variety, seed rate and spacing, seed treatment, soil testing, soil treatment, weeding, plant protection measures, irrigation scheduling, fertilizer application and harvesting has helped farmers to improve the yield of cumin. Similar results were also reported by Bhoraniya *et al.,* (2017) and Morwal *et al.,* 2018).

Farmer's satisfaction

The extent of satisfaction level of respondent farmers over extension services and performance of demonstrated variety was measured by Client Satisfaction Index (CSI) and results presented in Table 5. It was found that the majority of the respondent farmers expressed high level (51.2%) to medium (34.4%) level of satisfaction for extension services and performance of technology under demonstrations. Whereas, very few (14.4%) of respondents expressed lower level of satisfaction. The results are in conformity with the results of Meena *et al.,* (2018), Kumaran and Vijayaragavan (2005). The higher to medium level of satisfaction with respect to services rendered, linkage with farmers, and technologies demonstrated etc. indicate stronger conviction, physical and mental involvement in the frontline demonstration which in turn would lead to higher adoption. This shows the relevance of frontline demonstration.

Table 4. Extent of adoption level of the respondents regarding cumin production technologies (N=160)

Cumin production technology	Before FLDs		After FLDs		Increase in adoption level	
	F	%	F	%	F	%
Land preparation	125	78.1	155	96.9	30	18.8
Seed treatment	105	65.6	158	98.8	53	33.1
Improved and quality seed	65	40.6	140	87.5	75	46.9
Seed rate and spacing	75	46.9	118	71.9	43	26.9
Sowing time and method	130	81.3	145	90.6	15	09.4
Irrigation scheduling	113	70.6	153	95.6	40	25.0
Scientific weed management	95	59.4	142	88.8	47	29.4
Plant protection measures	50	31.3	108	67.5	58	36.3
Fertilizer application	60	37.5	122	76.3	62	38.8
Harvesting	110	68.8	136	85.0	26	16.3
Storage	90	56.3	125	78.1	35	21.9

Table 5. Extent of farmers satisfaction of extension services rendered (N=160)

Satisfaction level	Number of respondents (F)	Percent (%)
Low level	23	14.4
Medium level	55	34.4
High level	82	51.2
Total	**160**	**100.0**

Conclusions

The conclusion derived from the study was, that the FLD played important role in motivating the farmers for adoption of production technology resulting in increasing their yield and profit. It was observed that the horizontal spread of cumin cv. GC-4 was about 150 ha during 2011-12 to 5100 ha and it was covered more than 76.6 percent area of the total cumin area in the Pali district during the year 2017-18. The farmers expressed high to medium level of satisfaction for extension services and performance of technology under frontline demonstrations. There adoption levels increased after conducting the FLDs. It can also be concluded that the frontline demonstrations were conducted under the close supervision of scientists which is one of the important tools for extension to demonstrate newly released crop production and protection technologies and its management practices in the farmer's field under different agro-climatic regions and farming situations.

References

Bhoraniya, M. F., Chandawat, M. S. and Bochalya, B.C. 2017. Assessment of frontline demonstrations on yield enhancement and economic of cumin (GC-4) in Surendernagar district of Saurashtra region of Gujarat. *Gujarat J. Extension Education* 28(1): 14-17.

Chaudhary, M. K., Singh, D., Meena, M. L. and Tomar, P. K. 2015. Economic analysis of frontline demonstrations on cumin: A case in arid zone of Rajasthan. *Annals of Arid Zones* 52(2):137-139.

Dayanand, Verma, R. K. and Mahta, S. M. 2012. Boosting mustard production technology through front line demonstrations. *Indian Research J. Extension Education* 12(3): 121-123.

Kumaran, M. and Vijayaragavan, K. 2005. Farmersǫ satisfaction of agricultural extension services in an irrigation command area. *Indian J. Extension Education*, 41(3&4): 8-12.

Lal, G. 2014. Impact of adoption of scientific interventions in fenugreek on grain yield and farmersǫincome: An assessment by frontline demonstrations in arid zone of Rajasthan. *African J. Agricultural Research* 9(32):2391-2396.

Lal, G., Mehta, R. S., Singh, D. and Chaudhary, M. K. 2013. Effect of technological intervention on cumin yield at farmersǫfield. *Int. J. Seed Spices* 3(2):65-69.

Meena, B. L., Meena, R. P., Meena, R. R. and Singh, B. 2013. Popularization of improved maize production technology through frontline demonstrations in semi-arid zone IVa of Rajasthan. *J. Applied and Natural Sciences* 6(2):763-769.

Meena, K. C. and Gupta, I. N. 2013. Impact of KVK Training Programmes on Adoption of Garlic Production Technology. *J. Krishi Vigyan* 1(2): 41-43.

Meena, M. L. and Singh, D. 2013. On-farm assessment of technological innovation of fennel (*Foeniculum vulgare mill*) cultivation. *J. Spices and Aromatic Crop*, 22(2):200-202.

Meena, M. L., Singh, D. and Sharma, N. K. 2012. Impact of frontline demonstrations on yield enhancement of cumin: A case in arid zone of Rajasthan. *Indian J. Extension Education* 48(1&2):103-104.

Meena, M. L., Singh, D. and Dudi, A. 2018. Maximizing yield and economic of fennel production through frontline demonstrations in rainfed condition of Rajasthan, India. *J. Pharmacognosy and Phytochemistry* 7(1):1609-1612.

Mehrya, M. L. and Ramesh .2018. Impact of frontline demonstrations on cumin farmers in Jodhpur and Nagaur district. *Chemical Science Review and Letters* 7(26):449-453.

Morwal, B. R., Pagaria, P., Kantwa, S. L. and Das, S. 2018. Performance of FLD on yield enhancement of cumin in Barmer district of Rajasthan. *J. Krishi Vigyan* 6(2):176-178.

Narappa, G., Negalur, R. B., Roopashree, D. H., Guruprasad, G. S. 2018. Seed Village Programme-A Boon to the Rice Growing Farmers for Variety Replacement with Economic Stability. *Int. J. Current Microbiology and Applied Sciences* 7(4):3862-3868.

Sharma, R. and Choudhary, P. C. 2014. Improvement in wheat productivity through frontline demonstrations. *Indian J. Extension Education & Rural Development* 22:36-41.

Singh, B. and Sharma, A. K. 2018. Impact of frontline demonstrations on productivity enhancement of cumin in arid zone. *Int. J. Seed Spices* 7(2): 72-76.

Singh, B. and Solanki, R. K. 2015. Status of seed spices research and development in India. *Indian J. Agricultural Sciences* 85(2): 151-156.

Singh, D., Chaudhary, M. K., Meena, M. L., Balai, L. P. and Kumar, C. 2018. Seed village programme: Ensuring livelihood security of small and seed spices farmers. *Int. J. Seed Spices* 8(2):48-53.

Singh, I. 2013. Impact of frontline demonstration on yield and economics of gram in Burhanpur district of Madhya Pradesh. *Indian J. Extension Education & Rural Development.* 21:55-59.

Received : February 2019; Revised : April 2019; Accepted : May 2019.