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Influence of Frontline Demonstrations on Yield, Yield Contributing characters and Economics of Radish (*Raphanus sativus* L.)

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ABSTRACT

Radish is one of most important root vegetable grown in district Mohali for its edible roots. The productivity of radish is low because of non adoption of available technological options by the farmers. Thirty five demonstrations were conducted during 2016-17 to 2019-20 in different villages of Mohali district of Punjab to disseminate the production technology of high yielding (652.5 q/ha) Radish variety Punjab Safed Mooli-2. Various extension approaches ensured proper production and protection technologies. These activities ensured higher yield over local practice of cultivation in the range of 20.59-33.33 per cent. An average net profit of Rs 223,687/- was recorded under recommended practice while it was Rs 158,000/- under farmers' practice. Benefit/ cost ratio ranged from 2.60 to 4.0 under demonstration while it ranged from 2.16 to 3.20 under control plots. With frontline demonstration (FLD) of proven technology it could be shown that yield potential and net income from radish cultivation could be enhanced to a great extent resulting in higher income to the farming community.

Key Words: Radish, Yield, Demonstration, BC ratio, Technology Index.

INTRODUCTION

Radish (*Raphanus sativus* L.) is one of most important root vegetable grown for its edible roots belongs to family Cruciferae and has originated from the central and western China and India (Thamburaj and Singh, 2005). Radish has the potentiality to play vital role in the economy of the vegetable farmers of district Mohali of Punjab who grow this crop traditionally without adequate knowledge of the production practices. Radish is grown for its young tender tuberous roots which are eaten raw as a salad or cooked as a vegetable. It is relished for its pungent flavour and is considered as an appetizer (Dongarwar *et al,* 2018) .It is a good source of Vitamin C (ascorbic acid) and minerals like calcium, potassium and phosphorus. In homeopathy, it is used for neurological, headache, sleeplessness and chronic diarrhoea. Radish is predominantly a cool season vegetable crop. But, Asiatic types can tolerate higher temperature than European varieties. Being a cool season crop, it is sown during winter from September to October in northern plains. However there are lot of varieties by which it can be sown round the year. This is short duration crop and also fits in many cropping systems. Therefore, there is ample scope for improvement of production and productivity of radish and raising the income level of the farming community. However the cultivation of the crop was not practiced and adopted by the farmers as expected. Transfer of technology is thus paramount to spread new ideas from originating sources to the end users. With an objective to combat the causes of low yield and low economic returns, dissemination of recommended technology through frontline demonstration was attempted in the Mohali district for four years continuously.

MATERIALS AND METHODS

Krishi Vigyan Kendra, SAS Nagar (Mohali), Punjab carried the technology to the farmers field through 35 frontline demonstrations in various villages of district between 2016-17 and 2019-20.

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The average area under each demonstration was 0.25 ha with 35 beneficiaries. Through various extension approaches like trainings, method demonstrations and interactions etc. the factors contributing to low productivity like lack of knowhow on improved variety, improper management practices, negligent plant protection measures were identified. Critical inputs were applied as per the package of practices for vegetable crops recommended by the Punjab Agricultural University, Ludhiana. The recommended practices included sowing of seed during mid September to October. Seed rate for sowing in one ha was 12.5 kg. Spacing of 45 cm is kept between ridges and 7.5 cm in plants. Plant spacing was maintained by thinning at the time of true leaf formation. 37.5t of farm yard manure, 137.5 kg of Urea, 187.5kg of SSP per ha was applied. For weed control, one weeding about 2-3 wk after sowing and immediately followed by earthing up. In case of local check (control plots) no change was made in the existing practices of indiscriminate use of organic and inorganic fertilizers and little or indiscriminate use of fungicides and pesticides as well. Five plants were selected at random from each plot for recording observations. Based on the net plot yield, yield per ha was calculated and expressed in quintal (q) per ha. Yield data were collected from the control and demonstration plots and cost of cultivation, net income and benefit/cost ratio were computed. The economical assessment was done as per prevailing market prices. The data output were collected from both FLD plots as well as farmer's practice plot and finally the extension gap, technology gap, technology index along with the benefit cost ratio were worked out (Samui *et al,* 2000) as given below:

Technology gap= Potential yield-demonstration yield

Extension gap= demonstration yield-farmer's practice yield

Technology Index = (Technology gap/ Potential yield) ×100

RESULTS AND DISCUSSION

A comparison of productivity levels between demonstrated variety and local check was shown in table 3. Performance in terms of yield and contributing parameters of Radish variety Punjab Safed Mooli 2 was found to be substantially higher under the demonstration plots than under control plots during all the years (Table 2 & 3). The mean values (Table 2) over the years reveal that days taken for first harvest in demonstration was 47.43 as compared to 56.63 in farmers' practice whereas plant height (cm) of 55.59 cm was recorded as against 50.81 in local check. Mean values over the years reveal that root length (cm) in demonstration was 30.96 and 26.31 in local check whereas root diameter (cm) was 4.92 and 4.09 in RP and local check, respectively. Root weight/plant (g) was recorded to be 165.81 and 149.69 in local check.). The yield under demonstrations was 480, 500, 512.5 and 605 q/ha during 2016-17, 2017-18, 2018-19 and 2019-20 respectively. It was, thus, evident that improved high yielding variety Punjab Safed Mooli 2 performed well as comparison to local check at different locations in the district. The productivity of local varieties is observed to be low because of non adoption of available technologies by the farmers. Chandra *et al* (2005) and Rajput *et al* (2016) have shown similar trend of yield results. The yield enhancement due to technological intervention was to the tune of 31.50, 33.33, 20.59 and 27.37 per cent over control. The cumulative effect of technological intervention over four years revealed an average yield of 524.38 q/ha *i.e.* 28.20 per cent higher over local check. The results clearly indicated that the higher average root yield in demonstration plots over the years compared to local check was due to proper knowhow and full adoption of package of practices. Yield enhancement under recommended practice might be due to balanced nutrition as per soil test value, integrated approach, involving fertilizers and bio fertilizers which play a vital role in making availability of plant nutrients. Similar results were observed by Tiwari *et al* (2003).

Table1. Improved production technology and Farmers practices of Radish under FLD.

Sr . No.	Technology	Improved practices	Farmers practice	GAP (%)
01	Farming situation	Irrigated	Irrigated	No gap
02	Variety	Punjab Safed Mooli-2	Local	Full gap (100%)
03	Land preparation	Deep ploughing followed by rotavator	Deep ploughing followed by rotavator	No gap
04	Time of sowing	Mid September-October	September -October	No gap
05	Seed treatment	Seed treatment with Bavistin	No treatment	Full gap (100%)
06	Seed rate	12.5 Kg	15 Kg	20% more than recommendation
07	Method of sowing	Line sowing	Line sowing	No gap
08	Nutrients application	15 tonn FYM, 55 kg Urea, 75 Kg SSP	Indiscriminate use	Full gap (100%)
09	Weed management	One weeding about 2-3 weeks after sowing	No weeding	Full gap (100%)
10	Plant protection measure	As per recommendations	Indiscriminate use	Full gap (100%)

Table 2. Performance of Radish variety Punjab Safed Mooli 2 for various parameters.

Year	Days to first harvest		Plant height (cm)		Root length (cm)		Root diameter (cm)		Root weight per plant (g)	
	RP	FP	RP	FP	RP	FP	RP	FP	RP	FP
2016-17	47.25	52.75	51.50	48.50	27.87	25.50	4.66	3.85	157.50	140.50
2017-18	48.75	55.50	51.00	47.25	28.25	24.50	4.83	3.70	184.25	160.25
2018-19	46.50	58.25	60.25	54.00	34.00	27.25	5.08	4.30	153.25	145.50
2019-20	47.25	60.00	59.62	53.50	33.75	28.00	5.10	4.50	168.25	152.50
Mean	47.43	56.63	55.59	50.81	30.96	26.31	4.92	4.09	165.81	149.69

RP= Recommended practice, FP= Farmers practice

Table 3. Yield Performance and economic indicators of Radish variety Punjab Safed Mooli 2.

Year	No of Demo	Yield (q/ha)		% increase over FP	Gross Expenditure (Rs,000/ha)		Gross return (Rs,000/ha)		Net return (Rs,000/ha)		BC ratio	
		RP	FP		RP	FP	RP	FP	RP	FP	RP	FP
2016-17	05	480	365	31.50	72	75	280	240	208	165	3.88	3.20
2017-18	05	500	375	33.33	75	85	300	225	225	14	4.0:1	2.65:1
2018-19	15	512.5	425	20.59	137.5	137.5	358.7	297.5	233.7	160	2.60	2.16
2019-20	10	605	475	27.37	142	138	370	305	228	167	2.60	2.21
Total/ Mean	35	524.38	410	28.20	106.6	108.8	327.1	266.8	223.6	158	3.27	2.56

B:C ratio= Benefit/cost ratio

Data in table 3 clearly revealed that the cost involved in the adoption of improved technology in radish varied and was more profitable. The fluctuations in yield and cost of cultivation during different years can be explained based on variations in microclimatic conditions and marketable price in particular year. Mukherjee (2003) also reported that depending on identification and use of farming situation specific interventions may have greater implications in enhancing systems productivity. Similar variations in results have been documented by Mishra *et al* (2009) and Kumar *et al* (2012) in different crops. The data clearly reveal that the net returns from the demonstration plots were substantially higher than control plots during all the years. An average net return was observed to be Rs 2,23,687/- in comparison to control plot *i.e.* Rs 1,58,000/-. Thus on an average additional income of Rs 65,687/- was attributed to the technological intervention provided in demonstration plots. Economic analysis revealed that benefit/cost ratio in demonstration plots was comparatively higher than control plots and this may be due to higher yield obtained under improved technologies compared to local check (farmers' practice).. The highest benefit cost ratio (4.0:1) was observed in the year 2017-18 followed by 3.88 in the year 2016-17. The variation in B: C ratio could be due to price variation during the study years. The average B: C ratio of demonstration and control plots was 3.27 and 2.56 respectively during the study period. Hence favourable B: C ratio proved the economic viability of the intervention made under demonstration and convinced the farmers on the utility of intervention. Similar findings were reported by Kushwah et al (2017) in pea, Suryavanshi *et al* (2019) in greengram and Sharma *et al* (2019) in Bottle gourd.

Yield gap and yield index

Considerable variations in technology gap (47.5–172.5 kg/ha) reflected the influence of recommended technology used in FLDs in subsequent years (Table 3). These results were in close conformity with the findings of Mitra and Samajdar (2010) and Pathak (2018) .The yield index showed the feasibility of the evolved technology at the farmers' fields. Lower value of yield index mean more feasibility of disseminated technology (inverse relations). The reduction in Technology index (7.28) is good indicator of increased feasibility of demonstrated technology in these demonstrations and it can be gainful proposition for the farmers of the district. The extension gap ranging between 87.5-130 q/ ha during the study period emphasizes the need to educate the farmers through various means for adoption of improved agricultural production technologies to reverse the trend. Similar trends were reported by Teggelli *et al* (2017).

CONCLUSION

The results of the present study convincingly proved that the yield of Radish could be increased by 28.20 per cent with the adoption of better technological intervention. Favourable benefit cost ratios proved the economic viability of the interventions and further adoption by the farmers. The technology is suitable for enhancing the productivity of Radish crop and this is appropriate time for area expansion under Radish production in Mohali district of Punjab as the crop is of short duration, fits in various cropping cycle and promotes

Table 4. Impact of FLDs on yield gap and yield index.

Year	Technology gap (q/ ha)	Extension gap (q/ha)	Technology index (%)
2016-17	172.5	115	26.44
2017-18	152.5	125	23.37
2018-19	140	87.5	21.46
2019-20	47.5	130	7.28

crop diversification. The selection and adoption of appropriate varieties under favourable climate for its growth and development can transform lives of vegetable growers.

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