

Evaluation of Turnip (*Brassica rapa* L.) Var PTWG for Yield and Relative Economics under Frontline Demonstrations in District Budgam

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The study was conducted to evaluate the turnip variety purple top white globe for yield and yield contributing characters through front line demonstration in District Budgam for three consecutive years 2018,2019 and 2020.A total of 25 FLD's were distributed in village Roshanabad of block Narbal, District Budgam. The results obtained reveals that the improved variety was having higher yield and hence better returns to the farmers as compared to the local variety. Study also revealed a wide gap in the production technology of turnip. The farmers themselves observed the difference between the improved variety and local. The yield increase of 57.9% over the control and B:C ratio of 3.48 in demonstration plot (2.13 in control) may be attributed to scientific cultivation method viz proper selection of variety, use of quality seed, seed treatment, proper spacing, recommended dose of fertilizers and integrated pest management.

Keywords: Turnip; frontline demonstrations; yield; B:C ratio.

1. INTRODUCTION

The valley of Kashmir is known for cultivation of potato, turnip, carrots, spinach, cauliflowers, cabbage, radish, onion, lotus Stalk, brinjal, gourds etc. Turnip is one of the important root crops commonly grown in temperate climate worldwide for its white fleshy tap root. It is hardy biennial plant in the mustard family (Brassicaceae). It has dual purpose used as food both for human and livestock consumption [1]. Small tender varieties are grown for human consumption and large ones for livestock. It is low in fat and calories and rich in vitamins, minerals, antioxidants and dietary fibre [2]. The nutritive value for 100 gram of turnip bulb contains 91.6% moisture, 0.12% fat, 34 calories, 2.25% fibres, 7.84% carbohydrates, 1.10% protein and no cholesterol [3]. Turnip greens (tops) can be used as vegetable which has high levels of Vit A, B but the crops are generally grown for its swollen hypocotyls which grows beneath the surface of soil but are not actually roots [4]. In India turnip is grown on an area of 2500 ha with annual production of 50,000 tonnes [5]. Under Kashmir condition, it is grown in August to September. This is a short duration crop and fits well in many cropping systems. However the local varieties are yielding low and farmers were not getting the remunerative returns from the same. As such to boost the economy of farmers an improved SKUAST-k recommended variety of turnip, Purple top white globe was disseminated among farmers of zone Narbal District Budgam for three years Front Line Demonstration (FLD) programme of KVK Budgam. Front Line Demonstration (FLD) is one of the key extension tools for transfer of technology at grass root level that directly impact the horizontal spread of technology. It is a unique approach to provide a direct interface between researchers and farmers as the scientists are directly involved in planning, execution and monitoring of the demonstrations for the technologies developed by them, and get direct feed back from them [5].

2. MATERIALS AND METHODS

Krishi Vigyan Kendra Harran Budgam, gave 25 FLD in various villages of district Budgam during years 2018 and 2019. The average area under each demonstration was 0.20 ha with 25 beneficiaries. It was observed that the farmers lack the information regarding the scientific cultivation of this crop. So several training programmes were carried out in these areas to

acquaint the farmers with proper package of practice for raising a healthy successful crop. Scientific package of practice from SKUAST-K was followed. The recommended practice includes direct sowing during Aug- Sept, seed rate of 5-7 kg/ha, with spacing of 30 x 15-20cm. After germination when plants attain some height thinning was done to maintain desired plant to plant distance. Fertilisers were applied as per recommended fertilizer dose of 15-20 t/ha, 150 kg Urea, 187.5 kg DAP and 100 kg MOP. Entire FYM, P, K and ½ N was applied at the time of Ridge Raising and another ½ N as top dose after 30days of thinning. At early stages of growth weeds may pose a problem so shallow hoeing with the help of hand cultivators was recommended to suppress the weeds and provide aeration, thus enhancing root formation. Pre sowing irrigation was applied for rapid and uniform seed germination. It was also advised to apply half ridge irrigation, otherwise seeds and ridge tops are washed. It was also advised to keep soil moist, so frequent light irrigations were recommended. Low soil temperatures and higher moisture content are favourable for higher yield of quality roots. In case of local check (control plots) farmer was allowed to use his own method for raising the crop and indiscriminate use of chemical fertilisers and pesticides. Observations were recorded on yield (q/ha) from five randomly selected plants each in the control and demonstration plot and various economic parameters viz cost of cultivation, net profit and B: C ratio were worked out. Finally Extension gap, Technology gap and Technology index along with benefit cost ratio was worked out [7] as given below:

Technology gap= potential yield – Demonstration yield

Extension gap = Demonstration yield – farmers yield

Technology index= $\frac{\text{Technology gap}}{\text{potential yield}} \times 100$

3. RESULTS AND DISCUSSION

Table 2 depicts the comparison between productivity of demonstration and local check. Perusal of the data reveals that the variety under study i.e Purple Top White Globe performed well in terms of yield and yield contributing characters in comparison with the local varieties during all the years (Table 1 and 2). The mean value (Table 1) over the years reveal that mean plant height in demonstration plot was observed to be 32.75 cm as compared to 29.25 cm in farmers practice. Mean values over the years reveal that

leaf length and leaf width for demonstration plot recorded was 17.3cm and 8.7cm where as for farmers practice values were 16.12cm and 7.9 cm respectively. In local check, mean values for root length and root width was recorded as 4.9cm and 7cm and for demonstration plot 5.6cm and 9.3cm respectively. Average root weight for all the years studied was significantly higher in demonstration plots as compared to local check. In demonstration plot, average root weight was 243g in 2018, 260g in 2019, 256g in 2020 and mean value over years was 253 g where as for local check, average root weight was recorded as 160g, 180g, 173g and mean value over years was 171g respectively. The results also depict that improved variety performed well against the check in all the locations of district Budgam. Similar results were reported by Ganai et al 2018[8]. The productivity in the local variety is low due to use of low quality seed and non scientific cultivation practices adopted by the farmers. The same trends in yield results were earlier reported by Rajput et al. (2016)[9] and

Sharma and Singh [10]. The yield under demonstration was recorded as 280q/ha, 276q/ha, 268 q/ha in 2018, 2019 and 2020 respectively and yield average for three years was 274.6q/ha. The yield is governed by accumulation of carbohydrates and other metabolites which depend ultimately on the syntheses and supply of photosynthates by leaves and their subsequent translocation vertically downwards to the root. Percent increase in yield over check was calculated as 60.63 %, 55.61 % and 57.46% and the average percent increase over control was 57.9. Perusal of overall data reveals significant differences among check and demonstration plots which can be attributed to introduction of quality seed, improved variety, seed treatment with fungicide, line sowing, maintenance of proper spacing, recommended fertiliser dose and application and plant protection measures. Farmers were motivated by results of demonstration plot where scientific technologies were adopted.

Table 1. Performance of PTWG for yield and yield contributing characters

Year	Plant height(cm)		Leaf length(cm)		Leaf width (cm)		Root length (cm)		Root diameter (cm)		Root weight (cm)		Yield (q/ha)	
	FP	RP	FP	RP	FP	RP	FP	RP	FP	RP	FP	RP	FP	RP
2018	30.1	32.02	16.7	17.2	8.2	9	4.8	5.3	7.5	9.1	160	243	168.9	280
2019	28.6	33.9	16.2	16.9	8.0	8.7	4.1	5.5	7.2	10.4	180	260	173.5	276
2020	29.05	32.35	15.48	17.8	7.5	8.4	4.9	6	6.3	8.5	173	256	170.2	268
Mean	29.25	32.75	16.12	17.3	7.9	8.7	4.6	5.6	7	9.3	171	253	170.8	274.6

Table 2. Yield performance and economic indicators in TURNIP PTWG

Year	No. of Demos	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
2018	10	280	168.9	60.6	115.5	118.8	420.0	253.3	304.5	134.5	3.6	2.1
2019	10	270	173.5	55.6	128.4	130.8	432.0	277.6	303.6	146.8	3.3	2.1
2020	5	268	170.2	57.4	132.0	135.0	455.6	289.3	323.6	154.3	3.4	2.1
Total / Mean	25	272.6	170.8	57.9	125.3	128.2	436.0	273.4	310.5	145.2	3.4	2.1

Note: RP is recommended practice and FP is farmers practice

Table 3. Impact of FLD's on yield gap and yield index

Year	Potential yield	Average Demonstration yield	Technology Gap q/ha	Extension Gap q/ha	Technology index
2018	300	280	20	111.1	6.6
2019	300	270	30	96.5	10.0
2020	300	268	32	97.8	10.6

Perusal of data presented in Table 2 indicated that demonstration plot recorded higher gross return during all the years (Average 4,36,000Rs/ha) and average net return of Rs3,10,500 /ha with benefit cost ratio of 3.48 as compared to 2.13 in local check. The sale rate of turnip in local market was about 15 Rs/kg, 16 Rs/kg and 17 Rs/kg during 2018, 2019 and 2020 respectively. The higher returns obtained in demonstration plot are due to higher yields obtained during improved technologies as compared to farmers practice during the experimental years. Similar results were obtained by kumar et. al. [11] and Tiwari et. al. [12]. As such increased B:C ratio shows economic viability of interventions made under these demonstration. Thus convincing the farmers that the intervention is more remunerative. Similar reports were obtained from Kushwah et al [13] in pea, Suryavanshi et al.[14] in green gram and Sharma and Singh [10].

3.1 Yield Gap and Yield Index

The technology gap is the gap between demonstration yield and potential yield and it was 20 q/ha, 30q/ha and 32q/ha during 2018, 2019 and 2020. The observed technology gap is presented in Table 3 . This indicates that a gap existed between technology evolved and technology adoption at farmer's field. Hence, to reduce the yield gap, location specific recommendations for varieties and timely sowing appears to be necessary. The extension gap was recorded as 111.1q/ha in 2018, 96.5q/ha in2019 and 97.8q/ha in 2020 (Table 3). The extension gap should be assigned to adoption of improved dissemination process in recommended practices which outcome in higher yield than the farmers practice. There is a need to decrease this wider extension gap through latest techniques and emphasis the need to educate the farmers regarding improved agricultural technologies so that the trend can be reversed. The technology index showed the feasibility of evolved technology at farmer's field. Lower technology values indicated that the feasibility of variety among the farmers is more (inverse relations). The technology index was 6.66, 10 and 10.66 per cent during three study years.

4. CONCLUSION

The present study was carried to study the effect of using scientific cultivation methods and improved variety of turnip in block Narbal of District Budgam. The results revealed that there

was an average increase of 57.9% in yield over the local check. Higher benefit cost ratio proved that the technologies adopted are profitable and can be further adopted by the farmers. The technology is suitable for enhancing productivity of Turnip crop and can be used to increase the area under this crop. As this crop is short duration crop and fits in any cropping sequence and results in crop diversification. The selection and adoption of high yielding improved varieties can be more remunerative for the farmers. It can be concluded that SKUAST-K recommended variety of turnip Purple Top White Globe gives better yields and return to the farmers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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ANNEXURE 1

Comparison of Cultural Practices Adopted by Farmer and FLD

S. no.	Cultural operations	Farmers practice	FLD employing improved cultivation practices	Gap %
1	variety	Local	PTWG	100 %
	Sowing time	Aug -sep	Aug-Sep	No gap
2	Seed quality	Low quality seed	High quality seed	100%
3	Seed treatments	No treatment	Seeds treated with thiram @2g/kg seed	100%
	Seed rate	10-15kg/ha	5-7kg/ha	100%
4	Method of sowing	broadcasting	Line sowing	100%
5	Spacing	Not maintained	30x15-20cm	100%
6	Fertiliser application	Indiscriminate use	15-20 t/ha, 150 kg urea, 187.5 DAP and 100 kg MOP	100%
7	Farming situation	Irrigated	irrigated	No gap
8	Control measures	Indiscriminate use	As per recommendation	100%
9	Handling of pesticides	No safety measures undertaken	Use of all safety measures. (gloves, glasses, mask etc)	100%

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