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Impact of Cluster Frontline Demonstration on Bridging Yield Gap of Toria (*Brassica campestris*) under Rainfed Condition in Tinsukia District of Assam

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A B S T R A C T

Toria (*Brassica campestris*) is one of the important *Rabi* crops in Tinsukia district of Assam but due to unavailability of improved variety and non adoption of improved cultivation practices, its productivity (5.5 q/ha) is far below the average national productivity (9.7 q/ha) and state average of 6.5 q/ha. Krishi Vigyan Kendra, Tinsukia, Assam has conducted 77 demonstrations on Toria var. TS 67 and 100 demonstration on Toria var. TS 46 during the year in 2016-17 to 2018-19 in 30 ha and 40 ha area including eight villages of the district. The mean data of three years revealed that an average yield of 8.65 q/ha and 8.77 q/ha was recorded under cluster frontline demonstration plots of Toria var. TS 67 and TS 46, respectively over farmer's practice (6.8 q/ha). The percent increase in yield with both the varieties under demonstration over farmers practice was observed 27.29 and 29.01 percent. The average technology gap was recorded 1.35 q/ha and 3.23 q/ha in case of Toria var. TS 67 and TS 46, respectively, while average extension gap was recorded 1.85 q/ha and 1.95 q/ha. Average technology index of toria var. TS 67 and TS 46 was recorded 13.5 and 26.94 percent respectively.

Introduction

Oilseeds are important crops of Indian agriculture next to food grains in terms of acreage, production, and economic value. They share 15.07% of the gross cropped area and account for about 5% of gross national product (GNP) and 10% of the value of all agricultural products (Choudhary, 2009). Rapeseed-mustard (*Brassica* spp.) is the third largest vegetable oilseed crop in the world after soybean and palm oil. India is one of the largest rapeseed-mustard growing countries in the world, occupying the first position in area (5.76 m ha) and second in production (6.82 m tonnes) after China. In Assam, toria is the only popular oilseed crop because of the prevailing climatic conditions and early duration of the crop, which enable the farmers to adopt summer crop after harvest of toria. Tinsukia district of Assam has a sizeable area under rapeseed-mustard cultivation with area and production 0.14 lakh ha and 0.10 lakh MT, respectively (Anonymous 2015). There are different high yielding varieties of toria recommended for Assam condition developed

by Assam Agricultural University, Jorhat and other Agricultural Universities and Research Institutes under ICAR. In the present study two high recommended high yielding varieties *viz*., TS 67 and TS 46 has been demonstrated which are having higher potential yield than the varieties using by the farmers of the district. Keeping in view the present investigation attempts to study the yield gap between cluster front line demonstration technology and farmers yield, extent of technology adoption and benefit cost ratio.

Materials and Methods

Krishi Vigyan Kendra, Tinsukia, Assam has conducted cluster frontline demonstration on toria variety TS 67 and TS 46 during *Rabi* season under rainfed condition from 2016-17 to 2018-2019 under NMOOP. The demonstrations were conducted in farmer's field of eight different villages of Tinsukia district of Assam during in the year 2016-17, 2017-18 and 2018-19. For conducting CFLDs, a list of farmers was prepared from group meeting and specific skill training was imparted to the selected farmers regarding different aspect of cultivation. Farmers were provided training to follow the package and practices for rapeseed and mustard cultivation recommended by the Assam Agricultural University, Jorhat. A total of 77 and 100 numbers of practicing farmers were selected under CFLD on Toria var. TS 67 in 30 ha and TS 46 in 40 ha during 2016-17 to 2018-19. In case of Farmers practice, the traditional practices were followed by using existing varieties. The soil sample of the farmer's field was sandy loam in texture, low in organic carbon, available N and K contents but medium in P content with pH 5.1. Application of 40: 35:15 kg/ha each of N, P_2O_5 and K_2O along with 10 kg of borax was applied as basal.

The selected farmers under the CFLD were guided by KVK scientists in performing field operations like sowing, spraying, weeding, harvesting etc during the course of training and visits. The traditional practices were maintained in case of farmers practice. The data were collected from both from demonstration plots as well as control plot (farmers practice) and finally the extension gap, technology gap, technology index along with the economics were worked out (Samui *et al.*, 2000) as given below.

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield - Farmer's yield

$$\text{Technology index} = \frac{\text{Potential yield} - \text{Demo yield}}{\text{Potential yield}} \times 100$$

Results and Discussion

It has been observed that in the CFLDs Toria variety TS 46 recorded the higher seed yield (8.9 q/ha) as compared to control (6.6 q/ha) with 34.85 % increase in yield in the year 2018-19 (Table 2). However, the mean yield recorded in Toria var. TS 67 was (8.65 q/ha) with 27.24% increase in average yield over farmers practice (Table 1). The results are in conformity with the findings of (Hiremath *et al.*, 2007; Kumar *et al.*, 2010). From the results it is evident that the performance of demonstrated plot was found better than the farmers practice under same farming situation. The poor productivity in farmers practice might be mainly due to factors like use of non descript local variety, late sowing owing to late vacation of field after harvesting of medium to long duration winter paddy and low level of agronomic management in addition to non availability of resources in time. The result clearly depicts the positive effects of demonstrations over the existing practices towards enhancing the yield of toria in Tinsukia district.

Technology gap

The average technology gap was recorded 1.35 q/ha in toria variety TS 67 and 3.23 q/ha in respect of TS 46 during the period of study (Table 1 and 2). The technology gaps recorded are ranged from 1.3 to 3.4 q/ha which reflects the farmer's participation in conducting the demonstration. The variation in technology gap observed might be due to dissimilarity in soil fertility and management factors in the district. Similar finding were recorded by Katare *et al.,* 2011; Singh, 2017).

Technology index

The technology index showed the feasibility of evolved technology at the farmer's fields (Table 1 and 2). The lower value of technology index the more is the feasibility of technology. As such fluctuation in technology index (ranging from 13% to 28.3%) during the study period in certain region may be attributed to the dissimilarity in soil fertility status, weather conditions and insect pest attack in the crop.

Table.1 Influence of CFLD yield, Technology gap, extension gap, technology index in Toria variety TS 67

Year	Potential yield (q/ha)	CFLD (q/ha)	FP (q/ha)	% increase	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
2016-17	10	8.7	6.8	27.94	1.3	1.9	13
2017-18	10	8.6	7.0	22.86	1.4	1.6	14
2018-19	10	8.65	6.6	31.06	1.35	2.05	13.5
Mean		8.65	6.80	27.29	1.35	1.85	13.5

Table.2 Influence of CFLD yield, Technology gap, extension gap, technology index in Toria variety TS 46

Year	Potential yield (q/ha)	CFLD (q/ha)	FP (q/ha)	% increase	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
2016-17	12	8.6	6.8	26.47	3.4	1.8	28.3
2017-18	12	8.8	7.0	25.71	3.2	1.8	26.7
2018-19	12	8.9	6.6	34.85	3.1	2.3	25.8
Mean		8.77	6.80	29.01	3.23	1.97	26.94

Table.3 Economics of rapeseed-mustard under CFLD on Toria var. TS 67 vs. farmers practice

Year	Area (ha)	No. of Demo	Cost of Cultivation (Rs/ha)		Gross Return (Rs/ha)		Net Return (Rs/ha)		B: C ratio	
			CFLD	FP	CFLD	FP	CFLD	FP	CFLD	FP
2016-17	10	27	15430	14500	28710	22440	13280	7940	1.86	1.55
2017-18	10	25	16120	15000	30100	24500	13980	9500	1.87	1.63
2018-19	10	25	17900	16500	32870	25080	14970	8580	1.84	1.52

Table.4 Economics of rapeseed-mustard under CFLD on Toria var. TS 46 vs. farmers practice

Year	Area (ha)	No. of Demo	Cost of Cultivation (Rs/ha)		Gross Return(Rs/ha)		Net Return (Rs/ha)		B: C ratio	
			CFLD	FP	CFLD	FP	CFLD	FP	CFLD	FP
2016-17	10	25	15430	14500	28380	22440	12950	7940	1.84	1.55
2017-18	10	21	16120	15000	30800	24500	14680	9500	1.91	1.63
2018-19	20	54	17900	16500	33820	25080	15920	8580	1.89	1.52

Fig.1 Horizontal spread of Toria TS 67

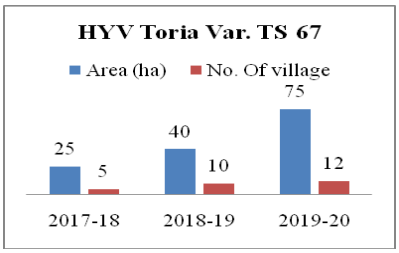
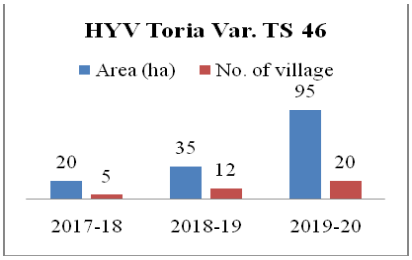


Fig.2 Horizontal spread of Toria TS 46



Economics

The higher cost of cultivation Rs. 17,900.00 involved in CFLD plots during 2018-19 as compared to Rs. 16,500 under control plots (Table 3 and 4). The CFLD plots fetched higher gross returns (Rs.33,820.00 q/ha) and net returns in toria variety TS 46 (Rs. 15,920 q/ha) with higher benefit: cost ratio (1.89) during 2018-19 (Table 4). While in FP plots the gross returns, net returns and benefit: cost ratio were recorded Rs. 24,500, Rs.9,500.00 and 1.63, respectively in the year 2017-18. It was also reported higher net returns and B: C ratio in the demonstrations due to on improved technologies compared to the farmer's practices.

Horizontal spread

Krishi Vigyan Kendra introduced the variety through cluster frontline demonstration during 2016-17, 2017-18 and 2018-19 at eight different villages of the district mainly in 3 blocks (Chepakhowa, Margherita and Saikhowa). The spread was recorded through field visit, survey and group meeting. The horizontal spread of both the varieties TS 67 and TS 46 was 75 ha in 12 villages (Fig. 1) and 90 ha in 20 villages (Fig. 2) respectively in the district one year after the intervention i.e. during 2019-20.

It can be concluded that cluster frontline demonstration on toria variety TS 67 and TS 46 proved to the best in respect of yield, net return and benefit cost ratio. The findings of the study revealed that wide gap existed in potential and demonstration yield in high yielding rapeseed varieties due to technology and extension gap in Tinsukia District of Assam. By conducting cluster front line demonstrations of proven technologies, yield potential of rapeseed (toria) increased to a great extent. This will substantially increase the income as well as the livelihood security. Moreover, horizontal expansion of improved variety increased to a great extent within a short period of time due to various extension activities like training programme, field day, exposure visit etc. organized in CFLD programmes in the farmer's fields.

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