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Suitable Cultivars of Broccoli, Red Cabbage, Capsicum and French Bean for Alluvial Tracts of West Bengal

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ABSTRACT

An experiment was conducted to find out the best suitable varieties of Broccoli, Red Cabbage, Capsicum and French Bean for the district South 24 Parganas in the Instructional Farm of Sasya Shyamala Krishi Vigyan Kendra, Ramakrishna Mission Vivekananda University, Arapanch and different blocks of the district during rabi season from 2014 to 2016. The experiment was carried out in randomized block design (RBD) with different varieties taken as different treatments replicated seven times. Genotypes taken under observation were Fiesta, Princess, Sultan, Centauro, Priya and Packmen for Brocolli whereas the varieties considered for Red Cabbage were Ruby Mart, Red Queen, Primero and Red Cabbage. Four varieties of Capsicum *viz*. Chinese Giant, Green Gold, California Wonder and Sindhoori were tested. The study was also carried out with four varieties of French bean (Contender, Pusa Himlata, Pusa Parvati and Falguni). Among all the varieties of Broccoli, California Wonder was found superior which gave highest yield in combination with best head formation. In case of Red cabbage, variety Red Queen showed the overall best performances. California Wonder of Capsicum and Falguni variety of French bean were found to be the best suitable varieties as compared to others. So, these varieties were found to be best for sustainable livelihood promotion with high productivity under wide range of environmental condition for this zone.

Key Words: Broccoli, Red Cabbage, Capsicum, French Bean, Variety, Varietal Evaluation, Yield.

INTRODUCTION

Among the major states of India, more than ten per cent of the gross cropped areas in Kerala, Orissa and West Bengal come under the horticultural crops like fruits and vegetables. Among the states, the performance of West Bengal in the production of horticultural crops is commendable as it occupies second position with a share of 14.8 per cent in all India production of horticultural crops while Maharashtra holding the first position (Dasgupta and Bhoumik, 2014). The farmers can earn a lot of profit by growing the unusual high value vegetables in nearby big cities and towns as they attract very high prices in cosmopolitan markets, star hotels and places of tourists' interest. They can also be exported to foreign especially European countries where their cultivation is not possible throughout the year under open field conditions.

Despite the potential, the contribution of high-value horticultural exports is still small but increasing. To avert the risk of pricing in case of traditional vegetable cultivation, the quality assured high value vegetable cultivation plays the pivotal role in case of delineating the sustainable livelihood pattern of the vegetable growers in our country. In 2016-17, small and marginal farmers raised bumper horticulture crops, fruits and vegetables, touching a record high of 295 m ton for the fifth consecutive year. This was made possible due to better monsoon, but it also reflected the structural change underway in the agriculture sector, where farmers are moving toward high-value horticulture crops.

Broccoli, Red cabbage, Capsicum, French bean etc. have opened the new opportunities for vegetable growers of West Bengal for diversification and off-season production for high market in metropolis.

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The high value crops being an alternative and remunerative vegetable in West Bengal has already established its worth towards sustainable livelihood promotion and nutritional security. The food self-sufficiency cannot give impetus to the national economy by developing different mechanism to utilize the available resources but also the movement should be created to earn foreign exchequer by giving due importance to the exportable agricultural products (Saha *et al*, 2011). The adoption gap analysis implies the appropriate strategy mover for preparing a plan to reorient the farming community towards socialization of any new technology (Suman, 2012). The present study was aimed at promotion of high value vegetables by identifying new promising varieties with high productivity under wide range of environmental condition, better horticultural characteristics and market opportunities.

MATERIALS AND METHODS

The experiment was carried out at the Instructional Farm of Sasya Shyamala Krishi Vigyan Kendra, RKMVU, Arapanch and different locations of Sonarpur, Baruipur, Budge Budge-II, Falta, Bhangore-I and Bishnupur-II blocks of South 24 Parganas district during rabi season from 2014 to 2016 with the principle objective of evaluating the production technology and popularization of high value crops. The experiment was carried out in randomized block design (RBD) with different varieties taken as different treatments replicated seven times. The data were analyzed statistically by the technique of "Analysis of variance" and significance was tested by variance ratio i.e., value at 5% level of significance as described by Gomez and Gomez (2010). The vegetables taken under this investigation with details are as follows:

Broccoli (*Brassica oleracea* var. italica)

Genotypes taken under observation were Fiesta, Princess, Sultan, Centauro, Priya and Packmen. Transplanting of seedlings were accomplished on first week of November with the spacing of 60cm X 45cm. Applied fertilizer doses in NPK ratio of 120:80:100 kg/ha. Regular cultural practices and crop protection measures were adopted as per the requirements of crop.

Red Cabbage (*Brassica oleracea* var. rubra)

Four varieties used in this investigation were Ruby Mart, Red Queen, Primero and Red Cabbage. The transplanting of seedling was done during first week of November with the spacing of 60cm X 45cm. Adopted fertilizer doses in NPK ratio were 80:60:50 kg/ha. All the cultural and biological practices were adopted as recommended practices.

Capsicum (*Capsicum annum* var. grossum L.)

The varieties considered were Chinese Giant, Green Gold, California Wonder and Sindhoori. Transplanting of seedlings was accomplished in first quarter of November with the spacing of 60cm X 45cm. Fertilizers were applied 100:60:50 kg/ha in the ratio of NPK.

French Bean (*Phaseolus vulgaris* L.)

Four genotypes taken under the consideration were Contender, Pusa Himlata, Pusa Parvati and Falguni. Sowing was done during first week of November with appropriate spacing (30cm X 6cm) along with fertilizers in the ratio of NPK *i.e.* 60:40:40 kg/ha in combination with recommended agronomical and cultural practices. Observations were recorded for randomly selected plants in each replication for each cultivar. Mean value of data were used for standard statistical analyses.

RESULTS AND DISCUSSIONS

Broccoli

The present investigation revealed that the plant height, plant spread, number of leaves, leaf area and other growth parameters and head diameter, sprout weight, head weight and different yield parameters and yield varied significantly amongst different cultivars of Brocolli (Table 1). It was revealed that plant height recorded was the highest in cultivar Centauro followed by Fiesta and Priya whereas the lowest was recorded by Sultan which was statistically at par with Princes. Head diameter was

recorded the highest in case of Centauro which was statistically at par with cultivar Fiesta and the lowest was recorded by Packmen which was at par with Sultan, Priya and Princes. Although the number of sprouts was found to be the highest in Priya but the sprout weight was lower. Number of sprouts was lowest in case of Centauro but the sprout weight was recorded highest by that cultivar. As a result the highest yield was recorded by the cultivar Centauro followed by Princes and the lowest value of yield was recorded by the cultivar Priya which was statically at par with Sultan, Fiesta and Packmen.

Red Cabbage

Among the four varieties of Red cabbage head initiation was found early in variety Primero followed by Ruby mart. All the varieties took approximately 89 to 95 d harvest. It has been revealed that out of four varieties maximum plant spread, number of outer leaves, leaf area, head diameter, head length and head width were found in variety Red Queen. Plant height was observed the highest in the cultivar Red Cabbage followed by Primero. Regarding yield, variety Red Queen ranked first position. Head length, Head width as well as the yield of Red Cabbage variety was found to be the highest in cultivar Red Queen which was statistically at par with the cultivar Ruby Mart. The lowest yield was found in case of Primero which was statistically at par with Red cabbage (Table 2).

Capsicum

The tallest plant was found in case of California wonder variety followed by Chinese Giant where as the lowest plant height was found in case of Green Gold which was at par with Sindhoori and Chinese Giant. The results of the present study were in agreement with study of Maya *et al* (1997) who stated that the plant height of sweet pepper significantly increased with closer spacing on the specification of experimental site. Viloria *et al* (1998) and Manchanda *et al* (1998) also expressed similar opinion on plant height of sweet pepper. The higher number of branches per plant was recorded in the variety California Wonder and lowest was documented in variety Green Gold. From the Table 3 it may be inferred that varietal specification was influenced significantly at 5% probability as to the days to 50% flowering. Flowering occurred earlier in variety Green Gold and late in variety Sindhoori. It was also noted that variety California Wonder produced the highest number of fruit per plant and Green Gold recorded the lowest. Fruit length was found to be the highest in variety Chinese Giant whereas maximum fruit breadth was observed in variety California Wonder. So, it may be concluded that this experiment showed significant variation in fruit length and fruit breadth. There was higher level of positive significance in case of fruit yield/plant. The variety California Wonder showed highest fruit yield/plant in combination with individual fruit weight. The variety California Wonder was identified as highest yielder followed by Sindhoori. The lowest yield was observed in the cultivar Chinese Giant which was statistically at par with the cultivar Green Gold (Table 3).

French Bean

Significant variations were observed in this experiment on varietal evaluation of French bean. From this work it was noticed that the plant height, number of brunches/plant, number of pod/plant, number of seeds/pod and the yield were recorded the highest by the cultivar Falguni where as the lowest value of all these parameters were observed in case of the cultivar Contender (Table 4). Number of pods/ plant was found to be the highest by the cultivar Falguni which was statistically at par with the cultivars Pusa Himlata and Pusa Parvati (Table 4).

CONCLUSION

The results of the experiment on evaluation and commercialization of high value vegetable crops for the sustainable agricultural production in West Bengal was found to be encouraging. The performance of these crops with different hybrid varieties proved that there is an ample scope to grow these crops due to prevailing suitable agro-climatic condition of the state as well as the gaining

Table 1. Varietal evaluation of broccoli in different growth and yield parameters.

Variety	Days to head initiation	Days to harvest	Plant height (cm)	Plant spread (cm2)	Number of leaves	Leaf area (cm2)	Head diameter (cm)	Stem diameter (cm)	Stem length (cm)	Number of sprout	Sprout weight	Head weight	Yield (q/ha)
Fiesta	67.67	80.6	39.83	5090.58	21.0	961.14	22.01	3.76	30.29	3.89	26.30	293.83	108.73
Princes	60.42	76.2	34.53	6741.81	13.0	1093.16	20.98	3.93	23.45	4.91	46.90	342.78	121.63
Sultan	59.21	72.0	33.64	4993.64	11.5	876.97	19.99	3.53	22.31	4.01	52.65	276.97	106.58
Centauro	64.30	79.60	43.41	5576.26	19.0	464.39	23.63	3.67	28.92	3.35	57.10	375.0	145.47
Priya	61.45	73.32	37.61	5967.78	15.5	1103.68	20.18	3.79	28.67	5.64	43.76	263.95	104.30
Packmen	59.0	77.33	36.20	4785.67	13.40	1108.49	19.37	3.65	24.30	4.69	40.93	279.60	111.60
SEm+	1.10	0.84	0.70	17.65	0.65	7.75	0.79	0.07	0.60	0.13	1.02	3.15	3.01
C D ($p<0.05$)	3.17	2.42	2.04	50.98	1.87	22.38	2.27	0.21	1.75	0.38	2.93	9.09	8.70

Table 2. Varietal evaluation of Red Cabbage in different growth and yield parameters

Variety	Days to head initiation	Days to harvest	Plant height (cm)	Plant spread (cm2)	Number of outer leaves	Leaf area (cm2)	Head diameter (cm)	Head length (cm)	Head width (cm)	Yield (q/ha)
Ruby Mart	53.0	93	35.5	2878.2	9.0	915	47.3	15.9	14.6	291.9
Red Queen	56.0	89	34.6	4132.4	11.5	966	45.5	16.9	15.9	317.9
Primero	51.0	91	37.9	2685.5	7.5	992.2	40.7	14.7	13.8	282.4
Red Cabbage	57.0	95	40.3	3131.6	10.0	952.8	39.3	14.1	14.1	287.4
SEm+	0.67	0.57	0.86	15.93	0.77	3.36	1.43	0.98	0.71	4.39
CD ($p<0.05$)	1.99	1.69	2.55	47.34	2.29	9.99	4.24	2.91	2.17	13.03

Table 3. Varietal evaluation of Capsicum in different growth and yield parameters.

Variety	Plant Height (cm)	Number of branches/ plant	Days to 50% flowering	Number of fruits/ plant	Fruit length (cm)	Fruit breadth (cm)	Individual fruit weight (g)	Fruit yield/ plant (g)	Yield (q/ha)
Chinese Giant	43.92	5.2	74.8	5.22	6.54	5.32	41.32	218.95	109.6
Green Gold	41.85	4.8	69.1	4.99	5.96	5.49	49.26	246.03	124.9
California Wonder	46.32	5.6	75.05	8.69	5.78	6.12	61.28	326.91	163.3
Sindhoori	43.70	5.5	77.0	6.41	5.45	6.2	54.5	287.65	141.8
SEm+	0.80	0.30	1.07	0.48	0.21	0.17	0.84	3.99	08.2
CD (p<0.05)	2.41	0.88	3.18	1.41	0.63	0.50	2.50	11.85	24.5

Table 4. Varietal evaluation of French Bean in different growth and yield parameters.

Variety	Plant height (cm)	Number of branches/ plant	Days to first harvest	Number of pod /plant	Number of pod /m2	Number of seeds/ pod	Mean pod length (cm)	Mean pod circumference (cm)	100 green pod weight (g)	Green pod yield (q/ha)
Contender	40	10	59	24	111.97	5.58	15.86	0.87	328.4	80.16
Pusa Himlata	48	13	50	29	90.33	6.13	11.68	0.73	413.7	95.93
Pusa Parvati	50	14	52	28	9853	6.74	14.24	0.88	434.6	98.34
Falguni	54	17	53	33	116.35	7.72	14.97	0.79	476.9	117.03
SEm+	0.81	0.59	1.95	1.19	0.72	0.32	0.95	0.07	5.23	2.04
CD (p<0.05)	2.43	1.80	5.80	3.53	2.10	0.95	2.68	0.19	15.53	6.08

importance of these high value crops as potential vegetables for export. Among all the varieties of Broccoli under the study, California Wonder was found superior which gave highest yield in combination with best head formation. In case of Red cabbage variety Red Queen showed the overall best performance. California Wonder of Capsicum and Falguni variety of French bean were found to be the best compared to other varieties.

Therefore, there is a need to promote scientific quality assured high value vegetable for replacing the traditional vegetable to fetch higher return. Also the scientific farming practices of high value vegetable ensures the exchequer from local as well as international markets for promoting their sustainable livelihood status in our country.

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