

## Original Research Article

### Varietal Evaluation of Broccoli (*Brassica Oleracea* var. *Italica*)

#### Abstract

Broccoli (*Brassica Oleracea* var. *Italica*) is an unusual vegetable that has gained appeal among Indian producers in recent years due to its excellent nutritional content and market potential. An experiment was done to measure the broccoli's growth, yield, and quality. The research experiment was carried out at Department of Horticulture, Naini Agricultural Institute, SHUATS, Prayagraj during the year 2021-2022. The experiment was laid out in Randomized Block Design comprising of 10 treatments viz., T1: Fiesta, T2: Green Magic, T3: Green Giant, T4: Local Broccoli, T5: Lucky F1, T6: Broccoli Hybrid, T7: Green star F1, T8: Broccoli Captain 488, T9: Green Fairy, T10: Anastya, with three replications. The observations were recorded as per the growth, yield and quality parameters. The results revealed that the treatment T2 (Green Magic) was the most suitable treatment over all the other treatments in relation to growth, yield and quality of Broccoli.

**Comment [T.F.1]:** What are these growth, yield and quality parameters? All these should be spelt out.

**Comment [T.F.2]:** These growth, yield and quality of Broccoli should be quantified.

**Keywords:** Broccoli, plant height, curd diameter, plant spread, curd yield.

#### Introduction

Broccoli (*Brassica oleracea* var. *italica*. L) is an edible green plant in the cruciferae family whose large, flower head is eaten as vegetable. The word broccoli comes from the Italian plural of broccolo, which means "the flower crest of cabbage", and is the diminutive form of brocco, meaning "small nail" or "sprout". It belongs to the family Cruciferae under order Papaverales. It has a chromosome number of  $2n=2x=18$ . The broccoli is developed in the Eastern Mediterranean and Italy is the main center of diversification. Broccoli commonly known as Harigobhi or broccoli in Hindi is gaining popularity in India. In the world market about 40% is marketed

as fresh and remaining 60% as frozen (Sharma, 2003 and Bose, 2000). Broccoli is a rich source of sulphoraphane which is associated with reducing the risk of cancer (Guo *et al.*, 2001). Broccoli has high nutritional and good commercial value (Yoldaset *et al.*, 2008). It is a recent introduction to India and is becoming popular among people because of its low fat content, low in sodium, low in calories, high vitamin C and good source of vitamin A, B1, B2 and calcium (Sanwal and Yadav, 2005). It has 130 times more vitamin A content than cauliflower and 22 times than cabbage (Thamburaj and Singh, 2003). The cultivation was initially restricted to hill areas of Jammu and Kashmir, Himachal Pradesh, and Uttar Pradesh but now successfully grown under North Indian plain condition (Nirmal *et al.*, 2004). Now-a-days broccoli attracts more attention due to its multifarious use and great nutritional value. Therefore, the aim of these work, was to promote high value cole crops and identify new promising varieties with high performance of different Broccoli varieties on the basis of its growth, yield and quality parameters.

## Materials and Method

The research experiment was laid out in Randomized Block Design comprising of 10 genotypes with 3 replications which makes it a total of 30 plots. The transplanting of seedlings was accomplished on the second week of November, 2020 during rabi season.

A total of 6 plants of each variety was sown at a spacing of 60 cm between rows and 45 cm. The unit plot size was 1 m x 1 m. The treatments were allocated randomly to a unit plot in each of the replication. Regular cultural practices, crop protection measures were taken as per the crop requirement. The crop was watered regularly. Observations were recorded as per the growth, yield and quality parameters and the mean values of data recorded were analyzed statistically by adopting the method suggested by Panse and Sukhatame (1985). The performance of different varieties of Broccoli was studied and data was collected on the basis of **Growth parameter:** Days to germination (days), Plant height (cm), Number of leaves per plant, Plant spread (cm) and Days to curd initiation (days). **Yield and yield parameters:** Days to first harvest (days), Head weight (g), Curd yield per plot (kg) and Curd yield per ha (t). **Qualitative Character:** Head

**Comment [T.F.3]:** The geographical description of the location should be given in term of latitude, longitude, elevation and overall climatic condition (rainfall, temperature, etc.) should also be given.

**Comment [T.F.4]:** Using what method?

diameter (cm), Total Soluble Solid (T.S.S) and Vitamin C content in head (mg/100g of fresh broccoli head).

**Comment [T.F.5]:** The methods used to collect data on these parameters should be given in brief.

## RESULT AND DISCUSSION.

The data on different genotypes' growth parameters, such as days to germination, plant height, number of leaves, plant spread, and days to curd initiation, vary significantly at various growth phases is shown in (Table 1). The least number of days to germination was observed in Green Magic (3 days) followed by Lucky F1 and Anastya (3.3 days respectively), whereas the Local variety took more days (4.07 days) for germination. The variation on days taken for germination may be due to genetic makeup of individual variety. These results are in accordance with the findings of Singh (2000) in cluster bean, **Thakor (2008)** in vegetable pea and **Gogoi et al., (2016)** in broccoli. The maximum plant height was recorded in Green Magic (63.78 cm) followed by Green Giant (59.11) and Green Fairy (58.55 cm) while the lowest plant height was found in Anastya (21.16 cm). The highest plant height observed in some varieties might be due to its inherent genotypic characteristics or for the variations in agro climatic conditions. These findings are in close conformity with that of **Chaudari et al., (2015)** in Knol-khol, **Hafiz et al., (2015)** and **Islam et al., (2015)** in broccoli. The maximum number of leaves per plant was recorded in Green Magic (34.89) followed by Fiesta (29.11) and Green Giant (28.89) respectively. The minimum number of leaves was recorded in Anastya (19.9). In this investigation variation in number of leaves per plant under different varieties, might be due to differences in their genetic inherent capacity, and suitability under this climate. The lower number of leaves in some cultivars was probably due to slow rate in leaf initiation. These findings are in close accordance with the findings of **El-Magd et al., (2006)**, **ElMagd et al., (2013)**, **Thapa and Rai (2012)** in broccoli. The maximum number of plant spread was recorded in Green magic (62.67cm) followed by Broccoli Captain-488 (53.08 cm) and Green star F1 (51.37 cm). The minimum plant spread was recorded in Local variety (42.67 cm). The variation in different

varieties with respect to plant spread [E-W and N-S] may be due to their inherent genetic makeup, number of days taken for head harvesting and suitability under this climate. These findings are in accordance with the findings of **El Bassionyet *et al.*, (2014)**, **Singh *et al.*, (2014)**, **Hafiz *et al.*, (2015)** and **Thakur *et al.*, (2016)** in broccoli. The earliest curd initiation was recorded in Anastya (61.66 days) followed by Green magic (64.67 days) and Broccoli Captain-488 (69.33 days), whereas the last head initiation was recorded in Broccoli Hybrid (75.34 days). The earliness in edible maturity might be due to genetical difference among the different varieties. These results are collaborating with the findings of **Thapa and Rai (2012)**, **Nooprom and Santiprachi (2013)**, **Gogoi *et al.*, (2016)**, and **Thakur *et al.*, (2016)** in broccoli.

**Table 1: Growth parameters of Broccoli (*Brassica Oleracea* var. *Italica*)**

Varieties	Days to germination (days)	Plant height (cm)	Number of leaves per plant.	Plant Spread (cm)	Days taken for head initiation (days)
Fiesta	3.45	54	29.11	47.33	70.67
Green Magic	3	63.78	34.89	62.67	64.67
Green giant	3.48	59.11	28.89	46.39	70
Local Broccoli	4.07	51.11	27.56	42.67	74.67
Lucky F1	3.30	56.33	27.67	47.67	72.33
Broccoli Hybrid	3.78	52.67	28.67	45.67	75.34
Green Star F1	3.63	54.89	24.67	51.37	70.34
Broccoli Captain-488	3.33	56.44	28.67	53.08	69.33
Green Fairy	3.9	58.55	25.44	50.44	71.33
Anastya	3.3	21.16	19.9	43.00	61.66
C.D at 5%	0.49	2.75	2.33	4.62	7.79
S.Ed. (+)	0.23	1.31	1.11	2.20	3.71

The yield parameters of different genotypes vary dramatically at different growth stages, as seen in the data (Table 2). The earliest days to head harvest was recorded in Anastya (87.1 days) followed by Green Magic (88.57 days) and Green Star F1(91.02 days), whereas the last days to head harvest was recorded in Local broccoli (96.15 days). The highest curd weight was recorded in Green Magic (501.41g) followed by Anastya (448g) and Lucky F1 (438.63g), whereas the lowest curd weight was recorded in Local Broccoli (299.14g).The highest curd yield per plot was recorded in Green Magic (3.08 kg) followed by Anastya (2.69 kg) and Lucky F1 (2.64), whereas the lowest curd yield per plot was recorded in Local Broccoli (1.80 kg).The maximum curd yield per ha was obtained in Green Magic (10.02 t/ha) followed by Anastya (8.97 t/ha) and Lucky F1(8.77 t/ha). The minimum curd yield per ha was recorded in Local Broccoli (5.98 t/ha). These significant differences with respect to fresh weight of head, head yield per plot and head yield per hectare among different varieties may be due to their own-genetic makeup and the suitability of varieties to the weather conditions of this zone. These findings are in conformity with the results, El-Bassiony *et al.*, (2014) in knol-khol, Bhangreet *et al.*, (2011) in broccoli, Moniruzzaman (2011) in cabbage, Thapa and Rai (2012) of broccoli, Uddain *et al.*, (2012) in knol-khol, Thapa *et al.*, (2013), Chandan *et al.*, (2013) in broccoli, El-Magd (2013), Giri *et al.*, (2013), Noopromet *et al.*,(2013), Nguille *et al.*, (2014), Singh *et al.*, (2014) and Islam *et al.*, (2015) and Thakur *et al.*, (2016) in Broccoli.

**Table 2: Yield parameters of Broccoli (*Brassica Oleracea*var. *Italica*)**

Varieties	Days to head harvest	Curd weight (g)	Curd yield per plot (kg)	Curd yield per ha (t/ha)
Fiesta	93.07	418.45	2.51	8.36

Green Magic	88.57	501.41	3.08	10.02
Green giant	92.48	352.88	2.12	7.05
Local Broccoli	96.15	299.14	1.80	5.98
Lucky F1	94.74	438.63	2.64	8.77
Broccoli Hybrid	95.79	329.89	1.98	6.59
Green Star F1	91.02	383.79	2.30	7.67
Broccoli Captain-488	92.24	411.52	2.47	8.23
Green Fairy	93.37	351.8	2.11	7.03
Anastya	87.1	448.9	2.69	8.97
C.D at 5%	3.71	30.13	0.37	1.78
S.Ed. ( $\pm$ )	1.77	14.34	0.68	0.85

As seen in the data, the quality metrics of different genotypes change considerably during different growth stages as seen in (Table 3) The maximum curd diameter was recorded in Green Magic (16.40 cm) followed by Broccoli Captain-488 (16.17 cm) and Anastya (15.48 cm), whereas the minimum curd diameter was recorded in Green Star F1 (13.18 cm). The difference in diameter of head might be due to genetic makeup of different varieties and adaptability to soil and climatic condition of this region. These findings are in accordance with the findings of Sharma et al., (2005) in Brussels sprout, Kumar et al., (2007) in broccoli, Bhangre et al., (2011) in broccoli, Uddain et al., (2012) in knol-khol, Kumar et al., (2012) in cabbage, Yadav et al., (2013) in cauliflower and Giri et al., (2013) in broccoli. The maximum TSS (BRIX) value was found in Green Magic (8.19) followed by Anastya (7.46) and Fiesta (7.40). The minimum TSS value was found in Green Fairy (6.39). The maximum Vitamin C mg/100g was recorded in Green Magic (87.38) followed by Green star F1 (80.73) and Lucky F1 (78.54). The minimum Vitamin C mg/100g was recorded in Local Broccoli (67.30). These findings are in accordance with the findings of **Kaloo et al., (2005)** in vegetable pea, **Bhangre et al., (2011)** in broccoli, **Uddain et al., (2012)** in knol-khol, **Chandan et al., (2013)** in broccoli, El-

Magd *et al.*, (2013), Amin *et al.*, (2014) in cowpea, Islam *et al.*, (2015) in broccoli and Patel (2015) in cowpea.

**Table 3- Varietal evaluation on Quality attributes of broccoli**

Varieties	Curd diameter (cm)	TSS (BRIX)	Vitamin C mg/100g
Fiesta	14.48	7.40	75.15
Green Magic	16.40	8.19	87.38
Green giant	15.09	7.04	76.44
Local Broccoli	13.60	6.39	67.30
Lucky F1	15.33	7.38	78.54
Broccoli Hybrid	13.33	7	71.25
Green Star F1	13.18	7.28	80.73
Broccoli Captain-488	16.17	7.09	70.27
Green Fairy	14.24	6.39	67.92
Anastya	15.48	7.46	78.17
C.D at 5%	2.05	0.91	9.18
S.Ed. (+)	0.97	0.43	4.37

## CONCLUSION.

According to the results of the current study the treatment T2 (Green Magic) was shown to be the most suitable over all other treatments in terms of growth, yield and quality of Broccoli.

**Comment [T.F.6]:** The conclusion should be rewritten to show the objective of the study, the result of the findings should be inclusive and contribution of the study to knowledge should be given along with concise recommendation.

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