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Varietal Evaluation of Cauliflower [*Brassica oleracea* L. var. *botrytis*] Under Agro-climatic Condition of Allahabad

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ABSTRACT

Selection of adapted varieties to environmental factors and soil types are paramount to growing profitable cauliflower crops. Varieties are selected for uniform maturity, field holding capability, head size, shape and color. The objective of this demonstration trial is to evaluate new and existing commercial varieties under agro-climatic condition of Allahabad. Eleven varieties with three replications in RBD were planted and evaluated at Horticulture research farm of department of Horticulture at Sam Higginbottom Institute of Agriculture Technology and Sciences, Allahabad, (Deemed-to-Be-University), Allahabad Uttar Pradesh India, for their agronomic characteristics and their commercial values. All varieties tested performed well, indicating that when planted under similar conditions and planting dates, these varieties are expected to do well. However, a significant head weight and head diameter difference was observed among varieties tested. Amongst all the cauliflower hybrids variety evaluated for growth, yield and quality test in present investigation revealed that the variety Madhuri recorded highest plant height (25.76cm), Number of leaves per plant (21.33) plant spread (64.56cm), diameter of curd (18.00cm), weight of untrimmed curd (2.84 kg), weight of trimmed curd (864.00g), curd yield (456.45kg ha-1) and vitamin C (53.57mg/100g each). Cauliflower hybrid variety for growth yield and quality character hybrid variety Madhuri is recommended for commercial cultivation in winter season of Allahabad agro – climatic condition.

Key words: *Brassica oleracea. var. botrytis, Vitamin C, Trimmed curd, Untrimmed curd*

INTRODUCTION

Cauliflower (*Brassica oleracea, var botrytis* L.) is a very popular vegetable belonging to cole group of vegetable. It is a member of crucifarae family and is characterized by petals, standing opposite to each other in a square cross. 6 stamens of which 4 are long and 2 are short. It has basic chromosome number (n=9) Cauliflower has both annual and biennial types, but in Indian only annuals are cultivated. It has small, thick stem, bearing whole of leaves and branched tap root system. The main growing point develops into shortened shoot system whose apices makes up the convex surface of curd, so the curd is a 'prefloral fleshy apical meristem'.

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The edible part, i.e curd is generally white in colour and may be enclosed by inner leaves before its exposer. Curd colour varies with the variety and environment. It may be white, cream-white, yellow, green or red. Cauliflower (*Brassica oleracea var. botrytis* L.) is grown mainly in cooler areas. It is steamed, stir fried, or pickled. Cauliflower is grown in 1,017 ha, mainly in locos Sur (450 ha) and Benguet (340 ha) ***(Bureau of Agricultural Statistics 2005)*.** Nutritional Value Per 100 g fresh edible portion, **Cauliflower** curd contains: Water (g) – 88.0, Protein (g) – 4.0, Fat(g) – 0.30, Carbohydrates (g) – 6.0, Fiber (g) – 1.5, Calcium (mg)–150, Potassium (mg) – 325, Carotene (mg) – 800, Vitamin C (mg) – 100, Energy Value (kj) – 245. Values are similar for cauliflower except for its lower calcium (25 mg), carotene (200 mg), and vitamin C (40 mg) contents.Bihar, Uttar Pradesh, Orissa, West Bengal, Assam, Haryana and Maharashtra are major cauliflower growing states. With the development of new varieties, it is now being grown in non-traditional areas-Andhra Pradesh, Tamil Nadu and Kerala.

Table 1: Area and Production of Cauliflower

Crops	**2013-14 (Final)**		**2014-15(Final)**	
Vegetable	**Area '000 Ha**	**Production'000 MT**	**Area '000 Ha**	**Production'000 MT**
Cauliflower	434	8573	411	7926

Source (National Horticulture Board NHB-2014 and 2015).

MATERIAL AND METHODS

The present experiment entitled "Varietal Evaluation of Cauliflower [*Brassica oleracea var.botrytis*] Under Agro-Climatic Condition of Allahabad*" was* carried out during 2012-13 at Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture Technology & Sciences, Allahabad. The materials used, techniques adopted and observations recorded during the course of investigation are indicated in this chapter.This region has a subtropical climate with both the extremes in the temperature i.e. the summer and winter. In cold winter the temperature drops as low as 1^0 C in the month of Dec – Jan. and rises as high as 48^0 C during the months of May – June. Frost during winter and hot scorching winds in summer is a common feature. The average rainfall is about 850-1100 mm with maximum concentration during July – Sep and occasional shower in winter. The average monthly rainfall, maximum and minimum temperature and relative humidity recorded at SHIATS, Allahabad during the observatory period are shown in the meteorological data. Eleven genotypes were grown in a Randomized Blok Design with 3 replications. The observation was recorded on the plant height in 30,45 and 60 days' intervals, no. of leaves in 30,45 and 60 days' intervals, plant spread in 30,45 and 60days interval, diameter of curd, weight of untrimmed curd, weight of trimmed curd, curd yield and vitamin C.

Treatment details

Table 2:

Treatments symbols	**Name of variety**	**Source/company**
V_1	Madhuri	Nunhems
V_2	Kartik	Sungrow
V_3	Poosi	R. K. Seeds Company
V_4	Maghi	R. K. Seeds Company
V_5	Agheni	Seminsis
V_6	Golden hybrid	Seminsis
V_7	Hybrid Safedi	Seminsis
V_8	Green	Namdhari
V_9	Tarjan	Namdhari
V_{10}	CST	Nunzubedi
V_{11}	Desiwala	R. K Seed Company

RESULTS AND DISCUSSION

Growth Parameter

Influence of variety on vegetative growth under different treatments is described below.

Plant height (cm)

The plant height as influenced by different varieties was at 30, 45 and 60 DAT and presented in Table 4. At 30 DAS the effect of treatments was significant on plant height. The plant height at 30 DAS was found to be significant among the varieties. The maximum plant height (11.37 cm) was observed in variety (V_1) with Madhuri variety followed by variety (V_{11}) with Desiwala variety (10.12 cm) Maghi variety (V_4) with (9.88 cm), Agheni (V_5) with (9.80 cm). Minimum plant height (7.57cm) was found to be in variety (V_3) with Poosi variety. The plant height at 45 DAS was found to be significant among the varieties. The maximum plant height (20.26 cm) was observed in variety (V_1) with Madhuri variety followed by variety (V_{11}) with Desiwala variety (19.78 cm) Kartik variety ($V_{2)}$ with (19.52 cm), Hybrid Safedi (V_7) with (19.04 cm). Minimum plant height (13.20 cm) was found to be in variety (V_3) with Poosi variety. The plant height at 60 DAS was found to be significant among the varieties. The maximum plant height (25.76 cm) was observed in variety (V_1) with Madhuri variety followed by variety (V_{11}) Desiwala (25.21 cm), Maghi (V_4) with (24.73 cm), and Kartik (V_2) with (24.56 cm). Minimum plant height (17.06 cm) was found to be in variety (V_3) with Poosi variety. Similar finding was also reported by Ahmad *et al*[1].

Number of leaves per plant

The Number of leaves per plant as influenced by different varieties was at 30, 45 and 60 DAT and presented in Table 4. At 30 DAS the effect of treatments was significant on number of leaves per plant. The Number of leaves per plant at 30 DAS was found to be significant among the varieties. The maximum Number of leaves per plant (8.27) was observed in variety (V_1) with Madhuri variety followed by variety (V_{11}) desiwala variety (7.92), Green variety (V_8) with (7.25), and kartik (V_2) with (7.13). Minimum Number of leaves per plant (4.03) was found to be in variety (V_3) with Poosi variety. The Number of leaves per plant at 45 DAS was found to be significant among the varieties. The maximum Number of leaves per plant (16.00) was observed in variety (V_1) with Madhuri variety followed by variety (V_{11}) with Desiwala variety (14.85), Kartik (V_2) and Hybrid Safedi (V_7) with (14.42). Minimum Number of leaves per plant (9.42cm) was found to be in variety (V_3) with Poosi variety. The Number of leaves per plant at 60 DAS was found to be significant among the varieties. The maximum Number of leaves per plant (21.33) was observed in variety (V_1) with Madhuri Variety followed by variety (V_{11}) $_{with}$ Desiwala (20.75), Kartik (V_2) with (20.25), and hybrid Safedi (V_7) with (19.58). Minimum Number of leaves per plant (15.83cm) was found to be in variety (V_3) with Poosi variety. Similar finding was also reported by Ahmad *et al*[1].

Plant spread (cm)

The Plant spread (cm) as influenced by different varieties was at 30, 45 and 60 DAT and presented in Table 4. At 30 DAS the effect of treatments was significant on Plant spread (cm). The Plant spread (cm) at 30 DAS was found to be significant among the varieties. The maximum Plant spread (23.68cm) was observed in variety (V_1) with Madhuri variety followed by variety (V_{11}) with Desiwala variety (2.67cm), V6 Golden hybrid with (20.85), Kartik (V_2) (20.83). Minimum Plant spread (cm) (17.39cm) was found to be in variety (V_3) with Poosi variety. The Plant spread (cm) at 45 DAS was found to be significant among the varieties. The maximum Plant spread (47.11cm) was observed in variety (V_1) with Madhuri variety followed by desiwala (V_{11}) and Hybrid Safedi ($V_{7)}$ (44.90cm). Minimum Plant spread cm (33.85cm) was found to be in variety (V_3) with Poosi variety. The Plant spread (cm) at 60 DAS was found to be significant among the varieties. The maximum Plant spread (64.56 cm) was observed in variety (V_1) with Madhuri variety followed by variety (V_{11}) with desiwala, (V_2) Kartik (62.88 cm). Minimum Plant spread (54.44 cm) was found to be in variety (V_3) with Poosi variety. Similar finding was also reported by Ahmad *et al*[1].

Diameter of curd (cm)

Perusal of the data contained in the Table 4.4 and clearly show that different varieties under varieties significantly influenced the curd diameter of cauliflower.Table 4.and reveals the maximum curd diameter (18.00cm) was obtained with variety (V_1) with Madhuri followed by (17.29cm) with (V_{11}) Desiwala, (16.65cm) with (V5) Agheni and (16.32 cm) with Hybrid Safedi ($V_{7)}$. Whereas, the minimum cud diameter was recorded (15.15cm) with (V_3) Poosi variety. Similar finding was also reported by EI-Rehim *et al*[3].

Weight of untrimmed curd (kg)

Table 4 shows the weight of untrimmed curd of cauliflower which was significantly influenced by different variety under varieties**.** The maximum weight of untrimmed curd was observed in variety (V_1) with Madhuri (2.84 kg) followed by variety (V_{11}) with Desiwala (2.27 kg) and variety (V_6) Golden hybrid (2.21 Kg). Minimum weight of untrimmed curd (0.96 kg) was found to be in variety (V_3) with Poosi variety**.** Similar finding was also Reported by EI-Rehim *et al*[3].

Weight of trimmed curd (g)

The curd yield per plant of cauliflower, recorded with different variety under varieties is presented in Table 4 which shows that the curd yield per plants was significantly influenced by different variety under varieties.Maximum weight of trimmed curd yield (864.00 g) was recorded in variety (V_1) with Madhuri followed by variety (V_{11}) with Desiwala (855.67 g) and (V8) Green (810.67g). Minimum weight of trimmed curd yield (464.00g) was recorded in variety (V_3) with Poosi variety.Variety (V_1) Madhuri was superior over all other varieties in relation to Weight of trimmed curd (g) followed by Desiwala (V_{11}). Similar finding was also Reported by EI-Rehim *et al*[3].

Curd yield per plot (kg)

Data given in Table 4 and revealed that significantly highest curd yield of per plot (6.25 kg) was recorded in variety (V_1) with Madhuri than all other variety. This variety was followed by variety (V_{11}) with Desiwala (6.12 kg), (V_{10}) CST with (5.69 kg). Minimum curd yield per plot was obtained in variety (V_3) Poosi variety with (3.23kg).Variety (T_1) Madhuri variety was superior over all other varieties in relation to Curd yield per plot (kg) followed by Desiwala ((V_{11}). Similar finding was also reported by Singh *et al*[5].

Vitamin C (mg / 100 g edible portion)

The ascorbic acid content in cauliflower recorded with different varieties is presented in Table, which shows that the ascorbic acid was significantly influenced by different varieties Maximum Vitamin C (53.57 mg / 100g of edible portion) was obtained with variety ($V_{1)}$ Madhuri variety followed by (V_{11}) Desiwala variety (53.52 mg / 100g of edible portion). The minimum (48.77 mg / 100g of edible portion) was recorded with (V_3) with Poosi variety.

Variety (V_1) Madhuri variety was superior over all other treatments followed by Desiwala (V_{11}) in relation to Vitamin C (mg/100g of edible portion). Similar finding was also reported by Thamburaj *et al*[6].

Economics of different treatments

The cost of cultivation and economics and economics of different varieties have been worked out and presented in Table 4.10.1, 4.10.2 and 4.10.3.Maximum gross return (Rs. 273,870/ha) was obtained with variety (V_1) Madhuri variety followed by (Rs. 241,488/ha) with (V_{11}) Desiwala variety and the minimum (Rs.129, 210/ha) was obtained with (V_3) Poosi variety. Maximum Net return (Rs. 221, 2500/ha) was obtained with variety (V_1) Madhuri variety followed by (Rs. 187,110/ha) with (V_{11}) Desiwala variety and the minimum (Rs.73, 569/ha) was obtained with (V_3) Poosi varietyMaximum Benefit cost ratio (1:5.20) was obtained with variety (V_1) Madhuri variety followed by (1:4.40) with (V_{11}) Desiwala variety and the minimum (1:2.32) was obtained with (V_3) Poosi varietyVariety (V_1) Madhuri variety was superior over all other varieties followed by Desiwala (V_{11}) in relation to Cost benefit ratio. Similar finding was also Reported by Batra and Singh *et al*[2]. and Sharma and Chandra *et al*[4].

Table: 3

Treatment Combinations	Plant Height in (cms)			Number of leaves per plant			Plant spread (cm)			Diameter of curd (cm)	Weight of untrimmed curd (Kg)	Weight of trimmed curd (Kg)	Curd yield per plot (kg)	Curd yield (q ha^{-1})	Vitamin C (mg / 100 g edible portion)	Fruits per vine	yield kg / vine	TSS (Brix):	Vitamin C(mg/ 100g):
	30 Days	45 Days	60 Days	30 Days	45 Days	60 Days	30 Days	45 Days	60 Days										
T_1=V_1 (Madhuri)	11.37	20.26	25.76	8.27	16.00	21.33	23.68	47.11	64.56	18.00	2.84	864.00	6.25	456.45	53.57	0.67	3.67	7.00	2.05
T_2=V_2 (Kartik)	9.07	19.52	24.56	7.13	14.42	20.25	20.83	42.81	59.35	15.31	2.00	793.33	4.91	327.60	50.97	2.00	6.00	7.67	2.01
T_3=V_3 (Poosi)	7.57	13.20	17.06	4.03	9.42	15.83	17.39	33.85	54.44	15.15	0.96	464.00	3.23	215.35	48.77	1.00	3.33	7.33	1.92
T_4=V_4 (Maghi)	9.88	16.55	24.73	6.42	10.92	19.17	18.01	42.66	58.66	15.92	2.13	795.33	4.70	305.73	51.80	1.67	5.33	8.67	1.92
T_5=V_5 (Agheni)	9.80	18.01	23.51	5.50	9.50	16.50	18.34	37.73	55.01	16.65	2.20	730.00	4.37	291.28	50.43	**2.00**	5.00	6.67	2.36
T_6=V_6(Golden Hybrid)	9.69	13.30	18.16	6.82	12.00	17.33	20.85	36.50	50.81	15.41	2.21	551.82	5.55	279.22	50.66	1.67	6.00	7.00	2.45
T_7=V_7 (Hybrid Safedi)	9.03	19.04	22.45	6.60	14.42	19.58	19.41	44.90	64.56	16.32	2.23	823.67	4.54	320.53	52.93	**2.00**	**7.00**	6.33	1.49
T_8=V_8 (Green)	8.85	16.94	23.46	7.25	13.67	19.17	18.47	43.37	59.18	16.40	2.14	810.67	5.63	310.53	52.20	0.67	4.67	7.33	1.93
T_9=V_9 (Tarjan)	8.15	15.46	19.86	4.92	9.67	18.25	18.09	37.75	55.08	15.52	2.03	733.00	4.40	312.22	53.32	1.33	6.00	8.33	2.39
T_{10}=V_{10} (CST)	7.91	17.80	18.72	6.42	10.33	18.08	19.12	35.63	55.35	15.78	2.15	709.86	5.69	303.41	50.27	1.33	5.33	8.67	1.94
T_{11}=V_{11} (Desiwala)	10.12	19.78	25.21	7.92	14.85	20.75	23.67	44.90	62.88	17.29	2.27	855.67	6.12	402.48	53.52	1.33	3.33	**9.33**	1.45
F-test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	S	S	S	S	S	2.00	5.67	7.67	2.05
C.D. (0.05%)	1.488	0.778	1.452	1.977	0.850	0.714	2.55	2.23	1.313	0.972	0.152	8.983	0.333	13.305	0.448	1.00	6.33	8.33	**3.57**
S.Ed(±)	0.713	0.373	0.696	0.948	0.407	0.342	1.22	1.06	0.629	0.466	0.073	4.307	0.160	6.378	0.215	S	S	S	S

CONCLUSION

In view of the experimental results obtained during the investigation, variety (V_1) Madhuri emerged as superior over other varieties followed by (V_{11}) Desiwala, in context to growth, yield, quality, gross return, net return and Benefit: Cost ratio of cauliflowers.

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