Diversity of Chrysanthemum (*Dendranthema grandiflora T*.) varieties under open field condition in Prayagraj

ABSTRACT

The field experiment entitled "Varietal evaluation of Chrysanthemum (*Dendranthema grandiflora T*.) under open field condition in Prayagraj" was carried out during September 2022 to January 2023, in Horticulture Research Farm,Department of Horticulture,Naini Agriculture Institute, SHUATS. The experiment was laid out in Randomized Block Design with three replications. The experiment comprised of fifteen varieties of chrysanthemum viz.Kanadee, Flood, Winter Queen, Basanti, White Bonsai, Local Yellow, Ravi Kiran, Button Type, Rani, UBC 12, Wall Street, Bidhan Rajat, Bidhan Antara, British gold and Vijay. It is clear from the experimental analysis that all characters were significantly affected by different varietal treatments. From the experimental findings,itwas found that maximum height was found in the variety Bidhan Antara(40.79cm),plant spread(30.55cm), primary branches(6), whereas earliness in flowering was found in the variety Bidhan Rajat, flower yield per plant (176.76g) was found maximum in the variety Bidhan Rajat, average flower weight was recorded more in the variety Rani(7.19g),duration of flowering (71.2days) and benefit-cost ratio(4.32:1) was found maximum in the variety Bidhan Rajat.

Key word: Chrysanthemum, Variety, Randomized Block Design, Open field

INTRODUCTION

"Chrysanthemum (*Dendranthemagrandiflora T.)* belongs to the Asteraceae family. It is believed to be native to the northern hemisphere chiefly Europe and Asia and was believed to have been originated in China. The basic chromosome number of chrysanthemum is 9, while 2n ranges from 36 to 75 though most of them are hexaploid. It is the national flower of Japan. It is commonly called as "Queen of the East", "Autumn Queen", "Guldaudi" in India and "Mum" in America. The word chrysanthemum is derived from the Greek word "chryos" means gold and "anthemon" or "anthos" means flower" (Cantor et al., 2020).

"In the trade of global flower market, chrysanthemum is the second largest cut flower after rose and holds fifth rank as pot plant. It is commercially grown in different parts of the world. Netherlands, Italy, Colombia, Spain, Germany and USA are the important countries where it is mainly grown under greenhouse conditions. Japan is the largest producer of chrysanthemum in the world. In India, it is commercially grown in Karnataka, Tamil Nadu and Maharashtra. Chrysanthemum covers 20,090 ha area with production of 1, 85, 240 MT of loose flowers and 14,930 MT of cut flowers in India during 2016-2017. Karnataka is the most prominent chrysanthemum growing state with an area of 5100 ha and production of 61,200 MT of loose flowers during 2014-2015. In different states of India, it is grown with different names, Guldaudi in Hindi belt, Chandramalika in the eastern states, Samanti in the southern states and Shevanti in the western states of India. Ease of cultivation, high returns and

increasing market demand are the main reasons for the popularity of this crop" (Fatmi et al., 2017).

"In India, chrysanthemum occupies a place of pride both as a commercial crop and as a popular exhibition flower. The erect and tall growing cultivars are suitable for background planting in borders. The cultivars with the dwarf and compact growing habit, on the other hand, are suitable for front row plantation or pot culture. The decorative and fluffy bloomed smallflowered cultivars are ideal for garland making and hair decoration. The extra-large bloomed cultivars are used for exhibition value. Loose flowers are used for garlands, venis, worship etc. Long stem flowers or cut flowers are used for bouquet, vase etc. In North India various hues of red, yellow, white and purple chrysanthemums are grown in abundance for decorating the landscape either in the ground or in pots. But, in South India mostly the yellow-coloured flowers are preferred and grown as loose flowers for trade. The cultivation of chrysanthemum is gaining importance in Gujarat due to its relative ease in cultivation, high returns and increasing market demand" (Cantor et al., 2020).

METHODS AND MATERIALS

The field experiment entitled "Varietal evaluation of chrysanthemum (Dendranthema grandiflora T.) under open field conditions of Prayagraj" was carried out at Horticulture Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Allahabad, during the season of 2022-2023.

Geographicallocation of the experimental site:

The experimental site is being located at a latitude of 25.41º North and longitude of 81.84 º East, with an altitude of 98 meters above the mean sea level (MSL).

Climatic conditions of the experimental area:

The area of Prayagraj comes under humid sub-tropical climate, which experiences warm humid monsoon, hot dry summer and cold dry winter. The annual mean temperature is 26.1ºC while monthly mean temperatures are 18-29ºC. The daily average maximum temperature is about 22ºC and the minimum temperature is 9ºC. The average annual rainfall received is 1042.2 mm. At this location, the temperature reaches upto 46ºC-48ºC and the minimum temperature recorded was 4ºC-5ºC. The relative humidity ranges in this location ranges between 20-94%.

RESULTS AND DISCUSSION

Vegetative Parameters

"Significantly, the maximum plant height was recorded in the variety Bidhanantara (40.79 cm), which is found to be at par with the variety Local yellow (39.20 cm. While, minimum plant height was recorded in the variety Vijay (9.36 cm).The difference in plant height may be due to the varietal character and vigour of the genotypes under study" (**Uppuleti et al, 2022**). Significantly, the maximum plant spread was found in the variety Bidhanantara (30.55 cm), which is found to be at par with the variety Basanti (24.30 cm). Whereas, minimum

plant spread was found in the variety Vijay (9.51cm). The difference in plant spread among all the varieties may be due to their genetic makeup and development of more number of secondary branches.Similar result was observed in (**Uppuleti et al, 2022**). Significantly maximum number of primary branches were found in the variety Bidhanantara (6 branches), which is found to be at par with the variety White bonsai (5.86 branches). While, minimum number of primary branches was recorded in the variety Winter queen (3.33). The difference in primary branches among all the varieties may be due to their genetic makeup. Similar result was observed in (**Uppuleti et al, 2022**).

Floral Parameters

Significantly, earliness in flowering was recorded in the variety Bidhanrajat (66.46 days), whereas late flowering was observed in the variety British gold (88.26 days). "Earliness in flowering had significantly differed and the difference may be due to the inherent character and genetic makeup of the variety" (**Uppuleti et al, 2022**).Significantly, earliness in 50% flowering was recorded in the variety Wall Street (84.46 days), whereas late 50%flowering was observed in the variety Bidhanrajat (126.46 days). Earliness in flowering had significantly differed and the difference may be due to the inherent character.Similar result was observed in (**Uppuleti et al, 2022**). Significantly, maximum number of flowers per plant was found in the variety Bidhanrajat (41.46), which is found to be par with the variety White bonsai(39.86). Whereas, minimum number of flowers per plant was found in the variety Winter queen (14.6)."The difference in the number of flowers may be due to varietal character, environmental factors" (**Uppuleti et al, 2022**). Significantly, maximum flower diameter was found in the variety Flood (8.63 cm), which is found to be par with the variety Winter queen (8.12 cm). While, minimum flower diameter was recorded in the variety UBC12 (2.24 cm). The difference in flower diameter may be due to varietal character, habitat type.Similar result was observed in (**Uppuleti et al, 2022**). Significantly, maximum duration of flowering was recorded in the variety Bidhanrajat (71.2 days), which is found to be par with the variety Basanti (71.06 days). Whereas, minimum duration of flowering was found in the variety Vijay (41.8 days).The difference in the duration of flower may be due to varietal character, environmental factors.Similar result was observed in (**Uppuleti et al, 2022**).Significantly, maximum flower yield per hectare was recorded in the variety Bidhan Rajat (159.08 q), which is found to be par with the variety Rani (130.81 q).While, minimum flower yield per hectare was recorded in the variety Winter queen (17.66 q). The difference in the flower yield per hectare may be due to varietal character, habitat type, environmental factors.Similar result was observed in (**Uppuleti et al, 2022**). Significantly, maximum flower weight was recorded in the variety Rani (7.19 g), which is found to be par with the variety Bidhanrajat (7.07 g). Whereas, minimum flower weight was recorded in the variety UBC12 (0.64 g). The difference in the number of flowers may be due to varietal character.Similar result was observed in (**Uppuleti et al, 2022**). Significantly, maximum stalk length was Flood (11.44 cm), which is found to be par with the variety Local yellow (10.62 cm). Whereas, the variety with minimum flower stalk length was Vijay (3.42 cm). The difference in stalk length may be due to varietal character, habitat type, environmental factors.Similar result was observed in (**Uppuleti et al, 2022**).

Economic Parameters

Significantly,gross returns were found maximum in the variety of ofBidhanrajat (2863512 Rs. per ha), which is at par with the variety Rani (2354724 Rs. per ha). While, minimum gross returns were observed in the variety Winter queen (706560 Rs. per ha), which is at par with the variety UBC12 (878640 Rs. per ha). The difference in gross return may be due to customer demand. Significantly, net returns were found maximum in the variety of Bidhanrajat (2326062 Rs. per ha), which is at par with the variety Basanti (1544268 Rs. per ha). While, minimum net returns were observed in the variety vijay (18070 Rs. per ha), which is at par with the variety Local yellow (137450 Rs. per ha). The difference in gross return may be due to customer demand and market demand. Significantly, benefit-cost ratio was found maximum in the variety of Bidhanrajat (4.32:1), which is at par with the variety Basanti (2.87:1). While, minimum benefit-cost ratio was observed in the variety Vijay (0.01:1), which is at par with the variety Local yellow (0.25:1).The results of the present work are presented under following headings.

CONCLUSION

It is concluded from the present investigation that the 15 chrysanthemum varieties showed significant variation in all the parameters observed. The variety Bidhan Rajat(V-12) showed the best performance in most of the parameters like number of primary branches, minimum days taken for first flower bud initiation, duration of flowering, flower yield per plant, gross returns, net returns and benefit-cost ratio, at par with the variety Bidhan Antara, followed by Basanti. While, the variety winter queen didn't perform well and stands at last place in each parameter.

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TABLE:1- Mean Performance of Plant height

TREATMENT	VARIETY	30DAP	60DAP	90DAP
V1	**KANADEE**	7.14	12.18	23.567
V2	**FLOOD**	9.067	15.807	29.953
V3	**WINTER QUEEN**	7.187	13.667	31.627
V4	**BASANTI**	7.647	15.467	28.307
V5	**WHITE BONSAI**	3.753	6.72	11.227
V6	**LOCAL YELLOW**	10.26	16.34	40.793
V7	**RAVI KIRAN**	6.287	11.053	23.12
V8	**BUTTON TYPE**	3.453	11.593	18.1
V9	**RANI**	8.393	16.78	36.953
V10	**UBC 12**	4.207	11.44	16.193
V11	**WALL STREET**	3.213	10.547	12.537
V12	**BIDHAN RAJAT**	11.273	19.953	28.653
V13	**BIDHAN ANTARA**	13.073	20.727	39.207
V14	**BRITISH GOLD**	5.667	10.853	22.493
V15	**VIJAY**	4.093	6.42	9.367

	C.D.	2.007	4.124	3.119
	SE(m)	0.689	1.416	1.071
	SE(d)	0.975	2.003	1.515
	C.V.	17.102	18.438	7.478

TABLE:2- Mean Performance of Plant spread

TREATMENT	VARIETY	30DAP	60DAP	90DAP
V1	**KANADEE**	4.433	8.067	16.033
V2	**FLOOD**	3.547	8.887	12.513
V3	**WINTER QUEEN**	3.66	7.68	11.927
V4	**BASANTI**	5.087	10.827	30.553
V5	**WHITE BONSAI**	3.827	8.507	13.627
V6	**LOCAL YELLOW**	4.453	9.8	22.293
V7	**RAVI KIRAN**	3.1	9.433	15.34
V8	**BUTTON TYPE**	2.487	7.333	14.293
V9	**RANI**	3.48	9.4	14.387
V10	**UBC 12**	2.38	8.78	14.26
V11	**WALL STREET**	2.081	11.693	16.907
V12	**BIDHAN RAJAT**	3.067	10.787	21.5
V13	**BIDHAN ANTARA**	5.747	12.52	24.307
V14	**BRITISH GOLD**	3.193	8.313	15.927
V15	**VIJAY**	2.147	6.673	9.513
	C.D.	0.673	1.91	4.308
	SE(m)	0.231	0.656	1.479
	SE(d)	0.327	0.927	2.092
	C.V.	11.398	12.284	15.169

TABLE:3- Mean Performance of different varieties of chrysanthemum

S.No	VARIETIES	NO OF PRIMARY BRANCHES	NO OF DAYS TO FIRST BUD INITIATION	DAYS TO 50%FLOWERING	FLOWER PER PLANT	FLOWER DIAMETER

1	**KANADEE**	4.133	80	115.8	19.133	5.693
2	**FLOOD**	4.4	76.6	107	23.667	**8.633**
3	**WINTER QUEEN**	3.333	87.2	110.8	14.6	8.12
4	**BASANTI**	5.133	75.467	102.867	37.867	4.627
5	**WHITE BONSAI**	5.867	70.4	106.333	39.867	4.193
6	**LOCAL YELLOW**	3.8	78.4	97.667	28	7.473
7	**RAVI KIRAN**	4.333	81.133	126.467	21.6	6.467
8	**BUTTON TYPE**	6	84.867	108.133	26.4	4.773
9	**RANI**	5.067	77.333	106.8	20.2	7.107
10	**UBC 12**	4.533	85.4	106.667	38.4	2.247
11	**WALL STREET**	3.667	67.067	84.467	26.467	4.467
12	**BIDHAN RAJAT**	10	71.467	102.2	25	8.093
13	**BIDHAN ANTARA**	10	72.733	96.933	41.467	4.74
14	**BRITISH GOLD**	8.133	88.267	124.8	22.4	5.067
15	**VIJAY**	5.467	77.533	115.733	27.8	3.833
	MEAN	5.591	78.2578	107.5111	27.5245	5.7022
	C.D.	0.795	5.145	5.433	1.701	0.862
	SE(m)	0.273	1.767	1.866	0.584	0.296
	SE(d)	0.386	2.499	2.638	0.826	0.419
	C.V.	8.453	3.911	3.006	3.676	8.993

TABLE:4- Mean Performance of various varieties of chrysanthemum

S.No	VARIETIES	STALK LENGTH	FLOWER WEIGHT	YEILD PER PLANT	YEILD PER HECTARE	FLOWERING DURATION
1	**KANADEE**	5.013	5.22	98.22	88.398	62.667
2	**FLOOD**	11.447	6.193	144.007	125.339	68.733
3	**WINTER QUEEN**	7.213	1.34	19.627	17.664	46.533
4	**BASANTI**	5.493	3.153	119.453	115.651	71.067

5	**WHITE BONSAI**	4.64	1.107	44.207	39.786	48.4
6	**LOCAL YELLOW**	10.62	4.213	117.993	106.194	68.267
7	**RAVI KIRAN**	5.093	4.153	89.72	80.748	48.333
8	**BUTTON TYPE**	5.133	1.14	29.913	26.922	42.4
9	**RANI**	7.06	7.193	148.353	130.818	52.667
10	**UBC 12**	5.113	0.64	24.407	21.966	52.933
11	**WALL STREET**	5.84	2.073	55.093	49.584	48.867
12	**BIDHAN RAJAT**	8.833	7.073	176.76	159.084	61.2
13	**BIDHAN ANTARA**	5.487	2.453	101.767	91.601	63.267
14	**BRITISH GOLD**	7.167	2.433	54.393	48.954	56
15	**VIJAY**	3.42	1.053	29.313	26.388	41.8
	MEAN	6.5048	3.2958	83.5484	75.2731	55.5422
	C.D.	0.429	0.073	7.863	10.404	2.899
	SE(m)	0.147	0.025	2.701	3.573	0.996
	SE(d)	0.208	0.035	3.819	5.053	1.408
	C.V.	3.923	1.312	5.598	8.221	3.105

TABLE:5- GROSS RETURN, NET RETURN, BENEFIT COST RATIO

S.No	VARIETY	Yeild(q/ha)	Selling price/q	Gross return (Rs./ha)	Cost of cultivation (Rs./ha)	Net return (Rs./ha)	Benefit cost ratio
1	**KANADEE**	88.398	18000	1591164	1037450	553714	0.533
2	**FLOOD**	125.339	18000	2256102	1037450	1218652	1.174
3	**WINTER QUEEN**	17.664	40000	706560	537450	169110	0.314
4	**BASANTI**	115.651	18000	2081718	537450	1544268	2.873
5	**WHITE BONSAI**	39.786	35000	1392510	1037450	355060	0.342
6	**LOCAL**	106.194	18000	1911492	537450	137450	0.255

	YELLOW						
7	**RAVI KIRAN**	80.748	18000	1453464	1037450	416014	0.4
8	**BUTTON TYPE**	26.922	35000	942270	537450	404820	0.753
9	**RANI**	130.818	18000	2354724	1037450	1317274	1.269
10	**UBC 12**	21.966	40000	878640	537450	341190	0.634
11	**WALL STREET**	49.584	35000	1735440	1037450	697990	0.672
12	**BIDHAN RAJAT**	159.084	18000	2863512	537450	2326062	4.327
13	**BIDHAN ANTARA**	91.601	18000	1648818	537450	1111368	2.067
14	**BRITISH GOLD**	48.954	35000	1713390	1037450	675940	0.651
15	**VIJAY**	26.388	40000	1055520	1037450	18070	0.017