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Takhellambam Henny

Department of Floriculture and Landscaping, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha, India

Siddharth Kumar Palai

Department of Floriculture and Landscaping, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha, India

Sashikala Beura

Department of Floriculture and Landscaping, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha, India

Lingneivah Chongloi

Department of Floriculture and Landscaping, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha, India

Okram Bijaya Devi

Department of Horticulture, NEHU, Tura Campus, Chasingre, Meghalaya, India

Suchismita Mishra

Department of Floriculture and Landscaping, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha, India

Corresponding Author:

Takhellambam Henny

Department of Floriculture and Landscaping, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha, India

Evaluation and selection of spray chrysanthemum (*Chrysanthemum morifolium* Ramat) genotypes suitable for commercial cultivation under coastal plain zone of Odisha

Takhellambam Henny, Siddharth Kumar Palai, Sashikala Beura, Lingneivah Chongloi, Okram Bijaya Devi and Suchismita Mishra

Abstract

Evaluation of chrysanthemum genotypes was carried out to identify and select elite genotypes. Nine genotypes viz., HCC-1, HCC-2, HCC-3, Bidhan Madhuri, Bidhan Jayanti, Bidhan Purna, Arka Gold, Arka Chandrika and Flirt as check were selected for evaluation. The study revealed that the various genotypes showed a significant difference in plant growth, flowering and flower yield. Flirt attained the maximum height (67.03cm), plant spread (E-W) (41.96cm); observed maximum flower diameter (7.52cm) and average flower weight (3.90g) but was late to flower (80.33 days). The minimum plant height (45.36cm), plant spread in both direction (24.59cm, 25.08cm), flower diameter (2.57cm), flower weight (0.40g) and weight of flowers per plant (102.42g) were recorded by HCC-2. HCC-3 had maximum plant spread in N-S direction, the minimum number of primary branches per plant; Bidhan Purna was early to first flower initiation and opening and has the longest duration of flowering. The highest number of flowers per plant was noted by HCC-2 and lowest by Flirt. HCC-2 and Bidhan Madhuri recorded the maximum vase life (21.44 days) while Flirt recorded the lowest.

Keywords: Coastal plain, elite, evaluation, genotypes, spray chrysanthemum

1. Introduction

Chrysanthemum, the 'Queen of the East' is a popular flower crop of commercial importance, native to the Northern hemisphere, chiefly Europe and Asia and belongs to the family Asteraceae. It is a multi-use flower crop and gaining more popularity for interior decoration and in bouquets; has high demand in both the domestic and international market. Apart from ornamental values, chrysanthemum is used for other purposes like essential oils, cosmetics, aromatherapy, dry flowers, pot pourries, natural dyes, medicines, etc. The utility and popularity of chrysanthemum have increased immensely with the introduction of the technique of year-round production based on scientific research in the field of photo-periodic and genetics. Environment/season is the most important limiting factor for growth and flowering of chrysanthemum (Raman *et al.*, 1969) [11]. The variations among chrysanthemum varieties are largely in response to the environment particularly temperature and the interaction between temperature and cultivar occur for every developmental trait (Pleog and Heuvelink, 2006) [10]. Chrysanthemum is very rich in varietal wealth and every year there is an addition of new varieties. Many cultivars have been developed from local material collected from different parts of the country. In India, its germplasm has been screened but the information on the performance for the higher yield of the cut flower and yield contributing parameters of chrysanthemum is meagre. Hence, there is a need to evaluate promising genotypes with extended vase life so that elite genotypes could be recommended for commercial cultivation. Therefore, the present investigation was conducted to evaluate various chrysanthemum genotypes best suited for commercial cultivation under the coastal plain zone of Odisha.

2. Materials and Methods

An experiment was carried out in the experimental plots of All India Co-ordinated Research Project on Floriculture at BTCC, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha, from July 2017 to February 2018. The experimental site is in the Eastern coastal plain zone of Odisha.

The site has an average altitude of 45 metres (148 feet) above mean sea level, is located at latitude of 20.27 °N and longitude of 85.84 °E; having mild winter for 4 months after which the summer season begins. The source of rainfall is South-West summer monsoon. It received an average annual rainfall of 1,542 mm (61 in), most of which is received between June and September. The experiment was laid out in a randomized block design with nine treatments and three replications. Nine genotypes viz., HCC-1, HCC-2, HCC-3, Bidhan Madhuri, Bidhan Jayanti, Bidhan Purna, Arka Gold, Arka Chandrika and Flirt as check were selected for their evaluation. The chrysanthemum plants of the respective genotypes were raised in nursery through terminal stem cuttings in pots filled with riverbed sand in July 2017. The well-rooted terminal cuttings of nine genotypes were transferred to polybags containing soil FYM mixture (1:1). The well-established plants in polybags were transplanted at 40 cm x 30 cm in a plot size of 2.0 m x 1.8m accommodating thirty plants per plot. All the treatments were randomized separately in each replication. Uniform package of practices was followed throughout the experiment to grow healthy crops. Irrigation and drainage channels were laid out for efficient intercultural operations. Routine intercultural operations were done at appropriate stages of the crop. Five randomly selected plants per genotype per replication were tagged for recording observations on various vegetative, flowering and quality characters as well as vase-life under tap water. The data collected were analyzed using statistical methods as suggested by Gomez and Gomez (1984)^[5].

3. Results and Discussion

Significant differences were observed in vegetative and flowering quality characters among chrysanthemum genotypes (Table 1.) indicating that a single genotype was not superior for all traits which may be due to varied growth conditions and their genetic make-up (Panwar *et al.*, 2013)^[9]. The maximum plant height was recorded by Flirt (67.03 cm) and is statistically at par with Bidhan Madhuri (66.42 cm), Bidhan Purna (66.09 cm) and Arka Chandrika (65.24 cm) whereas the minimum plant height was observed in HCC-2 (45.36 cm). The significant variation with respect to plant height among the chrysanthemum genotypes were also noticed by Ona *et al.* (2015)^[8], Srilatha *et al.* (2015)^[15] and in gerbera by Singh *et al.* (2008)^[14]. Bidhan Madhuri (42.06 cm) showed maximum plant spread (N-S) followed by Flirt (41.20 cm) and the minimum was recorded in HCC-2 (24.59 cm). The maximum plant spread (E-W) was exhibited by Flirt (41.96 cm) followed by Bidhan Madhuri (41.39 cm). The genotype HCC-2 (25.08 cm) attained minimum plant spread (25.08 cm). It might be due to bigger sized leaves produced by cultivars. Leaf production of any crop decides the spread of plant; leaves are the prime important functional units for photosynthesis, which greatly influence the growth and flower yield. These results were supported by Deka and Talukdar (2015)^[4]. Variation in plant spread may also be due to additive gene effects (Vidalie *et al.*, 1985)^[16]. The number of primary branches per plant was significantly higher in cultivar Bidhan Madhuri (4.60) followed by Arka Chandrika and Flirt (3.47); while HCC-3 and Bidhan Purna (2.73) has lesser number of primary branches per plant. The variation may be due to varied growth rates and their genetic potential resulted in variation in phenotypic expression. The results were similar

with findings of Srilatha *et al.* (2015)^[15] and Singh *et al.* (2008)^[14].

Floral characters are very important for judging the performance of any genotypes as they contribute to the time of availability and quality of flowers. The number of days taken for flower opening is an important character in chrysanthemum as early or late flowering genotypes may be useful for regular availability of flowers. However, earliness is a desirable trait in flower crops as early flowering is desirable to catch the early market for better return and maximizing financial gain. It is evident from the data that genotype Bidhan Purna (33.33 days) took the least number of days for bud appearance followed by HCC-3 (33.67 days), HCC-2 (34.33 days), HCC-1 (34.67 days) and Bidhan Jayanti (34.67 days) whereas the maximum days was recorded in Arka Gold (42.33 days). The minimum and maximum days for flower opening were recorded by Bidhan Purna (59.67 days) and Flirt (80.33 days) respectively. The variation exhibited by the genotypes for the flowering characters may be due to genotypic variability existing among genotypes and the individual response of genotypes to prevailing climatic conditions which is well supported by the work of Chezhiyan *et al.* (1985)^[3], Wilfert (1987)^[17], Singh and Dadlani (1989)^[13] and Barigidad *et al.* (1992)^[2].

Flower yield per plant is the most important factor in judging the performance of any genotypes and very much desired by the growers. The data presented in the table indicates that the largest diameter of the flower was observed in Flirt (7.52 cm), followed by Bidhan Purna (6.96 cm) and Arka Gold (6.96 cm) but the smallest diameter of the flower was showed by HCC-2 (2.57 cm). The highest number of ray florets per flower was observed by Bidhan Jayanti (363.13) followed by Arka Chandrika (272.47) while the lowest was noted in Bidhan Purna (71.87). HCC-2 (263.06) noted maximum number of flowers per plant while Flirt (89.20) recorded the lowest number of flowers per plant. The maximum average flower weight (3.90 g) was recorded by Flirt closely followed by Bidhan Madhuri (3.55 g) while the minimum flower weight (0.40 g) was recorded by HCC-2. Bidhan Madhuri (487.32 g) has the highest yield followed by Arka Chandrika (412.66 g) and Bidhan Jayanti (409.59 g) on the contrary the lowest yield was recorded by HCC-2 (102.42 g). The longest and shortest duration of flowering was exhibited by Bidhan Purna (39.00 days) and Flirt (26.33 days) respectively. The variation in yield might be due to regulation of yield characters by the different genetic constituent of the genotypes. The findings are in accordance with the work of Barigidad *et al.* (1992)^[2], Barigidad and Patil (1997)^[1], Laskar and Yadav (1995)^[7], Singh and Dadlani (1989)^[13].

Vase life or keeping quality of the flowers is of great importance in determining the safe marketing of flowers to the distant markets. At room temperature, the genotype Bidhan Madhuri (21.44 days) and HCC-2 (21.44 days) noted maximum vase life whereas the lowest keeping quality was in genotype Arka Gold (12.67 days); which is supported by the works of Kandpal *et al.* (2003)^[6] in gerbera flower. During the entire investigation, it has been observed that different chrysanthemum genotypes showed variable responses for vegetative and flowering characteristics under similar growing media and environment. This might be due to their genetic composition which interacts differently to the soil and climatic condition of the prevailing area.

Table 1: Mean performance of 9 genotypes of chrysanthemum for quantitative parameters

Sl. No.	Genotypes	Characters												
		Plant height*	Plant spread (N-S)*	Plant spread (E-W)*	No. of primary branches per plant*	No. of days taken for bud appearance*	No. of days taken for bud opening*	Vase life*	Flower diameter*	No. of flowers per plant*	Flower weight*	Weight of flowers per plant*	Duration of flowering*	No. of ray florets per flower*
1.	HCC-1	54.55	29.27	28.10	3.07	34.67	64.33	15.33	6.11	117.13	1.86	217.87	33.00	81.87
2.	HCC-2	45.36	24.59	25.08	3.13	34.33	64.33	21.44	2.57	263.06	0.40	102.42	32.33	192.27
3.	HCC-3	46.72	25.02	26.48	2.73	33.67	66.33	20.88	4.55	182.73	1.57	291.97	32.67	196.13
4.	Bidhan Madhuri	66.42	42.06	41.39	4.60	41.33	73.00	21.44	6.15	135.67	3.55	487.32	34.67	187.60
5.	Bidhan Jayanti	55.83	35.41	34.79	3.07	34.67	62.67	18.78	6.50	126.26	3.17	409.59	30.67	363.13
6.	Bidhan Purna	66.09	36.11	34.93	2.73	33.33	59.67	19.55	6.96	155.00	1.61	238.35	39.00	71.87
7.	Arka Gold	57.16	37.18	38.77	3.27	42.33	63.33	12.67	6.69	107.47	3.40	375.08	30.67	197.27
8.	Arka Chandrika	65.24	38.78	39.26	3.47	40.33	79.00	19.66	6.85	119.60	3.43	412.66	28.33	272.47
9.	Flirt	67.03	41.20	41.96	3.47	37.33	80.33	15.33	7.52	89.20	3.90	349.94	26.33	216.33
	S.Em (±)	0.90	1.01	0.95	0.32	0.45	0.71	0.45	0.14	3.53	0.11	11.57	0.68	2.20
	C.D. (5%)	2.70	3.02	2.84	0.97	1.35	2.14	1.36	0.42	10.61	0.32	34.69	2.05	6.60

* Significant at 5%

4. Conclusion

The genotypes Bidhan Madhuri, Arka Chandrika and Bidhan Jayanti were found to be promising genotypes with higher yield per plant, better vase life and have a desirable appearance with attractive blooms; based on quantitative and qualitative traits. Thus, Bidhan Madhuri, Arka Chandrika and Bidhan Jayanti were recommended genotypes for the commercial cultivation as a cut flower as well as a loose flower in the coastal plain zone of Odisha. Also, there were considerable morphological variations in vegetative and floral characters among genotypes studied; which can be considered as useful selection criteria for further improvement in chrysanthemum.

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