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# Performance of chrysanthemum varieties under the agro-climatic subzone of Bundelkhand

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## ABSTRACT

*An experiment was conducted to evaluate twelve varieties of chrysanthemum for vegetative and flowering attributes at the Rani Lakshmi Bai Central Agricultural University, Jhansi under the Agro-climatic subzone of Bundelkhand during the years 2019–20 and 2020-21 in Randomized block design with three replications. A wide range of variation was observed in the performance of the twelve varieties evaluated for vegetative growth and flowering parameters. The variety Flirt recorded maximum plant height (49.90 cm) whereas maximum plant spread (40.27 cm) was recorded in variety Pusa Shwet. Minimum days (46.33 days) taken to 50% flowering were recorded in variety Sadbhawana. Maximum average flower weight (3.86 g) was recorded in variety Flirt whereas, the highest number of flowers per plant ((38.78) was observed in Pusa Sona. However, the maximum flowering duration (52 days) was recorded in variety Kundan.*

**Keywords:** Bundelkhand, Chrysanthemum, climate, evaluation, flowering

## INTRODUCTION

Chrysanthemum (*Dendranthema grandiflora* Tzvelev) is one of the most important flowering plant, commercially grown in different parts of the world. It is native of northern hemisphere chiefly Europe and Asia. It is member of Asteraceae, the most phytogenetically advanced dicotyledonous family. It is popular due to its large number of varieties in respect of growth habit, size, colour and shape of bloom. As a short-day plant, it naturally flowers in the autumn and winter. Chrysanthemum is grown for cut flowers, loose flower, as potted plants and as border plant in the garden. Various types of red, yellow, white and pink coloured chrysanthemum are grown in abundance for different purposes. The major use of chrysanthemum in our country is for making garlands, *veni*, bracelets, flower decoration and in religious offerings. Chrysanthemum flowers can be produced throughout the year and (or) in off-season at any time by environmental manipulation, fertilization, using growth regulating chemicals, by manipulating lighting, its blooming time can be controlled accurately (Sharma *et al.*, 2022) and also growing media (Thakur, 2022). Chrysanthemum can be grown in Bundelkhand region of Uttar Pradesh particularly in one of its biggest cities of this region, Jhansi which has a relatively high market demand. However, much of the chrysanthemum flower produced are consumed in the form of loose flowers for various religious purposes such as for garlands and loose flowers for worship. At present the increasing demand for quality chrysanthemum flowers in this region of Uttar Pradesh are being met by the flowers supplied from the neighbour states viz. Madhya Pradesh at a relatively higher cost. Though there is a high demand of chrysanthemum flowers in this region but poor yielding ability of the existing varieties grown limit the production of chrysanthemum in Bundelkhand region in general and Jhansi in particular. The Bundelkhand region lying in the Bundelkhand Agro-climatic subzone (BACZ) under the Central plateau and the hills region is highly prone to the impacts of climatic variability particularly temperature and precipitation. Therefore, there is a need to identify varieties best suited for commercial cultivation in Bundelkhand zone which will find a ready acceptance among the farmers. This will not only meet demand of domestic market but also provide livelihood especially to the marginal and small farmers. Moreover, for breeding purpose, evaluation of germplasm for horticultural traits for genetic variability is crucial for selecting elite genotypes (Pandravada *et al.*, 2015). Keeping in view of the above facts, attempts were made to

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identify suitable varieties for commercial production of chrysanthemum loose flowers in Jhansi district of Bundelkhand Zone of Central plateau and hills agro-climatic zone.

## MATERIALS AND METHODS

The experiments were conducted at the Research Farm of the Rani Lakshmi Bai Central Agricultural University Jhansi during the years 2019-20 and 2020-21. The climatic data on temperature and precipitation of thirty years (1990-2020) was analyzed (Zepner *et al.*, 2020) and also that of experiment duration for both the years was recorded and compared for the suitability of chrysanthemum cultivation. The treatments comprised of twelve varieties of Chrysanthemum (*Dendranthema grandiflora* Tzvelev) viz., Pusa Sona, Pusa Aditya, Flirt, Lal Pari, Terri, Dolly Orange, Pusa Shwet, Kundan, Pusa Kesar, Sadbhavna, Ajay, Pusa Guldasta. Experiment was laid out in randomized block design (RBD) with three replications. The plants were transplanted during first week of August in both the years and the individual plot size was 2.4m x 1.2m. Distance between blocks and plots were 1m and 0.5 m, respectively. A uniform dose of F.Y.M. @ 20 t/ha was incorporated to all the plots before planting and NPK was applied @ 125: 120: 25 Kg/ha. Nitrogen was applied in two split doze. Half of the N and full doze of P and K was applied as a basal doze while remaining half nitrogen doze was applied 30 days after planting. The recommended agronomic package of practices was followed during the course of investigation. Data were recorded for different vegetative growth and flowering parameters viz., plant height (cm), plant spread (cm), days taken for 50% flowering, flower diameter (cm) and duration (days)and number of flowers per plant. The data recorded on growth and flowering behavior for both the years were pooled and subjected to statistical analysis using SPSS 10.0 statistical software (SPSS Inc., USA).

## RESULTS AND DISCUSSION

### Climatic parameters (temperature and precipitation) in Jhansi

Based on the thirty year record (1990-2020), both from the Walther-Lieth climate chart (Fig 1) and Distribution Plot (Fig 2), it can be seen that Jhansi district has a mean temperature of 25.9$^0$C and mean precipitation of 959.8 mm (Zepner *et al.*, 2020). The temperature starts rising steeply from the month of February (19.3$^0$C) with maximum in the months of May (34.4$^0$C) and June (34.1$^0$C) and lowers down in the month of July (29.6$^0$C) with the onset of monsoon rains and remains in declining trend till the month of January. Usually, the rainfall duration is from June to September, with maximum precipitation in the months of July (303.8 mm) followed by August (298.8 mm). Due to high rains in July, it becomes difficult for intercultural operations, therefore chrysanthemum planting was done in August in both the years at Jhansi. Further, the mean temperature and rainfall during the crop growth period in both the years (2019-20 and 2020-21) was in line with that of the preceding thirty years (Fig 3) with no abrupt trend. Temperature has a significant effect on development and flowering and optimum flowering temperature lies between 17º – 22ºC. But flowering is also variety dependent and distinct differences between varieties are seen in response to temperature (Ploeg and Heuvelink, 2006). Therefore, promising varieties were further evaluated for their performance under the prevailing climatic conditions of the Jhansi district.

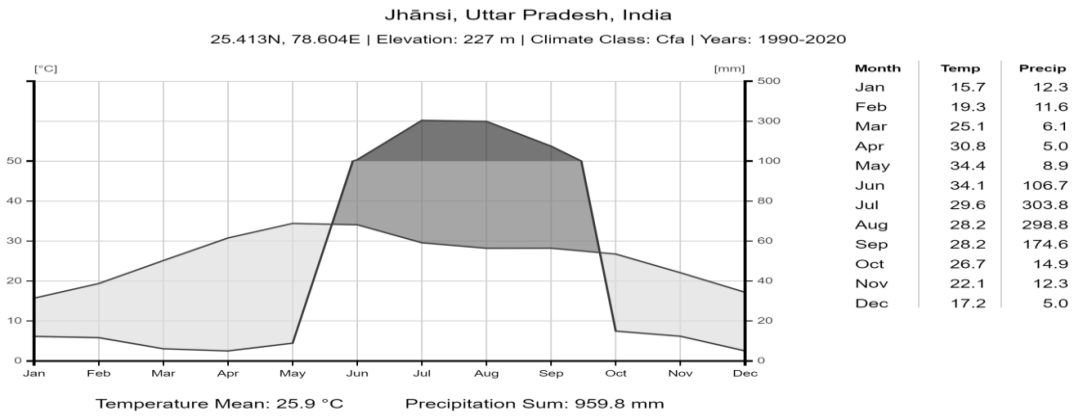


Fig 1: Walther-Lieth climate chart depicting mean temperature and precipitation (1990-2020) in Jhansi district

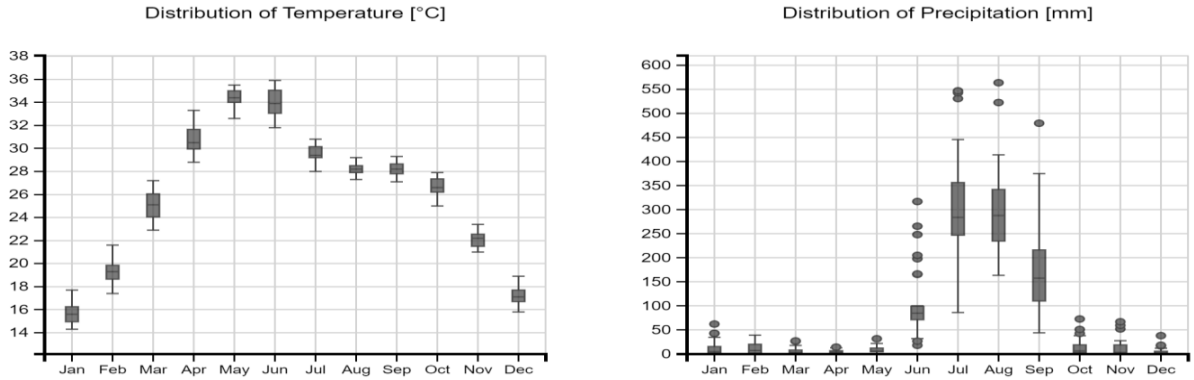


Fig 2: Distribution plot for mean temperature and precipitation (1990-2020) in Jhansi district

**Growth and flowering parameters in chrysanthemum**

The performance of the vegetative characters of the twelve chrysanthemum varieties presented in Table 1 indicates significant variation in these characters among the varieties. The variety Flirt, recorded maximum plant height (49.90 cm) which however, had at par values with varieties Kundan, Pusa Aditya, Pusa Guldasta, and Dolly Orange. Whereas, the maximum plant spread was recorded in variety Pusa Shwet (40.27 cm) which was at par with varieties Pusa Aditya and Flirt. The variation in vegetative growth parameters may be attributed to genetic factors which affect the performance over a wide range of environmental conditions. Vrsek *et al.* (2006) reported that the higher plant height obtained from plants could be attributed to increased photosynthetic capacity of the plants whereas, variation in plant spread may be due to additive gene effects (Singh *et al.*, 2017). The results are in conformity with the findings of Swaroop *et al.* (2008), Kumar and Chattopadhyay (2002) and Rao and Shushma (2014) who also reported distinct difference among vegetative parameters in Chrysanthemum varieties.

Table 1: Performance of vegetative and flowering characters of chrysanthemum varieties (Mean of two years)

| Varieties | Plant height (cm) | Plant spread (cm) | Days to 50% flowering | Flowering Duration (days) | Flower diameter (cm) | Flower weight (g) | No. of flowers |
|---|---|---|---|---|---|---|---|
| Pusa Sona | 35.70 | 34.00 | 54.67 | 48.00 | 5.00 | 1.10 | 38.78 |
| Pusa Aditya | 46.53 | 39.17 | 51.67 | 50.33 | 5.58 | 1.90 | 34.30 |
| Flirt | 49.90 | 38.27 | 72.67 | 43.67 | 6.48 | 3.86 | 35.89 |
| Lal Pari | 36.13 | 30.33 | 67.67 | 48.67 | 4.73 | 1.77 | 29.06 |
| Terri | 39.13 | 32.10 | 66.00 | 46.33 | 5.87 | 1.80 | 33.36 |
| Dolly Orange | 49.23 | 32.20 | 77.00 | 43.00 | 5.27 | 2.00 | 36.56 |
| Pusa Shwet | 40.70 | 40.27 | 73.33 | 45.67 | 7.60 | 2.36 | 34.97 |
| Kundan | 49.57 | 37.33 | 79.33 | 52.00 | 6.27 | 2.56 | 35.04 |
| Pusa Kesar | 37.27 | 31.12 | 64.00 | 43.67 | 4.58 | 1.83 | 33.87 |
| Sadbhavna | 39.37 | 30.17 | 46.33 | 48.00 | 4.57 | 1.00 | 33.26 |
| Ajay | 45.93 | 30.10 | 78.67 | 42.00 | 5.28 | 2.12 | 33.10 |
| Pusa Guldasta | 49.23 | 37.33 | 72.00 | 42.00 | 4.67 | 3.00 | 35.42 |
| CD (p=0.05) | 3.83 | 2.52 | 3.80 | 4.21 | 0.61 | 0.90 | 2.56 |

With regard to the flowering attributes, significant variation was observed among the varieties for various flowering attributes (Table 1). Significantly earliest days to 50% flowering (46.33 days) was recorded in variety Sadbhawana followed by variety Pusa Aditya. Singh *et al.* (2021) also reported earlier days of flowering in Pusa Aditya. The variation in time to flowering in chrysanthemum genotypes was also reported by Rao and Pratap (2006). The

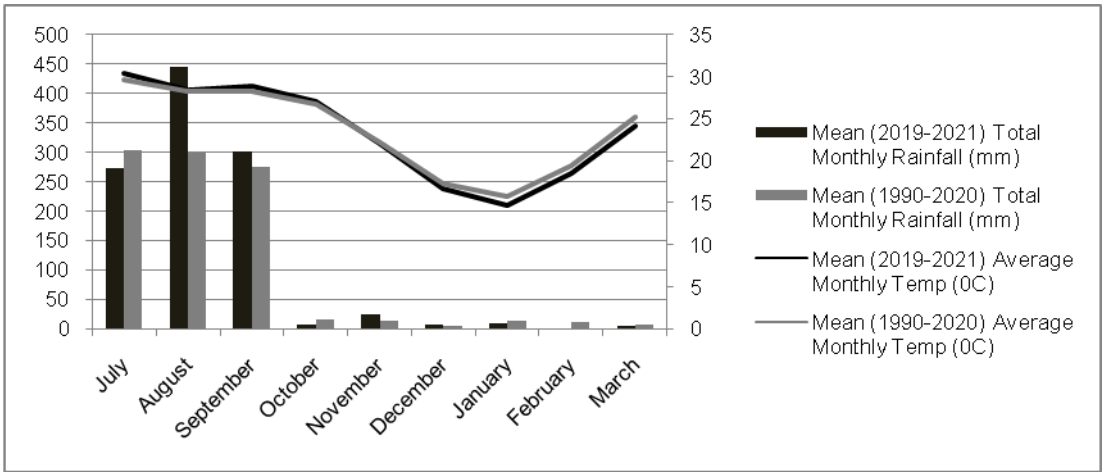


Fig 3: Mean temperature and rainfall in Jhansi district during crop period (2019-20 and 2020-21)

difference in flowering time might be due to the genotype or the influence of genotype and environment (Srilatha *et al.,* 2015). The maximum flower diameter (7.60 cm) was observed in the variety Pusa Shwet which was significantly superior over other varieties. Significant variation in flower diameter and weight were also observed by Negi *et al.* (2020). Variation in flower diameter may be due to genetic influence of the varieties under the particular environment (Kumar *et al.*, 2020). The variety Flirt recorded significantly maximum flower weight (3.86g) followed by Pusa Guldasta both of which however, were found to be at par with each other. This is in line with the findings of Singh *et al.* (2021) who also reported higher flower weight in Pusa Guldasta. The maximum number of flowers per plant was recorded in variety Pusa Sona (38.78) which had at par value with the variety Dolly Orange followed by Pusa Guldasta. Higher flower number in variety Pusa Sona in first year and Pusa Guldasta in the following year has also been reported by Singh *et al.* (2021). Variation of number of flowers per plant due to genotypes has also been reported by Kumar *et al.* (2020). Maximum flowering duration was obtained in variety Kundan followed by varieties Pusa Aditya, Lal Pari and Pusa Sona. Variation in accumulation of maximum photosynthates in different genotypes or varieties may have resulted in production of more weight and number of flowers as well as bigger size flowers. Similar results for difference in flowering duration among the genotypes have been reported by Singh *et al.* (2008) and Rao and Pratap (2006) and due to interaction between genotype and environment (Negi *et al.*, 2020).

Therefore, from the present study the varieties viz., Flirt, Pusa Sona, Pusa Guldasta and Kundan can be recommended for cultivations under Bundelkhand region, which can benefit the farmer by producing higher return by meeting out the current market demand of these regions.

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