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Performance of different cultivars of Dahlia (*Dahlia variabilis* L.) under agro-climatic conditions of Gwalior

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Abstract
The present investigation entitled "Performance of different cultivars of Dahlia (*Dahlia variabilis* L.) Under agro-climatic conditions of Gwalior" was carried out in the Research field of Department of Horticulture, School of Agriculture, ITM University Gwalior during the year 2014-2015. The experiment was laid out in randomized block design with three replications and 12 treatments V_1- Kenya Red, V_2- Blackout, V_3- Jyotsana,V_4 - DRS,V_5 - Korean Orange, V_6 - CalvinRose, V_7 - Korean Yellow, V_8-Prime Minister, V_9-Kenya Gerua, V_{10}-Kenya White, V_{11} - Korean Blue, V_{12}- Korean White. Study shows that the cultivar Prime Minister recorded maximum plant height (23.54 cm), number of leaves (59.57), number of branches (6.34) and number of flowers per plant (8.31). Minimum number of days taken to flowering was recorded in Blackout (56.39). Maximum diameter of flower (19.68 cm) and maximum bloom life of flower was recorded in Korean Orange (8.28). Further, the maximum numbers of tubers has been recorded Prime Minister (7.55) whereas; maximum weight of the tuber (85.32g) was recorded in Korean Orange. Thus, it was concluded that the cultivar Prime Minister is most suitable cultivar of Dahlia to get maximum number of flowers and tubers whereas, the cultivar Korean Orange was found to be best for flower diameter, bloom life of flowers and weight of tubers under Gwalior agro-climatic condition.

Keywords: Dahlia, cultivar, tuber size, flower diameter, number of flowers

Introduction
Floriculture in India has immense potential for generating gainful self-employment among small and marginal farmers. In the recent years, it has emerged as a profitable agri-business in India and worldwide. The increased in the production and trade of floricultural products is due to sound research system, focused attention of government coupled with innovative entrepreneurs. The states with major contribution in cut flower production are West Bengal (27%), Karnataka (13%), and Odisha (11%), whereas Tamil Nadu (19%), Karnataka (12%), Madhya Pradesh (11%) and Mizoram (10%) have gone ahead of other states in loose flower production. United States, Germany, United Kingdom, Netherlands and United Arab Emirates were major importing countries of Indian floriculture (Anonymous, 2016) [6].

Dahlia is one of the most popular bulbous flowers grown in many parts of the world for its beautiful ornamental blooms having varying shades of different colours, being useful as cut flowers besides for the beautification of gardens (Vikas *et al.*, 2015) [26]. They are extensively used for exhibition, garden display and home decoration and cut flowers of pompon and miniature types stay fresh in flower vases for many days and also make moderately good garlands (Gupta, 2015) [10]. Identification of genotypes better suited for particular region and their improvement is of immediate task to exploit their full potential. The improvement can be brought out after confirming the association among the most important growth with quality attributes (Vikas *et al.*, 2015) [26]. The modern dahlia cultivars offer a diversity of colors, shapes, and sizes and it is very rich in its varietal wealth and every year there is an addition of new varieties; hence varietal evaluation becomes necessary to find out suitable variety for a particular region (Kumar and Yadav 2005) [16].

Materials and Method
The present investigation was carried out at research field department of horticulture, School of Agriculture, ITM University Gwalior. MP during the year 2014-2015.The experiment comprises of twelve different varieties of dahlia tested under Gwalior condition. The soil type of experimental field was sandy loam in nature. The experiment was laid out in Randomized Block Design with three replications. All the agronomic practices wear practiced as per

recommended except the variety wise planting material used as per treatment. Well rotten farm yard manure was applied @ 2kg m^{-2}. Basal application of fertilizers, full dose of phosphorus, potassium and ½ dose of nitrogen were applied in marked plots respectively. These nutrients supplied by Urea, Di- ammonium phosphate (DAP) and Muriate of Potash (MOP). Some amount of nitrogen was supplied by Di-ammonium phosphate (DAP) and remaining nitrogen was applied through urea as top dressing at 30 days after sowing. The different morphological character were observed, recorded and analyzed as per recommended procedure to find out the result of present investigation.

Result and Discussion

The observation on the plant growth, phenological parameters flowering character and yield which were recorded have been tabulated, statistically computed and the same are presented here under the appropriate headings.

Plant height (cm)

The date recorded on plant height at harvest was statically analyzed and presented in (Table 1). Plant height is Prime Minister the maximum plant height (72.42 cm) which was significantly superior to all other cultivars. The cv. Korean Yellow (71.30 cm) was next to Prime Minister for plant height followed by Korean White (70.07 cm), Korean Blue (70.03 cm) and cv. Korean Orange (69.57 cm), while the minimum plant height was observed with cv. Kelvin Rose (51.97cm). The variation among the cultivars for plant height may be due to the genotypic character environmental factor, which may have accelerated or retarded the activity of natural plant hormones in the stem. The variation in plant height has also been reported by Ajeet *et al* (2015) [3] in dahlia, Basakaran *et al.* (2010) [8] in chrysanthemum, Raghuvanshi *et al.* (2011) [22] in marigold and Hussain and Khan (2004) [11] in rose.

Number of leaves per plant

Prime Minister recorded the maximum number of leaves per plant (59.20) followed by Korean Yellow (59.14) which was at par. The cv. Korean Blue (52.57), Korean White (52.63) and Korean Orange (48.66) were found to be next to Korean Yellow with respect to number of leaves. The minimum number of leaves per plant was observed with cv. Kelvin Rose (35.17). Maximum number of leaves in Prime Minister and Korean Yellow may be due to the favourable agro climatic conditions and their better interaction with the present environment. The mutual coordination of nutrients absorption and photo assimilates in the presence of optimum temperature and relative humidity during the vegetative growth resulted in more leaves appearing in some cultivars. These results coincide with the findings of Ali *et al.* (2015) [4] in chrysanthemum. According to Wilson (1972) [27] the production of more leaves may be due to the influence of environmental factors which accelerate photosynthesis processes and enable the plant to form a large number of leaves. Charles (1995) [9] reported that the difference for number of leaf per plant among cultivars was due to their genetic composition.

Number of branches per plant

The highest number of primary branches were recorded under the cv. Prime Minister (6.34) which was at par with Korean Yellow (6.33). However, it was significantly superior over all other cv. viz. Korean White (6.00), and Korean Blue 5.78 and Korean Orange (5.55). The minimum number of branches per plant (3.33) was observed in Kelvin Rose. Difference in branches among the dahlia cultivars could be due to influence of genetically make up of dahlia cultivars. Variation in number of branches may also be attributed to the soil and climatic conditions prevailing in the area that influenced the cultivars. Similar variation for number of branches was also observed by Munikrishnappa *et al.* (2013) [19] in China aster. Shaukat *et al.* (2013) [24] also reported variation in vegetative character in gladiolus.

Table 1: Effects of different cultivars on growth characters of dahlia

Variety/Cultivars	Plant height (cm)	No. of Leaves per plant	No. of Branches per plant
Kenya Red (V_1)	67.57	40.25	5.27
Blackout (V_2)	56.32	37.75	4.51
Jyotsana (V_3)	56.56	38.58	4.53
DRS (V_4)	57.50	39.56	4.65
Korean Orange (V_5)	69.57	48.66	5.55
Kelvin Rose (V_6)	51.97	35.17	3.33
KoreanYellow (V_7)	71.30	59.14	6.33
Prime Minister (V_8)	72.42	59.20	6.34
Kenya Gerua (V_9)	67.61	46.56	5.38
Kenya White (V_{10})	62.74	40.20	5.40
Korean Blue (V_{11})	70.03	52.57	5.78
Korean White (V_{12})	70.07	52.63	6.00
S. Ed. (±)	0.31	0.20	0.16
CD at 5%	0.65	0.41	0.33

Days taken to flowering

The data reveals that the cultivars varied significantly with respect to days taken to flowering.Table2. It is evident from the data that minimum number of days taken to flowering was observed in cv. Black Out (56.39) which was significantly superior over all other varieties and was followed by Prime Minister (62.48), DRS (63.57) and Jyotsana (63.65). Maximum days taken to flowering were recorded by cv. Korean Orange (77.79) followed by cv., Korean Yellow (76.96) and Korean Blue (76.37) which were at par with each other. This differential behaviour of cv. for flowers emergence might be due to individual response of the cultivars to prevailing temperature condition as reported by Arora and Khanna (1985) [7]. Similar variation among the cultivars has also been reported by earlier workers (Ganesh *et al.* 2014) [10].

Diameter of flower (cm)

It is evident from the table that the cv. Korean Orange recorded maximum diameter of flower of flower (19.68 cm) which was significantly superior over all other cv. It was followed by the cv. Korean Blue (18.47 cm), Korean Yellow (18.50 cm), Korean White (18.10 cm) and Kenya Red (17.76 cm), while minimum diameter of flower (16.20 cm) was measured in case of cv. Jyotsana. The variation among the cv. for diameter of flower may be due to inherent character of individual cultivars (Jamaluddin *et al.*, 2015) [12-13]. The size of flowers also depends on the size and health of the bulbs, which produced flowers accordingly (Ali *et al.* 2015) [4]. Sestras *et al.* (2007) [23] also conducted research on the varietal evaluation of different tulip cultivars and noted that the increase in the diameter of the flower was due to climatic factors and the genetic potential of the cultivars. Their work is in close conformity with the present findings. Similar findings have also been reported previously in Gerbera by Mahmood *et al*, (2013) [18] and Gupta *et al.* (2015) [10] in Dahlia.

Table 2: Effects of different cultivar on floral characters

Variety/Cultivars	Days taken to flowering	Diameter of flower(cm)	Bloom life of flower	No. of Flowers per plant
Kenya Red (V_1)	72.27	17.76	6.65	6.09
Blackout (V_2)	56.39	17.29	6.03	7.54
Jyotsana (V_3)	63.65	16.26	5.65	7.45
DRS (V_4)	63.57	16.41	5.64	7.43
Korean Orange (V_5)	77.79	19.68	8.28	5.54
Kelvin Rose (V_6)	65.44	16.26	5.63	6.67
KoreanYellow (V_7)	76.96	18.50	7.98	5.41
Prime Minister (V_8)	62.48	16.33	5.60	8.31
Kenya Gerua (V_9)	71.09	17.70	6.61	4.88
Kenya White (V_{10})	70.23	17.30	6.28	4.44
Korean Blue (V_{11})	76.37	18.47	7.73	4.31
Korean White (V_{12})	76.14	18.10	7.71	4.09
S. Ed. (±)	0.34	0.13	0.16	0.06
CD at 5%	0.71	0.26	0.33	0.17

Bloom life of flower

It can be observed from that the maximum bloom life of flower days was recorded in cv. Korean Orange (8.28) which was at par with Korean Yellow (7.98). The cv. Korean Blue (7.73), Korean White (7.7) and Kenya Red (6.65) were also observed to have more bloom life and were at par with Korean Yellow. The minimum bloom life of flower was recorded in cv. Prime Minister (5.60).Differences in days taken to durability may be attributed to varietal characteristics of different dahlia cultivars. Similar findings were found inrose (Tabassum *et al.*, 2002) [25] and in gerbera (Nair and Mehedi, 2004) [21]. The present findings in dahlia are also in conformity with Gupta *et al.* (2015) [10] and Mahawer *et.al.* (2010) [20] in Dahlia.

Number of flowers per plant

As shown in table 2. The maximum number of flowers per plant (8.31) was recorded in cv. Prime Minister which was followed by cv. Black Out (7.54), cv. Jyotsana (7.45), cv. DRS (7.43) and cv. Kelvin Rose (6.67), whereas minimum number of flowers per plant was recorded in case of cultivar Korean White (4.09). Varietal differences for number of floret spike may be due to the fact that a gene exerts influence on physiological processes by controlling the synthesis of amino acid and proteins responsible for growth and development. Such varietal differences for floret size have been reported by earlier works (Nagaraju and Parthasarathy (2001) [20].

Table 3: Effects of different cultivars of tuber characters

Variety/cultivars	No. of tuber per plant	Weight of the tuber per plant (g)
Kenya Red (V_1)	5.22	67.56
Blackout (V_2)	7.25	63.71
Jyotsana (V_3)	6.56	62.10
DRS (V_4)	6.44	56.19
Korean Orange (V_5)	4.54	85.32
Kelvin Rose (V_6)	5.48	55.17
KoreanYellow (V_7)	4.31	73..11
Prime Minister (V_8)	7.55	55.40
Kenya Gerua (V_9)	4.31	64.62
Kenya White (V_{10})	4.23	65.68
Korean Blue (V_{11})	4.18	72.30
Korean White (V_{12})	4.08	72.00
S. Ed. (±)	0.08	0.32
CD at 5%	0.16	0.66

Number of tubers per plants

The number of tubers per plant ranged from 4.08 to 7.55. It is evident from the table that the cv. Prime Minister has recorded maximum number of tubers per plants (7.55) which was significantly superior over all other cv. It was followed by Black Out (7.24), Jyotsana (6.56), DRS (6.44) and Kelvin Rose (5.48).The minimum number of tubers per plants was measured in case of Korean White (4.08).A wide range of variation in this parameter might be due to genetic constitution of the cultivars. The production of more bulbs may also be due to some cultivars the production of more tubers may also be attributed to the reason that some cultivars

acclimatized well to the environment and thus, produced more tubers per plant. These findings are related to the research of John *et al.* (2007) [14], who presented that the bulb lets production increased in some cultivars by the interaction of soil nutrients and environment.

Weight of the tuber (g)

It is evident from that the weight of the tuber (g) was influenced significantly by different dahlia cultivar Among the different cultivars, maximum weight of the tuber (85.32g) was recorded by cv. Korean Orange which was followed by cv. Korean Yellow (73.11g), Korean Blue (72.30g), cv. Korean White (72.00g) and cv. Kenya Red (67.56 g). The minimum weight of the tuber was recorded with cv. Kelvin Rose (55.17g). Variations in bulb weight among the different dahlia cultivars under trial might due to the genetic different and local environmental condition soil structure and texture might have been responsible for the increase in weight of tubers. The difference in the weight of the bulbs may also be attributed to the number of the leaves and leaf area which might have supplied a larger amount of food to the bulbs increasing the weight. These results are similar to finding of Ahmad and Khurshid (2004) [2], who reported that the differences in the weight of tubers might be due to the marketed varietal differences and genetic variation among the particular cultivars. Gupta *et al.* (2015) [10], Kumar *et al.* (2009) [17], Ahmad and Gul (2002) [1] also reported variation in the weight of tubers in Dahlia cultivars.

Conclusion

It was concluded that the dahlia cultivars showed statistically significant variations in all phenotypic characters observed in this study. Kenya Orange was found to be best cultivar regarding size and bloom life of flower whereas, the cultivar Prime Minister recorded maximum number of flowers and tubers.

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