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Prashant Shukla

Student, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh India

Dr. VM Prasad

Prof. Head, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India

Saad S Burondkar

Student, Department of Biological Sciences, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India

Xiaodong Dong

Student, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India

Correspondence**Dr. VM Prasad**

Prof. Head, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India

Evaluation of dahlia hybrids (*Dahlia variabilis* L.) under Allahabad agro climatic conditions

Prashant Shukla, Dr. VM Prasad, Saad S Burondkar, and Abdulraqueeb A Ainarkar

Abstract

An investigation, "Evaluation of Dahlia hybrids (*Dahlia variabilis* L.) Under Allahabad Agro Climatic Conditions" was carried out in the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, during the year 2017-2018. The experiment was laid out in simple randomized block design with three replication and thirteen treatments with a view to find out the overall evaluation of different hybrid varieties of Dahlia viz. Santasy Ma, S.P. Kamla, Kenya Yellow Spot, S.P. Glory of India, Kenya White, Kenya Blue, S.P. Sri Radha, Mangal Pandey, Eternity Sport, Bhikkus Buddha, Bhikkus Mother, Bama Khapa, on the basis of different growth, yield and tuberous root parameters. Maximum plant height was found in the hybrid Bhikkus Buddha (70.14 cm). Maximum plant spread was found in hybrid Bhikkus Buddha (52.20 cm). Maximum number of primary branches was found in hybrid Bhikkus Buddha (12.33). Maximum number of leaves was found in hybrid Bhikkus Buddha (32.29). Minimum number of days required for first bud emergence from planting (38.95 days) was found in hybrid Mangal Pandey. Maximum diameter of fully opened flower (23.55 cm) was found in hybrid S.P. Romia. Maximum weight of single flower (104.63 g) was found in hybrid S.P. Romia. Maximum flower duration (15.33 days) was found in S.P. Romia. Minimum number of days required for complete flower opening after bud emergence (7.23 days) was found in hybrid Bama Khapa. Maximum numbers of flower per plant (13.34) was found in hybrid Bama Khapa. Maximum flower yield per plant (810.23 g) were found in hybrid S.P. Romia. Maximum flower yield (28.19 t/ha) was found in hybrid S.P. Romia. Maximum weight of single tuber (122.05g) was found in hybrid S.P. Romia. Maximum number of tuber per plant (11.24) was found in hybrid S.P. Romia. Maximum yield of tuber per plant (426.30 g) was found in hybrid S.P. Romia. Maximum tuber yield (11.22 t/ha) was found in hybrid S.P. Romia.

Keywords: Evaluation, dahlia, Bhikkus Buddha, S.P. Romia

Introduction

Dahlia (*Dahlia variabilis* L.) is one of the most popular tuberous rooted perennial, herbaceous flowering plants, valued for their gorgeous attractive spectacular flowers. This plant is being grown in many parts of the world for its beautiful ornamental blooms of varying shades of colours for the beautification of gardens, for cut flowers and as a loose flower. It belongs to the family Asteraceae. Dahlia originated in Mexico, which received its name by Cavanilles in the year 1791, to commemorate the work of a Swedish Botanist Dr. Andreas Dahl, a pupil of Linneaus (Smith, 1971) [18]. Dahlia was introduced to India as early as 1857 under the auspices of the Agri-Horticultural Society of India (formerly, Royal Agri – Horticultural Society of India).

The height of dahlia plants varies from 30 to 180 cm depending upon the cultivar. Dahlia flower consists of a certain number of outer ray florets in which the male organs are modified in to a strap shaped petal, arranged round a central disk of bisexual florets. Dwarf growing types are suitable for flower beds and borders (pure or mixed borders) whereas, large flowering dahlia for pot. Cut flowers of pompon and miniature types stay fresh in flower vases for many days and better to make moderately good garlands and to use as individual loose flower. To obtain more flowers / plant, stress should be given on the number of branches / plant during selection of cultivars and strains. Plant height and number of leaves also showed a slight positive effect on the number of flowers (Suman *et al.*, 1991) [19].

Dahlia hybridization has so far been done by the commercial dahlia growers and amateurs in different parts of the world, mostly in America, New Zealand, Holland and England. In India Swami Vinyanand, a monk of the Ramakrishna order, has done a good deal of breeding work using hand- pollination technique. Some of their most popular hybrids are Bhikkus mother, Bhikkus vivek and Swami Lakeswarnanda. Certain species of dahlias have medicinal and nutritional uses.

Tubers of this plant contain significant amount of insulin and fructose and small quantities of medicinally active compounds such as pythin and benzoic acid.

Material and Methods

The present investigation on Evaluation of Dahlia hybrids (*Dahlia variabilis* L.) under Allahabad Agro Climatic Conditions during of the year, 2017-18 the details of materials used, procedures followed and criteria adopted for evaluation of varieties during the course of investigation are presented in this chapter. The experiment was carried out at the Departmental Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology And Sciences, Allahabad (U.P.) - 211007 to find out the best performing hybrid variety of Dahlia for this region. Allahabad is situated at an elevation of 78 meters above sea level at 25.87 degree north altitude and 81.15 degree E longitude. This region has a subtropical climate prevailing in the south-east part of U.P. with both the extremes in temperature i.e. the winter and the summer. In cold winter, the temperature sometimes is as low as 32°C in the months of December-January and very hot summer with temperature reaching up to 45°C in the month of May and June. The average rainfall is around 1014.4mm with maximum concentration during July-September months with occasional showers in winter. The average monthly rainfall, relative humidity, minimum and maximum temperature recorded during experimental period.

Results and Discussions

The result of the present study as well as relevant discussion has been presented under following sub heads:

Vegetative Characteristics

From the data presented in Table 1. The maximum plant height was found in the hybrid Bhikkus Buddha (70.14 cm) followed by S.P. Romia (57.49 cm), whereas minimum was found in hybrid Bhikkus Mother (36.47 cm). Maximum plant spread was found in hybrid Bhikkus Buddha (52.20 cm), which is followed by Bhikkus Mother (46.17 cm), whereas minimum plant spread found in hybrid Kenya Yellow Spot (32.25 cm). Maximum number of primary branches was found in hybrid Bhikkus Mother (12.33), which is followed by Eternity Sport (10.67), whereas minimum number of branches was found in hybrid Kenya White (3.33). Maximum number of leaves was found in hybrid Bhikkus mother (32.29), which is followed by S.P. Kamla (28.44), whereas minimum number of leaves was found in hybrid Kenya White (23.74).

Floral Characteristics

From the data presented in Table 2. The minimum number of days required for first bud emergence from planting (38.95 days) was found in hybrid Mangal Pandey followed by Bama Khapa (42.52 days), whereas maximum number of days required for first flower bud emergence from planting (61.36 days) was found in hybrid Santasy Ma. Maximum diameter of fully opened flower (23.55 cm) was found in hybrid S.P. Romia followed by Kenya White (21.21 cm), whereas minimum diameter of fully opened flower (14.73 cm) was found in hybrid Eternity sport. Maximum weight of single flower (104.63 g) was found in hybrid S.P. Romia followed by Kenya White (100.52 g), whereas minimum weight of single flower (44.19 g) was found in hybrid Bhikkus Mother. Maximum flower duration (15.33 days) was found in hybrid S.P. Romia followed by Eternity Sport (13.24 days), whereas minimum flower duration (9.19 days) was found in hybrid Bhikkus Buddha. Minimum number of days required for complete flower opening after bud emergence (7.23 days) was found in hybrid Bama Khapa, followed by Eternity sport (8.76 days), whereas maximum number of days required for complete flower opening after bud emergence (16.24 days) was found in hybrid S.P. Romia. Maximum numbers of flower per plant (13.34) was found in hybrid Bama Khapa followed by S.P. Sri Radha (11.53), whereas minimum number of flowers per plant (4.25) was found in hybrid Santasy Ma. Maximum flower yield per plant (810.23 g) was found in hybrid S.P. Romia followed by Kenya Yellow Spot (760.22 g), whereas minimum flower yield per plant (345.24 g) was found in hybrid Santasy Ma. Maximum flower yield (28.19 t/ha) was found in hybrid S.P. Romia followed by Kenya Yellow Spot (26.12 t/ha), whereas minimum flower yield (9.32 t/ha) was found in hybrid Santasy Ma.

Tuber Characteristics

From the data presented in Table 3. The maximum weight of single tuber (122.05g) was found in hybrid S.P. Romia followed by Bhikkus Buddha (118.31 g), whereas minimum weight of single tuber (54.33 g) was found in hybrid Bama Khapa. Maximum number of tuber per plant (11.24) was found in hybrid S.P. Romia followed by Bama Khapa (10.35), whereas minimum number of tuber per plant (4.38) was found in Kenya Yellow Spot. Maximum yield of tuber per plant (426.30 g) was found in hybrid S.P. Romia followed by S.P. Sri Radha (402.53 g), whereas minimum yield of tuber per plant (150.24 g) was found in hybrid Bama Khapa. Maximum tuber yield (11.22 t/ha) was found in hybrid S.P. Romia followed by S.P. Sri Radha (10.20 t/ha), whereas minimum tuber yield (5.14 t/ha) was found in hybrid Bama Khapa.

Table 1: Vegetative Characteristic of Dahlia hybrids under Allahabad Agro-Climatic Conditions

| Hybrids | Plant Height (Cm) | Plant Spread (Cm) | Number of Primary Branches/ Plant | Number of Leaves |
|---------------------|-------------------|-------------------|-----------------------------------|------------------|
| Santasy Ma | 56.15 | 47.23 | 7.00 | 24.18 |
| S.P. Kamla | 43.55 | 39.25 | 7.67 | 28.44 |
| Kenya Yellow Spot | 38.04 | 32.25 | 5.67 | 24.65 |
| S.P. Glory Of India | 38.64 | 35.74 | 5.33 | 25.34 |
| Kenya White | 45.81 | 34.31 | 3.33 | 23.74 |
| Kenya Blue | 37.18 | 36.80 | 5.00 | 26.63 |
| S.P. Sri. Radha | 47.63 | 39.40 | 6.33 | 24.63 |
| Mangal Pandey | 44.90 | 41.33 | 8.33 | 25.44 |
| Eternity Sport | 40.30 | 40.23 | 10.67 | 24.35 |
| Bhikkus Buddha | 70.14 | 52.20 | 6.67 | 27.66 |
| Bhikkus Mother | 36.47 | 46.17 | 12.33 | 32.29 |
| Bama Khapa | 47.48 | 43.83 | 7.00 | 23.77 |
| S.P. Romia | 57.49 | 40.51 | 6.00 | 20.23 |
| S. Ed | 0.27 | 0.10 | 0.57 | 0.11 |
| C.D. (5%) | 0.55 | 0.20 | 1.17 | 0.23 |

Table 2: Floral Characteristics of Dahlia hybrids under Allahabad Agro-Climatic Conditions

| Hybrids | First Bud Appearance (Days) | Flower Diameter (Cm) | Weight of Single Flower(G) | Flowering Duration (Days) | Complete Flower Opening (Days) | Number of Flowers / Plant | Flower Yield /Plant (G) | Flower Yield (t/ha) |
|---------------------|-----------------------------|----------------------|----------------------------|---------------------------|--------------------------------|---------------------------|-------------------------|---------------------|
| Santasy Ma | 61.36 | 17.21 | 67.40 | 11.16 | 10.38 | 4.25 | 345.24 | 9.32 |
| S.P. Kamla | 46.33 | 18.30 | 64.64 | 10.20 | 9.55 | 8.00 | 526.73 | 19.26 |
| Kenya Yellow Spot | 54.25 | 20.21 | 94.22 | 12.38 | 11.71 | 10.72 | 760.22 | 26.61 |
| S.P. Glory Of India | 52.70 | 16.44 | 56.22 | 11.58 | 8.73 | 8.18 | 496.61 | 18.32 |
| Kenya White | 55.31 | 21.21 | 100.52 | 10.72 | 14.19 | 5.72 | 720.46 | 24.17 |
| Kenya Blue | 58.41 | 15.22 | 78.69 | 12.00 | 9.29 | 6.45 | 610.43 | 15.28 |
| S.P. Sri. Radha | 56.25 | 17.33 | 50.36 | 11.60 | 10.39 | 11.53 | 395.33 | 11.30 |
| Mangal Pandey | 38.95 | 18.33 | 80.61 | 9.76 | 10.26 | 7.27 | 680.33 | 22.18 |
| Eternity Sport | 53.26 | 14.73 | 74.50 | 13.24 | 8.76 | 7.72 | 630.45 | 20.29 |
| Bhikkus Buddha | 51.28 | 18.37 | 90.36 | 9.19 | 13.32 | 8.42 | 446.38 | 14.33 |
| Bhikkus Mother | 56.28 | 19.32 | 70.56 | 12.15 | 10.23 | 9.33 | 460.48 | 17.15 |
| Bama Khapa | 42.52 | 13.30 | 44.19 | 11.38 | 7.23 | 13.34 | 560.33 | 17.30 |
| S.P. Romia | 58.20 | 23.55 | 104.63 | 15.33 | 16.24 | 6.65 | 810.22 | 28.19 |
| S. Ed | 0.13 | 0.08 | 0.20 | 0.07 | 0.11 | 0.15 | 0.05 | 0.02 |
| C.D. (5%) | 0.27 | 0.16 | 0.41 | 0.15 | 0.22 | 0.31 | 0.10 | 0.05 |

Table 3: Tuber Characteristics of Dahlia hybrids under Allahabad Agro-Climatic Conditions

| Hybrids | Weight of Single Tuber (G) | Number of Tuber/Plant | Tuber Yield /Plant | Tuber Yield (t/ha) |
|---------------------|----------------------------|-----------------------|--------------------|--------------------|
| Santasy Ma | 68.29 | 6.48 | 191.21 | 7.15 |
| S.P. Kamla | 60.25 | 5.48 | 170.58 | 6.55 |
| Kenya Yellow Spot | 95.21 | 4.38 | 377.79 | 8.22 |
| S.P. Glory Of India | 65.35 | 6.00 | 210.25 | 6.81 |
| Kenya White | 69.36 | 5.36 | 230.26 | 6.45 |
| Kenya Blue | 73.66 | 5.15 | 165.56 | 6.27 |
| S.P. Sri. Radha | 110.05 | 5.24 | 402.53 | 10.20 |
| Mangal Pandey | 78.31 | 7.65 | 280.56 | 7.34 |
| Eternity Sport | 56.30 | 9.47 | 210.45 | 6.53 |
| Bhikkus Buddha | 118.31 | 8.35 | 340.23 | 7.63 |
| Bhikkus Mother | 81.33 | 6.49 | 246.23 | 6.27 |
| Bama Khapa | 54.33 | 10.35 | 150.24 | 5.14 |
| S.P. Romia | 122.05 | 11.24 | 426.30 | 11.22 |
| S. Ed | 0.63 | 0.11 | 0.86 | 0.08 |
| C.D. (5%) | 1.30 | 0.22 | 1.77 | 0.16 |

Plant height being a genetically controlled factor, it varied among the genotypes as well as influence of the growing environmental conditions, production technology and cultural practices. Similar variation in plant height due to cultivars was also observed in dahlia by (Syamal and Kumar, 2002) [20], and Vikas *et al.*, (2015), in China aster by (Munikrishnappa, 2013), (Chowdhuri *et al.*, 2015) [5], (Chourasia *et al.*, 2015) [3], in Gladiolus.

Plant spread is an important growth factor for flower crops. It helps to utilize the sunlight to maximum extent. Plant spread differed significantly among all the varieties studied which is due to genetic makeup of the cultivars and development of more secondary branches in the cultivars thereby increasing plant spread. Similar results were also reported by Kumar *et al.*, (2009) [11] found in Dahlia.

The variation among the varieties in number of branches is due to the genetic difference as most of the characters are governed by genetic make-up of the varieties. Similar results were also reported by Joshi *et al.*, (1997) [9] found in Dahlia.

Leaves are the functional units for photosynthesis, which greatly influence the growth and may be flower yield of any crop. The variation in number of leaves per plant among the varieties is due to top variation in the rate of vegetative growth among the genotypes that could be attributed to genetic makeup and could have been further influence by agro climatic condition. Similar results were reported by Dhane and Nimbalkar (2002) [6] in Dahlia.

The varieties have shown significant difference with respect to the number of days taken for first flower bud emergence, it is may be due to its better growth and development in terms of maximum number of leaves, branches and plant spread which resulted in higher production accumulation of sugar leading to switching of vegetative phase in reproductive phase. These variations may be attributed to the fact that the performance of varieties may vary with the climatic conditions prevailing in a particular area. Similar results were also reported by Dhane and Nimbalkar (2002) [6], found in Dahlia.

The variation among the varieties was mainly because of genetical factors or may be due to cultural operations like disbudding and pinching. Variations expected among the varieties of Dahlia. Similar results were also reported by (Dhane and Nimbalkar 2002) [6], (Kumar *et al.*, 2009) [11], and (Mahawer *et al.*, 2010) [12] found in Dahlia.

Weight of individual flower is another important character. The variation among the varieties was mainly because of increased flower size and ray florets. Similar results were also reported by (Kanamadi and Patil 2002), (Kumar *et al.*, 2009) [11] and (Mahawera *et al.*, 2010) [12] found in Dahlia.

For garden display, Shelf life or longevity is important factor. The preference of gardener depends on longevity of the varieties, and it may be depends upon the genetical factors or climatic conditions of region. Similar results were also reported by (Dhane and Nimbalkar 2002) [6], (Kumar *et al.*,

2009)^[11] and (Mahawer *et al.*, 2010)^[12] found in Dahlia. Also reported by Negi *et al.*, (1988)^[16] in Chrysanthemum.

The varieties have shown significant difference with respect to the number of days taken for complete flower opening. These variations may be attributed to the fact that the performance of varieties may vary with the climatic conditions prevailing in Allahabad region. Similar results were also reported by (Dhane and Nimbalkar 2002)^[6] and (Vikas *et al.*, 2011)^[21] found in Dahlia.

The probable reason for variation in number of flowers per plant may be due to the effect of environmental conditions prevailing during field trial. The similar results were observed in Dahlia by (Ahmed and Gul 2002)^[8], in China aster by (Munikrishnappa 2013) and (Zosiamliana *et al.*, 2012), in Gladiolus reported by (Pant and Lal 1991)^[17].

The yield produced flower per plant may be related to increase in plant height, number of branches, better utilization of applying fertilizer and manure in soil, numbers of flower, weight of individual flower, flowering duration. Similar results were also reported by (Kumar *et al.*, 2009)^[11] and (Suman *et al.*, 1991)^[19] in Dahlia.

The yield of flower per hectare is directly related to increase in flower yield per plant, weight of flower, flower size. These variations may be attributed to the fact that the performance of varieties may vary with the climatic conditions prevailing in Allahabad region. Similar results were also reported by (Kumar *et al.*, 2009)^[11] and (Suman *et al.*, 1991)^[19] in Dahlia.

Tuber weight per plant showed significant difference among different genotypes of dahlia. The variation in tuber weight may be due to the genotypic expression of the genotypes. Similar results were also reported by (Jamil Ahmad and Shagufta Gul 2002)^[8] and (Manjula *et al.*, 2017)^[14] in Dahlia.

The number of tubers produced per plant may be directly related to production of more plant height, number of branches, there by synthesis of more photosynthates result in production of good number of developed flower buds on the branches finally to the production of tubers. The similar results observed in dahlia by (Ahmed and Gul 2002)^[8], (Kumar *et al.*, 2009)^[11] and in gladiolus by (Chopade *et al.*, 2012)^[4].

The yield of tubers produced per plant and per hectare may be directly related to number of tuber per plant, weight of individual tuber. Sometimes the tuber yield affected by availability of nutrients in soil. There by synthesis of more photosynthates and ultimately good tuber yield. The similar results observed in Dahlia by (Mahawer *et al.*, 2010)^[12] and in Gladiolus by (Chopade *et al.*, 2012)^[4].

Conclusion

It is concluded that, out of thirteen hybrids, hybrid Bhikkus Buddha was found to be best in condition of Allahabad in terms of growth parameter like; maximum plant height (70.14 cm), plant spread (52.20 cm), number of primary branches (12.33), and number of leaves per plant (32.29) 90 days after planting. But it shows fewer yields as compare to high yielding variety S.P. Romia.

S.P. Romia was found to be the most promising one, in terms flower yield (28.19 t/ha), flower quality like; flower weight (104.63 g), flower diameter (23.55 cm), flower duration (15.33 days) and tuber yield (11.22 t/ha) of Dahlia.

Therefore from the above statement I suggest that the hybrid S.P. Romia is good to grow in condition of Allahabad for commercial purpose. However the study was undertaken only

for one season, it needs further confirmation by conducting more trials.

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