

STUDIES ON GENETIC VARIABILITY IN DAHLIA (*Dahlia variabilis* L.)

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ABSTRACT

Twenty five dahlia accessions were evaluated to ascertain genetic parameters of variability. Phenotypic coefficients of variation (PCV) were higher than genotypic coefficients of variation (GCV) for all the characters studied. However higher PCV and GCV estimates were found for stalk length of the flower, duration of flowering, number of ray florets/flower and individual flower weight. High heritability with high genetic advance was observed for vase life, diameter of flower, stalk length of the flower and individual flower weight.

KEYWORDS: Genetic advance, genetic variability, dahlia, heritability.

INTRODUCTION

Dahlia is one of the most popular bulbous flowers grown in many parts of the world for its beautiful ornamental blooms of varying shades of colours for the beautification of gardens and cut flowers. It is a tuberous rooted, half-hardy herbaceous perennial belonging to the family Asteraceae having its origin 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 Linnaeus. Dahlia occupies a place of pride in any garden anywhere. Dahlias are easy to grow both in field and in pot and are extensively used for exhibition, garden display and home decoration. For exhibition and garden display all types of dahlias are used. Dwarf growing types are suitable for beds and borders (pure / mixed borders). Large flowering dahlias in pots are popular for terrace garden or *varandah* display. The long stemmed flowers of various forms and colours are used in flower arrangement. Cut flowers of pompon and miniature types stay fresh in flower vases for many days and also better to make moderately good garlands. Present investigations were initiated to assess 25 dahlia accessions for morphological, flowering and vase life parameters to select suitable accession for further exploitation.

MATERIAL AND METHODS

An investigation to study the performance of dahlia (*Dahlia variabilis* L.) cultivars was carried out at the New orchard, Floriculture Unit, department of Horticulture, University of Agricultural Sciences, Dharwad, during June 2007 to November 2007. The experiment was laid out in completely randomized design with three replications. Tubers collected from different places *viz.*, Sagar, Dharwad and Bangalore, were kept in warm humid condition for 24 hours to initiate sprouting. The dahlia tubers were planted in pots of 12"X 9" in size on twenty fifth June 2007, at the rate of one tuber per pot. Details of accessions used in study were as follows:

Sl. No.	Accessions
1.	Accession No. 1
2.	Accession No. 2
3.	Accession No. 3

4.	Accession No. 4
5.	Accession No. 5
6.	Accession No. 6
7.	Accession No. 7
8.	Accession No. 8
9.	Accession No. 9
10.	Accession No. 10
11.	Accession No. 11
12.	Accession No. 12
13.	Accession No. 13
14.	Accession No. 14
15.	Accession No. 15
16.	Accession No. 16
17.	Accession No. 17
18.	Accession No. 18
19.	Accession No. 19
20.	Accession No. 20
21.	Accession No. 21
22.	Accession No. 22
23.	Accession No. 23
24.	Accession No. 24
25.	Accession No. 25

RESULTS AND DISCUSSION

The analysis of variance revealed significant differences for all the characters under study, thereby indicating tremendous potential for improvement through selection. The mean performance of the varieties (Table 1) showed that the accession number 16 (140.33 cm) recorded higher plant height over all other accessions of dahlia and on par with accession number 12 (135.0 cm) whereas, accession number 8 recorded lower plant height (73.67 cm). The number of leaves was maximum for accession number 16. The accession number 16 (1.46 cm) recorded higher stem girth. Accession number 22 (42.0 days) took minimum number of days to initiate flower bud while accession number 18 (67.3 days) recorded highest. Accession number 22 (52.7 days) recorded minimum number of days to flower whereas, accession number 18 (74.3 days) took maximum number of days. The accession 22 had maximum duration of flowering (53.3 days) which is highest overall other accessions of dahlia and on par with accession number 6 and accession number 19 (52.0 days) where as accession number 15 recorded minimum duration

of 32.00 days. Higher diameter of flower recorded in accession number 10 (19.3 cm) whereas, accession number 3 recorded least (8.6 cm). The accession number 15 (271.3) recorded significantly higher ray floret. Accession number 21 recorded higher stalk length of 22.7 cm. The accession number 16 recorded highest of 6.7 days. The accession number 12 recorded maximum (29.3 g) flower weight and followed by accession number 14 (28.3 g). Maximum longevity (14.67 days) recorded in accession number 16. The accession number 16 (37.3) recorded highest number of flower per plant.

Results show that overall superior performance for vegetative characters *viz.*, plant height, number of leaves and stem girth and flower characters like Number of flowers per plant, longevity, vase life period was better for the accession number 16.

Table 2 represents data on range, mean, coefficients of variation, heritability and genetic advance as percentage of mean of the 12 characters under study. From the Table 2, it can be concluded that the difference among genotypic variance and phenotypic variance was very less for plant height, number of leaves, stem girth, number of days for flower bud initiation, number of days for flowering, and diameter of flower indicating the fact that these characters are not much influenced by environmental factors. This also suggests that presence of sufficient genetic variability, which can be exploited by practicing pureline selection. Mishra *et al.* (1997) obtained similar results in dahlia for number of leaves per plant.

The genotypic coefficient of variation and phenotypic coefficient of variation for growth parameters revealed that the differences were high for leaf area, stalk length, number of ray florets per flower, longevity of flower, vase life, individual flower weight and number of flowers per plant. These results are in accordance with results obtained by Rao and Negi (1990) in China aster and Sheela *et al.*, in Heliconia (2005).

The coefficient of variation indicates only the extent of variability present in different characters but not indicate their heritable portion.

When high heritability accompanied with high genetic advance it indicates additive gene effects and selection may be effective. High heritability and low genetic advance indicates importance of non-additive gene action effects. While low heritability with high genetic advance is governed by additive gene effects and heritability accompanied with low genetic advance indicates that character is highly influenced by environmental effects and selection would be ineffective.

In the present investigation, most of the characters exhibited moderate to high heritability per cent which indicates that the characters are less influenced by environmental effects and are effectively transmitted to progeny.

Heritability and genetic advance (GA) for growth characters varied considerably. Higher heritability indicates the effectiveness of selection through phenotypic performance, but it does not mean a high genetic gain. However, high heritability associated with high GA proves more useful for efficient improvement of a character through simple selection.

In the present investigation, high heritability estimates with high genetic advance was suggested that real progress in improvement through selection could be made for yield and associated traits *viz.*, plant height, leaf area, diameter of flower, number of ray florets per flower, individual flower weight and number of flowers per plant which indicates additive gene effects for these characters would be effective. Similar results on plant height and number of leaves was observed by Barigidad *et al.* (1992) in chrysanthemum and number of flowers per plant in dahlia by Singh (2003). High heritability with high GA for plant height in china aster by Negi *et al.* (1983).

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TABLE1. Mean performance of 25 accessions of Dahlia

Accession	Plant height (cm)	No. of leaves	Leaf area (cm ²)	Stem girth (cm)	No. of days for flower bud initiation	No. of days for flowering	Duration of flowering	Diameter of Flower (cm)	No. of ray florets/flower	Stalk length of the flower (cm)	Individual flower weight (g)	Vase life (days)	Longevity of flower (days)	No. of flowers per plant
1	109.33	43.67	44.35	1.33	52.0	60.3	36.0	14.3	128.0	14.7	25.5	5.7	6.3	24.7
2	107.33	43.65	41.23	1.35	53.7	62.3	41.0	13.2	118.7	8.0	22.2	5.7	10.7	24.0
3	99.00	41.60	36.01	1.30	46.0	58.7	45.3	8.6	93.3	22.2	14.5	6.0	6.7	18.7
4	101.67	43.67	37.13	1.32	52.3	63.3	41.0	14.8	115.3	5.2	21.2	5.3	9.7	19.3
5	118.67	48.75	56.17	1.42	56.0	66.7	45.7	18.5	151.3	19.0	23.2	5.3	9.3	28.0
6	93.83	39.00	31.19	1.28	51.7	62.0	52.0	11.1	56.7	7.8	15.7	4.3	6.7	16.0
7	98.67	40.33	34.50	1.29	58.0	68.8	49.0	11.1	105.3	5.8	19.8	6.7	12.3	18.0
8	73.67	37.67	30.86	1.27	50.0	61.3	52.3	13.7	74.7	20.0	13.7	3.0	4.0	14.0
9	111.00	45.00	45.66	1.36	48.0	64.0	43.3	12.2	124.7	11.8	23.5	5.3	9.0	24.7
10	103.00	43.67	38.10	1.32	54.7	63.3	41.7	19.3	137.3	17.0	26.8	4.7	11.3	21.0
11	105.33	43.00	39.83	1.34	58.0	68.4	44.7	16.3	113.7	17.2	22.2	6.0	10.0	22.0
12	135.00	49.00	59.01	1.44	60.0	66.0	40.3	13.9	183.3	6.3	29.3	4.7	10.7	29.7
13	111.33	45.67	45.89	1.37	55.7	66.7	39.7	10.8	112.7	11.5	18.5	5.7	12.3	24.7
14	114.67	48.33	54.44	1.41	45.7	56.3	63.3	14.6	152.0	12.7	28.3	5.0	9.3	27.7
15	103.00	43.67	38.11	1.33	51.3	60.7	43.5	17.2	271.3	15.5	24.5	4.7	8.3	21.0
16	140.33	49.65	72.89	1.46	56.7	66.0	42.3	13.3	118.7	15.8	24.8	6.7	14.7	37.3
17	113.67	47.67	48.16	1.41	52.7	59.5	58.3	18.0	110.0	15.5	26.5	6.3	14.0	27.3
18	109.67	44.33	45.33	1.36	67.3	74.3	41.3	11.3	84.0	12.5	16.8	5.0	11.7	24.7
19	99.33	42.00	36.31	1.30	49.7	61.0	52.0	10.8	83.7	12.8	17.8	4.3	13.3	19.0
20	104.33	43.67	38.20	1.33	57.3	66.3	50.7	14.2	96.0	15.3	16.2	6.0	11.0	21.7
21	97.00	39.60	32.83	1.28	50.0	64.3	32.0	13.1	116.0	22.7	21.2	5.0	7.7	17.7
22	101.33	43.00	36.57	1.31	42.0	54.7	53.3	12.7	59.7	13.8	17.8	5.7	11.3	19.0
23	98.33	40.33	32.98	1.29	57.3	65.7	49.3	17.0	84.7	16.2	17.8	4.3	6.0	18.0
24	112.00	45.67	46.10	1.41	58.0	68.7	40.3	17.6	144.3	6.8	25.5	6.3	11.0	25.3
25	123.00	48.50	56.35	1.44	47.0	58.5	40.7	11.1	124.0	21.0	25.8	4.7	9.0	29.0
C.D.(P=0.05)	7.71	2.75	2.54	0.03	4.60	4.56	4.50	0.87	5.97	3.29	1.46	1.40	2.16	5.45

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TABLE 2. Range, Mean, Coefficients of variation (PCV and GCV), Heritability and Genetic advances as % of mean in 12 characters in dahlia.

Sl. No	Character	Range	Mean \pm S.Em	GCV	PCV	H ² (%)	GA	GA as % Mean
1	Plant height (cm)	73.67-140-33	106.73 \pm 2.713	12.58	13.34	88.8	25.12	23.6
2	Number of leaves	37.67-49.67	43.90 \pm 0.96	7.18	8.12	79.87	5.77	13.14
3	Leaf area (cm ²)	30.86-72.89	42.58 \pm 0.891	33.1	33.74	97.81	21.54	49.42
4	Stem girth (cm)	1.27-1.46	1.35 \pm 0.0102	12.59	13.33	81.2	0.117	10.462
5	Number of days for flower bud initiation	42.0-67.33	53.24 \pm 1.616	9.82	11.14	81.41	9.49	17.82
6	Number of days for flowering	51.33-76.0	61.85 \pm 1.609	9.08	10.18	80.59	10.24	16.55
7	Duration of flowering	32.0-53.33	43.92 \pm 1.5752	29.9	32.51	83.42	5.85	13.31
8	Diameter of flower(cm)	8.59-29.33	14.62 \pm 0.305	11.95	13.47	98.81	9.6	65.66
9	Number of ray florets/flower	56.67-271.33	118.37 \pm 2.093	35.11	35.96	99.3	8.43	7.12
10	Stalk length of the flower(cm)	5.17-22.69	13.89 \pm 1.1527	36.95	39.64	86.84	9.83	70.77
11	Individual flower weight (g)	8.67-29.50	16.71 \pm 0.5127	30.66	31.12	97.07	10.29	63.63
12	Vase life (days)	3.00-6.67	5.28 \pm 0.4937	19.79	25.57	59.57	9.55	107.19
13	Longevity of flower (days)	4.0-14.67	9.45 \pm 0.758	26.97	30.34	78.97	0.89	9.42
14	Number of flowers per plant	14.0-37.33	22.89 \pm 1.9125	25.55	29.39	75.67	8.18	37.18