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Studies on genetic variability, heritability, genetic advance, correlation and path analysis in dahlia (*Dahlia variabilis* L.) under *tarai* region of Uttarakhand

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ABSTRACT

Genetic variability, inter-relation of the characters and path analysis between yield and its contributing traits were studied in eleven genotypes of dahlia (*Dahlia variabilis* L.). The analysis of variance revealed significant differences among the genotypes for all the fifteen characters studied. Higher estimates of PCV were recorded for all the characters but the difference between PCV and GCV was narrow which indicates that there was very meagre influence of environment on the expression of these characters. The highest P.C.V (27.59%) and G.C.V (27.50%) value was exhibited by the flower weight. High heritability (98.74%) coupled with high genetic advance (66.75) was reported for leaf area. At phenotypic and genotypic level, number of flowers per plant showed positive significant correlation with flower stalk length (0.321 and 0.323, respectively), internodal length (0.388 and 0.391, respectively) and plant height (0.393 and 0.402, respectively) and highly significant positive correlation with number of branches per plant (0.799 and 0.840, respectively), number of leaves per plant (0.560 and 0.871, respectively) and flower weight (0.575 and 0.578, respectively) whereas, negative significant correlation with duration of flowering (-0.401 and -0.404, respectively). Maximum positive direct effect on number of flowers per plant was exhibited by number of leaves per plant (0.541 and 0.659, respectively) whereas, highest negative direct effect on number of flowers per plant was exhibited by days to first flowering (-0.109 and -0.092, respectively) at phenotypic and genotypic level. Thus, the above traits which showed positive significant correlation as well as positive direct effects must be considered for yield improvement.

***Keywords*:** Dahlia (*Dahlia variabilis* L.), Genetic variability, Heritability, Genetic advance, Correlation, Path analysis.

INTRODUCTION

Dahlia (*Dahlia variabilis* L.) is one of the most widely grown bulbous flowers and it's chromosome number is 2n = 64. It is a half-hardy perennial, herbaceous flowering, dicot plant belonging to the family Asteraceae with tuberous roots. Though there are more than 20 species and different cultivars present with varied number of hues, texture, forms, shape and size of florets with different peduncle, stalk length, vigour and symmetry available in the world which lead to wide range of variation and even they contain many transposons that shifts from one place to other upon an allele which brings such great diversity and this variation might results from dahlias being octoploids i.e., they have 8 sets of homologous chromosomes, whereas most plants lack this ploidy level. The wide diversity leads to a lot of scope for improving these traits through breeding as this rich pool of diversity furnish the resource for incessant selection of adapted genotypes. The phenotypic character of the plant is governed by genotype and environment interaction, although the

variation due to environment is non-heritable, so selection based on phenotypic expression is less efficient than the genotypic expression. Hence, genetic variability plays significant role in the selection of the improved genotype as it aids the plant breeder for better exploitation of the genotype. Although yield is governed by several yield contributing characters and it is highly swayed by environment (Chejara *et al.*, 2021; Jasrotia *et al.*, 2023). Association of characters can be assessed by correlation coefficient. The path coefficient analysis helps in determining direct and indirect effect of various component towards yield, is a functional method reported by Wright (1921). Genetic diversity is helpful in identifying the suitable donor parent for hybridization and for the development of the most promising recombinants. Thus, estimation of correlation coefficient between characters are a matter of great concern when it comes to selecting indices and also grant the prediction of correlated response (Al-Jibouri *et al.*, 1958).

MATERIALS AND METHODS

The experiment was conducted at Model Floriculture Centre, G.B. Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand, India during 2020-2021. The experiment was laid out in Randomized block design (RBD) with three replications. Five plants were randomly selected from each replication for carrying out performance studies. Total eleven varieties were involved in the experiment. Rooted cuttings were transplanted in to the bed at a spacing of 60 × 45 cm and the dimension of each plot was 1.5 m × 1.5 m. All the recommended agronomic practices and intercultural operations were followed to raise a good flower crop. The data were analysed by using OPSTAT statistical package. Phenotypic and genotypic coefficients of variation were calculated as per formula described by Burton and Devane (1953). Heritability, in broad sense, was calculated as suggested by Allard (1960) and genetic advance as per cent of mean was calculated as suggested by Johnson *et al*. (1955). Observations recorded for the 15 characters were plant height, plant spread, number of branches per plant, stem girth, number of leaves per plant, internodal length, leaf area, days to bud appearance, days to flowering, duration of flowering, flower diameter, flower weight, flower stalk length, vase life and number of flowers per plant.

RESULTS AND DISCUSSION

Table 1 depicted the estimates of genetic variability parameters which consists of range, phenotypic coefficient of variation (P.C.V), genotypic coefficient of variation (G.C.V), heritability, genetic advance and genetic advance as percent of mean (%). The analysis of variance revealed significant differences among the genotypes for the 15 characters of dahlia. In the present study, the maximum range was reported for leaf area

Table 1. Estimates of variability and other genetic parameters in *Dahlia variabilis* L.

Characters	Range	Mean ±S.E.	P.C.V (%)	G.C.V (%)	Heritability (%)	Genetic advance	Genetic advance as per cent mean (%)
Plant height (cm)	58.46 – 108.50	85.39 ± 1.21	17.49	17.32	98.03	30.16	35.32
Plant spread (cm)	39.55 – 51.37	46.40 ± 0.66	7.89	7.50	90.31	6.81	14.67
Number of branches per plant	8.20 – 11.23	10.12 ± 0.16	10.33	9.97	93.24	2.01	19.86
Stem girth (cm)	1.08 – 1.50	1.32 ± 0.02	10.12	9.98	80.00	0.43	32.57
Number of leaves per plant	48.61 – 99.79	71.46 ± 0.89	25.38	25.29	99.28	37.10	51.91
Internodal length (cm)	7.50 – 17.76	12.60 ± 0.14	26.45	26.38	99.46	6.83	54.20
Leaf area (cm^2)	99.68 – 220.13	152.70 ± 2.13	21.49	21.36	98.74	66.75	43.71
Days to bud appearance (days)	68.33 – 90.00	77.78 ± 1.12	9.63	9.31	93.29	14.40	18.51
Days to flowering (days)	90.23 – 119.50	102.51 ± 2.05	9.42	8.76	86.54	17.22	16.79
Duration of flowering (days)	45.23 – 59.26	53.25 ± 2.58	10.15	9.76	92.50	18.72	19.34
Flower diameter (cm)	14.56 – 21.85	18.03 ± 0.24	14.17	13.98	97.30	5.12	28.39
Flower weight (gm)	18.81 – 41.79	31.20 ± 0.40	27.59	27.50	99.35	17.62	56.47
Flower stalk length (cm)	13.58 – 21.62	18.49 ± 0.27	12.40	12.15	95.90	4.53	24.49
Vase life (days)	3.52 – 5.89	4.65 ± 0.07	17.18	16.96	97.50	1.60	34.40
Number of flowers per plant	9.00 – 19.91	14.76 ± 0.23	21.96	21.80	98.53	6.58	44.57

P.C.V: Phenotypic coefficient of variation, G.C.V: Genotypic coefficient of variation

(99.68-220.13 cm^2) with a mean value (152.70 ± 2.13) indicating wide variation in flower yield (number of flowers per plant) of different genotypes. Similar results were observed by Vikas (2009) and Kumar (2019), reported maximum range for leaf area in dahlia. General mean value was highest for leaf area (152.70 cm^2) and lowest was recorded for stem girth (1.32 cm). It is evident from the data depicted in Table 1. that the values for the phenotypic coefficient of variation (P.C.V) were found to be higher than the genotypic coefficient of variation (G.C.V) and there were very slight differences observed between the values of P.C.V and G.C.V in most of the traits studied. Therefore, narrow differences present among the genotypes indicates that there was very meagre influence of environment on the expression of these characters. The highest P.C.V and G.C.V values was recorded for the characters flower weight (27.59% and 27.50%, respectively) followed by internodal length (26.45% and 26.38%, respectively), number of leaves per plant (25.38% and 25.29%, respectively), number of flowers per plant (21.96% and 21.80%, respectively) and leaf area (21.49% and 21.36%, respectively) whereas, lowest P.C.V and G.C.V values were exhibited by plant spread (7.89% and 7.50%, respectively) suggesting low variability among the genotypes studied. Thus, high P.C.V and G.C.V values indicates the high variability among the characters due to genetic factor and low influence of environment which on further selection can lead to crop improvement. The above results are in close affirmation with the findings of Beura *et al.* (1995), Singh (2003) in dahlia and Raghava *et al.* (1992) where they also reported high P.C.V and G.C.V. for number of flowers per plant and narrow difference between P.C.V and G.C.V was also observed for all the characters studied.

The highest heritability (>90%) was exhibited by the internodal length (99.46%) followed by flower weight (99.35%), number of leaves per plant (99.28%), leaf area (98.74%), number of flowers per plant (98.53%), plant height (98.03%), vase life (97.50%), flower diameter (97.30%), flower stalk length (95.90%), days to bud appearance (93.29%), number of branches per plant (93.24%), duration of flowering (92.50%), plant spread (90.31%). Though estimates of high heritability is an important parameter but alone heritability value may not justify or associate with high genetic advance, genetic gain or determine the amount of variation that is heritable (Ali *et al.*, 2002). High heritability associated with high genetic advance suggests the contribution of additive gene effects whereas, high heritability along with low genetic advance suggests the occurrence of the non-additive gene effects for the governance and expression of a particular trait. Estimates of high heritability (98.74%) coupled with high genetic advance (66.75) was reported for leaf area followed by number of leaves (99.28 % and 37.10) while moderate heritability coupled with low genetic advance was exhibited by stem girth (80.00% and 0.43) and high heritability with low genetic advance was observed for vase life (97.50% and 1.60). High genetic gain was observed for flower weight (56.47%) followed by internodal length (54.20%), number of leaves per plant (51.91%), number of flowers per plant (44.57%) and leaf area (43.71%), whereas, moderate values was reported for plant height (35.32%), vase life (34.40%), stem girth (32.57%), flower diameter (28.39%) and flower stalk length (24.49%). Thus, the traits which showed high genetic gain were also coupled with high heritability and provides a good scope for selection. The findings are relatable with the observation recorded by Devi *et al.* (2020) in dahlia and Gantait *et al.* (2016) in gladiolus**.**

Table 2 and Table 3 depicts the phenotypic and genotypic correlation for 15 characters in dahlia. Correlation coefficient is used to estimate the degree of association or dependence degree between two or more variables, aids to comprehend the mutual association between various plant traits and through which selection can be made for yield improvement. Yield i.e., number of flowers per plant is a complex quantitative character which is observed to be associated with various number of component characters which occurs due to actions and interactions among component characters and awareness of the correlation between various characters is very essential as if two characters are positively correlated then one character can be enhanced indirectly by ameliorating the other character. At phenotypic and genotypic level, number of flowers per plant showed positive significant correlation with flower stalk length (0.321 and 0.323, respectively), internodal length (0.388 and 0.391, respectively) and plant height (0.393 and 0.402, respectively) and highly significant positive correlation with number of branches per plant (0.799 and 0.840, respectively), number of leaves per plant (0.560 and 0.871, respectively) and flower weight (0.575 and 0.578, respectively) whereas, negative

Table 2. Phenotypic correlation coefficient for 15 characters in *Dahlia variabilis* L.

Characters	X 1	X 2	X 3	X 4	X 5	X 6	X 7	X 8	X 9	X 10	X 11	X 12	X 13	X 14	X 15
X 1															
X 2	0.402*														
X 3	0.083	-0.064													
X 4	0.015	-0.190	-0.090												
X 5	0.036	0.291	0.688**	-0.325											
X 6	0.559**	0.026	0.416*	-0.271	0.197										
X 7	0.354*	-0.103	-0.401*	-0.058	-0.361*	0.438*									
X 8	0.168	0.429*	-0.264	-0.476**	-0.085	-0.193	-0.216								
X 9	0.307	0.440*	-0.135	-0.413*	-0.049	-0.092	-0.247	0.889**							
X 10	-0.412*	-0.415*	0.044	-0.187	0.022	0.014	0.062	-0.506**	-0.519**						
X 11	0.589**	-0.046	-0.202	0.230	-0.324	0.111	0.232	0.024	0.101	-0.248					
X 12	0.131	-0.070	-0.564**	0.407*	-0.601**	-0.372*	0.051	0.000	0.024	-0.151	0.731**				
X 13	0.849**	0.332	0.012	-0.017	-0.124	0.681**	0.404*	0.070	0.218	-0.137	0.350*	0.022			
X 14	-0.138	0.022	0.094	-0.049	-0.015	-0.203	-0.193	0.346*	0.216	-0.035	-0.137	-0.364*	-0.161		
X 15	0.393*	0.126	0.799**	-0.120	0.860**	0.388*	-0.210	-0.259	-0.199	-0.404*	-0.121	0.575*	0.321*	0.201	

* at 5% level of significance (significant) , **at 1% level of significance (highly significant)

X1 : Plant height
X2 : Plant spread
X3 : Number of branches per plant
X4 : Stem girth
X5: Number of leaves per plant
X6: Internodal length
X7: Leaf area
X8: Days to bud appearance
X9: Days to flowering
X10: Duration of flowering
X11: Flower diameter
X12: Flower weight
X13: Flower stalk length
X14: Vase life
X15: Number of flowers per plant

Table 3. Genotypic correlation coefficient for 15 characters in *Dahlia variabilis* L.

Characters	X 1	X 2	X 3	X 4	X 5	X 6	X 7	X 8	X 9	X 10	X 11	X 12	X 13	X 14	X 15
X 1															
X 2	0.438*														
X 3	0.095	-0.095													
X 4	0.019	-0.200	-0.070												
X 5	0.033	0.313	0.722**	-0.339											
X 6	0.567**	0.029	0.431*	-0.284	0.201										
X 7	0.366*	-0.121	-0.423*	-0.062	-0.365*	0.444**									
X 8	0.167	0.491**	-0.296	-0.504**	-0.091	-0.197	-0.216								
X 9	0.347*	0.499**	-0.193	-0.467**	-0.042	-0.118	-0.268	0.994**							
X 10	-0.448**	-0.437*	0.058	-0.207	0.029	0.008	0.069	-0.503**	-0.467**						
X 11	0.599**	-0.044	-0.202	0.233	-0.331	0.107	0.239	0.034	0.102	-0.282					
X 12	0.134	-0.079	-0.579**	0.415*	-0.606**	-0.372*	0.052	0.002	0.036	-0.157	0.744**				
X 13	0.875**	0.370*	0.019	-0.026	-0.126	0.696**	0.413*	0.071	0.247	-0.135	0.375*	0.022			
X 14	-0.141	0.027	0.103	-0.060	-0.017	-0.207	-0.189	0.349*	0.228	-0.033	-0.146	-0.371*	-0.154		
X 15	0.402*	0.141	0.840**	-0.123	0.871**	0.391*	-0.218	-0.275	-0.211	-0.401*	-0.118	0.578*	0.323*	0.212	

* at 5% level of significance (significant) , **at 1% level of significance (highly significant)

X1 : Plant height
X2 : Plant spread
X3 : Number of branches per plant
X4 : Stem girth
X5: Number of leaves per plant
X6: Internodal length
X7: Leaf area
X8: Days to bud appearance
X9: Days to flowering
X10: Duration of flowering
X11: Flower diameter
X12: Flower weight
X13: Flower stalk length
X14: Vase life
X15: Number of flowers per plant

significant correlation with duration of flowering (-0.401 and -0.404, respectively). Both the genotypic and phenotypic correlations were almost in same direction but the value of genotypic correlation coefficients were superior as compared to the corresponding phenotypic correlation coefficient. This low value of phenotypic correlation might be due to effect of the environment on the phenotype of the plants. Leffring (1973) reported a positive correlation between number of flowers produced and number of lateral shoots (branches) in gerbera. This positive significant correlation could be due to plant height which might have positive impact on number of branches, number of leaves that increases the internodal length and flower stalk length by accumulation of sufficient photosynthates which ultimately increases the number of flowers per plant. Similar positive significant and highly significant correlation at both phenotypic and genotypic level are in conformity with the findings of Kumar (2019) and Raghupati *et al*. (2019) in dahlia and Kumar *et al*. (2012) in chrysanthemum. The negative significant correlation of number of flowers per plant with duration of flowering are in conformity with the findings of Vikas (2009) in dahlia. Therefore, selection of positively correlated characters provides an opportunity for the improvement and strategizing the crop breeding programme.

Table 4 and Table 5 depicts the direct and indirect effects on yield i.e., number of flowers per plant at both phenotypic and genotypic level. Path coefficient analysis has been extensively used in crop breeding programmes to estimate the direct and indirect effects of the component characters on yield by partitioning the correlation coefficients which aids in computing the impact of each significant character on the paramount yield. In this analysis, dependent variable was marked as number of flowers per plant (yield) and

Table 4. Genotypic path coefficient among different characters in dahlia through direct and indirect effects

Characters	X 1	X 2	X 3	X 4	X 5	X 6	X 7	X 8	X 9	X 10	X 11	X 12	X 13	X 14	'rg' values Number of flowers/ plant
X 1	**0.551**	0.285	0.062	0.012	0.021	0.369	0.238	0.109	0.226	-0.291	0.389	0.087	0.569	-0.092	0.402*
X 2	0.015	**0.043**	-0.003	-0.007	0.011	0.001	-0.004	0.017	0.018	-0.015	-0.002	-0.003	0.013	0.001	0.141
X 3	0.052	-0.052	**0.659**	-0.038	0.395	0.236	-0.231	-0.162	-0.105	0.032	-0.111	-0.316	0.011	0.056	0.840**
X 4	-0.004	0.043	0.015	**-0.214**	0.073	0.061	0.013	0.108	0.100	0.044	-0.050	-0.089	0.006	0.013	-0.123
X 5	0.018	0.170	0.391	-0.184	**0.541**	0.109	-0.198	-0.049	-0.023	0.016	-0.179	-0.328	-0.068	-0.009	0.871**
X6	-0.141	-0.007	-0.107	0.071	-0.050	**0.249**	-0.110	0.049	0.029	-0.002	-0.027	0.093	-0.173	0.051	0.391*
X7	0.073	-0.024	-0.084	-0.012	-0.073	0.088	**0.199**	-0.043	-0.053	0.014	0.048	0.010	0.082	-0.038	-0.218
X 8	-0.049	-0.146	0.088	0.150	0.027	0.058	0.064	**-0.297**	-0.295	0.149	-0.010	-0.001	-0.021	-0.104	-0.275
X 9	-0.038	-0.054	0.021	0.051	0.005	0.013	0.029	-0.108	**-0.109**	0.056	-0.011	-0.004	-0.027	-0.025	-0.211
X 10	-0.011	-0.010	0.001	-0.005	0.001	0.000	0.002	-0.012	-0.012	**-0.502**	-0.007	-0.004	-0.003	-0.001	-0.401*
X 11	-0.135	0.010	0.046	-0.053	0.074	-0.024	-0.054	-0.008	-0.023	0.063	**-0.225**	-0.167	-0.084	0.033	-0.118
X 12	0.040	-0.023	-0.171	0.123	-0.179	-0.110	0.015	0.001	0.011	-0.046	0.220	**0.436**	0.007	-0.110	0.578*
X 13	-0.225	-0.095	-0.005	0.007	0.032	-0.179	-0.106	-0.018	-0.063	0.035	-0.097	-0.006	**0.296**	0.040	0.323*
X14	-0.056	0.011	0.041	-0.024	-0.007	-0.082	-0.075	0.138	0.090	-0.013	-0.058	-0.147	-0.061	**0.057**	0.212

'r_g' : Genotypic correlation coefficient, Genotypic residual effect = 0.02691

X1 : Plant height
X2 : Plant spread
X3 : Number of branches per plant
X4 : Stem girth
X5: Number of leaves per plant
X6: Internodal length
X7: Leaf area
X8: Days to bud appearance
X9: Days to flowering
X10: Duration of flowering
X11: Flower diameter
X12: Flower weight
X13: Flower stalk length
X14: Vase life

Table 5. Phenotypic path coefficient among different characters in dahlia through direct and indirect effects

Characters	X 1	X 2	X 3	X 4	X 5	X 6	X 7	X 8	X 9	X 10	X 11	X 12	X 13	X 14	'rg' values Number of flowers/ plant
X 1	**0.423**	0.170	0.035	0.007	0.015	0.236	0.150	0.071	0.130	-0.174	0.249	0.056	0.359	-0.058	0.393*
X 2	-0.017	**0.035**	0.003	0.008	-0.013	-0.001	0.004	-0.019	-0.019	0.018	0.002	0.003	-0.014	-0.001	0.126
X 3	0.031	-0.024	**0.372**	-0.034	0.256	0.155	-0.149	-0.098	-0.050	0.016	-0.075	-0.210	0.004	0.035	0.799**
X 4	-0.001	0.017	0.008	**-0.090**	0.029	0.024	0.005	0.043	0.037	0.017	-0.021	-0.037	0.002	0.004	-0.120
X 5	0.024	0.192	0.453	-0.214	**0.541**	0.130	-0.238	-0.056	-0.032	0.015	-0.213	-0.396	-0.082	-0.010	0.860**
X 6	-0.135	-0.006	-0.100	0.065	-0.048	**0.241**	-0.106	0.047	0.022	-0.003	-0.027	0.090	-0.164	0.049	0.388*
X 7	0.049	-0.014	-0.056	-0.008	-0.050	0.061	**0.139**	-0.030	-0.034	0.009	0.032	0.007	0.056	-0.027	-0.210
X 8	-0.039	-0.099	0.061	0.110	0.020	0.045	0.050	**-0.231**	-0.206	0.117	-0.005	0.000	-0.016	-0.080	-0.259
X 9	-0.028	-0.040	0.012	0.038	0.004	0.008	0.023	-0.082	**-0.092**	0.043	-0.009	-0.002	-0.020	-0.020	-0.199
X 10	-0.003	-0.003	0.000	-0.002	0.000	0.000	0.001	-0.004	-0.004	**-0.512**	-0.002	-0.001	-0.001	0.000	-0.404*
X 11	-0.003	0.000	0.001	-0.001	0.002	-0.001	-0.001	0.000	-0.001	0.001	**-0.006**	-0.004	-0.002	0.001	-0.121
X 12	0.004	-0.002	-0.019	0.014	-0.020	-0.013	0.002	0.000	0.001	-0.005	0.025	**0.428**	0.001	-0.012	0.575*
X 13	-0.068	-0.027	-0.001	0.001	0.010	-0.055	-0.032	-0.006	-0.018	0.011	-0.028	-0.002	**0.250**	0.013	0.321*
X 14	-0.043	0.007	0.029	-0.015	-0.005	-0.062	-0.059	0.106	0.066	-0.011	-0.042	-0.112	-0.050	**0.034**	0.201

'r_p' : Phenotypic correlation coefficient, Phenotypic residual effect = 0.04572
Bold diagonal : Direct effect, Above and below diagonal : Indirect effect

X1 : Plant height; X2 : Plant spread; X3 : Number of branches per plant; X4 : Stem girth; X5: Number of leaves per plant; X6: Internodal length; X7: Leaf area; X8: Days to bud appearance; X9: Days to flowering; X10: Duration of flowering; X11: Flower diameter; X12: Flower weight; X13: Flower stalk length; X14: Vase life

the other characters (fourteen characters) was marked as independent variables. The residual effect is analyzed by the indirect and direct effects which assess the role of other possible independent variables which were not incorporated in the study on the dependent variable. At phenotypic and genotypic level, positive direct effects on number of flowers per plant was exhibited by number of leaves per plant (0.541 and 0.659, respectively) followed by plant height (0.423 and 0.551, respectively), flower weight (0.428 and 0.436, respectively), number of branches per plant (0.372 and 0.547, respectively), flower stalk length (0.250 and 0.257, respectively), internodal length (0.241 and 0.249, respectively), leaf area (0.139 and 0.199, respectively), plant spread (0.035 and 0.043, respectively) and vase life (0.034 and 0.057, respectively) whereas negative direct effects on number of flowers per plant was exhibited by days to first flowering (-0.109 and -0.092, respectively) followed by stem girth (-0.214 and -0.090, respectively), flower diameter (-0.225 and -0.006, respectively), days to bud appearance (-0.297 and -0.231, respectively), duration of flowering (-0.502 and -0.512, respectively). The residual effect of the phenotypic path coefficient analysis was 0.04572 (95.43%) and for genotypic path coefficient analysis, it was low i.e., 0.02691 which indicates that 97.309% of the variability which was due to the contribution of component characters (independent) on yield i.e., number of flowers per plant (dependent) and the remaining 2.961% of variability was due the other contribution factors which needs to be further identified for the future crop breeding programme. The present findings are in agreement with Prakash *et al*. (2018) in which they reported 94.69% of variability i.e., 0.0531 genotypic residual effect on number of flowers per plant in chrysanthemum at genotypic level, Kumar (2019), reported

89% of variability at genotypic level in dahlia, Nimbalkar *et al.* (2004) in dahlia and Kumar *et al.* (2012) in chrysanthemum, reported 95.4% of variability i.e., 0.046 genotypic residual effect.

CONCLUSION

On the basis of above findings, it can be concluded that the characters i.e., number of flowers per plant (yield) showed positive significant correlation as well as positive direct effects with internodal length, flower weight and flower stalk length whereas, highly significant positive correlation with number of branches per plant and number of leaves per plant. Therefore, direct selection for these characters will have a positive impact on number of flowers per plant.

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