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Character Association and Path Co-efficient Analysis in F_2 Segregating Population of Cross "Arka Kamini x PG Violet" in China Aster (*Callistephus chinensis* [L.] Nees)

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A B S T R A C T

An experiment was carried out at experimental farm of Department of field of Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere, during the year 2017-18 in the unreplicated design. The phenotypic correlation coefficients and path coefficient analysis were carried out for the F_2 segregating population of cross Arka Kamini × PG Violet in China aster for fifteen characters. The results revealed that flower yield per plant had high significant and positive correlation with the individual flower weight (0.599), flower diameter (0.562), disc diameter (0.491), number of flowers per plant (0.219) and number of branches per plant (0.197). Path analysis revealed that number of branches per plant (0.0285), plant spread North-South (0.1475), plant spread East-West (0.0064), days to first flowering (0.2439), duration of flowering (0.0312), flower diameter (0.2341) and disc diameter (0.6472), number of flowers per plant (0.4896), individual flower weight (0.3383), had maximum positive direct effect on flower yield per plant.

Introduction

China aster [*Callistephus chinensis* (L.) Nees], belonging to the family Asteraceae, is most popular annual flowering plant grown throughout the world. In India, it is grown traditionally for its loose flowers, cut flowers, in arranging in vase, floral decorations, making garlands and venis. It is extensively grown in Karnataka, Tamil Nadu, West Bengal and Maharashtra by marginal and small farmers.

Correlation analysis is a biometrical technique used to find out the nature and degree of association among various traits. Knowledge of association among the traits is necessary for making indirect selection for improvement of economically important traits. Character association as correlation is a measure of degree of association prevailing between highly heritable characters with most economic characters and gives better understanding of the contribution of each trait in building up of the genetic make-up of the crop. High positive correlation between the traits indicates that selection for improvement of one character leads to the simultaneous improvement in the other character. Hence, it is of greater significance and could be

effectively utilized in formulating effective selection scheme. The path coefficient analysis method splits the correlation coefficients into direct and indirect effects which help in assessing the relative influence of each important character on the ultimate yield and flower quality.

Materials and Methods

The present investigation was conducted at an experimental field of Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere, during the year 2017-18. The F_2 population of cross Arka Kamini × PG Violet was selected based on the superior yield and yield contributing characters. The materials under study comprises of 200 F_2 populations and their parents *viz.*, Arka Kamini, PG Violet and F_1. The F_2 population is obtained from selfing F_1 hybrids of Arka Kamini × PG Violet and selfed seeds are collected and used for F_2 study. Observations were recorded on single plant basis for different growth, flowering, quality and yield parameters. The data were subjected to statistical analysis for calculating, phenotypic correlation coefficient as per the formula suggested by Singh and Chaudhary (1977). Path co-efficient analysis was done following the formula of Dewey and Lu (1959).

Results and Discussion

Correlation studies

Correlation was studied in the cross Arka Kamini x PG Violet for fifteen characters and revealed that positive and significant phenotypic correlation on flower yield per plant was observed for number of flower per plant (0.219), individual flower weight (0.599), flower diameter (0.562), disc diameter(0.491) and number of branches per plant (0.197). However significant and negative correlation was observed for days to first flower bud initiation (-0.139) on plant spread East-West and number of flowers per plant on flower diameter (-0.907), disc diameter (-0.900) and flower stalk length (-0.147) (Table 1). Similar results were reported by Khangjarakpam *et al.*, (2015), Harishkumar *et al.*, (2018) in China aster and Manjula and Nataraj (2016) in dahlia.

Path coefficient analysis

The path coefficient analysis of flower yield per plant in the F_2 population of the cross Arka Kamini x P G Violet revealed that number of branches per plant (0.0285), stem girth (0.1475), plant spread North-South (0.0064), days to first flowering (0.2439), duration of flowering (0.0312), number of flower per plant (0.4896), individual flower weight (0.3383), flower diameter (0.2341) and disc diameter (0.6472) had showed positive direct effects on flower yield per plant.

The finding of Harishkumar *et al.*, (2018) and Rai *et al.*, (2017) in China aster, Ramzan *et al.*, (2016) in gladiolus and Usha *et al.*, (2014) in marigold are in agreement with the above results. Whereas, the characters like plant height (-0.1023), plant spread East-West (-0.0434), days to flower bud initiation (-0.0527), days for fifty percent flowering (-0.1778) and flower stalk length (-0.0562) showed negative direct effect on flower yield plant (Table 2).

In conclusion, the correlation and path analysis study revealed that flower yield per plant showed positive and significant associations with number of flower per plant, individual flower weight, flower diameter, disc diameter, number of branches per plant, plant spread North-South, plant spread East-West and duration of flowering at phenotypic level.

Table.1 Phenotypic correlation coefficients of F_2 population of the cross Arka Kamini x PG Violet among yield components in China aster

Traits	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	**1.000**	0.105	0.965**	0.459**	0.530**	-0.067	-0.039	-0.024	0.045	0.120	0.109	0.562**	-0.129	0.102	**0.0117**
2		**1.000**	0.132	0.266**	0.290**	-0.041	-0.023	-0.002	0.551**	0.024	0.036	-0.014	0.054	0.049	**0.1971 ***
3			**1.000**	0.480**	0.544**	-0.036	-0.008	0.005	0.044	0.111	0.098	0.543**	-0.121	0.093	**0.0194**
4				**1.000**	0.869**	-0.096	-0.042	0.005	0.185**	-0.044	-0.029	0.198**	0.022	-0.035	**-0.0606**
5					**1.000**	-0.139*	-0.083	-0.040	0.173*	-0.043	-0.016	0.235**	0.018	-0.032	**-0.0751**
6						**1.000**	0.941**	0.918**	-0.022	-0.060	-0.072	-0.056	0.054	-0.075	**-0.0295**
7							**1.000**	0.978**	0.018	-0.084	-0.092	-0.036	0.080	-0.093	**-0.0244**
8								**1.000**	0.018*	-0.050	-0.057	-0.022	0.061	-0.056	**0.0082**
9									**1.000**	-0.134	-0.131	-0.018	0.203**	-0.138	**0.0884**
10										**1.000**	0.969**	0.136	-0.907**	0.984**	**0.5629****
11											**1.000**	0.132	-0.900**	0.967**	**0.4918 ****
12												**1.000**	-0.147*	0.135	**-0.0023**
13													**1.000**	0.884**	**0.2195****
14														**1.000**	**0.5997****

* & ** indicates significant @ 5 % and 1 % level respectively.

1. Plant height (cm)
2. Number of branches per plant
3. Stem girth (cm)
4. Plant spread N-S (cm)
5. Plant spread E-W (cm)
6. Days to first flower bud initiation
7. Days to first flowering
8. Days for 50% flowering
9. Duration of flowering (days)
10. Flower diameter (cm)
11. Disc diameter (cm)
12. Flower stalk length (cm)
13. Number of flowers per plant
14. Individual Flower weight (g)
15. Flower yield per plant (g)

Table.2 Direct and indirect effects of characters on flower yield per plant in F_2 population of cross Arka Kamini x PG Violet in China aster

Traits	1	2	3	4	5	6	7	8	9	10	11	12	13	14	rp
1	**-0.1023**	-0.0107	-0.0987	-0.0469	--0.0542	0.0069	0.0040	0.0024	-0.0047	-0.0122	-0.0111	-0.0575	0.0132	-0.0104	**0.0117**
2	0.0030	**0.0285**	0.0038	0.0076	0.0083	-0.0012	-0.0006	-0.0001	0.0157	0.0007	0.0010	-0.0004	0.0015	0.0014	**0.1971 ***
3	0.1424	0.0195	**0.1475**	0.0708	0.0803	-0.0053	-0.0011	0.0007	0.0065	0.0164	0.0145	0.0802	-0.0178	0.0137	**0.0194**
4	0.0029	0.0017	0.0031	**0.0064**	0.0056	-0.0006	-0.0003	0.0001	0.0012	-0.0003	-0.0002	0.0013	0.0001	-0.0002	**-0.0606**
5	-0.0230	-0.0126	-0.0236	-0.0377	**-0.0434**	0.0060	0.0036	0.0017	-0.0075	0.0019	0.0007	-0.0102	-0.0008	0.0014	**-0.0751**
6	0.0035	0.0022	0.0019	0.0051	0.0073	**-0.0527**	-0.0496	-0.0484	0.0012	0.0031	0.0038	0.0030	-0.0028	0.0039	**-0.0295**
7	-0.0095	-0.0055	-0.0019	-0.0102	-0.0202	0.2296	**0.2439**	0.2386	0.0043	-0.0204	-0.0224	-0.0088	0.0195	-0.0227	**-0.0244**
8	0.0042	0.0004	-0.0009	-0.0009	0.0071	-0.1633	-0.1739	**-0.1778**	-0.0032	0.0088	0.0102	0.0038	-0.0109	0.0099	**0.0082**
9	0.0014	0.0172	0.0014	0.0058	0.0054	0.0007	-0.0005	0.0006	**0.0312**	-0.0042	-0.0041	-0.0005	0.0063	-0.0043	**0.0884**
10	0.1476	0.0299	0.0376	-0.0538	-0.0535	-0.0736	-0.1033	-0.0612	-0.1659	**0.2341**	-0.1953	0.1682	0.1199	0.2138	**0.5629****
11	-0.0704	-0.0231	-0.0635	0.0185	0.0104	0.0468	0.0593	0.0370	0.0845	-0.1268	**0.6472**	-0.0853	0.5825	-0.6258	**0.4918 ****
12	-0.0316	0.0008	-0.0306	-0.0112	-0.0132	0.0032	0.0020	0.0012	0.0010	-0.0077	-0.0074	**-0.0562**	0.0083	-0.0076	**-0.0023**
13	-0.1927	0.0800	-0.1798	0.0329	0.0266	0.0805	0.1190	0.0910	0.3030	0.0518	0.3407	-0.2194	**0.4896**	-0.3163	**0.2195****
14	**0.1361**	**0.0656**	**0.1241**	**-0.0470**	**-0.0429**	**-0.1003**	**-0.1244**	**-0.0745**	**-0.1851**	**0.3163**	**0.2942**	**0.1810**	**-0.0325**	**0.3383**	**0.5997****

Diagonal values indicates direct effect Residual= 0.3108 rp – Phenotypic correlation with flower yield per plant (g)

1. Plant height (cm)
2. Number of branches per plant
3. Stem girth (cm)
4. Plant spread N-S (cm)
5. Plant spread E-W (cm)
6. Days to first flower bud initiation
7. Days to first flowering
8. Days for 50% flowering
9. Duration of flowering (days)
10. Flower diameter (cm)
11. Disc diameter (cm)
12. Flower stalk length (cm)
13. Number of flowers per plant
14. Individual Flower weight (g)

However flower yield per plant exhibited high positive direct effect with plant height, number of branches per plant, plant spread East-West, days to flower bud initiation, days to first flowering, days to fifty percent flowering, number of flower per plant, individual flower weight, flower diameter and disc diameter. Hence the characters contributing significantly to desirable traits can be significantly identified and can be used as alternate selection criteria in crop improvement programme.

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