Biological Forum – An International Journal **15(10): 1668-1670(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Genetic Studies in F_3 Population of Cross Miraj Local × AAC-1 in China Aster [*Callistephus chinensis* (L.) Nees.]

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(Received: 25 August 2023; Revised: 25 September 2023; Accepted: 08 October 2023; Published: 15 October 2023)
(Published by Research Trend)

ABSTRACT: During 2021–2022, the Kittur Rani Channamma College of Horticulture in Arabhavi conducted an evaluation of the genetic variability in the F_3 population of the cross Miraj Local × AAC-1 in China aster. Across all traits, the phenotypic coefficient of variation was greater than the genotypic coefficient of variation. For each plant, the number of branches, leaf area, number of leaves, number of flowers, flower yield, and seed yield were found to have high (>20%) phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV). For plant height, number of flowers per plant, flower yield per plant, and seed yield per plant, high heritability (>60%) combined with high genetic advance as percent over mean (>20%) was noted. These findings suggest that additive gene effects are responsible for the high heritability, which can be used to further agricultural improvement programs.

Keywords: China aster, Miraj Local, AAC-1, Variability, Heritability.

INTRODUCTION

Classified as an Asteraceae species, *Callistephus chinensis* (L.) Nees., commonly referred to as China aster, is a well-known winter annual flower and decorative plant that is native to China (Navalinski *et al.*, 2005). As a self-pollinating crop, china aster has a 10% natural crossing, according to Fleming's 1937 research. Marigold, chrysanthemum, and china aster are three of the most well-liked annual flowers. It blooms almost year-round, is widely grown worldwide, and is generally tolerant to a range of agro-climatic conditions. For year-round production in kharif, rabi, and summer, it may be grown successfully in open spaces, guaranteeing a consistent supply of flowers for the market. One may grow it in a greenhouse. China aster is being commercially cultivated as a result of its rising popularity in India's major cities.

For any crop's genetic development, producing and utilizing diversity through efficient breeding techniques is crucial. Any crop improvement's efficacy is based on the genetic diversity found in the genotypes that are currently accessible, which may be a result of environmental variation or cultivar genetics. Overall, early segregating populations produce a significant amount more distinctiveness than later generations. Thus, the selection of appropriate segregants is made possible by F_2 population segregation. A self-pollinating crop, China asters need a high-yielding variety with distinctively coloured blooms to be included in a desirable breeding program.

MATERIALS AND METHODS

From 2021 to 2022, the current experiment was conducted at the Kittur Rani Channamma College of Horticulture, Arabhavi, in the Department of Floriculture and Landscape Architecture. In this experiment, F_3 populations of the cross Miraj Local × AAC-1 and their parents, Miraj Local and AAC-1, are involved. A randomized block design with two replication was used to set up the experiment. After 45 days, rooted cuttings measuring 30 by 30 cm were transplanted, and all advised agronomic package practices were adhered to. Every F_3 population underwent observations concerning various growth, flowering, yield, and quality parameters.

According to Burton and De-Vane (1953), the parameters of variability such as mean, range, phenotypic and genotypic coefficient of variation, broad sense heritability, and genetic advancement were calculated by Johnson *et al.* (1955).

RESULTS AND DISCUSSION

For the majority of the characters under study, the F_3 population of the Miraj Local x AAC-1 cross was found to be noticeably better. For every trait, the estimates of the phenotypic coefficient of variation values were comparatively higher than the genotypic coefficient of variation values (Table 1), indicating greater interactions between genotype and environment.

The estimates of PCV (phenotypic coefficient of variation) and GCV (genotypic coefficient of variation) were moderate to high (>20%) for number of branches (13.24% and 11.43%), leaf area (25.70% and 24.79%), number of leaves per plant (25.72% and 24.79%), number of flowers per plant (20.50% and 19.10%), flower yield per plant (29.67% and 29.45%) and seed yield per plant (24.98% and 23.87%) and high PCV and moderate GCV (24.00% and 22.74%) showed by the character individual flower weight indicating wider variation in the population and less environmental influence on the expression of traits.

This also demonstrated that characters with larger coefficients of variation present a greater chance for selection-based improvement. This supports previous findings by Hebbal *et al*. (2018) in chrysanthemum, Hosalli *et al*. (2019); Varun (2018) in China aster, and Patel *et al*. (2019) in marigold.

There was a moderate difference in PCV and GCV for plant height (9.51% and 6.63%), stem girth (13.32% and 11.68%), flower diameter (18.30% and 17.14%), seed test weight (20.84% and 19.87%), and flower duration (10.12% and 7.72%), suggesting that the environment had an impact on the expression of the traits. The results of Rajiv *et al*. (2014); Harishkumar *et al*. (2017) in China aster support this.

Days to first flowering (13.31% and 11.23%), days to 50% flowering (10.12% and 7.72%), and vase life (11.87% and 10.12%) all showed moderate PCV and GCV. The findings of Hosalli *et al*. (2019); Varun (2018); Harishkumar *et al*. (2017) in China aster are consistent with these results.

High genetic advance and heritability were found in the percentage of mean for plant height (4.93% and 48.62%), flower yield (90.00% and 99.00%), number of flowers per plant (91.50% and 98.50%), and seed yield per plant (3.76% and 91.02%). These results show that these traits are useful in the selection of desirable segregants because they are genetically controlled by additive gene action (Table 1). According to Henny *et al*. (2021) in chrysanthemum, Patel *et al.* (2019) in marigold, Khangjarakpam *et al.* (2015) in China aster, and Ramya *et al.* (2019), these results are consistent.

High to moderate heritability with high to moderate genetic advance as per cent mean was observed for number of branches per plant (74.55% and 20.34%), stem girth (76.92% and 21.10%), leaf area (92.95% and 49.21%), number of leaves per plant (92.87% and 49.21%), flower diameter (87.69% and 33.06%), individual flower weight (89.81% and 36.64%), seed test weight (90.90% and 39.20%), days to first flowering (71.28% and 19.54%), flower duration (58.20% and 12.13%)and vase life (72.70% and 17.78%) and the character days to 50% flowering showed moderate heritability with low genetic advance as per cent of mean, indicating non-additive gene action (Table 1). These results are in agreement with the result of Harishkumar *et al*. (2017) in China aster, Prakash *et al*. (2017) in chrysanthemum, Anil *et al*. (2015) in balsam and Jyothi and Kulkarni (2017) in dahlia.

High heritability along with genetic advance increases the efficiency of selection in a breeding programme by assessing the influence of environmental factors and additive gene action.

In conclusion, present study revealed that there was a wide range of variability existed in cross Miraj Local × AAC-1 for different growth, flowering, quality and yield parameters. Plants which exhibited different characters with high heritability coupled with high genetic advance would be effective for selection and utilized for breeding of high yielding China aster cultivars.

Table 1: Estimation of mean, range, components of variance, heritability and genetic advance of F_2 population "Miraj Local × AAC-1" for fifteen parameters.

Character	Mean	Range	PCV (%)	GCV (%)	h^2 (%)	GA	GAM
Plant height (cm)	51.78	45.05-56.70	9.51	6.63	48.62	4.93	9.52
Number of branches	12.81	10.41-16.25	13.24	11.43	74.55	2.61	20.34
Stem girth (cm)	1.16	0.94 - 1.35	13.32	11.68	76.92	0.25	21.10
Leaf area (cm^2)	1981.64	1407.66–2730.10	25.70	24.79	92.95	975.21	49.21
Number of leaves per plant	158.23	105.50 - 330.50	25.72	24.79	92.87	126.60	49.21
Flower diameter (cm)	5.55	4.06 - 7.22	18.30	17.14	87.69	1.83	33.06
Flower weight (g)	3.50	1.62 - 5.00	24.00	22.74	89.81	15.63	36.64
Number of flowers per plant	42.66	26.46 - 60.31	20.50	19.10	86.76	15.63	36.64
Flower yield (g/ plant)	151.99	80.56-260.25	29.67	29.45	98.50	91.50	60.20
Seed yield (g/ plant)	8.01	3.12 – 10.79	24.98	23.87	91.31	3.76	46.99
Test weight (g/ plant)	2.43	1.71 - 2.94	20.84	19.87	90.90	0.95	39.02
Days to first flowering	64.04	50.15 - 80.18	13.31	11.23	71.28	12.52	19.54
Days to 50% flowering	74.73	64.33 - 89.71	10.20	8.18	64.30	10.10	13.51
Flower duration (days)	33.87	27.68 – 40.22	10.12	7.72	58.20	4.11	12.13
Vase life (days)	8.04	6.73 - 9.31	11.87	10.12	72.70	1.43	17.78

PCV- Phenotypic Co-efficient of Variation; GCV- Genotypic Co-efficient of Variation; h^2 - Heritability in broad sense; GA- Genetic Advance; GAM- Genetic advance as per cent of mean

CONCLUSIONS

In conclusion, present study revealed that there was a wide range of variability existed in cross Miraj Local × AAC-1 for different growth, flowering, quality and yield parameters. Plants which exhibited different characters with high heritability coupled with high genetic advance would be effective for selection and utilized for breeding of high yielding China aster cultivars.

Acknowledgement. The authors sincerely acknowledge department of Floriculture and Landscape Architecture for providing the facilities.

REFERENCES

Anil, K. S., Jitendra, K., Maurya, Pal, A. K., Bijendra, K. S. and Singh, S. V. (2015). Studies on genetic parameters and correlation in single whorled balsam (*Impatiens balsamina* L.). *Indian J. Agric. Allied Sci.*, *1*(3), 21-26.

Burton, G. W. and De-Vane, E. H. (1953). Estimating heritability in tall fescue (*Festuca arundinaceaei*) from replicated clonal material. *Agron. J., 45*(10), 284-291.

Fleming, W. M., (1937). U. S. D. A. Year book of Agriculture, U. S. Dept. of Agric., pp: 985.

Harishkumar, K., Mukund Shiragur, Kulkarni, B. S. and B. C. Patil (2017). Studies on genetic variability, heritability and genetic advance in F_2 segregating population of China aster [*Callistephus chinensis* L. (Nees.)]. *Agric. Res. J.*, *54*(3), 407-409.

Hebbal, M., Mukund Shiragur, Mahantesha B. N. Naika, G. K. Seethramu, Sandhyarani Nishani and Patil, B. C. (2018). Assessment of genetic variability, heritability and genetic advance in chrysanthemum (*Dendrathema grandiflora* Tzvelve). *Int. J. Micribiol. App. Sci., 7*(08), 4544-4553.

Henny, T., Palai, S. K. and Chongloi, L. (2021). Assessment of genetic variability, heritability and genetic advance in spray chrysanthemum (*Chrysanthemum morifolium* Ramat). *Crop Research*, *56*(6), 336-340.

Hosalli, A., Shiragur, M., Patil, B. C., Masuthi, D. and Tatager, M. H. (2019). Studies on genetic variability, heritability and genetic advance in F_4 population of China Aster [*Callistephus chinensis* L. (Nees.)]. *Int. J. Curr. Microbiol. App. Sci., 8*(9), 822-828.

Johnson, H. W., Robinson, H. F. and Constock, R. E. (1955). Estimate of genetic and environmental variability in Soyabeans. *Apron. J., 47,* 314-318.

Jyothi, K. and Kulkarni, B. S. (2017). Evaluation of dahlia genotypes for growth and yield characters under dry zone of Karnataka, India. *Int. J. Curr. Microbiol. App. Sci*., *6*(11), 402-409.

Khangjarakpam, G., Rajiv, K., Seetharamu, G. K. and Rao, M. T. (2015). Genetic variability for quantitative traits in China aster [*Callistephus chinensis* (L.) Nees]. *J. Horti. Sci., 9*(2), 141-144.

Navalinskien, M. Samuitien M and Jomantiene R. (2005). Molecular detection and characterisation of phytoplasma infecting *Callistephus chinensis* plants in Lithuania. *Phytopathology*, *35*, 109–112.

Patel, M. A., Chawla, S. L., Chavan, S. K., Shah, H. P. and Patil, S. D., (2019). Genetic variability, heritability and genetic advance studies in marigold (*Tagetes* spp.) under the South Gujarat region. *Electron. J. Plant Breed.*, *10*(1), 272-276.

Prakash, A., Kumar, M., Sirohi, U., Singh, M. K., Malik, S., Kumar, V., Rana, A. and Maurya, O. P., (2017). Assessment of genetic variability, heritability and genetic advance in chrysanthemum (*Dendranthema grandiflora* Tzvelev.). *Hort. Flora Res. Spectrum*., *6*(3), 212-214.

Rajiv, K., Gayatri, K., Manjunatha, R. T. and Dhananjaya, M. V. (2014). Genetic variability for quantitative traits in China aster. *Agro. Technol*., *2*(4), 105-110.

Ramya, H. M., Nataraj, S. K., Lakshmana, D. and Kumar, R. (2019). Studies on genetic variability, heritability and genetic advance in F_2 segregating population of cross Arka Archana × AAC-1 in China Aster [*Callistephus chinensis* (L.) Nees]. *Int. J. Curr. Microbiol. App. Sci*., *8*(4), 1230-1233.

Varun, K. R. (2018). Genetic studies in F_3 population of china aster [*Callistephus chinensis* (L.) Nees.]. M.Sc., *thesis* Univ. Hort. Sci., Bagalkot, India.

How to cite this article: Tanzeela Kanganolli, Mukund Shiragur, B.C. Patil, Manjula Karadiguddi, Sayeed Almas and Naveen Puttaswamy (2023). Genetic Studies in F_3 Population of Cross Miraj Local × AAC-1 in China Aster [*Callistephus chinensis* (L.) Nees.]. *Biological Forum – An International Journal, 15*(10): 1668-1670.