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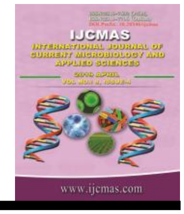

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Studies on Genetic Variability, Heritability and Genetic Advance in F_2 Segregating Population of Cross Arka Archana × AAC-1 in China Aster [*Callistephus chinensis* (L.) Nees]

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A B S T R A C T

The present study was conducted to evaluate genetic variability in F_2 population of cross Arka Archana × AAC-1 in China aster at the College of Horticulture, Mudigere during 2017-18. The phenotypic coefficient of variation was higher than genotypic coefficient of variation for all the traits. High (>20 %) phenotypic coefficient of variation (PCV) and genotypic coefficient of variation(GCV) was recorded for number of branches per plant, plant spread East-West, number of flowers per plant, disc diameter, individual flower weight and flower yield per plant. High heritability (>60 %) coupled with high genetic advance as per cent over mean (>20 %) were recorded for plant height, number of branches per plant, plant spread North-South and East-West, flower diameter, disc diameter, flower stalk length and flower yield per plant and indicated that the high heritability is due to additive gene effects which can be utilized for further crop improvement programme.

Introduction

China aster [*Callistephus chinensis* (L.) Nees.] is a half-hardy annual and an important commercial flower crop belonging to the family Asteraceae with chromosome number of (2n = 18). The genus *Callistephus* is derived from two Greek words *Kalistos* meaning 'most beautiful' and *Stephos* 'a crown' referring to the flower head. Among annuals china aster ranks next to chrysanthemum and marigold. China aster is a self pollinated crop but the natural crossing is approximately 10 per cent as reported by Fleming (1937).

The success of any crop improvement depends on the genetic variability existing in the available genotypes, which may be either due to genetic constitution of cultivars or variation in the growing environment. Creation and utilization of the variability using proper breeding procedure is the pre-requisite for genetic improvement of any crop. Generally, amount of variability generated is more in the early segregating generations than compared to later generations. Hence, segregating F_2 population provides an opportunity for selection of desirable segregants. Being a self pollinated crop, there is need of high yielding variety of china aster with specific colored flowers. Hence keeping all these in view, the present study was undertaken to examine the magnitude of variability, heritability, genetic advance, and genetic advance as percent mean for different growth, flowering, quality and yield parameters among segregating F_2 populations.

Materials and Methods

The present experiment was carried out in the Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere, University of Agricultural and Horticultural Sciences, Shivamogga during 2017-18. The Experiment consists of 200 F_2 populations of cross Arka Archana and AAC-1, F_1 and their parents *viz.,* Arka Archana and AAC-1. The F_2 population is obtained from selfing F_1 hybrids of Arka Archana × AAC-1. Experiment was laid out in unreplicated design. Thirty days old rooted cuttings were transplanted in 30 x 30 cm spacing and all the recommended agronomic package of practices were followed. Observations were recorded in all the F_2 populations for different growth, flowering, yield and quality parameters. The parameters of variability like mean, range, phenotypic and genotypic coefficient of variation (As per the Burton and De-Vane, 1953), broad sense heritability (Johnson *et al*, 1955) and genetic advance were calculated according to Johnson *et al.,* (1955).

Results and Discussion

The F_2 population of the cross Arka Archana × AAC-1 was found to be significantly superior for most of the characters studied. The estimates of phenotypic coefficient of variation values were relatively higher than those of genotypic coefficient of variation for all the traits (Table 1) which indicated greater genotype × environment interactions.

The estimates of PCV (phenotypic coefficient of variation) and GCV (genotypic coefficient of variation) were high (> 20%) for number of branches per plant (30.25 % and 23.41 %), plant spread East-West (22.07% and 21.30%), number of flowers per plant (26.02 % and 25.30%), disc diameter (34.08% and 33.33%), individual flower weight (25.59% and 25.18%) and flower yield per plant (30.54% and 29.99%) indicating wider variation in the population and less environmental influence on the expression of traits. Similar findings were recorded by Harishkumar *et al.,* (2017) and Rai *et al.,* (2017) in china aster, Prakash *et al.,* (2017) and Telem *et al.,* (2017) in chrysanthemum. This indicated that the characters showing higher magnitude of coefficient of variation offer better opportunity for improvement through selection and moderate PCV and GCV were recorded for plant height (17.58% and 15.78%), stem girth (16.88% and 10.56%), duration of flowering (13.78% and 10.63%), flower diameter (11.73% and 11.35%), flower stalk length (19.20% and 15.58%), indicating environmental influence on the expression of the traits with little or high difference in PCV and GCV (Table 1). This is in accordance with the findings of Rajiv *et al.,* (2014) and Harishkumar *et al.,* (2017) in china aster.

Low PCV and GCV were recorded for days to flower bud initiation (6.87% and 6.48%), days to first flowering (6.11% and 5.46%), shelf life (8.50% and 4.80%) and vase life (12.87% and 7.18%) This is in agreement with the findings of Harishkumar *et al.,* (2017) in china aster, Vikas *et al.,* (2015) in dahlia (Table 1). High heritability coupled with high genetic advance as per cent of mean was recorded for plant height (80.50% and 29.17%), number of branches per plant (63.82% and 39.15%), plant spread North-South (87.33% and 38.46%), plant spread East-West (93.18% and 42.37%), flower diameter (93.74% and 22.65%), disc diameter (95.61% and 67.13%), flower stalk length (65.83% and 26.04%) and flower yield per plant (96.39% and 81.53%) indicating usefulness of these traits in selection of desirable segregants due to its genetic control by additive gene action (Table 1). These results are in agreement with the findings of Khangjarakpam *et al.*, (2014) in China aster, Telem *et al.*, (2017) in chrysanthemum.

Table.1 Mean, range, genetic components of variance, heritability and genetic advance on different growth, flowering, quality and yield parameters in F2 population of cross Arka Archana × AAC-1 in China aster

Character	Mean	Range	PV	GV	PCV(%)	GCV (%)	h^2 (%)	GA	GAM
Plant height (cm)	59.5	30-87	109.52	88.17	17.58	15.78	80.50	17.35	29.17
Number of branches per plant	8.76	5-18	7.05	4.50	30.25	24.20	63.82	3.43	39.15
Stem girth (cm)	0.67	0.42-0.98	0.012	0.005	16.88	10.56	39.18	0.09	13.62
Plant spread (N-S) (cm)	35.38	20-60	57.23	49.98	21.38	19.98	87.33	13.61	38.46
Plant spread (E-W)(cm)	32.68	18-48	52.05	48.50	22.07	21.30	93.18	13.84	42.37
Days to flower bud initiation	58.66	50-67	16.26	14.46	6.87	6.48	88.93	7.38	12.59
Days to first flowering	65.75	57-74	16.17	12.92	6.11	5.46	79.91	6.62	10.07
Days to 50% flowering	77.28	59-87	24.58	23.28	6.41	6.24	94.71	9.67	12.51
Duration of flowering (days)	34.09	27-44	22.09	13.14	13.78	10.63	59.48	5.75	16.89
Flower diameter (cm)	5.44	3.8-6.9	0.40	0.38	11.73	11.35	93.74	1.23	22.65
Disc diameter (cm)	1.32	0.6-2.3	0.20	0.19	34.08	33.33	95.61	0.89	67.13
Flower stalk length (cm)	20.60	13-30	15.65	10.30	19.20	15.58	65.83	5.36	26.04
Vase life (days)	8.10	6-10	1.08	0.33	12.87	7.18	31.15	0.66	8.26
Shelf life (hours)	30.21	25-37	6.60	2.10	8.50	4.80	31.84	1.68	5.58
Number of flowers per plant	45.91	21-78	142.71	135.01	26.02	25.30	94.60	23.28	50.71
Individual flower weight (g)	2.68	1.4-5.7	0.47	0.45	25.59	25.18	96.82	1.37	51.04
Flower yield (g/plant)	120.98	43.8-188.8	1365.68	1316.46	30.54	29.99	96.39	73.38	81.53
Flower yield (q/ha)	134.42	48.66-209.77	1686.02	1625.25	30.54	29.99	96.39	81.53	60.65

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

Moderate heritability with moderate to high genetic advance as per cent mean was observed for stem girth (39.18% and 13.62%), duration of flowering (59.48% and 16.89%), vase life (31.15% and 8.26%) and shelf life (31.84% and 5.58%) indicating non-additive gene action (Table 1). These results are in accordance with the findings of Khangjarakpam *et al.*, (2014) and Rajiv *et al.*, (2014) in china aster, Ghimiray and Sarkar (2015) in gerbera. 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 Arka Archana × 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.

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