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Studies on Genetic Variability, Heritability and Genetic Advance In Gaillardia (Gaillardia Pulchellafoug.)

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Abstract: *The twelve genotypes of gaillardia ('Genotype-1', 'Genotype-2', 'Genotype-3', 'Genotype-4', 'Genotype-5', 'Genotype-6', 'Genotype-7', 'Genotype-8', 'Genotype-9', 'Genotype-10', 'Genotype-11' and 'Genotype-12') were evaluated to determine genetic variability, heritability, genetic gain for twenty five contributing characters. The results illustrated high value of phenotypic and genotypic co-efficient of variation for traits like number of ray florets per flowers (PCV = 47.41, GCV = 47.31) and weight of flowers per plant (PCV = 41.54, GCV = 41.47). High heritability with high value of genetic advance was observed for weight of flowers per plot, weight of flowers per plant, plant fresh weight, estimated flower yield per hectare, number of ray florets per flower, number of disc florets per flower and number of flowers per plant. High genetic advance as per cent of mean was observed for number of ray florets per flower, weight of flowers per plant, weight of flowers per plot and number of whorls per flower. It was observed that heritable variability in the breeding materials characters like number of ray florets per flower, weight of flowers per plant, weight of flowers per plot, number of disc florets per flower and number of flowers per plantcould be exploited for improvement through crop breeding programme.*

Keywords: *Gaillardia,Genetic variability, Heritability, Genetic advance, Ray floret*

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I. Introduction:

Gaillardia (Gaillardia pulchellaFoug.) popularly known as 'Blanket Flower'or Fire Wheel, belong to the family Asteraceae and is native to Central and Western United States, having the basic chromosome number X=18 and 2n=36(Srivastava and Kandpal, 2006). The generic name Gaillardia was proposed by Mr. Gaillard de Marentoneau, a French botanist in 18th century. There are about twenty eight species reported in the genus Gaillardia, but only two of them viz. Gaillardia pulchella (annual) and Gaillardia aristica (perennial) are under cultivation.The plants possess brilliant daisy-like flowers with single, double and semi double forms(Cox and Klett, 1984). Flowers are small and numerous, born solitary at each node, showy heads are 4 to 6 cm in diameter having a long hairy stalk. Individual flowers in a capitulam are called florets. As a member of Asteraceae (Compositae) it has both ray (Pistillate) and disc florets (Hermaphrodite). The crop produce flowers in a wide range of colors such as yellow, orange, cream, scarlet, bronze, brick red, red tipped and red with yellow tipped and can be grown all around the year. Gaillardia is a perfect plant for flower beds, borders and corners. It is also used for garlands, bouquets and as loose flower. This is a substitute flower crop for chrysanthemum and China aster (Bose et al., 2003).

II. Materials And Methods:

The experiment was conducted at Instructional Farm of the Department of Floriculture and Landscaping, Collage of Horticulture & Forestry, Jhalrapatan, Jhalawar, Agriculture University, Kota (Rajasthan), during the year 2017-2018. The soil had organic carbon 0.56 %, available nitrogen 335.57 kg/ha, available phosphorus 15.91 kg/ha and available potash 261.00 kg/ha. Well decomposed vermi-compost at the rate of 4 kg/sqm was recommended dose of NPK (100:80:60 g/m²) with applied at the time of bed preparation. Twelve genotypes of gaillardia collected from different states of country (Rajasthan, Uttar Pradesh, Madhya Pradesh and Karnataka). The experiment was laid out in randomized block design with three replications. Seeds are sown in nursery beds and 40 days old seedlings were transplanted in main field at spacing of 30 X40cm (plant to plant and row to row). The genetic parameters such as genotypic co-efficient of variation (GCV), phenotypic co-efficient of variation (PCV), heritability, genetic advance and genetic advance as per cent of mean in broad sense.

III. Results And Discussion:

The results indicated (Table 1.) significant differences among the genotypes for twenty six the characters studies in this experiment. Extent of variability was measured in terms of variance, genotypic co-efficient of variation (GCV), Phenotypic co-efficient of variation (PCV), Environmental co-efficient variation (ECV) along with per cent heritability (h^2), advance mean and genetic advance per cent of mean.

In general, phenotypic co-efficient of variation was greater than the corresponding genotypic co-efficient of variation for all the characters Similar findings were reported by Namitaet al. (2008) and Verma et al. (2002). It was indicating the importance and influence of interaction of environment expression of the characters. The differences between the PCV and GCV were relatively very small which indicated that large amount of variability was contributed by genetic component and less by environmental influence.

The PCV and GCV values were higher for number of ray florets per flower followed by weight of flowers per plant, weight of flowers per plot, estimated flower yield per hectare, number of whorls of ray floret and fresh flower weight, which indicates that greater amount of variability among the different genotypes thus useful for making selections particularly based on that characters. Highest PCV and GCV were reported for number of ray florets per flower also found the highest variability for the weight of flowers per plant (Khangjarakpamet al. 2014) in China aster suggesting selection of genotypes based on this trait will be effective for further improvement through breeding programmes. Similar findings were also reported by Tamutet al. (2015) in Gaillardia, Khangjarakpamet al. (2014) in China aster, Vikaset al. (2011) in dahlia, Baskaranet al. (2009) in chrysanthemum.

The estimates of heritability (broad sense) ranged from 66.35-99.78 % for different characters. The highest heritability associated with the weight of flowers per plant, fresh flower weight, weight of flowers per plot, estimated flower yield per hectare, number of flowers per plant and number of ray florets per flower, number of whorls of ray floret, plant dry weight, number of disc floret per flower and the lowest heritability found in leaf width, length of ray floret, duration of flowering, flower diameter and width of ray floret was also reported by Vishnupriyet al. (2015) in marigold. Similar findings were recorded by Singh et al. (2014) in marigold, Vikaset al. (2011) in dahlia.

The results indicates that genetic advance differences among the all characters highest genetic advance with plant fresh weight and followed by the weight of flowers per plant, weight of flowers per plot, estimated flower yield per hectare and number of ray florets per flower, while the lowest genetic advance associated with length of ray floret, width of ray floret, leaf width, flower diameter and other traits belong to medium group. Similar results were also reported by Raiet al. (2017) in China aster, Yuvraj and Dhatt, (2014) in marigold, Khangjarakpamet al. (2014) in China aster,Senapathiet al. (2013) in gerbera,

In present study, estimates of high heritability with high genetic advance mean of per cent (GAM) for vegetative growth characters were observed for plant height, number of primary branches, plant spread, plant fresh weight ,plant dry weight, leaf length and leaf width. Flowering traits was recorded in duration of flowering, days taken first flower opening, indicating the possible role of additive gene action. Similarly, for yield and quality parameters high genetic advance over per cent mean (GAM) was observed for number of ray florets per flower, number of flowers per plant and plot, flower and yield both per plant and hectare, stalk length, shelf life of flower and in-situ flower life. The results are in conformity to those observed for number ray florets per flower by Hegde and Gopinath (2003) in gaillardia. Similar findings were recorded by Vishnupriyet al. (2015) in marigold, Kumar (2015) in gerbera, Singh et al. (2014) in marigold, Khangjarakpamet al. (2014) in China aster, Senapathiet al. (2013) in gerbera.

IV. Conclusion:

High PCV and GCV was recorded in number of ray floret per flower, weight of flowers per plant, weight of flowers per plot, number of whorls of ray floret, fresh flower weight, plant dry weight, number of disc florets per flower, plant fresh weight, number of flowers per plant, indicate the existence of wide range of genetic variability and hence there is a good scope for the improvement of these characters through selection and responsiveness of these traits to appropriate selection for evolution of improved genotypes of gaillardia due to low influence of environment whereas these traits had a more importance for selection in breedingprogramme.

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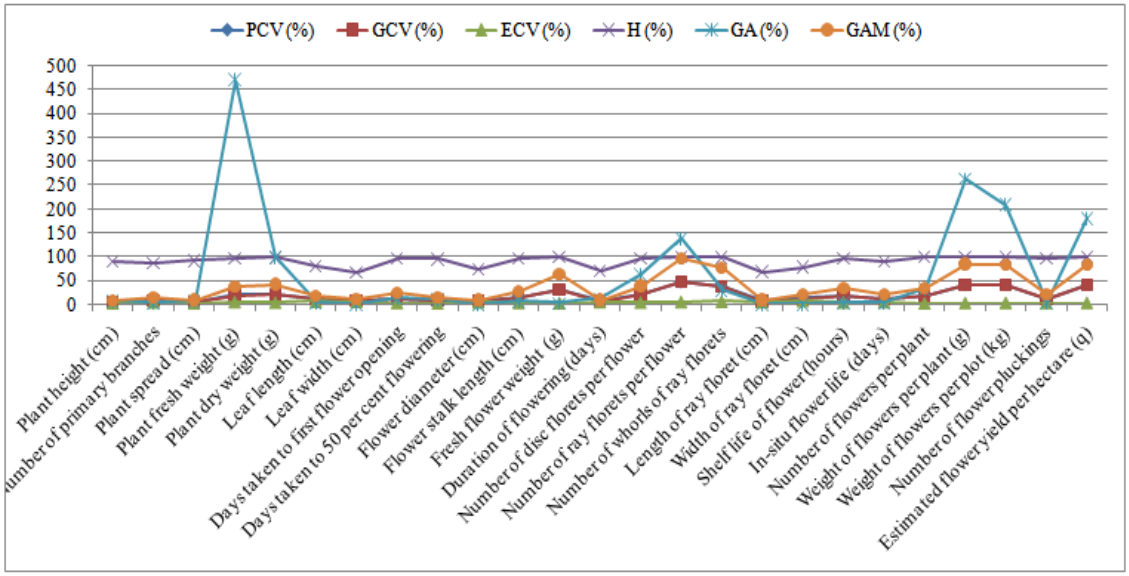
Table 4.13: Range, Mean, Phenotypic coefficient of variation (PCV), Genotypic coefficient of variation (GCV), Environment coefficient of variation (ECV), Heritability, Genetic advance and Genetic advance mean per cent for 25 characters in gaillardia

CHARACTERS	RANGE	MEAN	PCV (%)	GCV (%)	ECV (%)	H (%)	GA (%)	GAM (%)
Plant height (cm)	67.93-81.03	75.22	5.04	4.77	1.62	89.68	7.00	9.31
Number of primary branches	14.73-18.87	17.10	8.40	7.76	3.22	85.26	2.52	14.76
Plant spread (cm)	62.69-73.70	67.52	5.47	5.24	1.58	91.62	6.98	10.33
Plant fresh weight (g)	929.33-1626.93	1200.79	19.91	19.46	4.23	95.49	470.38	39.17
Plant dry weight (g)	164.50-321.46	229.46	21.08	20.89	2.85	98.20	97.85	42.65
Leaf length (cm)	8.26-11.67	10.11	11.46	10.30	5.03	80.73	1.93	19.06
Leaf width (cm)	3.54-4.38	3.87	8.28	6.74	4.80	66.35	0.43	11.32
Days to first flower opening	42.60-65.93	50.05	12.40	12.25	1.92	97.59	12.48	24.92
Days taken to 50 per cent flowering	64.93-84.33	72.54	7.39	7.20	1.65	95.02	10.50	14.47
Flower diameter (cm)	4.95-6.29	5.66	6.79	5.80	3.53	72.91	0.58	10.20
Flower stalk length (cm)	17.42-32.64	29.05	14.29	14.04	2.63	96.60	8.26	28.45
Fresh flower weight (g)	1.31-4.40	3.12	31.34	31.30	1.52	99.76	2.00	64.41
Duration of flowering (days)	108.80-143.66	126.94	6.91	5.79	3.78	70.22	12.69	10.00
Number of disc florets per flower	117.26-242.30	155.63	19.86	19.65	2.90	97.86	62.32	40.05
Number of ray florets per flower	16.53-214.26	141.90	47.41	47.23	4.16	99.23	137.53	96.92
Number of whorls of ray florets	1.26-5.96	3.88	38.64	38.31	5.05	98.29	30.30	78.24
Length of ray floret (cm)	2.41-3.03	2.70	7.15	5.90	4.05	67.93	0.27	10.01
Width of ray floret (cm)	1.22-1.84	1.50	13.36	11.78	6.30	77.73	0.32	21.39
Shelf life of flower (hours)	9.00-15.66	12.74	17.24	16.88	3.52	95.82	4.34	34.04
In-situ flower life (days)	8.60-13.53	10.84	11.77	11.46	3.74	89.89	2.36	21.79
Number of flowers per plant	75.60-131.53	96.48	16.98	16.95	1.09	99.59	33.61	34.84
Weight of flowers per plant (g)	102.67-578.72	307.29	41.54	41.40	1.95	99.78	262.39	85.39
Weight of flowers per plot (kg)	8.07-45.89	24.45	41.53	41.47	2.17	99.73	208.62	85.32
Number of flower pluckings	14.53-21.33	18.21	10.78	10.54	2.25	95.65	3.87	21.24
Estimated flower yield per hectare (q)	69.51-395.26	210.58	41.53	41.47	2.16	99.73	179.69	85.33

Fig. 4.13 Range, Mean, Phenotypic coefficient of variation (PCV), Genotypic coefficient of variation (GCV), Environment coefficient of variation (ECV), Heritability, Genetic advance and Genetic advance mean of per cent for 25 characters in gaillardia



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