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## Studies on phenotypic characterization of *Gaillardia* species in Raipur plain condition

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### Abstract

The present investigation phenotypic characterization of *Gaillardia* species in Raipur plain condition (C.G.) was conducted during 2022-23 in eight existing genotype of *Gaillardia* planted in the premises of Indira Gandhi Krishi Vishwavidyalaya, Raipur is utilized as experimental materials and coded as GLC-1, GLC-2, GLC-3, GLC-4, GLC-5, GLC-6, GLC-7 and GLC-8. Experiment was conducted in Randomized Block Design (RBD) with four replications. The morphological observations were analysed using descriptor taken from "Native Plant Trust Go Botany" descriptors taken from guidelines for the conduct of tests on *Gaillardia* species L. ANONYMOUS (2023). NPTGB guidelines published by Framingham, USA. Morphological characters of *Gaillardia* genotypes revealed that, plant growth habits, Stem: internodes hairs, flower: disk color, flower: ray flower colors and fruit color and quantitative characters viz., number of number of flower disk, number of bract, flower ray length, Number of pappus parts and fruit length show variations with respect to parameters under study.

**Keywords:** *Gaillardia*, morphological, *gaillardia* local collection (GLC), characterization

### Introduction

*Gaillardia* (*Gaillardia pulchella* Foug.) is commonly known as "Blanket Flower" or brown eyed susan in European countries (Helen *et al.*, 2007) [13]. Whereas it is called as "Galatehoovu" and "saventige" in vernacular language. It is one of the important hardiest annual flower crop which belongs to the family Asteraceae with the basic chromosomes number of  $n=18$  and  $2n=36$ . It is popularly known as blanket flower due to its colors and spreading habit. It resembles as blanket. It is an important flower crop of Karnataka state especially in the northern districts. It is native to Florida and western United States. Central and western united states are considered to be its origin (Anon, 1969) [14]. The crop has been named after a French botanist Mr. M. Gaillard, who cultivated this first. The generic name of *Gaillardia* was proposed in honour of Gaillard de Marentonneau, a French supporter of Botany in 18<sup>th</sup> century.

It is a herbaceous annual or short-lived perennial growing up to a height of 30 to 150 cm, out of twenty species available in the genus. *Gaillardia pulchella* is only annual and *Gaillardia aristata*, is a perennial species is cultivation. The annual types grow to a height of 30 to 90 cm. The leaves that appear in initial stages are large, up to 15-20 cm length and more lobed than those that appear in the later stages. The characteristics such as leaf shape and size are highly variable in nature, leaves may be basal and linear to lanceolate, grayish green and very hirsute. The flowers of *gaillardia* are small and numerous; born in solitary, usually showy heads which is known as capitulum with 4 to 6 cm in diameter. *Gaillardia* has gained importance for its profuse and long duration flowering habit. It is one of the hardiest annuals that can be grown in a variety of soils and under varied climatic conditions it tolerates temperature as low as  $-1^{\circ}\text{C}$ . *Gaillardia* can withstand fairly high salinity and 50 percent of yield could be obtained even at 8.7 ds/m salinity level and this can be tried as a new flower crop for saline soils.

### Materials and Methods

The experiment was conducted in a Randomized Block Design (RBD) with four replications. The experimental materials utilized for the current study consists of eight genotypes of *Gaillardia* named as GLC-1, GLC-2, GLC-3, GLC-4, GLC-5, GLC-6, GLC-7 and GLC-8.

**Table 1:** List of genotypes used in the study

Genotypes	Flower colour	GPS Location: latitude, longitude
GLC-1	(RHS, Colour chart- FAN-2 Red-purple group-60) Deep red (A)	N 21°23'45.45'', E 81°70'50.40''
GLC-2	(RHS, Colour chart- FAN-1 Orange group-28) Vivid yellowish pink (A)	N 21°23'45.60'', E 81°70'50.65''
GLC-3	(RHS, Colour chart- FAN-2 Yellow-orange group-14) Vivid yellow (A-1)	N 21°23'45.50'', E 81°70'50.60''
GLC-4	(RHS, Colour chart - FAN-1 Orange red group-34) Vivid reddish orange (B)	N 21°23'45.44'', E 81°70'50.79''
GLC-5	(RHS, Colour chart- FAN-1 Yellow group-13) Vivid yellow (A-2)	N 21°23'45.52'', E 81°70'50.87''
GLC-6	(RHS, Colour chart- FAN-1 Yellow group-12) Vivid yellow (A-3)	N 21°23'45.55'', E 81°70'50.92''
GLC-7	(RHS, Colour chart- FAN-1 Yellow group-11) Pale yellow (D)	N 21°23'45.59'', E 81°70'51.09''
GLC-8	(RHS, Colour chart- FAN-1 Orange group- 23) Vivid orange – yellow (A)	N 21°23'46.15'', E 81°70'51.34''

The morphological observations were analysed using descriptors provided by “Native Plant Trust Go Botany” descriptors taken from guidelines for the conduct of tests on *Gaillardia species* L. Anonymous (2017) [1]. NPTGB guidelines published by Framingham, USA. Morphological characters of *Gaillardia* genotypes revealed that, plant growth habits, Stem: internodes hairs, flower: disk color, flower : ray flower colors and fruit color. Quantitative characters were observed visually viz., number of flower disk, number of bract, flower ray length, Number of pappus parts and fruit length show variations with respect to parameters under study.

## Results and Discussion

### Morphological characters

According to NPTGB classification for three (37.5%) were classified under spreading, three (37.5%) were classified under upright and two (25%) were classified under semi-upright growth habit. Similar results were found by Asha *et al.*, (2016) [15] that the *gaillardia* 23 genotypes were bushy plant types. Six of the bushy genotypes were upright, 16 were semi-upright, and one genotype had a spreading growth habit, which was distinct from all other genotypes.

Based on the stem : internodes hairs was categorized into four groups viz., soft, slender, straight and branched. Out of eight genotypes, five (62.5%) were classified under slender, three (37.5%) were classified under branched stem : internodes hairs. Similar results were found by Hegde and Gopinath (2003), discovered that *gaillardia* 11 genotypes were slender stem intermodal hairs types and five of the genotypes were straight. The flower disk color was categorized into eight groups viz., brilliant orange yellow (B-1), brilliant orange yellow (B-2), brilliant greenish yellow (A-1), vivid yellow (A-1), vivid yellow (A-2), vivid yellow (A-3), brilliant greenish yellow (A-2) and brilliant greenish yellow (B). Out of eight genotypes, one (12.5%) was classified under brilliant orange yellow (B-1), one (12.5%) was classified under brilliant orange yellow (B-2), one (12.5%) was classified under brilliant greenish yellow (A-1), one (12.5%) was classified under vivid yellow (A-1), one (12.5%) was classified under vivid yellow (A-2), one (12.5%) was classified under vivid yellow (A-3), one (12.5%) was classified brilliant greenish yellow (A-2) and one (12.5%) was classified under brilliant greenish yellow (B) flower disk colors. Similar results were found by

Gawade *et al.*, (2018) [16], Lemon Yellow flower color, Aureolin flower color, Buttercup Yellow flower color and Indian Yellow flower color were observed in two, eleven, twelve and fourteen genotypes respectively.

Ray color of flower was categorized into eight groups viz., deep red (A), vivid yellowish - pink (A), vivid yellow (A-1), vivid reddish-orange (B), vivid yellow (A-2), vivid yellow (A-3), pale yellow (D) and vivid orange-yellow (A). Out of 8 genotypes, one (12.5%) was classified under deep red (A), one (12.5%) was classified under vivid yellowish - pink (A), one (12.5%) was classified under vivid yellow (A), one (12.5%) was classified under vivid reddish-orange (B), one (12.5%) was classified under vivid yellow (A), one (12.5%) was classified under vivid yellow (A), one (12.5%) was classified under pale yellow (D) and one (12.5%) was classified under vivid orange - yellow (A) flower ray colors. Similar results were found by Gawade *et al.*, (2018) [16] resulted on different genotypes of *gaillardia* for quantitative and qualitative performance were studied. The Lemon Yellow flower color, Aureolin flower color, Buttercup Yellow flower color and Indian Yellow flower color were observed in two, eleven, twelve and fourteen genotypes respectively.

Fruit colors was categorized into eight groups viz., Light yellowish brown (C), Moderate yellowish brown (C-1), Dark greyish brown (B), Moderate yellowish brown (C-2), Moderate yellowish brown (C-3), Dark greyish yellowish brown (B-1), Strong yellowish brown (D) and Dark greyish yellowish brown (B-2). Out of eight genotypes, one (12.5%) was classified under Light yellowish brown (C), one (12.5%) was classified under Moderate yellowish brown (C-1), one (12.5%) was classified under Dark greyish brown (B), one (12.5%) was classified under Moderate yellowish brown (C-2), one (12.5%) was classified under Moderate yellowish brown (C-3), one (12.5%) was classified under Dark greyish yellowish brown (B-1), one (12.5%) was classified under Strong yellowish brown (D) and one (12.5%) was classified under Dark greyish yellowish brown (B-2) fruit colors. Similar results were found by Gawade *et al.*, (2018) [16] resulted on different genotypes of *gaillardia* for quantitative and qualitative performance were studied. The light brown color two genotype, brownish color two genotype and black brown color eight genotype fruit color found.

**Table 1:** Morphological descriptions of different genotypes of *Gaillardia* for characterization and classification

S. No.	Genotype	Plant growth habits	Stem: internodes hairs	Flower: disk color	Ray flower colors	Fruit color
1	GLC-1	U	SL	BOY-1	DR	LYBC
2	GLC-2	SU	B	BOY-2	VYP	MYBC-1
3	GLC-3	S	B	BGY-A1	VY-1	DGBB
4	GLC-4	U	SL	VY-1	VRO	MYBC-2
5	GLC-5	S	B	VY-2	VY-2	MYBC-3
6	GLC-6	S	SL	VY-3	VY-3	DGYB-1
7	GLC-7	SU	SL	BGY -A2	PY	SYBD
8	GLC-8	U	SL	BGY-B	VOY	DGYB-2
S = Spreading	SL= Slender	BOY-1= Brilliant orange yellow B 1, BOY-2 = Brilliant orange yellow B 2, BGY-A1= Brilliant greenish yellow A1, VY-1 = Vivid yellow A 1, VY-2 = Vivid yellow A 2, VY-3 = Vivid yellow A 3, BGY -A2= Brilliant greenish yellow A1, BGY-B = = Brilliant greenish yellow B		DR= Deep Red, VYP = Vivid yellowish pink, VY-1= Vivid yellow (A-1), VRO = vivid reddish orange (B), VY-2 = yellow (A-1), VY-3 = yellow (A-1), PY = pale yellow - (D), VOY = vivid orange - yellow		LYB = Light yellowish brown (C), MYB = Moderate yellowish brown (C-1), DGB = Dark greyish brown (B), MYB = Moderate yellowish brown (C-2), MYB = Moderate yellowish brown (C-3), DGY = Dark greyish yellowish brown (B-1), SYB = Strong yellowish brown (D), DGY = Dark greyish yellowish brown (B-2).
U = Upright	B= Branched					
SU = Semi upright						

**Table 2:** Quantitative characters of different genotypes of *Gaillardia* for characterization and classification

S. No.	Genotype	Number of flower disk	Number of flower bract	Flower ray length (cm)	Number of pappus parts	Fruit length (cm)
1	GLC-1	88.00	131.25	2.67	56.75	0.45
2	GLC-2	98.00	150.00	2.35	51.00	0.47
3	GLC-3	110.25	134.25	2.22	42.00	0.67
4	GLC-4	68.25	95.75	2.45	41.00	0.50
5	GLC-5	138.50	182.00	2.80	45.25	0.42
6	GLC-6	86.00	146.00	2.375	45.75	0.47
7	GLC-7	114.25	143.75	2.70	42.50	0.52
8	GLC-8	97.50	142.25	1.85	58.75	0.45
C.D. at 0.5%		2.29	2.36	0.22	2.48	0.19
SE(m) ±		0.77	0.79	0.77	0.84	0.06

### Quantitative characters

The disk flower number ranged from 68.25 to 114.25. The overall mean for number of disk was 100.09. The maximum number of disk was recorded under GLC-7 (114.25) followed by GLC-3 (110.25) with least value obtained from GLC-4 (68.25). Similar result was noticed by Rajiv *et al.*, (2018) number of flower disk was highest in ACC-6 (98.22) while, the ACC-8 (55.25) observed least flower disk.

The flower bract number ranged from 95.75 to 182.00. The overall mean for number of bract was 140.65. The maximum number of bract was recorded under GLC-5 (182.00) followed by GLC-2 (150.00) with least value obtained from GLC - 4 (95.75). Similar result was noticed by Rajiv *et al.*, (2018) number of flower bract was highest in ACC-6 (174.25) while, the ACC-8 (168.29) observed least flower bract. The difference in number of branches could be attributed to the genetic makeup of the cultivars.

Range of flower ray length (cm) lied between 1.85 to 2.80 cm. The overall mean for ray length (cm) was 2.42 cm with least value obtained from GLC-8 (1.85 cm) and highest value from GLC-5 (2.80 cm) followed by GLC-7 (2.70 cm). Similar result found that Nair and Shiva (2003), carried out genetic variability studies on 25 genotypes of gerbera whereas narrowest range was observed for length of ray florets (2.51 to 4.05 cm). Range of number of pappus parts lied between 41.00 to 58.75. The overall mean for number of pappus parts was 47.87 with highest value from GLC-8 (58.75) followed by GLC-1 (56.75) and least value obtained from GLC-4 (41.00).

Range of fruit length (cm) lied between 0.42 to 0.67 cm. The overall mean for fruit length was 0.49 cm. The maximum fruit length was recorded under GLC-3 (0.67 cm) followed by GLC-7 (0.52 cm) with least value obtained from GLC-5 (0.42 cm).



Fig 1: Plant growth habit

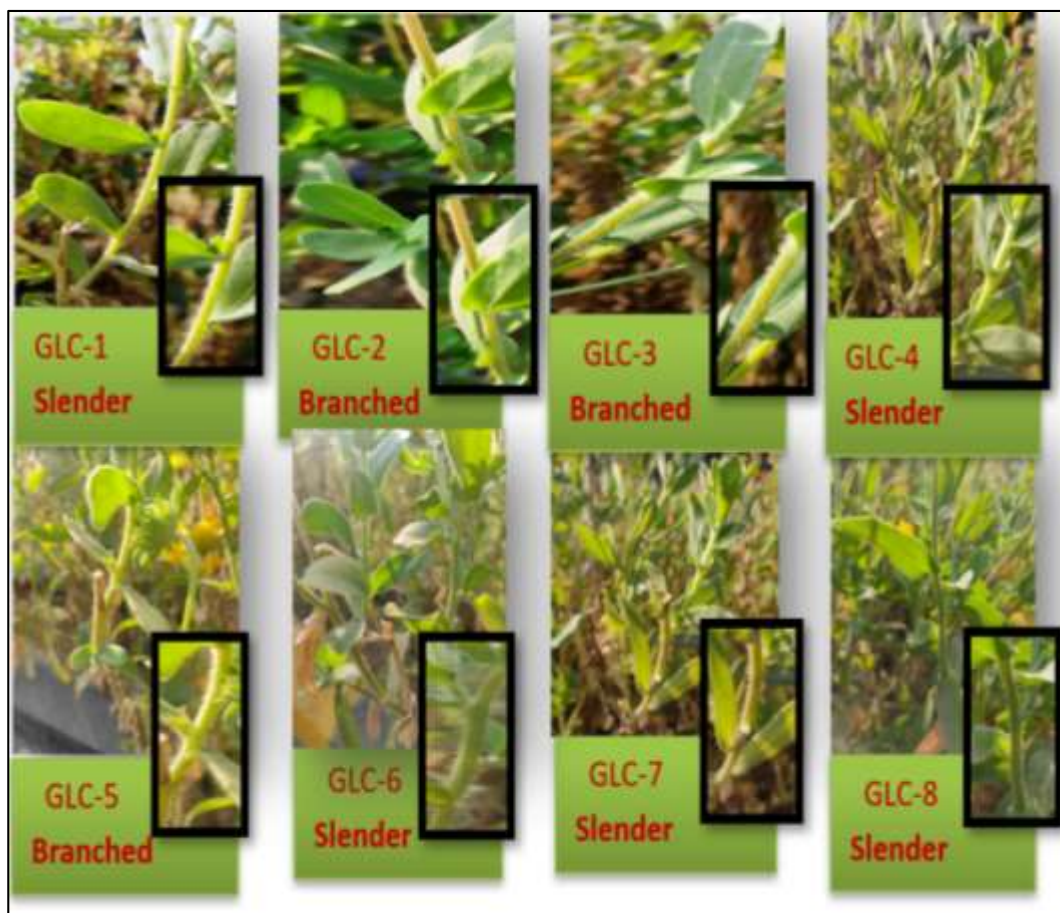
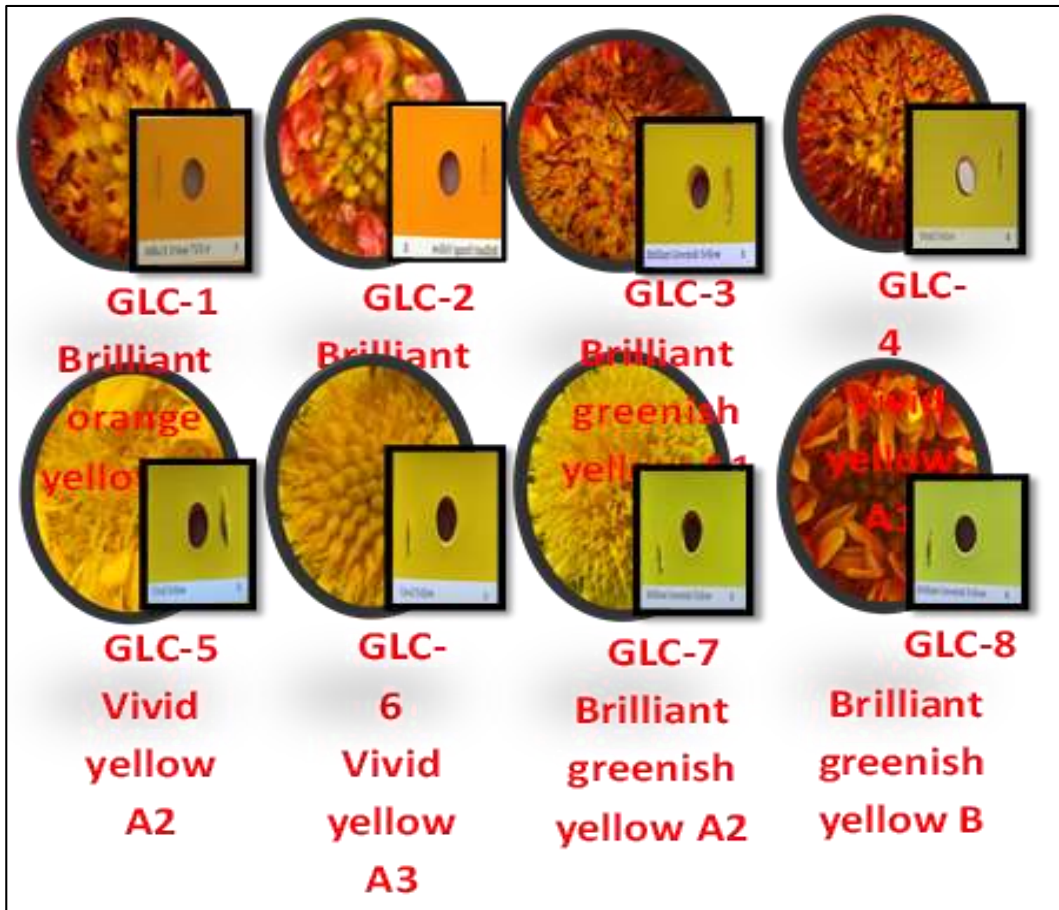
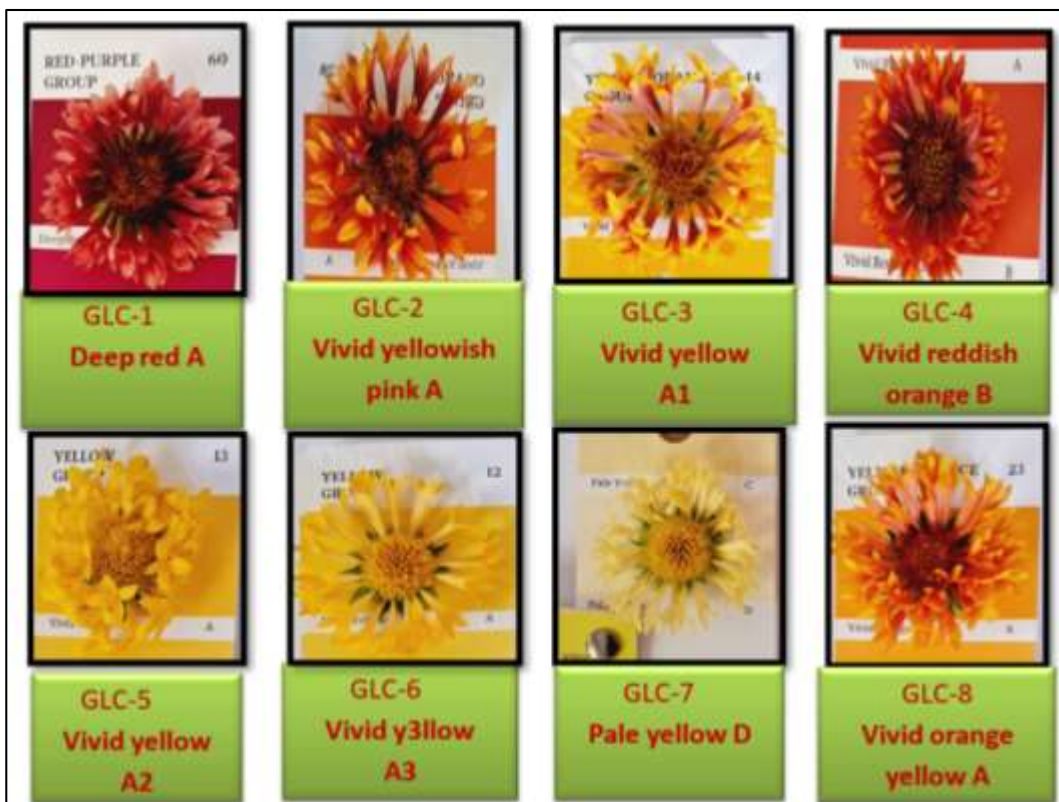


Fig 2: Stem internodes hairs



**Fig 3:** Disc flower color



**Fig 4:** Ray flower color



**Fig 5:** Fruit color

### Conclusion

The results of the present investigation that the morphological characterization of *Gaillardia* genotypes revealed that, characters like plant growth habit, stem: internodes hairs and flower bracts color, disc flower color, and fruit color were varied phenotypically and showed significant variability. Other than above mentioned characters, quantitative characters *viz.* disk flower number, no. of flower bracts, ray flower length (cm), no. of pappus parts and fruit length (cm) are highly significant to their characters and showed significant variation.

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