The Pharma Innovation Journal 2023; 12(6): 201-206

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(6): 201-206

www.thepharmajournal.com
Received: 01-03-2023
Accepted: 04-04-2023

Omem Tamut
Kittur Rani Channamma College of Horticulture, Arabhavi, Karnataka, India

Balaji S Kulkarni
Kittur Rani Channamma College of Horticulture, Arabhavi, Karnataka, India

Thupten Tsomu
Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

Ampee Tasumg
ICAR Research Complex for NEH Region, Arunachal Pradesh Centre, Basar, Arunachal Pradesh, India

L Joymati Chanu
ICAR Research Complex for NEH Region, Umiam, Meghalaya, India

Corresponding Author:
Thupten Tsomu
Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India

Correlation and path co-efficient analysis in gaillardia (*Gaillardia pulchella* Foug.) genotypes

Omem Tamut, Balaji S Kulkarni, Thupten Tsomu, Ampee Tasumg and L Joymati Chanu

Abstract
Twenty gaillardia germplasm have taken to measure association of yield components and their direct and indirect interaction with flower yield. Experiment was laid out in randomized block design with three replications and observations carried in monthly intervals. Correlation analysis showed the flower yield per plant was found to be significantly and positively correlated with stem girth, number of flowers, number of whorls, number of petals and single flower at both genotypic level and phenotypic levels. Number of branches, leaf area, first flowering, duration and flower diameter, observed positive and significant correlation at genotypic level only. Remaining traits results non-significant. Path analysis has revealed that flower yield per plant was directly and positively influenced by ten flower weight, flower diameter, days to commencement for flowering, number of whorls per flower, days to 50 per cent flowering, number of branches, stalk length and leaf area. The study showed that ten flower weights, flower diameter, days for commencement for flowering and number of whorls per flower are valuable characters in deciding the flower yield/plant. These characters may be considered as selection indices in gaillardia breeding programme.

Keywords: Gaillardia, correlation, path analysis, genotypes

Introduction
Gaillardia (*Gaillardia pulchella* Foug.) became popular among the loose flower growers especially in south India due to its easy cultivation, wide adaptability, different color, shape, size and hardy in nature. Gaillardia is mostly used for making garlands, *veni* and religious offerings and display in beds and pots. The main objectives of the study in gaillardia is for higher yield, early maturing, good shape, attractive color, larger size flower, biotic and abiotic diseases resistant. As of now not much work has carried out for the genetic improvement of gaillardia flower for economic traits. These characters are not only polygenically controlled but also considerably influenced by the environmental fluctuating conditions. Hence, this experiment was established to observed correlation and path analysis in twenty genotypes of gaillardia which includes local and private company genotypes.

Materials and Methods
An investigation was established at Floriculture and landscaping architecture, Arabhavi, during the period 2012-2013. Twenty germplasms of Gaillardia (*Gaillardia pulchella* Foug.) collected from different location were used for the experiments. Fourteen are local genotypes from Belgaum District, one local genotypes from Lucknow district, two local genotypes from Dhward district, two local genotypes from Gokak Taluk (Belgaum district) and one from Lalbagh (Bangalore) were resourced and grown in field in Randomized Block Design with three replications of spacing of 45 × 30 cm between row and plant of which thirty were grown in each replication with uniform cultural practices of which recording of 5 plants in each experimental plot were observed randomly for various traits under observation. Yield contributing character's such as number of flowers, flower diameter, number of branches, leaf area, number of petals, number of whorls per flower and single flower weigh tetc., recorded. Genotypic and phenotypic correlation coefficient was recorded as proposed by Al-Jibouri *et al*. (1958) [1] and path coefficient analysis (Dewey and Lu.1959) [6].

Results and Discussion
In crop breeding work, there is necessity to understand the association between yield and its components. Thus, correlation coefficient heritable based part of the value provides an

efficient basis for selection. With this perspective, correlation coefficient between yield and its components and inter correlation among yield contributing characters were recorded. The result showed that the flower yield per plant was showing positive correlation and significant with stem girth (0.451 and 0.308), number of flowers (0.553 and 0.316), number of whorls (0.735 and 0.395), number of petals (0.823 and 0.528), and single flower (0.784 and 0.661) at both genotypic and phenotypic levels. Number of branches (0.297), leaf area (0.291), days taken for first flowering (0.546), duration of flowering (0.838) and flower diameter (0.413), showed positive and significant correlation at genotypic level. Plant height recorded (table 1), positive correlation and significant with number of flowers, number of branches, and number of leaves. Similar as results observed by Raghava *et al*. (1992) [17] in chrysanthemum. Number of branches exhibited significant and positive correlation with leaf area, stem girth, number of flowers, number of florets, single flower weight and flower yield. As confirmed by Choudhry (1989) [5] in dahlia and Misra *et al.* (2013) [12] in chrysanthemum. Number of lateral branches had positive significant association with plant spread and flower yield per plant as observed by Mathew *et al*., 2005 [10] and with number of flowers/plant by Banupratap *et al*. (1999) [4] in marigold. While, leaves area had significant and positive correlation with number of branches, number of flowers, stem girth, stalk length, flower yield. Whereas, negative correlation and significant was observed with days taken for first flowering. Stem girth had shown significant and positive correlation with number of branches, number of flowers, flower diameter, number of whorls, single flower weight, leaf area and number of florets whereas it showed negative correlation and significant with days taken for first flowering. Days taken for first flowering had positive correlation and significant with flower yield as recorded by Negi *et al.* (1983) [13] in China aster. Whereas, days taken for first flowering showed negative correlation and significant with plant height, number of branches, leaf area, flower yield, leaf area, flower diameter, single flower weight, number of flower and number of whorls. Number of flowers recorded positive correlation and significant with plant height, number of branches, leaf area, stem girth, flower diameter, number of ray florets, number of florets, single flower weight, flower yield assimilar results were recorded by Beura *et al* (1995) [3], Mishra *et al*. (1987) [11], Singh (2003) [22] and Suman *et al*. (1980) [24] in dahlia, Sreenivasulu *et al*. (2007) [23], Rao (1982) [18] in China aster,in chrysanthemumby Pandita and Bhan (1989) [15], in gerbera by Anuradha and Narayanagowda (2000) [2] and Mager*et al*. (2010) [9], in China aster by Negi *et al*. (1983) [13] while Singh and Singh (2005), Karuppaiah *et al*. (2004) [8] and Banupratap (1999) [4], in marigold. Flower diameter showed significant and positive correlation with stem girth, number of flowers, number of whorls, number of florets, single flower weight and flower yield. Similar results were reported by Patil and Rane (1994) [16], Ravikumar and Patil (2003) [19] in China aster, in dahlia Nimbalkar *et al*. (2004) [14], in marigold Singh *et al*. (2008) [20]. Significant correlations and negative were recorded for days taken for first flowering. While, number of ray florets showed positive significant correlation with number of florets, flower yield and with individual flower weight. Number of florets showed significant positive correlation with number of flowers, flower diameter, number of ray florets, stalk length, flower yield, number of branches and stem girth. Individual flower weight had significant and positive correlation with stem girth, number of flowers, flower diameter, number of ray florets, and number of florets, flower yield, plant height and number of branches. Similarly, weight of flowers/plant in chrysanthemum had positive and significant correlations with height of plants, spread of plant, duration of flowering, number of branches per plant and shelf life of flowers. Negative and Significant correlation was observed with number of leaves, days to first flowering, duration of flowering and stalk length. Thus, the characters stem girth, number of flowers, number of whorls, number of number of florets and single flower are the selection indices for flower yield/plant based on the correlation studies.

The phenotypic and genotypic path coefficients are shown in table 2 and 3; while only genotypic coefficients are discussed. Flower yield per plant was directly and positively effects by ten flower weight (0.744), flower diameter (0.442), days for commencement for flowering (0.382), number of whorls per flower (0.208), days to 50 per cent flowering (0.120), number of branches (0.113), stalk length (0.092) and leaf area (0.005). coincides with the result as reported for number of branches, number of leaves, leaf area and flower head size Misra *et al*., 2013 [12]; Karuppaiah *et al*., 2004 [8]: Sirohi and Behera, 1999) in chrysanthemum, Magar *et al*., 2010, Anuradha and Narayanagowda, 2000 [2] in gerbera. Hence, direct selection for following characters would be beneficial for increasing yield. While, negative direct effects through plant height (-0.165), stem girth (-0.118), number of leaves (-0.247), duration of flowering (0.209) and number of florets (-0.456).

Table 1: Genotypic and phenotypic correlation coefficients for different pairs of traits in gaillardia (*Gaillardia pulchella* F.)

Parameters		(X^1)	(X^2)	(X^3)	(X^4)	(X^5)	(X^6)	(X^7)	(X^8)	(X^9)	(X^{10})	(X^{11})
Plant height (120DAP) (cm)(X^1)	G	0.696**	0.227	0.08	-0.496**	0.38**	-0.086	0.019	-0.037	0.278*	0.066	
	P	0.246	0.156	-0.086	-0.389 **	0.268*	-0.226	0.253	0.243	0.083	0.04	
Number of branches (120 DAP) (X^2)	G	1	0.435**	0.66**	-0.444**	0.606**	0.057	0.398**	0.287*	0.308*	0.297*	
	P	1	0.381 **	0.483 **	-0.333*	0.638 **	0.234	0.356 **	0.105	0.248	0.205	
Leaf area (120DAP) (dm^2) (X^3)	G		1	0.369**	-0.3*	0.446**	0.044	0.21	0.105	0.198	0.291*	
	P		1	0.179	-0.185	0.348 **	-0.005	0.054	-0.04	0.154	0.201	
Stem girth (cm) (X^4)	G			1	-0.548**	0.623**	0.707**	0.598**	0.527**	0.512**	0.451**	
	P			1	-0.288*	0.508 **	0.374 **	0.382 **	0.222	0.337**	0.308*	
Days taken for first flowering(X^5)	G				1	-0.228	-0.477**	-0.24	0.025	-0.513**	0.546**	
	P				1	-0.349**	-0.122	-0.387 **	-0.201	-0.044	0.166	
Number of flowers(X^6)	G					1	0.274*	0.43**	0.475**	0.603**	0.535**	
	P					1	0.303*	0.461 **	0.313*	0.309*	0.316*	
Flower diameter (cm) (X^7)	G						1	0.821**	0.613**	0.669**	0.413**	
	P						1	0.55 **	0.387 **	0.485 **	0.229	
Number of whorls/ flower(X^8)	G							1	0.955**	0.901**	0.735**	

	P							1	0.832 **	0.61 **	0.395 **
Number of petals/flower(X^9)	G								1	0.908**	0.823**
	P								1	0.625 **	0.528 **
Individual flower weight(g) (X^{10})	G									1	0.784**
	P									1	0.661 **
Flower yield(g/plant(X^{11})	G										1
	P										

Table 2: Genotypic path coefficient analysis of different quantitative characters on flower yield gaillardia genotypes

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**rG**
1	-0.165	0.028	-0.062	0.001	0.011	-0.163	-0.049	0.023	0.156	0.120	0.053	-0.010	0.062	0.005
2	-0.042	0.113	-0.023	0.002	-0.065	-0.127	-0.039	0.028	0.34	-0.117	0.021	-0.003	0.205	0.294
3	-0.042	0.01	-0.247	00.001	0.007	-0.073	-0.022	0.019	0.700	0.620	-0.063	0.017	0.173	-0.435**
4	-0.025	0.044	-0.003	0.005	-0.024	-0.069	-0.010	0.018	0.191	0.002	-0.01	0.019	0.092	0.233
5	0.016	0.062	0.014	0.001	-0.118	-0.119	-0.044	0.059	0.256	-0.223	0.047	0.001	0.455	0.405**
6	0.070	-0.038	0.047	-0.001	0.037	0.382	0.126	-0.171	-0.193	0.085	-0.045	0.035	-0.182	0.151
7	0.068	-0.036	0.046	0.001	0.043	0.401	0.12	-0.175	-0.157	0.037	-0.042	0.045	-0.172	0.177
8	0.018	-0.015	0.022	0.002	0.033	0.313	0.101	-0.209	-0.085	0.077	-0.022	0.045	-0.064	0.213
9	-0.058	0.087	-0.039	0.002	-0.068	-0.167	-0.043	0.04	0.442	-0.203	0.078	-0.002	0.513	0.583**
10	0.044	0.029	0.034	0.003	-0.058	-0.071	-0.01	0.035	0.197	-0.456	0.093	0.013	0.462	0.313*
11	-0.042	0.012	0.070	0.000	-0.027	-0.083	-0.024	0.022	0.166	-0.204	0.208	-0.033	0.621	0.69**
12	0.019	-0.004	-0.044	0.001	0.001	0.145	0.059	-0.102	-0.008	-0.065	-0.074	0.092	-0.200	-0.182
13	-0.014	0.031	0.057	0.001	-0.072	-0.094	-0.028	0.018	0.305	-0.283	0.173	-0.025	0.744	0.814**

Residual Effect= 0.02 * Significant at 0.05 probability level (0.304) ** Significant at 0.01 probability level (0.393)
Bold: Direct effect Above and below diagonal: Indirect effect

1	Plant height (120 DAP) (cm)	5	Stem girth (cm)	9	Flower diameter (cm)	13	Ten flower weight (g)
2	Number of branches (120 DAP)	6	Days taken for first flowering	10	Number of florets/flower	rG	Correlation with flower yield (g/plant)
3	Number of leaves (120DAP)	7	Days taken for 50 per cent flowering	11	Number whorls / flower		
4	Leaf area (120 DAP) (dm^2)	8	Duration of flowering (days)	12	Stalk length (cm)		

Table 3: Phenotypic path coefficient analysis of different quantitative characters on flower yield gaillardia genotypes

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**rP**
1	0.063	0.012	-0.029	0.033	-0.013	-0.207	0.045	-0.003	0.024	0.003	0.079	0.021	0.012	0.040
2	0.015	0.048	-0.011	0.083	0.069	-0.174	0.036	-0.004	0.059	-0.003	0.033	0.052	0.003	0.204
3	0.015	0.004	-0.119	0.003	-0.007	-0.099	0.022	-0.003	0.012	0.001	-0.096	-0.043	-0.02	-0.33*
4	0.010	0.018	-0.002	0.216	0.026	-0.094	0.009	-0.003	0.032	0.002	-0.015	0.024	-0.022	0.199
5	-0.006	0.023	0.006	0.04	0.142	-0.144	0.037	-0.008	0.046	-0.005	0.066	0.099	0.009	0.306*
6	-0.025	-0.016	0.022	-0.038	-0.039	0.53	-0.117	0.027	-0.033	0.002	-0.069	-0.039	-0.043	0.163
7	-0.020	-0.012	0.018	-0.014	-0.037	0.443	-0.141	0.022	-0.021	0.001	-0.051	-0.031	-0.035	0.122
8	-0.006	-0.006	0.011	-0.016	-0.034	0.417	-0.09	0.035	-0.016	0.002	-0.034	-0.017	-0.060	0.186
9	0.017	0.030	-0.016	0.074	0.071	-0.189	0.032	-0.006	0.092	-0.004	0.104	0.105	0.002	0.314*
10	-0.014	0.011	0.012	-0.002	0.051	-0.070	0.007	-0.006	0.029	-0.013	0.127	0.116	-0.017	0.231
11	0.015	0.005	0.036	-0.01	0.029	-0.113	0.022	-0.004	0.03	-0.005	0.322	0.158	0.042	0.528**
12	-0.006	-0.001	-0.018	0.036	-0.010	0.173	-0.037	0.016	-0.001	-0.002	-0.103	-0.043	-0.132	-0.129
13	0.006	0.012	0.024	0.024	0.067	-0.099	0.021	-0.003	0.046	-0.007	0.243	0.21	0.027	0.572**

Residual Effect = 0.45 ** Significant at 0.01 probability level (0.393) * Significant at 0.05 probability level (0.304)
Bold: Direct effect Above and below diagonal: Indirect effect

1	Plant height (120 DAP) (cm)	5	Stem girth (cm)	9	Flower diameter (cm)	13	Ten flower weight (g)
2	Number of branches (120 DAP)	6	Days taken for first flowering	10	Number of florets/flowers	rG	Correlation with flower yield (g/plant)
3	Number of leaves (120 DAP)	7	Days taken for 50 per cent flowering	11	Number whorls / flower		
4	Leaf area (120 DAP) (dm^2)	8	Duration of flowering (days)	12	Stalk length(cm)		

References

1. Al-Jibourie HA, Miller PA, Robinson HF. Genetic and environmental variances in an upland cotton cross on inter-specific origin. Agronomy Journal. 1958:50:633-637.
2. Anuradha S, Narayanagowda JV. Association of cut flower yield with growth and floral characters in gerbera. Crops Reserch. 2000;19(1):63-66.
3. Beura S, Maharana T, Jagadev PN. Genetic variability and character association in dahlia. Journal of Tropical Agriculture. 1995;33:20-22.
4. Bhanupratap GN, Tewari, Mishra LN. Correlation studies in marigold. Journal of Ornamental Horticulture (New series). 1999;2(2):84-88.
5. Choudhary, ML. Genetic variability in dahlia. Progressive Horticulture. 1989;19(1-2):58-60.
6. Dewey DR, Lu KH. A correlation and path coefficient analysis of components of crested wheat grass seed production. Agronomy Journal. 1959;5:515-518.
7. Janakiram T, Rao TM. Genetic improvement of marigold. In Floriculture Technology, Trade and Trends. Ed. Prakash, J and Bhandary, K.R., Oxford and IBH

Company Private Limited, New Delhi, 1991;331-335.
8. Karuppaiah P, Sudhakaran K, Kumar PS, Kathiravan J. Correlation and path analysis for yield, yield attributes and xanthophylls content in African marigold (*Tagetes erecta*L.) South Indian Horticulture. 2004;54(1-6):304-310.
9. Magar SD, Warade SD, Nalge NA, Nimbalkar CA. Correlation and path analysis studies in gerbera (*Gerbera jamesonii*). International Journal of Plant Science. 2010;5(2):553-555.
10. Mathew R, Hatia SK, Beniwal BS, Deswal DP. Correlation and path analysis in flower production and seed yield in marigold. National symposium on recent trend and future strategies in ornamental horticulture, 2005.
11. Mishra RL, Verma TS, Thakur PC, Singh HB. Variability and correlation studies in dahlia. Indian Journal of Horticulture. 1987;44(3-4):269-273.
12. Misra S, Mandal T, Vanlalruati, Das SK. Correlation and path coefficient analysis for yield contributing parameters in spray chrysanthemum. Journal of Horticulture Letters. 2013;3(1):14-16.
13. Negi SS, Ragava SPS, Sharma TVRS, Sreenivasan RR. Studies on variability and correlation in China aster. Indian Journalof Horticulture. 1983;40:102-106.
14. Nimbalkar CA, Dhane AV, Bajaj VH. Relative contribution of component characters on yield of dahlia. Journal of Maharashtra Agricultural University. 2004;29(3):351-352.
15. Pandita PN, Bhan MK. Genotypic and phenotypic correlations in pyrethrum. Pesticides.1989; 23 (2): 28-29.
16. Patil SSD, Rane DA. Correlation and path coefficient analysis in China aster. Journal of Maharastra Agricultural University. 1994;19(3):375-377.
17. Raghava, SPS, Negi SS, Nancharaiah D. Genetic variability, correlation and path-analysis in chrysanthemum. Indian Journal of Horticulture. 1992;49(2):200-204.
18. Rao MT. Studies on genetic variability and correlation in China aester (*Callisthephus chinensis* Ness.). M. Sc. (Hort.) Thesis University of Agricultural Science, Bangalore, 1982.
19. Ravikumar H, Patil VS. Genetic variability and character association studies in China aster (*Callistephus chinensis*) genotypes. Journal of Ornamental Horticulture. 2003;6(3):222-228.
20. Singh D, Mishra KK. Genetic variability in quantitative characters of marigold. Indian Journal of Horticulture. 2008;65(2):187-192.
21. Singh D, Singh AK. Correlation and path coefficient analysis in marigold (*Tagetes* spp). Progressive Horticulture. 2005;37(2):385-388.
22. Singh RK. Variability studies in dahlia for some quantitative traits. Journal of Ornamental Horticulture. 2003;7(1):58-60.
23. Sreenivasulu GB, Kulkarni BS, Natraj SK, Reddy BS, Naik KM, Chandan K. Correlation studies for yield and yield contributing characters in China aster (*Callistephus chinensis*). Asian Journal of horticulture. 2007;2(2):192-194.
24. Suman CL, Wahi SD, Bhattacharjee SK. Genetic analysis in *Dahlia variabilis* Defs. Agricultural Science Digest (Karnal). 1980;11(4):190-194.