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Studies On Correlation And Path Coefficient Analysis In Chrysanthemum (Chrysanthemum Morifolium Ramat)

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Abstract:* Correlation and path analysis was carried out for 58 genotypes of chrysanthemum for different yield attributing traits. Correlation studies showed significant and positive association with flower yield at phenotypic and genotypic levels for number of flowers per plant, plant height, number of lateral branches, stem girth, number of leaves per plant, plant spread, days to full bloom, flower diameter, number of ray florets, number of flower clusters per plant, shelf life, number of flowers per plant, individual flower weight and flower yield per plant. The results of path analysis indicated that flower yield per plot showed positive and direct effect on plant spread, days to flower bud appearance, number of flower clusters per plant, number of flowers per plant and weight of the individual flower suggesting that these characters can be chosen for further improvement in the breeding programme.

***Keywords:* Correlation, Path analysis, Chrysanthemum**

I. INTRODUCTION

Chrysanthemum (*Chrysanthemum morifolium* Ramat) is a short day plant commercially grown for loose flower, cut flower and bedding purpose. Variation in flower colour, size and form plays a vital role in chrysanthemum breeding and mostly it has been achieved through mutation breeding and bud spots. The correlation and path analysis help the breeders to define the selection indices for the breeding programme. Similarly, quality parameters are used to assess the consumer preference of the particular genotype. This study was to identify magnitude of variability, degree of association between the yield and yield components and their relative contribution to flower yield per plot of the chrysanthemum genotypes. The goal of any crop improvement programme is to achieve high level of yield. Yield from plants is the end product of interaction of many correlated characters. Selection for these characters will be more effective when it is based on component characters that are highly heritable and positively correlated. When more number of variables is considered in correlation, the association becomes more complex and less obvious. Yield is a complex entity associated with a number of component characters. A study of association of these characters helps selection of genotypes and also suggests the advantage of a selection scheme for more than one character at a time, which could be explained that improvement of one character results in the simultaneous improvement of all positively related characters. The relationship between genotypic, phenotypic and environmental correlations was discussed by Falconer (1981), which emphasized the characters having high heritability.

II. MATERIALS AND METHODS

The experiment was conducted at Department of Floriculture and Landscaping, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. 58 genotypes of chrysanthemum collected from different sources *viz.*, IARI, New Delhi, BCKV, Kalyani, Private nursery at Bangalore and germplasm collection of Department of Floriculture and Landscaping, TNAU, Coimbatore, were evaluated during 2013 and 2014. The experiment was laid out in Randomized Block Design with three replications. The rooted cuttings were planted in the plot size of 1.2 m ×1.2 m at 30 ×30 cm spacing. Uniform recommended package of practices were followed along with nutritional application and normal flood irrigation. The data on plant height (cm), plant spread (cm), number of lateral branches/plant, stem girth (cm), number of leaves, days to flower bud appearance (days), days to full bloom (days), duration of flowering (days), number of flower clusters/plant, longevity (days), flower diameter (cm), number of ray florets, number of flowers/plant, flower colour as per the RHS colour chart, individual flower weight (g) and flower yield/plant (g) were recorded. The observations were statistically analysed.

III. RESULT AND DISCUSSION

In the present study for most of the characters, genotypic correlation coefficient was found to be higher in magnitude than phenotypic correlation coefficient indicating a strong inherent association among various characters are furnished in Tables 1 and 2. Similar results were obtained in china aster by Manjunath Rao (1982) and Poornima *et al.* (2006), in chrysanthemum by Chaugule (1995). Plant height showed positive genotypic correlation with flower yield per plant (0.467), number of lateral branches per plant (0.364), number of flowers per plant (0.222), days to flower bud appearance (0.002), days to full bloom (0.002), flower diameter (0.493) and number of flower clusters per plant (0.315). Whereas, the trait showed negative correlation with duration of flowering (-0.185). The phenotypic correlation for plant height exhibited positive correlation with flower yield per plant (0.439), number of lateral branches per plant (0.332), number of flowers per plant (0.209), days to flower bud appearance (0.005), days to full bloom (0.006), flower diameter (0.467), number of flower clusters per plant (0.289). This trait also showed negative correlation with duration of flowering (-0.150). The genotypic correlation coefficients revealed that the association of plant height and number of flowers per plant with flower yield per plant was positive and significant. The results are in agreement with the findings of Barigidad (1991) and Ragava *et al.* (1992) in chrysanthemum. Barigidad (1991), Ragava *et al*. (1992) and Deepti Singh and Singh. (2005) also reported such positive and significant association of the above characters with yield per plant in chrysanthemum. It suggests that these characters are the most important yield components and that effective improvement in yield can be achieved through selection based on these characters.

Plant spread (E-W) & (N-S) showed positive genotypic correlation with flower yield per plant (0.465, 0.436), number of flowers per plant (0.443, 0.422), days to flower bud appearance (0.013, 0.009), days to full bloom (0.112, 0.122), diameter of the flower (0.385,0.362) and number of flower clusters per plant (0.506, 0.475). This trait also showed negative correlation with duration of flowering (-0.119, -0.114). The phenotypic correlation for plant spread (E-W) & (N-S) exhibited positive correlation with flower yield per plant (0.444, 0.423), number of flowers per plant (0.428, 0.412), days to flower bud appearance (0.011, 0.004), days to full bloom (0.107, 0.114), diameter of the flower (0.372, 0.347) and number of flower clusters per plant (0.486, 0.465). This trait also showed negative correlation with duration of flowering (-0.112, -0.105). Number of lateral branches per plant showed positive genotypic correlation with flower yield per plant (0.409), number of flowers per plant (0.487), diameter of the flower (0.047) and number of flower clusters per plant (0.476). This trait also showed negative correlation with days to flower bud appearance (-0.218), days to full bloom (-0.214) and duration of flowering (-0.110). The phenotypic correlation for number of lateral branches per plant exhibited positive correlation with flower yield per plant (0.389), number of flowers per plant (0.463), diameter of the flower (0.044) and number of flower clusters per plant (0.433). This trait also showed negative correlation with days to flower bud appearance (-0.195), days to full bloom (-0.194) and duration of flowering (-0.106).

Days for flower bud appearance showed positive genotypic correlation with days to full bloom (0.827), diameter of the flower (0.216) and number of flower clusters per plant (0.101). This trait also showed negative correlation with flower yield per plant (-0.029), number of flowers plant per (-0.128) and duration of flowering (-0.163). The phenotypic correlation for days for flower bud appearance exhibited positive correlation with days to full bloom (0.834), diameter of the flower (0.212) and number of flower clusters per plant (0.100). This trait also showed negative correlation with flower yield per plant (-0.030), number of flowers per plant (-0.126) and duration of flowering (-0.139). Days to full bloom showed positive genotypic correlation with flower yield plant (0.001), diameter of the flower (0.259) and number of flower cluster per plant (0.018). This trait also showed negative correlation with number of flowers per plant (-0.183) and duration of flowering (-0.274). The phenotypic correlation for days to full bloom exhibited positive correlation with diameter of the flower (0.255) and number of flower clusters per plant (0.020). This trait also showed negative correlation with flower yield per plant (-0.001), number of flowers per plant (-0.179) and duration of flowering (-0.239). Flower diameter showed positive genotypic correlation with flower yield per plant (0.124). This trait also showed negative correlation with number of flowers per plant (-0.096), number of flower clusters per plant (-0.032) and duration of flowering (-0.112). The phenotypic correlation for flower diameter exhibited positive correlation with flower yield per plant

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(0.124). This trait also showed negative correlation with number of flowers per plant (-0.090), number of flower clusters per plant (-0.034) and duration of flowering (-0.102). Number of ray florets per flower showed positive genotypic correlation with flower yield per plant (0.262), number of flowers per plant (0.170), number of flower clusters per plant (0.153) and duration of flowering (0.054). The phenotypic correlation for number of ray florets per flower exhibited positive correlation with flower yield per plant (0.247), number of flowers per plant (0.162), number of flower clusters per plant (0.152) and duration of flowering (0.055).

Number of flower clusters per plant showed positive genotypic correlation with flower yield per plant (0.665), number of flowers per plant (0.789) and duration of flowering (0.030). The phenotypic correlation for number of flower clusters per plant exhibited positive correlation flower yield per plant (0.665), number of flowers per plant (0.789) and duration of flowering (0.030). Duration of flowering showed positive genotypic correlation with number of flowers per plant (0.100). This trait also showed negative correlation with flower yield per plant (-0.095). The phenotypic correlation for duration of flowering exhibited positive correlation with number of flowers per plant (0.090). This trait also showed negative correlation with flower yield per plant (-0.088). Shelf life showed positive genotypic correlation with flower yield per plant (0.417) and number of flowers per plant (0.204). The phenotypic correlation for shelf life exhibited positive correlation with flower yield per plant (0.348) and number of flowers per plant (0.175). Shelf life of flowers on plant exhibited significantly positive correlation with number of flowers per plant and individual flower weight showed significantly positive correlation with yield of flowers per plant. Sirohi and Behera (1999) in chrysanthemum and Ravi Kumar and Patil (2003) in China aster reported significant positive association of number of flowers per plant. It suggests that selection for more number of flowers per plant and flower yield per plant will increase the flower yield per plot. Plant height showed positive genotypic with flower yield per plant (0.624).The phenotypic correlation for plant height exhibited positive correlation with flower yield per plant (0.629).

PATH COEFFICIENT ANALYSIS

In path analysis, the genotypic correlation coefficient was partitioned quantitatively into components due to direct and indirect effects of the characters influencing yield. It is an efficient biometrical tool throwing light on the contribution of a character on the yield and also its influence (indirect effect) through other component characters.

In the present investigation, the estimate of direct effect of various component characters on flower yield was studied and furnished in Table 3. Plant spread (2.1272), days to flower bud appearance (0.0511), number of flower clusters per plant (0.0415), number of flowers per plant (0.6373) and weight of the individual flower (0.7864) .plant height (-0.1058), number of lateral branches (-0.0432), Days to full bloom (-0.1776), Diameter of the flower (-0.2431), duration of flowering (-0.1569). Among the various characters, Plant spread showed maximum positive direct effect on flower yield per plant. The indirect effect of plant height on flower yield per plant through plant spread (1.2164), days to flower bud appearance (0.0009), number of flower clusters per plant (0.0289), duration of flowering (0.1415) and weight of the individual flower (0.3754) was positive. The indirect effect of number of lateral branches on flower yield per plant through plant spread (1.0512), days to full bloom (0.0379), number of flower clusters per plant (0.0173), duration of flowering (0.3105), number of flowers per plant (0.0173) and weight of the individual flower (0.0485) was positive.The indirect effect of plant spread on flower yield per plant through, days to flower bud appearance (0.0006), number of flower clusters per plant (0.0187), duration of flowering (0.2825), number of flowers per plant (0.0187) and weight of the individual flower (0.2230) was positive. The indirect effect of days to flower bud appearance on flower yield per plant through number of lateral branches plant spread (0.0094), number of flower clusters per plant (0.0256), diameter of flowers (0.0042) and weight of the individual flower (0.1499) was positive. The indirect effect of days to full bloom on flower yield per plant through number of lateral branches (0.0092), plant spread (0.2387), days to flower bud appearance (0.0423), number of flower clusters per plant (0.0429), diameter of flower (0.0007), and weight of the individual flower (0.2730) was positive. The indirect effect of number of flowers per plant on flower yield per plant through plant spread (0.8192), days to flower bud appearance (0.0110), number of flower clusters per plant (0.0176) and weight of the individual flower (0.4003) was positive. The indirect effect of diameter of flower on flower yield per plant through plant spread (1.0756), days to flower bud appearance (0.0051), duration of flowering (0.5027) and weight of the individual flower (0.0434) was positive. The indirect effect of number of flower clusters per plant on flower yield per plant through plant height (0.0195), number of lateral branches (0.0047), days to full bloom (0.0486), diameter of flower (0.0012), duration of flowering (0.0637) and number of flowers per plant (0.0273) was positive. The indirect effect of duration of flowering on flower yield per plant through plant spread (0.9431), days to full bloom (0.0325), number of flowers per plant (0.0233) and diameter of the flower (0.0327) was positive. The indirect effect of weight of the individual flower on flower yield per plant through plant spread (0.6032), diameter of the flower (0.0023), days to flower bud appearance (0.0097) and number of flower clusters per plant (0.0223) was positive.

Results indicated that the first ranking components of flower yield in chrysanthemum were plant spread, duration of flowering, number of flower clusters per plant, number of flowers per plant and weight of the individual flower as these characters totally influenced flower yield. Similar results were reported in chrysanthemum by Deka and Paswan (2002) and Baskaran *et al*., (2004). Plant height influenced flower yield indirectly through yield of flowers per plant and it is similar to the findings of Ragava *et al*. (1992) in chrysanthemum

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Characters	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	**1.000**	0.364**	0.284*	0.302*	0.572**	0.535**	0.002	0.002	0.493**	0.348**	0.315*	-0.185	0.464**	0.222	0.477**	0.467**
2		**1.000**	0.207	0.247	0.494**	0.481**	-0.218	-0.214	0.047	0.427**	0.476**	-0.110	0.257*	0.487**	0.062	0.408**
3			**1.000**	0.289*	0.275*	0.267*	0.025	0.054	0.067	0.169	0.359**	0.211	0.414**	0.281	0.364**	0.532**
4				**1.000**	0.420**	0.389**	0.092	0.165	0.047	0.134	0.370**	-0.076	0.278*	0.458**	0.166	0.397**
5					**1.000**	0.995**	0.013	0.112	0.385**	0.337**	0.506**	-0.119	0.406**	0.443**	0.284*	0.465**
6						**1.000**	0.009	0.122	0.362**	0.337**	0.475**	-0.114	0.386**	0.422**	0.283*	0.436**
7							**1.000**	0.827**	0.216	-0.155	0.101	-0.163	0.135	-0.128	0.191	-0.029
8								**1.000**	0.259*	0.174	0.018	-0.274	0.158	-0.183	0.347**	0.001
9									**1.000**	0.130	-0.032	-0.112	0.226	-0.096	0.509**	0.124
10										**1.000**	0.153	0.054	0.339**	0.170	0.232	0.262
11											**1.000**	0.030	0.293*	0.789	0.055	0.665**
12												**1.000**	0.137	0.100	-0.143	-0.095
13													**1.000**	0.204	0.363**	0.417**
14														**1.000**	-0.139	0.624**
15															**1.000**	0.564**
16																**1.000**

*Significant at 5% **Significant at 1%

- ✓ Plant height
- ✓ Number of lateral branches
- ✓ Stem girth
- ✓ Number of leaves per plant
- ✓ Plant spread (E-W)
- ✓ Plant spread (N-S)
- ✓ Days to flower bud appearance
- ✓ Duration of flowering
- ✓ Days to full bloom
- ✓ Flower diameter
- ✓ Number of ray floret
- ✓ Number of flower clusters per plant
- ✓ Shelf life
- ✓ Number of flowers per plant
- ✓ Individual flower weight
- ✓ Flower yield per plant

Table 1: Genotypic correlation coefficients for vegetative, flowering and yield characters of chrysanthemum genotypes

Characters	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	**1.000**	0.332**	0.231	0.287*	0.537**	0.505**	0.005	0.006	0.467**	0.332**	0.289*	-0.150	0.395**	0.209	0.454**	0.439**
2		**1.000**	0.157	0.234	0.474**	0.452**	-0.195	-0.194	0.044	0.402**	0.433**	-0.106	0.206	0.463**	0.059	0.388**
3			**1.000**	0.254	0.252	0.240	0.023	0.049	0.057	0.150	0.313**	0.159	0.287*	0.261*	0.330	0.478**
4				**1.000**	0.405**	0.382**	0.091	0.162	0.048	0.133	0.357**	-0.067	0.251	0.446**	0.162	0.387**
5					**1.000**	0.974**	0.011	0.107	0.372**	0.329**	0.486**	-0.112	0.331**	0.428**	0.282*	0.444**
6						**1.000**	0.004	0.114	0.347**	0.330**	0.465**	-0.105	0.335**	0.412**	0.281**	0.424**
7							**1.000**	0.834**	0.212	-0.149	0.100	-0.139	0.103	-0.126	0.187	-0.030
8								**1.000**	0.255*	-0.168	0.020	-0.239	0.124	-0.179	0.340**	-0.001
9									**1.000**	0.124	-0.034	-0.102	0.186	-0.090	0.497**	0.124
10										**1.000**	0.152	0.055	0.296*	0.162	0.230	0.247
11											**1.000**	0.037	0.266*	0.767**	0.055	0.644**
12												**1.000**	0.106	0.090	-0.131	-0.088
13													**1.000**	0.175	0.313**	0.348**
14														**1.000**	-0.137	0.629**
15															**1.000**	0.553**
16																**1.000**

*Significant at 5% **Significant at 1%

- ✓ Plant height
- ✓ Number of lateral branches
- ✓ Stem girth
- ✓ Number of leaves per plant
- ✓ Plant spread (E-W)
- ✓ Plant spread (N-S)
- ✓ Days to flower bud appearance
- ✓ Days to full bloom
- ✓ Flower diameter
- ✓ Number of ray floret
- ✓ Number of flower clusters per plant
- ✓ Duration of flowering
- ✓ Shelf life
- ✓ Number of flowers per plant
- ✓ Individual flower weight
- ✓ Flower yield per plant

Table 2: Phenotypic correlation coefficients for vegetative, flowering and yield characters of chrysanthemum genotypes

Characters	1	2	3	4	5	6	7	8	9	10	Genotypic correlation coefficient with flower yield
1	**-0.1058**	-0.0157	1.2164	0.0009	-0.0004	-0.1198	0.0130	0.0289	0.1415	0.3754	0.467
2	-0.0385	**-0.0432**	1.0512	-0.0111	0.0379	-0.0113	0.0197	0.0173	0.3105	0.0485	0.408
3	-0.0605	-0.0213	**2.1272**	0.0006	-0.0199	-0.0936	0.0210	0.0187	0.2825	0.2230	0.465
4	-0.0001	0.0094	0.0267	**0.0511**	-0.1468	-0.0525	0.0042	0.0256	-0.0816	0.1499	-0.029
5	-0.0002	0.0092	0.2387	0.0423	**-0.1776**	-0.0630	0.0007	0.0429	-0.1167	0.2730	0.001
6	-0.0521	-0.0020	0.8192	0.0110	-0.0461	**-0.2431**	-0.0013	0.0176	-0.0611	0.4003	0.124
7	-0.0333	-0.0205	1.0756	0.0051	-0.0032	0.0078	**0.0415**	-0.0046	0.5027	0.0434	0.665
8	0.0195	0.0047	-0.2541	-0.0083	0.0486	0.0273	0.0012	**-0.1569**	0.0637	-0.1120	-0.095
9	-0.0235	-0.0210	0.9431	-0.0065	0.0325	0.0233	0.0327	-0.0156	**0.6373**	-0.1090	0.624
10	-0.0505	-0.0026	0.6032	0.0097	-0.0616	-0.1237	0.0023	0.0223	-0.0883	**0.7864**	0.564

Bold figures indicate direct effect

(Residual effect = 0. 2762)

- ✓ Plant height
- ✓ Number of lateral branches
- ✓ Plant spread
- ✓ Days to flower bud appearance
- ✓ Days to full bloom
- ✓ Number of flowers per plant
- ✓ Flower diameter
- ✓ Number of flower clusters plant
- ✓ Duration of flowering
- ✓ Individual flower weight

Table 3: Direct and indirect effects of yield components for flower yield in chrysanthemum genotypes

REFERENCES

[1] Barigidad, H., A. A. Patil and U. G. Nalawadi. 1992. Variability studies in chrysanthemum. Prog. Hort., 24 (1-2): 55-59.

[2] Baskaran, V., T. Janakiram and Jayanthi. 2004. Correlation and path coefficient analysis studies in chrysanthemum. J. Ornamental Hort., 7(3-4):37-44.

[3] Chaugule, B. B. 1985.Studies on genetic variability in chrysanthemum (*Chrysanthemum morifolium* Ramat). M.Sc. (Agri.) Thesis, MPKV, Rahuri, Maharashtra.

[4] Deka, K. K. and L. Paswan. 2002. Correlation and path analysis study in chrysanthemum. Annuals of Biology, 18(1): 31-34.

[5] Manjunath Rao, T. 1982. Studies on genetic and variability and correlation in China aster (*Callistephus chinensis* (L.) Nees). M.Sc. (Agri.) Thesis, UAS, Bangalore.

[6] Poornima, G., D.P. Kumar and G. K. Seetharamu. 2006. Evaluation of China aster (*Callistephus chinensis* (L.) Ness) genotype under hill zone of Karnataka. J. Ornamental Hort., 9(3): 208- 211.

[7] Raghava, S. P. S., S. S. Negi and D. Nanchariah. 1992. Genetic variability, correlation and path analysis in chrysanthemum. Indian J. Hort., 49: 200-204.

[8] Sirohi, P. S. and T. K. Behara, 1999. Correlation and path analysis studies in chrysanthemum. J. Ornamental Hort., 2(2): 80-83.