

## Correlation and path coefficients analysis in *Chlorophytum borivilianum*

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**Abstract:** *Chlorophytum borivilianum* Sant. & Fernand (Safed musli) is an important medicinal plant, used in various preparations of Ayurvedic vital tonics and aphrodisiac formulations. Correlation and path coefficients were studied for eleven characters utilizing thirty one genotypes of *Chlorophytum borivilianum*. Genotypic correlations were higher than phenotypic ones. Significant positive associations of fresh root yield was observed with number of fingers per clump, leaf width, leaf length and number of leaves per plant. Further the numbers of fingers per clump had positive and maximum direct effect on fresh root yield followed by number of leaves per plant and days for emergence. The highest contribution towards the fresh root yield through number of fingers per clump was made by increase of finger length and was followed by number of leaves, leaf width and length and length of inflorescence. For all the characters, phenotypic coefficient of variation were greater than genotypic coefficient of variation and high heritability was coupled with high genetic advance recorded in relation to flowering.

**Key word:** *Chlorophytum borivilianum*, correlation, path coefficient

### INTRODUCTION

*Chlorophytum* has three commercial species, namely *C. arundinaceum* Baker, *C. tuberosum* Baker and *C. borivilianum* Sant. & Fernand. The fleshy root of this plant is used in various kinds of Ayurvedic formulation for general debility and vital tonic (Maiti and Geetha, 2005). Selection of *Chlorophytum borivilianum* genotypes with high root yielding ability requires combination of the characters, many of which are inter-related. Their correlation may be either due to genetic linkage or physiological and developmental relationship. It is often assumed that association between characters is an evidence of pleiotropy (when single gene is responsible for many characters) rather than linkage, under complex situations; path coefficient analysis is also one of the reliable statistical techniques which allow quantifying the inter-relationships of different traits and their direct and indirect effects on plant traits through partitioning of genotypic correlation estimates. Present study was conducted to evaluate the genetic variability in different *Chlorophytum borivilianum* accessions and estimates the extent of correlations between different pairs of plant traits to develop the suitable selection criteria for breeding the desirable high root yielding genotypes of *Chlorophytum borivilianum*.

### MATERIALS AND METHODS

Thirty one genotypes of *Chlorophytum borivilianum* long grown in diverse ecological habitats of the

country, were collected and evaluated in Randomized Block Design along with three replications during Kharif 2006-07 at Research Farm of Central Institute of Medicinal and Aromatic Plants, Lucknow, INDIA. Each treatment (genotype) was shown in 3 m row of 50 cm apart planted with spacing of 15 cm. All recommended agronomic practices were followed to raise a good crop of safed musali. Five random plants per plot/replication selected for recording the data in respect to days to 50% flowering, number of leaves per plant, leaf length (cm), leaf width (cm), canopy diameter (cm<sup>2</sup>), length of inflorescence (cm), number of fingers per clump, length of finger (cm), width of finger (cm) and fresh root yield per plant (gm). Observations pertaining to the days for emergence was recorded when > 90 % plants were emerged per plot per replicate. Phenotypic and genotypic correlation and path coefficient analysis was carried out following procedure of Dewey and Lu (1959).

### RESULTS AND DISCUSSION

Analysis of variance indicated that the results were significant for all the traits suggesting that experimental material possessed considerable variability. For all the characters, phenotypic coefficient of variation (PCV) was equal or slightly greater than genotypic coefficient of variation (GCV) indicating equal role of genotypic as well as environmental effects on the expression of characters (Table1). High heritability coupled with high genetic advance, observed for days for emergence, days to

50% flowering, leaf length, canopy diameter, length of inflorescence and fresh root yield per plant. These traits were under additive genetic control and simple selection for these traits would be quite effective. The above findings were in consonance to that of Jat and Sharma (1996); Kothari and Singh (2001). In general genotypic correlation coefficients were higher than their respective phenotypic ones which underlined the greater contribution of genetic factors in association to development (Table 2) which is partly contrary to the finding of Jat (1993) and Bhagat and Jadeja (2003). Further, it was also observed that in most cases sign of phenotypic correlation coefficient was same as that of genotypic correlation coefficients indicating no adverse impact of environment on the inter-relationship among the traits. The fresh root yield per plant exhibited highly significant and positive correlation with number of fingers per clump, number of leaves per plant, leaf width, and leaf length at both phenotypic and genotypic levels respectively.

Among the other significant positive associations, was the number of days to 50% flowering with days to emergence (highest) followed by leaf width and leaf length, in relation to length of inflorescence and number of fingers per clump. Further the partitioning of the genetic correlation of fresh root yield with component traits through the path coefficient analysis revealed that the magnitude of direct effects of number of fingers (0.566), number of leaves (0.401), days to emergence (0.214) and canopy diameter (0.136) were high and positive towards fresh yield (Table 3). Finger length (0.335), number of leaves per plant (0.306), leaf width (0.211), length of inflorescence (0.195) and leaf length (0.191) were the some traits which indirectly contributed substantial through number of fingers per clump. The indirect effect of days for emergence was indicated by the indirect effect through days to 50% flowering and the related characters. Thus, the results shown that traits for high yielding clones in *Chlorophytum borivilianum* are important. Breeding attention should be paid on number of fingers per clump along with number of leaves. The above findings of present study provides sound basis for formulating effective selection strategy while developing high yielding varieties of *Chlorophytum borivilianum*.

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Table 1. Estimates of different genetic parameters for attributes of fresh root yield in *Chlorophytum borivilianum*.

Characters	Range	Mean	Phenotypic Coefficient of Variation	Genotypic Coefficient of Variation	Heritability (h <sup>2</sup> b)	Genetic Advance
Days for emergence	11.67 - 51.33	38.09 ± 0.59	31.36	31.30	99.6	24.52
Days to 50% flowering	24.67 - 97.67	69.51 ± 0.80	24.90	24.86	99.7	35.54
Number of leaves	5.67 - 13.33	9.81 ± 0.91	18.97	15.31	65.2	2.50
Leaf length (cm)	18.52 - 41.27	30.54 ± 1.33	16.64	15.76	89.6	9.39
Leaf width (cm)	1.03 - 2.50	1.91 ± 0.078	21.12	20.51	94.3	0.78
Canopy diameter (cm <sup>2</sup> )	29.80 - 73.20	58.79 ± 1.04	19.00	18.87	98.7	22.70
Length of inflorescence (cm)	16.93 - 45.67	29.51 ± 1.20	30.36	29.94	97.3	17.95
Number of fingers/ clump	6.66 - 13.29	9.79 ± 1.24	23.99	18.22	57.7	2.79
Length of finger (cm)	4.13 - 10.43	7.60 ± 0.65	19.75	16.74	71.9	2.22
Width of finger (cm)	0.43 - 0.88	0.67 ± 0.05	16.85	14.15	70.6	0.16
Fresh root yield per plant (g)	8.00 - 41.92	20.48 ± 1.70	41.38	40.06	93.9	16.38

Table2. Estimates of phenotypic and genotypic correlation coefficients among eleven characters in *Chlorophytum borivilianum*.

Characters		Days to 50% flowering	No. of leaves/ plant	Leaf length (cm)	Leaf width (cm)	Canopy diameter (cm <sup>2</sup> )	Length of inflorescence (cm)	No. of fingers/ clump	Length of finger (cm)	Width of finger (cm)	Fresh root yield per plant (gm)
Days for emergence	p	0.833**	-0.108	-0.335	0.045	-0.410*	-0.329	-0.176	-0.353	0.020	-0.124
	g	0.836**	-0.123	-0.245	0.047	-0.413*	-0.334	-0.227	-0.426*	0.023	-0.148
Days to 50% flowering	p	-	-0.180	-0.379*	0.045	-0.434*	-0.266	-0.203	-0.319	-0.084	-0.281
	g	-	-0.224	-0.403*	0.048	-0.438*	-0.270	-0.267	-0.380*	-0.095	-0.289
No. of leaves	p		-	0.322	0.410*	-0.112	0.150	0.319	0.310	0.264	0.508**
	g		-	0.413*	0.512**	-0.135	0.190	0.541**	0.422*	0.369*	0.646**
Leaf length (cm)	p			-	0.515**	0.035	0.439*	0.251	0.199	0.383*	0.358*
	g			-	0.578**	0.040	0.454*	0.338	0.264	0.484**	0.397*
Leaf width (cm)	p				-	-0.150	0.466**	0.246	0.208	0.344	0.390*
	g				-	-0.116	0.489**	0.373*	0.245	0.419*	0.414*
Canopy diameter (cm <sup>2</sup> )	p					-	0.126	0.046	-0.103	-0.079	0.161
	g					-	0.130	0.074	-0.112	-0.099	0.174
Length of inflorescence (cm)	p						-	0.248	0.263	0.181	0.297
	g						-	0.345	0.327	0.229	0.314
No. of fingers/ clump	p							-	0.421*	0.235	0.528**
	g							-	0.592**	0.170	0.707**
Finger length (cm)	p								-	-0.016	0.276
	g								-	-0.037	0.280
Finger width (cm)	p									-	0.291
	g									-	0.310

Table 3. Estimates of direct (bold) and indirect effects (Genotypic path) of ten characters on fresh root yield in *Chlorophytum borivilianum*.

Characters	Days for emergence	Days to 50% flowering	No. of leaves/plant	Leaf length (cm)	Leaf width (cm)	Canopy diameter (cm <sup>2</sup> )	Length of inflorescence (cm)	No. of fingers/clump	Length of finger (cm)	Width of finger (cm)	Correlation with fresh root yield (gm)
Days for emergence	<b>0.214</b>	-0.202	-0.053	0.004	0.002	-0.056	-0.033	-0.128	0.105	0.000	-0.148
Days to 50% flowering	0.179	<b>-0.242</b>	-0.090	0.007	0.002	-0.059	-0.027	-0.151	0.094	-0.001	-0.289
No. of leaves/plant	-0.028	0.054	<b>0.401</b>	-0.007	0.019	-0.018	0.019	0.306	-0.104	0.004	0.646**
Leaf length (cm)	-0.052	0.098	0.166	<b>-0.017</b>	0.022	0.005	0.045	0.191	-0.065	0.005	0.397*
Leaf width (cm)	0.010	-0.012	-0.205	-0.010	<b>0.037</b>	-0.022	0.048	0.211	-0.061	0.005	0.414*
Canopy diameter (cm <sup>2</sup> )	-0.088	0.106	-0.054	-0.001	0.006	<b>0.136</b>	0.013	0.042	0.028	-0.001	0.174
Length of inflorescence (cm)	-0.071	0.065	0.076	-0.008	0.018	0.018	<b>0.099</b>	0.195	-0.018	0.003	0.314
No. of fingers/clump	-0.048	0.064	0.217	-0.006	0.014	0.010	0.034	<b>0.566</b>	-0.146	0.002	0.707**
Length of finger (cm)	-0.091	0.092	0.169	-0.004	0.009	-0.015	0.032	0.335	<b>-0.247</b>	0.000	0.280
Width of finger (cm)	0.005	0.023	0.148	-0.008	0.016	-0.013	0.023	0.096	0.009	<b>0.011</b>	0.310

Residual effect = 0.3043



Fig. 1 Whole plant of *Chlorophytum borivilianum*



Fig. 2 Roots of *Chlorophytum borivilianum*



Fig. 3 Inflorescence of *Chlorophytum borivilianum*