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An Interpretation of Nature and Extent of Relationship Between Yield and its Related Traits of Fodder Cowpea in F_3 Generation

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Abstract: Cowpea is grown for both grain and fodder exhibiting wide range of variability. The correlation between yield and other component traits should therefore be given importance in the selection of genotypes for more yield in cowpea. Among 13 characters studied, six of them viz., number of branches, number of leaves, leaf weight, stem weight, green fodder yield and crude protein content had positive and significant phenotypic and genotypic correlation with dry matter yield. The phenotypic and genotypic intercorrelations among the characters with dry matter yield revealed that the seven character namely plant height, number of branches, number of leaves, leaf length, leaf breadth, stem weight, and green fodder yield exhibited positive significant intercorrelation. Negative significant values were observed between leaf stem ratio and number of leaves, days to 50 per cent flowering and green fodder yield. The maximum positive direct effect contributing to dry matter yield was exhibited by green fodder yield followed by days to 50 per cent flowering, crude protein content, stem thickness, number of branches and number of leaves. This revealed the true relationship between dry matter yield and the above component characters. Direct selection for these characters would improve the dry matter yield. Negative direct effects shown by leaf length, leaf breadth and leaf weight suggest that they have less direct influence on the magnitude or direction of correlation coefficients and is mainly due to indirect effects of the characters through other components traits. Improvement of yield could be possible by indirect selection through such traits.

Key words: Association analysis, fodder cowpea, direct effect, indirect effect

INTRODUCTION

Cowpea (Vi*gna unguiculata* (L.) Walp.) is one of the important food legumes and a valuable component of the traditional cropping systems. Cowpea is grown for both grain and fodder exhibiting wide range of variability. It is of major importance to the nutrition and livelihood of millions of people. The addition of even a small amount of cowpea improves the nutritional balance of the diet and enhances protein quality. Cowpea is equally important as a nutritious fodder for livestock. The nutritive value of cowpea grain, leaves and haulms is very high. The crude protein content is 5 and 23% in the fresh and dry leaves, respectively[1]. Correlations and path analysis aid in the selection of superior genotypes from the breeding population. The correlation between yield and other component traits should therefore be given importance in the selection of genotypes for more yield in cowpea. The partitioning of correlation coefficient into the measures of direct and indirect effects determines their contribution towards yield.

MATERIALS AND METHODS

The present study was undertaken to select high yielding fodder cowpea lines in F_3. The materials for this study were selected from the F_2 population of cowpea raised by a research scholar in the Department of Pulses, TNAU, Coimbatore. The crop was sown in ridges of 4m length with an inter row spacing of 60cm and an intra row spacing of 15cm. Each entry had one row of twenty-five single plants per replication. This base population consisted of twelve cross combinations, out of these, eleven cross combinations comprising of ninety-two single plants were selected based on their field performance for the fodder attributing characters such as plant height, number of branches, number of leaves, leaf length, leaf breadth, stem thickness, days to 50 per cent flowering, leaf weight, stem weight, leaf stem ratio, green fodder yield and dry matter yield. The seeds collected from selected plants were used to raise F_3 progenies in a Randomized Block Design with two replications. The associations between yield and other component traits as well as among the component traits were estimated in the F_3 as suggested by Goulden,[5]. The path coefficient analysis was worked out following the method suggested by Dewey and Lu[3].

RESULTS AND DISCUSSION

Estimation of genotypic and phenotypic correlations are useful in planning and evaluating breeding programmes. Therefore, a study on their association is also carried out and the result obtained is discussed below.

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Table 1: Phenotypic and genotypic correlation coefficient in F_3 generation

C		DF	PH	NB	NL	LL	LB	ST	LW	SW	L/S	GFY	CPC	DMY
DF	r_p	1.000	-0.167	-0.167	0.061	0.270**	0.270**	-0.098	-0.083	-0.018	-0.068	-0.06	0.043	0.146
	r_g	1.000	-0.18	-0.161	0.09	0.345**	0.379**	-0.131	-0.087	-0.019	-0.072	-0.066	0.029	0.182
PH	r_p		1.000	0.530**	0.490**	0.139	0.068	0.067	0.214*	0.177	0.028	0.215*	0.189	0.095
	r_g		1.000	0.538**	0.519**	0.151	0.082	0.069	0.212*	0.175	0.03	0.212*	0.195	0.096
NB	r_p			1.000	0.641**	-0.006	0.084	0.153	0.292**	0.410**	-0.131	0.386**	0.171	0.238**
	r_g			1.000	0.638**	-0.041	0.103	0.141	0.284**	0.409**	-0.138	0.380**	0.183	0.267**
NL	r_p				1.000	0.132	0.203	0.015	0.287**	0.503**	-0.235*	0.436**	0.221*	0.320**
	r_g				1.000	0.105	0.214*	-0.076	0.281**	0.528**	-0.268**	0.446**	0.246	0.356**
LL	r_p					1.000	0.712**	0.123	0.197	0.13	0.069	0.173	0.105	0.043
	r_g					1.000	0.868**	0.122	0.206*	0.124	0.085	0.172	0.123	0.028
LB	r_p						1.000	0.248*	0.217*	0.154	0.07	0.2	0.069	0.081
	r_g						1.000	0.244*	0.251*	0.186	0.066	0.240*	0.093	0.105
ST	r_p							1.000	0.306**	0.163	0.18	0.258*	0.176	0.07
	r_g							1.000	0.342**	0.171	0.202	0.287**	-0.212	0.105
LW	r_p								1.000	0.658**	0.494**	0.910**	0.021	0.499**
	r_g								1.000	0.659**	0.500**	0.911**	0.018	0.520**
SW	r_p									1.000	-0.311**	0.910**	0.127	0.580**
	r_g									1.000	-0.304**	0.910**	0.131	0.614**
L/S	r_p										1.000	0.102	-0.13	-0.034
	r_g										1.000	0.11	-0.141	-0.043
GFY	r_p											1.000	0.08	0.591**
	r_g											1.000	0.081	0.620**
CPC	r_p												1.000	0.216*
	r_g												1.000	0.237*

** Significance at 1% level = 0.267
* Significance at 5% level = 0.205

In the present study, in F_3 generation, the genotypic correlation coefficient was of higher magnitude than the phenotypic correlation coefficient showing the effects of environment in masking the full expression of the characters. Among 13 characters studied, six of them viz., number of branches, number of leaves, leaf weight, stem weight, green fodder yield and crude protein content had positive and significant phenotypic and genotypic correlation with dry matter yield (Table 1).

Positive, significant phenotypic and genotypic correlation coefficients were observed between number of branches with plant height, number of leaves; leaf weight and stem weight with green fodder yield. Number of leaves had positive and significant correlation with number of branches, plant height, leaf weight, stem weight, GFY and crude protein content. Negative and significant association was observed with leaf stem ratio. The phenotypic and genotypic intercorrelations among the characters with dry matter yield revealed that the seven character namely plant height, number of branches, number of leaves, leaf length, leaf breadth, stem weight and green fodder yield exhibited positive significant intercorrelation. Negative significant values were observed between leaf stem ratio and number of leaves, days to 50 per cent flowering and green fodder yield. This was also reported by Ponmariammal and Das[8], Srinivasan and Das[9] and Borah and Khan[2] in fodder cowpea.

Table 2: Direct and indirect effects of 12 characters over dry matter yield in F_3 generation

C	DF	PH	NB	NL	LL	LB	ST	LW	SW	L/S	GFY	CPC
DF	0.326	-0.059	-0.052	0.029	0.112	0.124	-0.043	-0.028	-0.006	-0.022	-0.022	0.009
PH	0.002	0.012	-0.006	-0.006	-0.002	-0.001	-0.001	-0.002	-0.002	-0.0003	-0.002	-0.002
NB	-0.002	0.006	0.012	0.007	-0.001	0.001	0.002	0.003	0.005	-0.002	0.004	0.002
NL	0.000	0.000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
LL	-0.028	-0.012	0.003	-0.009	-0.082	-0.071	-0.010	-0.017	-0.010	-0.007	-0.014	-0.010
LB	-0.051	-0.011	-0.014	-0.029	-0.118	-0.135	-0.033	-0.034	-0.025	-0.009	-0.032	-0.013
ST	-0.006	0.003	0.007	-0.004	0.006	0.012	0.049	0.017	0.009	0.010	0.014	-0.010
LW	0.126	-0.308	-0.412	-0.408	-0.299	-0.365	-0.497	-1.452	-0.956	-0.726	-1.323	-0.026
SW	0.031	-0.293	-0.686	-0.886	-0.209	-0.312	-0.300	-1.105	-1.678	0.510	-1.527	-0.220
L/S	0.011	-0.005	0.021	0.041	-0.013	-0.010	-0.031	-0.076	0.046	-0.512	-0.017	0.021
GFY	-0.232	0.747	1.337	1.571	0.607	0.844	1.011	3.210	3.205	0.386	3.522	0.285
CPC	0.006	0.039	0.036	0.049	0.025	0.019	-0.042	0.004	0.026	-0.028	0.016	0.200
DMY	0.182	0.096	0.247	0.356**	0.028	0.105	0.105	0.520**	0.614**	-0.041	0.620**	0.237*

Numbers in bold indicate direct effect
**Significance at 1% level =0.267
*Significance at 5% level = 0.205
Residual effect r = 0.505

In F_3 generation, the yield of dry matter is the result of component characters like plant height, number of branches, number of leaves, leaf length, leaf breadth, stem thickness, leaf weight, stem weight, green fodder yield, leaf stem ratio and crude protein content. The maximum positive direct effect contributing to dry matter yield was exhibited by green fodder yield followed by days to 50 per cent flowering, crude protein content, stem thickness, number of branches and number of leaves. This revealed the true relationship between dry matter yield and the above component characters. Direct selection for these characters would improve the dry matter yield (Table 2). Negative direct effects shown by leaf length, leaf breadth and leaf weight suggest that they have less direct influence on the magnitude or direction of correlation coefficients and is mainly due to indirect effects of the characters through other components traits. Improvement of yield could be possible by indirect selection through such traits.

The indirect effects of the characters plant height, number of branches, plant height, number of leaves, leaf breadth, stem thickness, leaf weight, stem weight and crude protein content on dry matter yield was recorded through green fodder yield. The indirect effect of days to 50 per cent flowering was through leaf weight, leaf stem ratio through stem weight and green fodder yield was through crude protein content.

In F_3, number of branches, number of leaves, stem thickness and crude protein content exhibited direct contributions to the improvement of yield. Similar finding were reported earlier by Kohli and Agarwal[7] in forage cowpea; Digee *et al*[4], Kalariyarasi and Palanisamy[6], Yadav *et al.*[10] in grain cowpea.

The indirect effect of plant height, number of branches, number of leaves, leaf length, leaf breadth and crude protein content on dry matter yield was through green fodder yield in F_3 generation. The characters that has direct effect also influences the dry matter yield through these traits. In such cases, indirect selection through such traits would be effective in yield improvement.

REFERENCES

1. Aravindhan, S and L.D.V. Das, 1995b. Correlation and path analysis for fodder attributes in cowpea. Madras Agric. J., 82: 420-422.
2. Borah, H.R. and A.K.F. Khan, 1999. Correlation and path analysis in fodder cowpea. Crop Res., 18: 278-282.
3. Dewey, D.R. and L.H. Lu, 1959. Correlation and path analysis of components of crested wheat grass seed production. Agron. J., 51: 515-518.
4. Digee, B., L.D.V. Das., G. Kandasamy and M. Sakila, 2001. Path analysis Cowpea [*Vigna unguiculata*. (L.). Walp.]. Madras Agric. J., 88: 526-527.
5. Goulden, C.H., 1952. Methods of statistical Analysis. John wiley and Sons, Inc., New York.
6. Kalaiyarasi, R and G.A. Palanisamy, 2002. Path analysis of F_3 populations in cowpea [*Vigna unguiculata*(L.) Walp.]Legume Res., 25: 47-49.

7. Kohli, K.S. and D.K. Agarwal, 2002. Character association and path coefficient analysis in forage cowpea. Range Mgmt. and Agroforestry. 23: 66-69.
8. Ponmariammal. T. and V.L.D. Das, 1996. Correlation and path analysis for fodder yield in cowpea. Madras Agric. J., 83: 660-661.
9. Srinivasan, C. and V.L.D. Das, 1996. Correlation and path analysis for fodder yield in cowpea. Madras Agric. J., 83: 660-661.
10. Yadav, K.S., H.S. Yadava and M.L. Naik, 2003. Correlation and path analysis in early generations of cowpea. Indian J. Pulses Res., 16: 101-103.