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Association Studies for Yield and its Related Traits of Fodder Cowpea in F_4 Generation

S. Sheela Mary and A. Gopalan

Department of Forages, Centre for Plant Breeding and Genetics,
Tamil Nadu Agricultural University, Coimbatore-3, India.

Abstract: Cowpea (Vig*na unguiculata* (L.) Walp.) is one of the important food legumes and a valuable component of the traditional cropping systems. Correlations and path analysis aid in the selection of superior genotypes from the breeding population. High positive significant phenotypic and genotypic correlations were observed for traits plant height, number of branches, number of leaves, leaf length, leaf weight, stem weight, green fodder yield and crude protein content. Days to 50 per cent flowering showed negative significant relationship at both the levels. The genotypic and phenotypic inter correlation were expressed by the characters plant height, number of branches, number of leaves, leaf length, leaf breadth, leaf weight stem weight and green fodder yield. the direct effect of the characters plant height to number of leaves, number of branches, leaf length, leaf breadth, stem thickness, stem weight, leaf stem ratio and crude protein content revealed the direct contribution to yield in the positive direction. Negative direct effect was noticed in days to 50 per cent flowering and leaf weight to dry matter yield. The green fodder yield exhibited the maximum direct effect on yield.

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

INTRODUCTION

Cowpea (Vig*na 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 yields 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_4 generations. The materials for this study were selected from the F_3 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 associations between yield and other component traits as well as among the component traits were estimated in the F_4 generations 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.

Corresponding Author: S. Sheela Mary, Department of Forages, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore-3

Table 1: Phenotypic and genotypic correlation coefficient in F_4 generation

C		DF	PH	NB	NL	LL	LB	ST	LW	SW	L/S	GFY	CPC	DMY
DF	r_p	1.000	-0.07	-0.189	-0.327**	-0.001	-0.122	0.011	-0.334	-0.422**	0.045	-0.409**	0.144	-0.330**
	r_g	1.000	-0.08	-0.213*	-0.376**	-0.008	-0.052	0.022	-0.367**	-0.462**	0.043	-0.449**	0.133	-0.395**
PH	r_p		1.000	0.342**	0.276	0.347**	0.151	0.267**	0.477**	0.353**	0.179	0.450**	0.398**	0.303**
	r_g		1.000	0.354**	0.329	0.369**	0.197	0.299**	0.476**	0.354**	0.177	0.450**	0.406**	0.322**
NB	r_p			1.000	0.559**	0.157	0.112	-0.094	0.162	0.359**	-0.228*	0.281**	-0.219*	0.206*
	r_g			1.000	0.558**	0.206*	0.116	-0.12	0.139	0.358**	-0.256*	0.268**	-0.234*	0.239*
NL	r_p				1.000	0.192	0.259*	-0.085	0.179	0.327**	-0.158	0.274**	-0.072	0.237*
	r_g				1.000	0.233*	0.353**	-0.106	0.168	0.324**	-0.168	0.266*	-0.064	0.268**
LL	r_p					1.000	0.235*	0.206*	0.273**	0.311**	0.03	0.316**	0.223*	0.323**
	r_g					1.000	0.303**	0.229*	0.297**	0.338**	-0.029	0.343**	0.244*	0.366**
LB	r_p						1.000	0.229*	0.214*	0.15	0.15	0.197	0.022	0.173
	r_g						1.000	0.271**	0.287**	0.195	0.211*	0.261*	0.058	0.245*
ST	r_p							1.000	0.315**	-0.011	0.422**	0.166	0.159	0.105
	r_g							1.000	0.360**	-0.012	0.486**	0.19	0.197	0.142
LW	r_p								1.000	0.706**	0.488**	0.925**	0.374**	0.537**
	r_g								1.000	0.707**	0.494**	0.925**	0.384**	0.578**
SW	r_p									1.000	-0.256*	0.923**	0.194	0.529**
	r_g									1.000	-0.250*	0.923**	0.2	0.572**
L/S	r_p										1.000	0.128	0.255*	0.106
	r_g										1.000	0.134	0.264*	0.116
GFY	r_p											1.000	0.308**	0.577**
	r_g											1.000	0.317**	0.623**
CPC	r_p												1.000	0.274**
	r_g												1.000	0.292**

** Significance at 1% level = 0.267

In F_4 generation, high positive significant phenotypic and genotypic correlations were observed for traits plant height, number of branches, number of leaves, leaf length, leaf weight, stem weight, green fodder yield and crude protein content. Days to 50 per cent flowering showed negative significant relationship at both the levels (Table 1). The genotypic and phenotypic inter correlation were expressed by the characters plant height, number of branches, number of leaves, leaf length, leaf breadth, leaf weight stem weight and green fodder yield.

In the present study, dry matter yield and green fodder yield recorded positive significant phenotypic and genotypic correlation with number of leaves, number of branches, leaf weight, stem weight, green fodder yield and crude protein content. This was also reported by Srinivasan and Das[9] and Borah and Khan[2] in fodder cowpea, in grain cow pea.

Among 12 characters which contribute to yield, positive significant association at both levels were reported by the characters plant height, number of branches, number of leaves, leaf length, breadth, leaf weight, stem weight and green fodder yield.

In F_4 generation, the direct effect of the characters plant height to number of leaves, number of branches, leaf length, leaf breadth, stem thickness, stem weight, leaf stem ratio and crude protein content revealed the direct contribution to yield in the positive direction. Negative direct effect was noticed in days to 50 per cent flowering

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

C	DF	PH	NB	NL	LL	LB	ST	LW	SW	L/S	GFY	CPC
DF	**0.214**	0.017	0.045	0.08	0.002	0.011	-0.005	0.079	0.099	0.032	0.223	0.027
PH	0.004	**0.053**	-0.018	-0.017	-0.02	-0.01	0.016	-0.025	-0.019	0.009	-0.024	-0.022
NB	-0.029	0.049	**0.138**	0.177	0.028	0.016	-0.017	0.019	0.049	-0.035	0.037	-0.032
NL	-0.004	0.003	0.005	**0.01**	0.002	0.003	-0.001	0.002	0.003	-0.002	0.003	-0.001
LL	-0.002	0.069	0.039	0.044	**0.188**	0.057	0.043	0.056	0.064	-0.005	0.065	0.046
LB	-0.0001	0.0002	0.0001	0.0004	0.0003	**0.001**	0.0003	0.0003	0.0002	0.0002	0.0003	0.0001
ST	-0.0003	0.004	-0.002	-0.002	0.003	0.004	**0.015**	0.005	-0.0002	0.007	0.003	0.003
LW	0.175	-0.226	-0.066	-0.08	-0.141	-0.136	-0.171	**-0.476**	-0.336	-0.235	-0.44	-0.183
SW	-0.608	0.466	0.471	0.427	0.445	0.257	-0.016	0.931	**1.316**	-0.329	1.215	0.263
L/S	0.032	0.132	-0.191	-0.125	-0.021	0.157	0.363	0.368	-0.187	**0.746**	0.1	0.197
GFY	0.223	-0.223	-0.133	-0.132	-0.171	-0.13	-0.094	-0.46	-0.459	-0.067	**-0.497**	-0.157
CPC	0.027	0.084	-0.048	-0.013	0.05	0.012	0.041	0.079	0.041	0.055	0.065	**0.206**
DMY	-0.395**	0.322**	0.239*	0.268**	0.366**	0.242*	0.142	0.578**	0.572**	0.116	0.623**	0.292**

Numbers in bold indicate direct effect,
**Significance at 1% level = 0.267
*Significance at 5 % level = 0.205
Residual effect r = 0.515

and leaf weight to dry matter yield. The green fodder yield exhibited the maximum direct effect on yield.

In F_4 generation, number of leaves, number of branches, leaf length, leaf breadth, crude protein and green fodder yield showed the positive indirect effects through stem weight. In other characters, the indirect effects of days to 50 per cent flowering was through green fodder yield, stem weight was through days to 50 per cent flowering, stem thickness was through leaf stem ratio and leaf stem ratio through crude protein content.

In F_4 generations, 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_4 generation. The character 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 (Table 2).

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