Multiple regression function (Table 2) shows that the number of bunches and days to flowering gave high degree of influence on the expression of grain yield. The R^2 value indicated that the variation in yield was 72.98% ($R^2 = 0.7298$) by the combined influence of all the characters studied. The above combined influences were statistically significant. This is in line with the findings of Irfan Khan (1989) in black gram.

The path coefficient analysis (Table 3) indicates that the number of bunches per plant exert a maximum direct effect on the grain yield. The total number of pods per plant, the total number of days taken by the plant to flower and the 100 seeds weight also have an effect on the grain yield in a descending order. These observations are in line with the earlier findings (Malik and Singh, 1983).

It has also been noticed that the plant height and number of pods per bunch have the least positive direct effect on the grain yield. From this study it is obvious that the plant height, the number of bunches per plant, the total number of pods per plant, the total number of branches per plant, increase in stem girth and 100 seeds weight and their direct and indirect combinations have a direct bearing in improving the yield potential in black gram mutants.

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VARIATION AND CHARACTER ASSOCIATIONS OF GREEN FODDER YIELD AND COMPONENT TRAITS IN RAGI (*Eleusine coracana* L. Gaertn.)

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ABSTRACT

Forty diverse genotypes of ragi were evaluated for the variability, heritability estimates and path co-efficient analysis of six quantitative traits. Close resemblence between GCV and PCV estimates for days to 50 per cent flowering and green fodder yield/plant, and high heritability indicated that selection for these traits would be much effective. The highest heritability and genetic advance in green fodder yield revealed predominance of additive gene effects. Green fodder yield/plant significantly and positively correlated with all the characters studied. Though leaf weight/plant had high influence of environment, it had the maximum positive direct and indirect effects through all other characters. Besides, days to 50 per cent flowering should be reckoned as an important trait in selection programmes.

The non availability of high yielding fodder types in the small millets which can be grown under less fertile lands is a limiting factor. The common feature of ragi is that, it can come up on land that is too poor and too dry for other crops. As forage crop, it is palatable to the stock and has a feeding value, can be utilised for hay or silage even when badly damaged (Kempanna, 1974). Another advantage is that it can be cut and fed to the animal at any stage of the crop growth unlike sorghum which contains - HCN compared to other millets. So the present investigation aims to obtain information on genetic variability, heritability (broad sense) and genetic advance for different

Table 1. Genetic variability and heritability for six quantitative traits among forty genotypes of ragi.

Characters	Mean	Genotypic variance	Co-efficient of variability (%)		Heritability (%)	Genetic advance	Genetic advance as percentage over mean
			Phenotypic	Genotypic			
Days to 50% flowering	72.61 ± 1.20	105.28	14.42	14.13	96.07	20.74	28.56
Plant height (cm)	66.36 ± 3.40	93.36	17.05	14.56	72.89	17.01	25.63
Number of tillers/plant	4.11 ± 0.39	1.23	31.63	26.98	72.79	1.95	47.47
Number of leaves/plant	46.16 ± 4.99	154.30	32.79	26.91	67.38	21.02	45.55
Leaf weight (g)	31.06 ± 3.54	70.38	33.45	27.01	65.21	13.97	44.98
Green fodder yield/plant (g)	106.55 ± 10.29	1741.09	42.58	39.16	84.58	79.13	74.27

traits in 40 diverse genotypes of ragi, and to determine association of different characters among each other and with green fodder yield.

MATERIALS AND METHODS

Forty genotypes of ragi obtained from the NBPGR, Akola; the Co- ordinator (Small millets), Bangalore; and the Director, School of Genetics, Tamil Nadu Agricultural University, Coimbatore were evaluated in randomized block design replicated thrice in plots of 3.0 x 1.5 m size, accommodating five 3 m long rows spaced 30 cm apart with 10 cm plant-to-plant spacing. Five plants were tagged at random from the middle rows of each plot to record the observations. The data on days to 50 per cent flowering were recorded on plot basis. Harvesting was done at 50 per cent flowering and observations were recorded for green fodder yield per plant, plant height, number of tillers/plant, number of leaves/plant and leaf weight/plant. The data were subjected to statistical analysis. The phenotypic and genotypic coefficient of variation (PCV & GCV) and expected genetic advance were computed following BURTON (1952). Heritability in broad sense was calculated in accordance with JOHNSON *et al.* (1955). Phenotypic and genotypic correlations were estimated from the phenotypic and genotypic components of variances and co-variances. Path co- efficient analysis based on genotypic correlation was performed according to DEWEY and LU (1959).

RESULTS AND DISCUSSION

Analysis of variance indicating that the genotypes differ significantly for all the traits. Partitioning of variance into its components revealed that genotypic effects accounted for an appreciable portion of the variability. There was a close resemblence between GCV and PCV estimates for days to 50 per cent flowering followed by green fodder yield which was reflected in high heritability values for these two traits (Table 1). It indicated that the phenotype strongly reflected the genotype and the individuals that were superior for these two traits should also possess desirable genes and should transmit them to their

Table 2. Phenotypic and genotypic corelation co-efficients of green fodder yield and its components.

Characters		Plant height (cm)	Number of tillers per plant	Number of leaves per plant	Leaf weight per plant (g)	Green fodder yield per plant (g)
Days to 50% flowering	P	0.574**	0.215*	0.468**	0.678**	0.873**
	G	0.643**	0.238**	0.544**	0.810**	0.935**
Plant height (cm)	P		0.144	0.295**	0.473**	0.591**
	G		0.126	0.341**	0.603**	0.679**
Number of tillers per plant	P			0.716**	0.345**	0.453**
	G			0.735**	0.227*	0.434**
Number of leaves per plant	P				0.661**	0.664**
	G				0.632**	0.683**
Leaf weight per plant (g)	P					0.814**
	G					0.836**

P - Phenotypic correlation co-efficient G - Genotypic correlation co-efficient * - Significant at P = 0.05 ** - Significant at P = 0.01

Table 3. Direct (diagonal) and indirect effects of different characters on green fodder yield.

Characters	Days to 50% flowering	Plant height (cm)	Number of tillers per plant	Number of leaves per plant	Leaf weight per plant (g)	Correlation with green fodder yield
Days to 50% flowering	0.124	0.019	0.048	0.084	0.661	0.873**
Plant height (cm)	0.092	0.012	0.025	0.133	0.417	0.591**
Number of tillers per plant	0.035	0.025	0.200	0.017	0.157	0.453**
Number of leaves per plant	0.097	0.034	0.147	0.045	0.360	0.664**
Leaf weight per plant (g)	0.153	0.022	0.045	0.080	0.536	0.814**

$R^2 = 0.946$ Residual = 0.233 ** = Significant at P = 0.01

offspring. Whereas the wide differences between PCV and GCV noticed for number of leaves and leaf weight which in turn was reflected in low heritability values. This appreciable differences in the magnitude of PCV and GCV indicated that environmental factors significantly contributed to the variation for number of leaves and leaf weight. The highest heritability and genetic advance in green fodder yield revealed predominance of additive gene effects in its inheritance and offers ample scope for improvement of this trait through selection. For days to 50 per cent flowering genetic advance was low inspite of high heritability. On the contrary, genetic advance for number of leaves was comparatively high inspite of low heritability and variance together determine the genetic advance.

The association analysis (Table 2) indicated that the green fodder yield was positively correlated with all the other characters both at phenotypic and genotypic level. In general, the genotypic correlation co-efficient values were slightly higher than phenotypic correlation co-efficients which may be due to the masking effect of environment modifying the total expression of the genotypes resulting in reduced phenotypic expression. Path co- efficient analysis helps in separating the direct effect of a component character on yield from indirect effects via other traits. The path analysis (Table 3) based on genotypic correlation co-efficients showed that leaf weight/plant, which has high positive correlation with green fodder yield/plant, also had the highest direct effect. The direct effects of number of tillers/plant and days to 50 per cent flowering were also positive and comparatively high. Days to 50 per cent flowering, plant height, number of tillers/plant and number of leaves/plant exhibited marked indirect effect via leaf weight/plant on green fodder yield. Leaf weight/plant was indirectly influenced by days to 50 per cent flowering for green fodder yield. These results indicated that leaf weight/plant and days to 50 per cent flowering were the most important component characters of green fodder yield and should therefore be given special attention while making selection for fodder yield. However, it must be borne in mind that leaf weight is highly influenced by environment.

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