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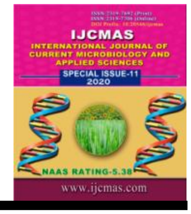

Original Research Article

Correlation and Path Analysis for Yield and Yield Contributing Traits in Forage Sorghum

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A B S T R A C T

The experiment with 32 genotypes was conducted at the sorghum research unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola in randomized block design with three replications during kharif, 2011-2012. The studied revealed that the magnitudes of genotypic correlation coefficients were greater than phenotypic correlation coefficients for most of the character under studied. All the characters under investigation exhibited positive association at genotypic and phenotypic level with green fodder yield except leaf stem ratio. Correlation studies revealed positive and highly significant association of green fodder yield with dry fodder yield, days to 50% flowering, number of leaves per plant, stem girth (cm) TSS, leaf breadth (cm) and protein. Path coefficient analysis showed positive and high direct effect of days to 50% flowering, plant height, dry fodder yield and stem girth on green fodder yield. These characters may be considered as important yield contributing components. Hence selection of the genotypes based on these traits alone or in combination will result in increasing high green fodder yield.

Keywords

Correlation, Path analysis, Forage sorghum

Introduction

Sorghum is an important food and fodder crop of dry land agriculture. It has wider adaptability to various agro-ecological conditions especially in sub-tropical region. It is grown mainly for food and fodder purpose in Africa and India. It is grown extensively for fodder in the countries like, USA, Austria, and China etc. In the northern parts of India sorghum is grown mainly for fodder production. Where as in the central and southern part of India it is grown as source of food and fodder. Sorghum has significance after wheat rice and maize among cereals. Sorghum is one of the most widely adapted fodder crops in draught prone areas because of its higher productivity per day and better palatability and digestibility. Fodder sorghum is widely used in various forms such as green chop, silage and hay. These various forms act a highly palatable feed for cattle. It is superior to pearl millet due to lower oxalates and fiber content.

In forage breeding programme research in the productivity of green fodder yield is an important objective. A programme of breeding also requires the conformation regarding the direct and indirect effect of yield contributing character on fodder yield.

Therefore, the present studies were undertaken to assess the correlation coefficient analysis measure mutual relationship between green fodder yield and yield contributing characters. Path analysis permits the examination of direct effect of various characters on green fodder yield as well as their indirect effect via other component trait.

Materials and Methods

Study was conducted at sorghum research unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS) during kharif 2011-2012. The experimental material comprised of 32 genotypes. The experiment was conducted in randomized block design with three replications. The genotypes were grown in the plot consisted of 4 meter and row to row distance 30 cm. The recommended cultural practices were followed to raise a good and healthy crop.

Observation were recorded on plot basis for the three characters viz; days to 50 percent flowering, green fodder yield (t/ha) and dry fodder yield (t/ha) and on five randomly selected plants from each plot of each replication of the genotypes for the seven characters viz. Plant height (cm), no. of tillers per plant.

Leaf stem ratio (%), number of leaves per plant, leaf length (cm), leaf breadth (cm), stem girth (cm) and two characters of fodders quality viz; total soluble sugar (TSS) % and protein content (%). The data were subjected to pooled analysis environment genotype correlation as per method suggested by Wright (1921) and path analysis as per procedure prescribed by Dewey and Lu (1959).

Results and Discussion

In the present investigation the correlation coefficients were estimated among various characters at phenotypic and genotypic levels. The genotypic correlation coefficient was in general observed to be higher than that of phenotypic correlation coefficient indicating the strong inherent association for the various characters studied (Table 1).

All the characters except, leaf stem ratio, leaf length and plant height had positive and highly significant association with green fodder yield at genotypic level (Table 1). Hence, selection based on any one of these trait either alone or in combination with these results identifying high forage yielding strain.

Therefore, the direct selection for these characters is expected to better yield results and should be given top priority in all improvement programme as revealed by their positive and highly significant correlation coefficient.

Similar results were obtained by Manickam and das (1994), Devanand *et al.,* (1996), Lyanar and Khan (2005), Singh *et al.,* (2009), Jain *et al.,* (2010). The characters leaf length showed positive and significant association with fodder yield. The similar findings were reported by Singh *et al.,* (2009), Jain *et al.,* (2010), Prakash *et al.,* (2010).

The genotypic correlation coefficient was greater than phenotypic correlation coefficient for most of the characters under investigation; these were in agreement with findings of Sukhchain and Singh (2009), Mahajan *et al.,* (2011) (Fig. 1).

Table.1 Genotypic (rg) and Phenotypic (rp) correlation coefficients between yield and yield contributing characters

Characters	r	Days to 50% flowering	Plant height (cm)	Number of leaves per plant	Leaf length (cm)	Leaf breadth (cm)	Leaf stem ratio	Stem girth (cm)	TSS (%)	Protein (%)	Dry fodder yield (t/ha)	Green fodder Yield (t/ha)
Days to 50% flowering	G		-0.217*	0.880**	0.702**	0.925**	-0.404**	0.968**	0.052	0.184	0.509**	0.518**
	P		-0.121	0.764**	0.473**	0.629**	0.272**	0.631**	0.050	0.169	0.454**	0.435**
Plant height (cm)	G			0.043	0.251*	-0.286**	0.127	-0.026	-0.282**	-0.051	-0.068	0.150
	P			0.041	0.037	-0.153	0.039	0.032	-0.210*	-0.040	-0.049	0.059
Number of leaves per plant	G				0.635**	0.741**	-0.197	0.730**	0.008	0.054	0.480**	0.509**
	P				0.425**	0.571**	-0.207*	0.557**	0.014	0.071	0.393**	0.426**
Leaf length (cm)	G					0.705**	0.038	0.867**	-0.256*	-0.003	0.147	0.190
	P					0.455**	0.047	0.528**	-0.186	-0.015	0.081	0.116
Leaf breadth (cm)	G						-0.316**	0.951**	0.071	0.232*	0.287**	0.330**
	P						-0.222*	0.778**	0.033	0.198	0.107	0.213*
Leaf stem ratio	G							-0.236*	-0.517**	-0.374**	-0.528**	-0.601**
	P							-0.227*	-0.407**	-0.279**	-0.309**	-0.477**
Stem girth (cm)	G								-0.010	0.190	0.287**	0.494**
	P								-0.019	0.116	0.101	0.245*
TSS (%)	G									0.289**	0.410**	0.378**
	P									0.278**	0.330**	0.343**
Protein (%)	G										0.121	0.257*
	P										0.150	0.225*
Dry fodder yield (t/ha)	G											0.758**
	P											0.645**

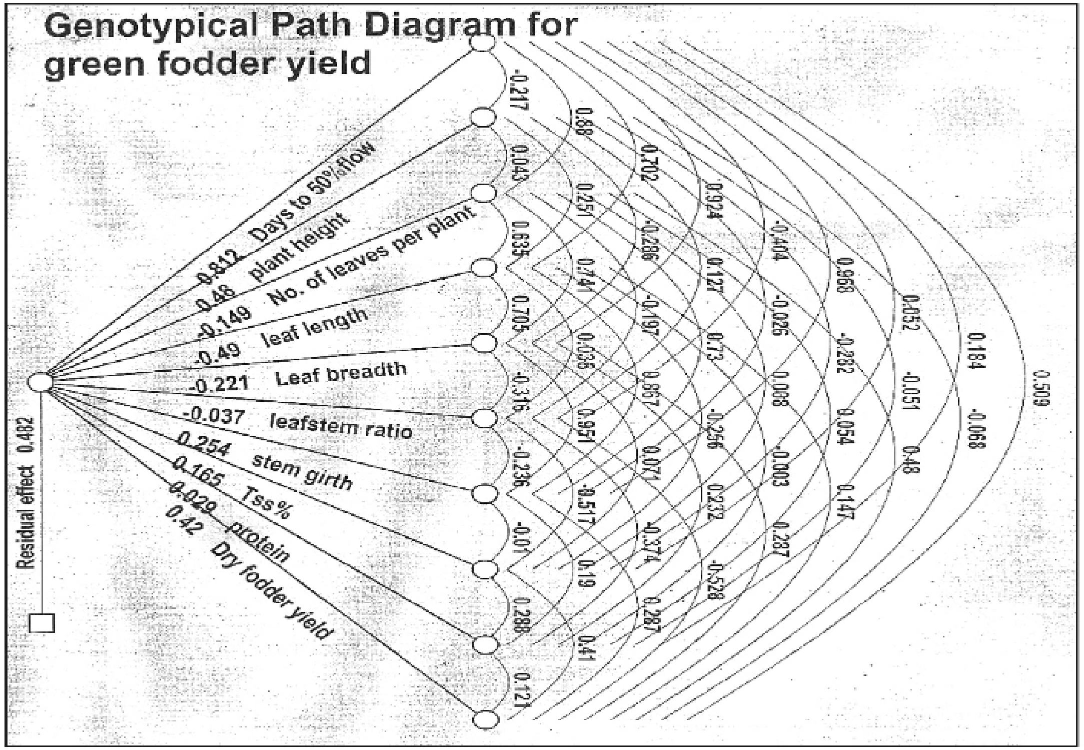
G- Genotypic correlation coefficient, P-Phenotypic correlation coefficient **Significant at 1% level, *Significant at 5% level.

Table.2 Path coefficient analysis showing the direct (diagonal) and indirect (non-diagonal) effect of various characters on green fodder yield

Characters	Days to 50% flowering	Plant height (cm)	Number of leaves per plant	Leaf length (cm)	Leaf breadth (cm)	Leaf stem ratio	Stem girth (cm)	TSS (%)	Protein (%)	Dry fodder yield (t/ha)	Green fodder Yield (t/ha)
Days to 50% flowering	**0.812**	-0.104	-0.131	0.344	-0.204	0.015	0.246	0.009	0.005	0.214	0.518*
Plant height (cm)	-0.176	**0.480**	-0.006	-0.123	0.063	-0.005	-0.007	-0.046	-0.002	-0.028	0.150
Number of leaves per plant	0.714	0.021	**-0.149**	-0.311	-0.164	0.007	0.186	0.001	0.002	0.202	0.509**
Leaf length (cm)	0.570	0.121	-0.095	**-0.490**	-0.156	-0.001	0.221	-0.042	0.000	0.062	0.190
Leaf breadth (cm)	0.751	-0.137	-0.110	-0.345	**-0.221**	0.012	0.242	0.012	0.007	0.121	0.330**
Leaf stem ratio	-0.328	0.061	0.029	-0.019	0.070	**-0.037**	-0.060	-0.085	-0.011	-0.222	-0.601**
Stem girth (cm)	0.859	-0.013	-0.109	-0.425	-0.210	0.009	**0.254**	0.002	0.006	0.121	0.494**
TSS (%)	0.043	-0.135	-0.001	0.125	-0.016	0.019	-0.003	**0.165**	0.009	0.172	0.378**
Protein (%)	0.150	-0.024	-0.008	0.001	-0.051	0.014	0.048	0.048	**0.030**	0.051	0.257*
Dry fodder yield (t/ha)	0.413	-0.033	-0.071	-0.072	-0.063	0.019	0.073	0.068	0.004	**0.420**	0.758*

Residual Effect = 0.4819
Bold value indicates direct effect (diagonal)
Normal value indicates indirect effect (non-diagonal)

Fig.1



1.Days to 50% flowering
2.Plant height (cm)
3.No. of leaves per plant
4.Leaf length (cm)
5.Leaf breadth (cm)
6.Leaf stem ratio (%)
7.Stem girth (cm)
8.TSS (%)
9.Protein content (%)
10.Dry fodder yield (t/ha)
11.Green fodder yield (t/ha)

Fig 1. Genotypical Path diagram, showing path coefficient (direct effect) and genotypic correlation (rg) of different characters on green fodder yield.
Direct effect indicated by straight line and Genotypic correlation (rg) indicated by curve line.

All the characters under investigation exhibited positive associations with green fodder yield at both genotypic and phenotypic level. Patel *et al.,* (2005), Lyanar & khan (2005).

Among the yield components themselves, Days to 50 percent flowering should positive and highly significant associations with stem girth, (0.968**) leaf breadth, (0.925**) number of leaves per plant, (0.880**) leaf length (0.702**) and dry fodder yield (0.509**).

Plant height exhibited positive significant association with leaf length (0.251*). No. of leaves per plant show highly significant and positive association with stem girth, (0.730**) leaf breadth, (0.741**) leaf length (0.635**) and dry fodder yield (0.480**). Leaf length showed positive and highly significant association with stem girth (0.867**) and leaf breadth (0.705**). Leaf breadth exhibited positive and highly significant association with stem girth (0.951**) (Table 1).

Path coefficient analysis

Path analysis provides an effective means of partitioning direct and indirect effect and cause of association while permitting a critical examination of the specific forces to produce a given correlation and measure the relative importance of each causal factor. In the present study green fodder yield was considered as dependent character and other characters were taken as independent characters.

Path coefficient analysis showed that the high direct effect of days to 50 percent flowering (0.812), Plant height (0.480), dry fodder yield (0.420) and stem girth (0.254) on green fodder yield (Table 2). Similar findings were also reported by Jain *et al.,* (2010), Sankarapandian *et al.,* (2000) for dry fodder yield, stem girth & plant height.

The high indirect positive contribution of number of leaves per plant (0.509**), leaf length (0.190), leaf breadth (0.330**), stem girth (0.494**) and dry fodder yield (0.758*) via days to 50 percent flowering indicates that effectiveness of selection for higher green fodder yield could be enhanced by inclusion of days to 50 percent flowering.

Correlation studies revealed positive and highly significant association of green fodder yield with dry fodder yield, days to 50% flowering, number of leaves per plant, stem girth (cm) TSS, leaf breadth (cm) and protein. Path coefficient analysis showed positive and high direct effect of days to 50% flowering, plant height, dry fodder yield and stem girth on green fodder yield.

The characters days to 50 percent flowering showed significant positive correlation, high direct effect and it had high indirect contribution through no. of leaves per plant, leaf length, leaf breadth, stem girth and dry fodder yield indicating the importance of days to 50 percent flowering in selection of trait for higher green yield in forage sorghum.

These characters may be considered as important yield contributing components. Hence selection of the genotypes based on these traits alone or in combination will result in increasing high green fodder yield.

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