

Correlation studies in multi-cut forage sorghum under different environment

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Abstract

Correlation has been studied in various growth, quality characters and yield of multi-cut forage sorghum cultivars which were planted at two locations in a split plot design. The linear correlation study revealed positive and highly significant association between yield and growth/quality components at both the locations. Highly positive and significant correlation ($r = 1$) was between crude protein yield and total N – uptake at both the locations. Among quality and growth parameters, significantly positive correlation was noticed at both the locations, except between crude protein/N content and plant height, L: S ratio, dry matter accumulation in third cutting at Lakhauti, dry matter accumulation and digestibility in first cutting at Pantnagar, when the positive correlation was not significant.

Keywords: Correlation, positive, quality, dry matter accumulation

Introduction

Fodder yield of sorghum is a complex cause of several effects and influenced by many components traits. The degree of associations among various components of yield and with yield ensures the importance of the specific components. Thus study of correlation provides an opportunity to assess the magnitude and direct of association of yield with its direct and indirect components. Which is essential for formulating an effective and efficient crop improvement. Direct selection for yield generally results in low genetic gain, thus knowledge of the correlation of component responsible for desired cause forms an integral part of the scheme. For this knowledge of components having significant positive correlation with yield and quality is essential. Not only the linear correlation between yield and its components themselves are essential. In view the present study was under taken to identify inter relationship of economic trait and their association with the yield of multi-cut forage sorghum under different locations.

Materials and Methods

The field experiments were conducted to evaluate suitable cutting interval and nitrogen level for multi-cut forage sorghum genotypes under different locations viz. Instructional Dairy Farm, Pantnagar and Amar Singh Post Graduate College, Lakhauti, Bulandshahr during *Kharif* season of 2010. The treatments, consisted of two genotypes (variety UTMC-532 and hybrid CSH-20 MF) and two cutting intervals (40 and 55 days) as main plot and four nitrogen levels (0, 50,

100 and 150 kg ha⁻¹) as sub plot treatments, were tested in a split plot design with four replications. The crop was sown in rows opened at 30 cm apart with a seed rate of 35 kg ha⁻¹ in well prepared levelled land on April, 6 at Pantnagar and May, 9 at Lakhauti. The crop was fertilized with nitrogen (as per treatments), 60 kg P₂O₅ and 40 kg K₂O ha⁻¹. One fourth N and full dose of P₂O₅ and K₂O was applied as basal. Remaining nitrogen was applied into three equal splits by top dressing at 30 days after sowing, after first and second cut. Common harvest of the crop for green forage yield was taken at 55 days stage and other cuttings were taken as per treatments leaving a stem height of 8-10 cm for re-growth. At each harvest 500 g random fresh samples from each plot were taken to determine dry matter content, crude protein and digestible dry matter contents. At each harvest, yield attributes like plant height, stem diameter, L: S ratio and dry matter accumulation were recorded. Observations were recorded on plant height, stem diameter, L:S ratio, dry matter accumulation in plant, crude protein content, digestibility per cent, nitrogen content, green fodder and crude protein yield at all the three cuttings and total of these parameters were used for correlation study as per procedure given by Cochran and Snedecor (1994).

Results and Discussion

Growth parameter and fodder quality:

Estimates of correlation coefficients presented in table 1 revealed that all the growth parameters were significantly and positively associated with crude protein, digestibility and nitrogen content at all the cutting and total of cutting under Pantnagar

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Table 1: Correlation between growth and quality parameter of sorghum

Growth Parameters	Quality parameter (Pantnagar)											
	Crude protein (%)				Digestibility (%)				N-content (%)			
	1 st H	2 nd H	3 rd H	Total	1 st H	2 nd H	3 rd H	Total	1 st H	2 nd H	3 rd H	Total
Plant height	0.857	0.897	0.858	0.910	0.846	0.894	0.917	0.901	0.853	0.905	0.857	0.909
Stem diameter	0.875	0.880	0.897	0.890	0.755	0.828	0.934	0.875	0.875	0.883	0.896	0.898
L:S ratio	0.899	0.778	0.919	0.926	0.794	0.811	0.941	0.911	0.902	0.783	0.918	0.927
Dry matter accumulation	0.763	0.788	0.817	0.781	0.603	0.775	0.866	0.749	0.761	0.790	0.815	0.787
Quality parameter (Lakhauti)												
Plant height	0.679	0.859	0.667	0.835	0.713	0.866	0.856	0.898	0.677	0.845	0.670	0.828
Stem diameter	0.901	0.794	0.726	0.870	0.895	0.802	0.841	0.901	0.900	0.795	0.724	0.863
L:S ratio	0.896	0.805	0.595	0.856	0.911	0.774	0.738	0.896	0.894	0.800	0.593	0.849
Dry matter accumulation	0.779	0.885	0.587	0.767	0.730	0.867	0.721	0.824	0.780	0.874	0.583	0.760

Table 2: Correlation between growth parameters, quality characters and yields

Parameters	Green fodder						Crude protein					
	Pantnagar			Lakhauti			Pantnagar			Lakhauti		
	1 st H	2 nd H	3 rd H	1 st H	2 nd H	3 rd H	1 st H	2 nd H	3 rd H	1 st H	2 nd H	3 rd H
Growth parameters												
Plant height	0.980	0.914	0.970	0.527	0.944	0.865	0.956	0.925	0.959	0.655	0.928	0.859
Stem diameter	0.963	0.986	0.912	0.960	0.843	0.926	0.967	0.963	0.949	0.947	0.853	0.941
L:S ratio	0.939	0.771	0.901	0.932	0.861	0.910	0.945	0.794	0.980	0.913	0.887	0.854
D M accumulation	0.923	0.970	0.977	0.912	0.948	0.943	0.911	0.954	0.961	0.877	0.949	0.903
Quality characters (%)												
Crude protein	0.867	0.892	0.720	0.912	0.968	0.716	0.951	0.924	0.919	0.979	0.971	0.852
Digestibility	0.839	0.885	0.798	0.901	0.977	0.758	0.861	0.918	0.928	0.958	0.966	0.845
Nitrogen content	0.866	0.896	0.718	0.911	0.960	0.710	0.949	0.925	0.918	0.979	0.965	0.846
N- uptake(kg/ha)	0.965	0.989	0.910	0.967	0.993	0.970	1.000	1.000	1.000	1.000	1.000	1.000

environment. Similar association was noticed under Lakhauti conditions except that plant height, L:S ratio, dry matter accumulation with protein and nitrogen content were significantly correlated. It suggests that in multi-cut fodder sorghum, it is possible to enhance quality of fodder at different cuttings by enhancing the growth parameters like plant height, stem diameter, L:S ratio and dry matter accumulation irrespective of differences in the environment. Higher leaf and stem ratio has been found to enhance quality characters of sorghum (Chaudhary, *et.al*, 2007 & Rai, *et.al*, 1980). *Quality parameters and yield*

The green forage and protein yield of multi-cut forage sorghum has been showed significant positive correlation with all the growth parameters and quality characters at all the cuttings irrespective of location (table 2). This also indicated that more fodder yield genetically depends on growth parameters. These results combo rate with findings of Sood and Ahluwalia (2003). A perfect significant positive correlation ($r=1$) was noticed between crude protein yield and total nitrogen uptake at both the location in all the harvests.

This means that in multi-cut forage sorghum it is possible to combine high nitrogen uptake with high protein yield.

From the fore going discussion it can be concluded that the quality parameters and yield of fodder of multi-cut forage sorghum can be maximized by enhancing the growth parameters irrespective of regional differences. The crude protein yield can be maximized by producing more biomass with high nitrogen content.

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