VARIABILITY AND PATH COEFFICIENT ANALYSIS FOR FORAGE YIELD AND ANCILLARY TRAITS IN HYBRID NAPIER

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ABSTRACT

The present study was conducted during Kharif-2018 with 24 diverse hybrids Napier along with four checks. The genotypes were analyzed for genetic variability, correlation and path analysis. High heritability along with high genetic advance was recorded for plant height, number of tillers per plant, number of internodes per tiller, leaf width, L/S ratio, dry matter yield, crude protein yield and green forage yield. High values of GCV and PCV were observed for number of tillers per plant, L/S ratio, dry matter yield, crude protein yield and green forage yield, whereas low values were observed for dry matter and crude protein content. Green forage yield was significantly and positively correlated with dry matter yield and crude protein yield. Dry matter yield exhibited highest positive direct effect and significant positive correlation with green forage yield.

KEY WORDS: Correlation, Hybrid Napier, Path analysis, Variability

INTRODUCTION

The non availability of quality forages is a serious limitation in fully utilising the production potential of improved animals. The importance of forage crops in livestock nutrition cannot be over looked and every possible effort is needed to increase its availability in the country. To overcome this problem, fodder production per unit area should be increased, which could only be achieved by growing high yielding varieties of forage crops such as hybrids Napier.

Hybrid Napier is a perennial forage crop is derived from inter-specific cross between Bajra [*Pennisetum glaucum* (L) R.Br.] (2n = 2x = 14) and Napier grass [*Pennisetum pupureum* (K) Schum.] (2n = 4x = 28). The interspecific hybrid is a triploid with 2n = 3x = 21 chromosomes. The triploid hybrids are completely sterile, vigorous and vegetatively propagated. Hybrid Napier is best suited to irrigated conditions and is found to be more nutritious, succulent, palatable and responsive to nitrogenous fertilizers than Napier grass. Presence of variability in material in hand is a prerequisite in successful selection programme. Further, green forage yield is a complex character determined by a number of component traits; hence correlation coefficient and path coefficient were studied in hybrid Napier.

MATERIALS AND METHODS

The present investigation entitled "Variability and path coefficient analysis for forage yield and ancillary traits in hybrid Napier: was conducted at AICRP on Forage

Crops and Utilization, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra during *Kharif*-2018. Twenty four new bajara x Napier hybrids and 4 checks were evaluated in randomized block design with two replications. Each genotype was planted in two rows of 6 m length with spacing of 90 x 60 cm apart. All the recommended agronomical practices were followed to raise the good crop. Data of three cuts during *Kharif* 2018 were recorded on five randomly selected plants in each replication for plant height (cm), number of tillers/plant, number of internodes/plant, number of leaves/tiller, leaf length (cm), leaf width (cm), L/S ratio, stem thickness (cm), dry matter content (%), crude protein (%) and green forage yield (kg/plant) and averages were then worked out. In case of green forage yield, total of three cuts was made. Dry matter yield (kg/plant) and crude protein yield (kg/plant) also worked out. Standard statistical procedures were followed for estimating genetic phenotypic and genotypic coefficients of variation, heritability in broad sense, genetic advance, correlation and path analysis. The significance of genotypic correlation coefficient was tested with the formula suggested by Robertson (1959). The significance of phenotypic correlation coefficient was tested with the formula suggested by Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

The analysis of variance indicated the existence of significant differences among the genotypes studied for all character revealing sufficient variability (Table 1).

High range of variability observed for number of tillers/plant (9.10-30.80), L/S ratio (0.375-1.48), dry matter yield (0.59-1.9), crude protein yield (0.055-0.165) and green forage yield (2.10-6.15) (Table 2)**.** Kumari *et al.* (2018) reported wide range of variability for dry matter yield and crude protein yield. Chavan (2012) and Satpute (2012) reported wide range of variability for L/S ratio, dry matter yield and crude protein yield. High estimates of GCV was observed for traits *viz*., number of tiller/plant (25.30), L/S ratio (42.51), dry matter yield (26.14), crude protein yield (28.71) and green forage yield (24.22) highlighting ample scope for selection for improvement of these characters. Kumari *et al.* (2018) reported high values of GCV and PCV for L/S ratio, crude protein yield and green fodder yield. Kapoor (2017) reported high values of GCV and PCV for dry matter yield and green fodder yield.

High estimates of heritability (broad sense) accompanied by high estimates of genetic advance as percentage of mean were observed in the present studies for the characters namely plant height, number of tillers/plant, number of internodes/tiller, leaf width, L/S ratio, dry matter yield, crude protein yield and green forage yield (Table 2). It indicates that these traits were predominantly governed by additive gene action and selection for these characters could be effective in the hybrid napier strains. Kapoor (2017) reported high estimates of heritability accompanied by high estimates of genetic advance as percentage of mean for the characters *viz*., plant height, leaf width, green fodder yield and dry matter yield. Kumari *et al* (2018) and Shinde (2015) reported high estimates of heritability accompanied by high estimates of genetic advance as percentage of mean for the characters *viz*., number of tillers/plant, L/S ratio, dry matter yield and green fodder yield.

Green forage yield recorded the highest significant and positive correlation at genotypic and phenotypic level with dry matter yield (0.969, 0.967, respectively), followed by crude protein yield (0.920, 0.917, respectively) and selection based on these traits results in improving the green

forage yield (Table 3). Kapoor (2017) reported green forage yield had significant and positive association at genotypic and phenotypic level with dry matter yield. Satpute (2012) and Chavan (2012) reported green forage yield had significant and positive association at genotypic level with dry matter yield.

Dry matter yield had high positive direct effect (1.762) coupled with significant and positive correlation (0.969) with green forage yield. Thus, indirect selection for this trait could be effective in the present material for green forage improvement. Shinde (2015), Lokhande (2015), Kapoor (2017) and Kumari *et al* (2018) also reported that dry matter yield showed high direct effect coupled with significant and positive association with green forage yield.

CONCLUSION

In the present study, high heritability along with high genetic advance was recorded for plant height, number of tillers per plant, number of internodes per tiller, leaf width, L/S ratio, dry matter yield, crude protein yield and green forage yield. High values of GCV and PCV were observed for number of tillers per plant, L/S ratio, dry matter yield, crude protein yield and green forage yield, whereas low values were observed for dry matter and crude protein content. Green forage yield was significantly and positively correlated with dry matter yield and crude protein yield. Dry matter yield exhibited highest positive direct effect and significant positive correlation with green forage yield.

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Table 1: Analysis of variance for ten different characters in hybrids Napier

Sr. No.	Characters	Mean Sum of Squares	
		Genotype	Error
1.	Plant Height (cm)	693.043**	23.890
2.	Number of Tillers/Plant	45.179**	2.415
3.	Number of Internodes/Tiller	1.287**	0.155
4.	Number of Leaves/Tiller	1.167**	0.231
5.	Leaf Length (cm)	139.703**	8.820
6.	Leaf Width (cm)	0.190**	0.024
7.	Leaf/Stem Ratio	0.236**	0.005
8.	Stem Thickness (cm)	0.224**	0.042
9.	Dry Matter Content (%)	7.660**	0.623
10.	Crude Protein Content (%)	0.668**	0.002
11.	Dry Matter Yield (kg/plant)	0.201**	0.014
12.	Crude Protein Yield (kg/plant)	0.002**	0.001
13.	Green Forage Yield (kg/plant)	2.114**	0.179

***Significant at 1 per cent levels*

Table 2: Parameters of genetic variability for green forage yield and ancillary traits in hybrids Napier

Sr. No.	Characters	Range	General Mean	GCV	PCV	ECV	Heritability (b.s.) (%)	GA	G.A. as % of Mean
1.	**Plant Height (cm)**	135.57-206.94	174.56	10.48	10.85	2.80	93.30	36.40	20.85
2.	**Number of Tillers/Plant**	9.10-30.80	18.28	25.30	26.69	8.50	89.90	9.03	49.40
3.	**Number of Internodes/Tiller**	2.57-5.50	4.14	18.16	20.49	9.49	78.50	1.37	33.15
4.	**Number of Leaves/Tiller**	6.13-9.07	7.34	9.31	11.38	6.54	67.00	1.15	15.70
5.	**Leaf Length (cm)**	62.10-96.24	82.09	9.85	10.50	3.62	88.10	15.64	19.06
6.	**Leaf Width (cm)**	1.87-3.13	2.44	11.78	13.40	6.39	77.30	0.52	21.32
7.	**Leaf/Stem Ratio**	0.375-1.480	0.79	42.51	43.50	9.23	95.50	0.68	85.57
8.	**Stem Thickness (cm)**	2.60-3.91	3.09	9.79	11.81	6.61	68.70	0.52	16.71
9.	**Dry Matter Content (%)**	24.75-31.80	28.72	6.53	7.09	2.75	85.00	3.56	12.40
10.	**Crude Protein Content (%)**	7.17-9.53	8.49	6.80	6.82	0.58	99.30	1.18	13.95
11.	**Dry Matter Yield (kg/plant)**	0.59-1.90	1.17	26.14	28.05	10.17	86.90	0.59	50.18
12.	**Crude Protein Yield (kg/plant)**	0.055-0.165	0.09	28.71	30.67	10.77	87.70	0.06	55.38
13.	**Green Forage Yield (kg/plant)**	2.10-6.15	4.06	24.22	26.36	10.41	84.40	1.86	45.84

Table 3: Genotypic and phenotypic correlation coefficients of green forage yield with yield contributing character in hybrids Napier

Sr. No.	Characters		Plant Height (cm)	Number of Tillers/ Plant	Number of Internodes /Tiller	Number of Leaves/ Tiller	Leaf Length (cm)	Leaf Width (cm)	L/S Ratio	Stem Thickness (cm)	Dry Matter Yield (kg/plant)	Crude protein Yield (kg/Plant)	Green Forage Yield (kg/ plant
1.	**Plant Height (cm)**	G P	**1.000** **1.000**	-0.108 -0.042	0.886* 0.801**	0.485 0.484**	0.196 0.217	0.416 0.420**	-0.510 -0.447**	0.719 0.628**	0.423 0.439**	0.356 0.371**	0.367 0.391**
2	**Number of Tillers/Plant**	G P		**1.000** **1.000**	-0.241 -0.179	-0.425 -0.217	0.133 0.166	-0.573 -0.401**	0.087 0.129	-0.410 -0.233	0.561 0.576**	0.549 0.564**	0.564 0.580**
3	**Number of Internodes/Tiller**	G P			**1.000** **1.000**	0.699 0.640**	0.143 -0.099	0.570 0.514**	-0.557 -0.466**	0.675 0.498**	0.236 0.239	0.191 0.196	0.146 0.176
4	**Number of Leaves/Tiller**	G P				**1.000** **1.000**	0.045 0.161	0.513 0.538**	-0.309 -0.167	0.356 0.409**	0.048 0.188	-0.001 0.143	-0.056 0.124
5	**Leaf Length (cm)**	G P					**1.000** **1.000**	0.052 0.107	0.289 0.296*	0.314 0.347**	0.356 0.383**	0.356 0.378**	0.273 0.309*
6	**Leaf Width (cm)**	G P						**1.000** **1.000**	-0.173 -0.101	0.540 0.540**	-0.206 -0.065	-0.246 -0.108	-0.311 -0.140
7	**Leaf/Stem Ratio**	G P							**1.000** **1.000**	-0.221 -0.120	-0.118 -0.050	-0.063 -0.009	-0.180 -0.099
8	**Stem Thickness (cm)**	G P								**1.000** **1.000**	0.072 0.204	-0.001 0.139	0.037 0.180
9	**Dry Matter Yield (kg/plant)**	G P									**1.000** **1.000**	0.977** 0.974**	0.969** 0.967**
10	**Crude protein Yield (kg/Plant)**	G P										**1.000** **1.000**	0.920** 0.917**
11	**Green Forage Yield (kg/plant)**	G P											**1.000** **1.000**

****and*** ***indicates significant at 5% and 1% level of significance respectively*** ***(G=Genotypic, P=Phenotypic)***

Table 4: Genotypic path effect of yield components on green forage yield in hybrids Napier

Sr. No.	Characters	Plant Height (cm)	Number of Tillers/ Plant	Number of Internodes /Tiller	Number of Leaves/ Tiller	Leaf Length (cm)	Leaf Width (cm)	L/S Ratio	Stem Thickness (cm)	Dry Matter Yield (kg/plant)	Crude protein Yield (kg/Plant)	Genotypic Correlation With Green Forage Yield
1	**Plant Height (cm)**	**0.012**	0.015	-0.097	-0.049	-0.013	-0.049	0.045	0.013	0.746	-0.255	0.367
2	**Number of Tillers/Plant**	-0.001	**-0.143**	0.026	0.043	-0.009	0.068	-0.008	-0.007	0.988	-0.393	0.564
3	**Number of Internodes/Till er**	0.011	0.034	**-0.109**	-0.071	0.010	-0.068	0.049	0.012	0.415	-0.137	0.146
4	**Number of Leaves/Tiller**	0.006	0.061	-0.076	**-0.101**	-0.003	-0.061	0.027	0.006	0.085	0.000	-0.056
5	**Leaf Length (cm)**	0.002	-0.019	0.016	-0.005	**-0.067**	-0.006	-0.026	0.005	0.628	-0.255	0.273
6	**Leaf Width (cm)**	0.005	0.082	-0.062	-0.052	-0.004	**-0.118**	0.015	0.009	-0.363	0.177	-0.311
7	**Leaf/Stem Ratio**	-0.006	-0.012	0.061	0.031	-0.020	0.021	**-0.089**	-0.004	-0.208	0.045	-0.180
8	**Stem Thickness (cm)**	0.009	0.059	-0.074	-0.036	-0.021	-0.064	0.020	**0.017**	0.126	0.001	0.037
9	**Dry Matter Yield (kg/plant)**	0.005	-0.080	-0.026	-0.005	-0.024	0.024	0.011	0.001	**1.762**	-0.700	0.969**
10	**Crude protein Yield (kg/Plant)**	0.004	-0.078	-0.021	0.000	-0.024	0.029	0.006	0.000	1.720	**-0.717**	0.920**

Diagonal values in bold font represent direct effect and other indirect effects. R=0.062

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