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A study of the genetic variability of Brachiaria brizantha (Hochst ex. A. Rich) stapf.

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Abstract

Brachiaria brizantha (Hochst ex. A. Rich) Stapf. is one of the major pasture grasses in Sri Lanka because of its ability to survive long spells of dry weather. This grass had been introduced into Sri Lanka but the amount of planting material imported and the country of origin is uncertain. This study was designed to investigate the genetic variability of *B. brizantha* and to select high yielding and high quality clones. Two hundred and eighty three clones selected from 7000 randomly collected plants from 12 different agroclimatic regions of Sri Lanka, and 17 imported clones were included in this study. Broad sense heritability was high for plant height, total green matter yield, fresh weight of leaves and stems and total dry matter yield. The plant height in swards could be used as an indication of the yield. The correlations between yield characters and quality characters were low. Therefore, the selection for either of these characters could be made without sacrificing the other and there is a possibility of improving both the yield and quality of *B. brizantha*.

Introduction

All the improved pasture grasses in Sri Lanka are introduced species (Senarathne 1956). Among these species *Brachiaria brizantha* (Hochst ex. A. Rich) Stapf. became one of the major pasture grasses largely because of its ability to survive long spells of dry weather (Fernando, 1958, Plucknett, 1979). It is one of the most widely utilized forage crops in the eastern hemisphere (Sotomayor-Rios *et al*, 1960).

The amount and form of planting material (seeds or tillers) and the country of origin of *B. brizantha* is rather uncertain. Appadurai (1968) has reported that this grass was introduced from Queensland, Australia. But elsewhere it has been mentioned that it was introduced from East Africa (Anon. 1962). Anker-Ladefoged (1955) has reported that only a single plant was introduced into Sri Lanka but origin of that single plant was not known.

The objectives of this study were to investigate the genetic variability of *B. brizantha* grown in Sri Lanka and some imported accessions and to select high yielding and high quality clones.

The experiment was carried out at the Research Farm, University of Ruhuna, Mapalana, Kamburupitiya, Sri Lanka.

Materials and Methods

Seven thousand individual plants were randomly collected from 12 locations representing different agro-climatic regions of Sri Lanka, and established a sspaced plants (0.5 m X 0.5m) in the research farm, in September 1985. Two months after the establishment observations were made on, plant height, plant spread, tillers per plant, leaves per tiller, and green matter yield. Two hundred and eighty three clones were selected on the basis of the above mentioned agronomic characters.

Three hundred clones (283 from Sri Lanka, 9 from Centro International de Agricultura Tropical (CIAT), 5 from South Africa, 1 from Zimbabwe, 1 from Australia and 1 from United States Department of Agriculture (USDA), United States of America) were then grown in rows of 1.0 m in a randomized complete block design with three replications. The spacing between rows and within rows were 20 cm and 10 cm respectively. At both ends of each block, two border rows were established to prevent border effects.

Six weeks after planting the first of five harvests was carried out. The interval between two harvests was five weeks. The observations were recorded fox six competitive plants of each clone. The characters studied were, plant height (cm) before each cutting, total green matter yield (g), fresh weight of leaves and stems (g), dry matter yield of leaves and stems and total dry matter yield (g). Tilley and Terry (1963) technique was used to estimate organic dry matter (%), ash (%) and *in-vitro* organic dry matter digestibility (%) of leaves and stems.

Results and Discussion

Highly significant differences were observed among clones as well as harvests in all the yield and quality characters studied. The differences in these characters among harvests are due to the environment. Williams, Burt and Strickland (1976) and Wilson (1982) have also reported the influence of environment on yield and quality characters.

The broad sense heritability was high for plant height, total green matter yield, fresh weight of leaves and stems and total dry matter yield (Table 1). This indicated that the genetic component of the existing variation among clones for these characters is high and therefore successful selection can be carried out for high yields of *B. brizantha.*

The plant height was strongly correlated with total green matter yield and dry matter yield of leaves and stems. In a large scale screening of clones for yield, plant height could therefore, be used as an indication of the yield. But measurements should be made either in swards or simulated swards, because correlations in spaced plants might be low (Alexander, Sullivan and McCloud,

1962). The dry matter yield of leaves has shown a strong correlation with that of stems. The digestible organic dry matter of leaves (%) was significantly correlated with digestible organic dry matter of stems (%) (Table 2). Hacker (1982) has reported similar results in tropical grasses. The correlations between yield characters and quality characters were low. Similar results have been reported by Hacker (1982) and Hacker and Minson (1981). Therefore the selection for either of these characters could be made without sacrificing the other and there is a possibility of improving both yield and quality of *B. brizantha.*

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Table 1 — Mean, range, broad sense heritability and standard error of heritability (SE h^2 B) for agronomic characters of *B. brizantha*

Character	Mean	Range	Heritability	SE.h^2 B
Plant height	30.8	11.2—74.3	0.89	0.0077
Green yield	46.3	12.4—153.0	0.89	0.0081
Leaf weight(*a*)	25.2	5.7—86.3	0.85	0.0108
Stem weight(*a*)	21.2	6.1—66.5	0.82	0.0124
Dry matter yield	10.9	2.7— 33.7	0.78	0.0143
Dry matter%	23.5	17.0—26.4	0.31	0.0203
Leaf%(*b*)	46.1	31.4—60.9	0.27	0.0192

(*a*) Fresh weight (*b*) Dry weight basis

Table 2 — Correlation coefficients among six characters of *B. brizantha*.

Character	*Green yield*	*Leaf dry matter yield*	*Stem dry matter yield*	*Leaf digestible organic dry matter%*	*Stem digestible organic dry matter%*
Plant height ..	0.832qqq	0.744qqq	0.829qqq	0.106	0.106
Green yield ..		0.893qqq	0.955qqq	0.245qqq	0.179qq
Leaf dry matter yield ..			0.828qqq	0.268qqq	0.203qq
Stem dry matter yield ..				0.199qq	0.157qq
Leaf digestible organic dry matter% ..					0.938qqq

qq p 0.01 qqq p 0.001

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