Technical Note

Morphobotanical characterization of *Cenchrus purpureus* (Schumach.) Morrone plants from a national collection

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Abstract

The objective of the study was to make the morphobotanical characterization of a group of *Cenchrus purpureus* plants, from a collection carried out under field conditions in two geographical zones of Cuba, on a Ferralitic Red soil. Eight quantitative and seven qualitative traits were evaluated, in two phenological phases: vegetative and reproductive. The variability in this collection was determined through a principal component analysis (PCA). The quantitative descriptors with higher variability were the number of internodes, limbo length and width, length of the leaf sheath and vegetative height. Among the qualitative descriptors, all the plants had erect growth habit and inflorescence shaped as a spiciform panicle; the color of the leaf parts was generally green, just like that of the stem, although the plants with keys 603 and 607 showed maroon shades. In the accessions no hairs were observed on the underside of the leaf limbo, but they were observed on the bundle, which is characteristic of the species. It is concluded that the evaluated material has high variability in several quantitative descriptors, which should be taken into consideration in future research about the breeding and selection of this species for its inclusion in animal husbandry systems.

Keywords: breeding, grasses, forage plants

Introduction

One of the most widely used forage grass species in Cuba, after sugarcane (*Saccharum officinarum* L.), is elephant grass [*Cenchrus purpureus* (Schumach.) Morrone], mainly due to its high biomass production, leaf proportion, and rusticity and plasticity; which allows it to adapt to a large diversity of soil types (including low fertility ones) and to adverse climate conditions (high temperatures and low rainfall), according to the report by García *et al*. (2014).

As previous stage to the agronomic evaluation and selection of the best plants, the morphobotanical characterization should be made to know the diversity of the studied material (Garduño-Velázquez *et al*., 2015; Valdés-Reyna *et al*., 2015). Through this activity the description of the phenotypic expression of each individual under study is obtained, from a set of quantitative and qualitative traits or descriptors (Saluzzo *et al*., 2015).

At the Pastures and Forages Research Station (EEPF) Indio Hatuey several actions are carried out to obtain new materials with potential to be integrated to animal husbandry systems, among which are collections. The objective of this study was to make the morphobotanical characterization of a group of plants of the species *C. purpureus*, from a collection conducted in two geographical zones of Cuba.

Materials and Methods

Location of the experimental area. The study was conducted in areas of the EEPF Indio Hatuey, located between 22° 48' 7" North latitude and 81° 2' West longitude, at 19,01 m.a.s.l., in the Perico municipality, Matanzas province, Cuba.

Soil characteristics. The accessions were sown on a Ferralitic Red soil (Hernández-Jiménez *et al*., 2015).

Procedure. A total of 25 accessions were introduced from the Pastures and Forages Research Station of Camagüey and from the Institute of Animal Science, located in the Mayabeque province, which had the following keys for their identification: 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 600, 601, 602, 603, 604, 605, 600, 607, 608, 609, 801, 802, 803, 804 and 805. The field plots in which the accessions were sown measured 3 m^2. For the morphobotanical characterization several qualitative and quantitative descriptors were evaluated, which are related in table 1.

The observations were made during the two phenological phases of the plants: vegetative and reproductive. Each of the quantitative descriptors was evaluated fifteen times.

Table 1. Descriptors used in the morphobotanical characterization.

Quantitative	Qualitative
SD: stem diameter	IT: inflorescence type
SL: stem length	GH: growth habit
LL: limbo length of the 3rd leaf	LC: limbo color
LW: limbo width of the 3rd leaf	SC: sheath color
VL: sheath length of the 3rd leaf	HB: hairs on the bundle
INL: internode length	HU: hairs on the underside
IL: inflorescence length	SC: stem color
NI: number of internodes	
RH: reproductive height	

For the quantitative descriptors SL, LL, LW, VL, INL and IL a graduated ruler was used and the caliper for the SD; while the qualitative indicators were visually appreciated, and for descriptors HB and HU the microscope-stereoscope was used.

Statistical analysis. The data were processed through the principal component analysis (PCA) (Morrison, 1990), in which those principal components that showed proper values higher than one and sum or preponderance factors higher than 0,70 were taken as criterion. The data were processed with the statistical package SPSS version 15.1 for Windows®.

Results and Discussion

From the results of the PCA (table 2) an accumulated variance of 74,89 % was detected in the three components. The variables that best explained the variance in the first component (36,13 %) were the sheath length and number of internodes; and, negatively, the vegetative plant height. These plants have long and wide leaves, with higher number of internodes, but of a lower height. The second component extracted a variance of 24,63 %, mainly explained by the leaf limbo length and width; while the third component extracted a variance of 14,13 %.

The accessions showed their highest differentiation for these descriptors; this has relevant interest, because that variability can constitute an important basis for later studies, mainly with regards to their breeding, especially if it is taken into consideration that they are plants of a species within a genus. Similar results regarding the high variability in a

Table 2. Population variability and relation among the descriptors.

Variable	Component		
	1	2	3
Stem diameter (mm)	0,155	0,360	0,609
Stem length (cm)	-0,213	0,405	-0,562
Limbo length (cm)	0,173	**0,863**	0,062
Limbo width (cm)	-0,296	**0,846**	-0,156
Sheath length (cm)	0,857	0,171	0,072
Internode length (cm)	0,623	0,221	0,507
Inflorescence length (cm)	-0,632	0,616	0,148
Number of internodes	**0,886**	-0,164	-0,214
Reproductive height (cm)	-0,584	-0,346	0,471
Vegetative height (cm)	**-0,828**	-0,230	0,169
Proper value	3,61	2,46	1,41
Variance	36,13	24,63	14,13
Accumulated value	36,13	60,76	74,89

collection formed by accessions of the same species were reported by Olivera *et al*. (2010) and Olivera *et al*. (2014) for collections of *Cynodon dactylon* (L.) Pers. and *Urochloa brizantha* (Hochst. ex A. Rich.) R. D. Webster. [= *Brachiaria brizantha* (Hochst. ex A. Rich.) Stapf], respectively.

The variables SD, SL, INL, IL and RH did not show high sum or preponderance values, according to the stated selection criterion (0,70); this allows to assume that the variability among the accessions was relatively low and that there is higher similarity among the individuals, for which in future studies those variables can be disregarded.

Regarding the qualitative descriptors (table 3), all the plants showed erect growth habit and inflorescence in the shape of spiciform panicle, characteristics that differentiate this genus (Machado, 2010; Gantner, 2012).

The color of the leaf (limbo and sheath) was generally green, just like that of the stem, although the plants identified with keys 603 and 607 showed maroon shades on that vegetative part, which indicates that there is also variability in that qualitative trait. In the accessions there was no presence of hairs on the underside of the leaf limbo, but there were hairs on the bundle, which is characteristic of this species.

The results allow to conclude that there is availability of a material with high variability in several descriptors, such as number of internodes, length and width of the leaf limbo, length of the leaf sheath and vegetative height of the plant, which corroborates its genetic richness; this should be taken into consideration in future research about the breeding and selection of these plants, for their inclusion in animal husbandry systems as high quality forage in animal feeding.

Table 3. Qualitative descriptors of the collected plants.

Accession	IT	GH	LC	SC	HB	HU	SC
500	Spiciform panicle	Erect	Green	Green	Yes	No	Green
501	Spiciform panicle	Erect	Green	Green	Yes	No	Green
502	Spiciform panicle	Erect	Green	Green	Yes	No	Green
503	Spiciform panicle	Erect	Green	Green	Yes	No	Green
504	Spiciform panicle	Erect	Green	Green	Yes	No	Green
505	Spiciform panicle	Erect	Green	Green	Yes	No	Green
506	Spiciform panicle	Erect	Green	Green	Yes	No	Green
507	Spiciform panicle	Erect	Green	Green	Yes	No	Green
508	Spiciform panicle	Erect	Green	Green	Yes	No	Green
509	Spiciform panicle	Erect	Green	Green	Yes	No	Green
600	Spiciform panicle	Erect	Green	Green	Yes	No	Green
601	Spiciform panicle	Erect	Green	Green	Yes	No	Green
602	Spiciform panicle	Erect	Green	Green	Yes	No	Green
603	Spiciform panicle	Erect	Green	Green	Yes	No	Green with maroon shades
604	Spiciform panicle	Erect	Green	Green	Yes	No	Green
605	Spiciform panicle	Erect	Green	Green	Yes	No	Green
606	Spiciform panicle	Erect	Green	Green	Yes	No	Green
607	Spiciform panicle	Erect	Green	Green	Yes	No	Green with maroon shades
608	Spiciform panicle	Erect	Green	Green	Yes	No	Green
609	Spiciform panicle	Erect	Green	Green	Yes	No	Green
801	Spiciform panicle	Erect	Green	Green	Yes	No	Green
802	Spiciform panicle	Erect	Green	Green	Yes	No	Green
803	Spiciform panicle	Erect	Green	Green	Yes	No	Green
804	Spiciform panicle	Erect	Green	Green	Yes	No	Green
805	Spiciform panicle	Erect	Green	Green	Yes	No	Green

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Received: May 19, 2017
Accepted: August 8, 2017