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...phological description of selected pigeonpea (*Cajanus cajan* (L.) Millsp.) lines

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... pigeonpea pure line accessions selected for desirable forage traits and ... commercial cultivars were described according to morphological characters. ... descriptors were used: growth habit, plant height, number of primary ... branches, stem color and thickness, leaf shape and hairiness, flower ... color, pattern of flower streaks, flowering pattern, immature and ... pod form and hairiness, seed color pattern, base and second seed ... (region around hilum) color and seed shape and width. Each indivi... and cultivar was satisfactorily distinguished from the others by the chosen ...

KEYWORDS: botanical description, pure lines, leguminous forage crop, ... variation

INTRODUCTION

... is a valuable, multiple-use legume plant, adapted to a variety of tropical ... However, the commercial cultivars available in Brazil have problems ... persistence, low leaf retention in the winter, low palatability and culti... Therefore, a breeding program was initiated aiming the development ... with superior forage traits. Two collections were field-evaluated and ... accessions selected (Godoy et al., 1994; 1997). Pure lines of these acces... were obtained through selection for predominant morphological traits ... observed in the field, in isolated conditions. Seventeen of the selected ... three commercial cultivars were field-grown and their main morphological ... characteristics, described.

MATERIAL AND METHODS

... selected pure lines (Godoy et al., 1994; 1997) and three commercial ... Anão, Caqui e Fava Larga) were planted in December 1998, in São Carlos ... Brazil (lat. 21° 54' S, long. 47° 48' W; 911 m a.s.l.), in five-row plots. Each ... 3 m long and spaces of 0.5 m and 0.25 were used among rows and plants, ... respectively. The plants were described according to growth habit, plant height, ... of primary and secondary branches, stem color and thickness, leaf shape ... flower base and second color, pattern of flower streaks, flowering ... immature and mature pod color, pod form and hairiness, seed color pattern, ... and second seed color, seed eye (region around hilum) color and seed shape ... and width. The description observed the IBPGR (1993) criteria but the British Colour ... (1938) standard was used for stem and flower colors.

RESULTS AND DISCUSSION

... presents a partial morphological characterization of the selected genotypes. ... two lines presented a semi-spreading growth habit; the all others had in... stem thickness. The only thin-stem-line, g58-95, is an annual type and ... material in the collection, showing stability for this character, as did line ..., since both were selected for plant height (Godoy et al., 1994; 1997).

The number of primary branches varied from seven to twenty-one, but few ... had secondary branches. Most lines present narrow-elliptic leaflets; six ..., however, had broad-elliptic leaflets and three, lanceolate. Only line g101-... a dense flower streak pattern, while all others presented a unique streak pattern. ... streak patterns. Nine lines presented a determinate growth habit; ... are the three shortest genotypes, respectively, g58-95, g127-97 and ... the latter two being perennial types.

A wide variation on stem and flower colors was found. Line g17c-94 has lettuce ... stems, and so do Anão and g66-95, but also with dianthus purple 730 ... purple o31/1 as second colors, respectively; g101-97has lettuce green 861/ ... purple o31/1 stems. Oxblood red oo823/2 is the stem color of g127-97; ... has oxblood red oo823/2 and willow green ooo862/1 stems, g146-97, oxblood red oo823 and willow green ooo862/1. Caqui presents oxblood red oo823/2 and lavender green ooo761/1 stems in separate plants; g18-95 and g6-95 have willow green stems, ooo862 and ooo862/1, respectively; g184-97 and g3-94, willow green ooo862/1 and ooo862/2, and oxblood red oo823/2; g154-95 and g124-95 have lilac purple o31/1 and lettuce green 861/2 stems; Fava Larga, fern green o862/2, g47-94, fern green o862/2 and dianthus purple 730. The remaining lines, g27-94, g19b-94, g167-97 and g58-95 have stems, respectively: lavender green ooo761/1, leek green ooo858/1, pansy purple 928/1 and willow green ooo862/1 and spinach green 960/1.

Chrome yellow 605 is the predominant flower base color, presented by Anão, Caqui, Fava Larga, g3-94, g18-95, g17c-94, g27-94, g29b-94, g47-94, g58-95, g66-95, g101-97, g124-95, g146-97, g154-95, g167-97 and g184-97. This same color with a spot carmine rose 621 at the base of the flag is the base color of g19b-94; g127-97 has lemon yellow 4 as its base color, and g6/95, mimosa yellow 602/2. More variation was found for the flower second color: g124-95 and g167-97, have it chrome yellow 605/1 with camellia rose 622/1 streaks; g6-95, g27-94, g58-95, g146-97, g154-95 and g184-97, have it mimosa yellow 602; g17c-94, mimosa yellow 602/1 and Anão, g3-94 and g29b-94, 602/2; g47-94 and g101-97, mimosa yellow 602 with beetroot purple 830/3 streaks, g66-95 with camellia rose 622/1streaks, and g127-97, with claret rose o21/1 streaks. Fava Larga had plants with primrose yellow 601/1 with carmine rose 621 streaks and plants with Ruby red 827/1 with maroon 1030 streaks. The same happens with Caqui (currant red 821 and mimosa yellow 602 with rhodonite red oo22/1). The latter type was also found in g19b-94. Magenta rose o27/1, is the second flower color of g18-95.

Caqui presented brown and light green immature pods in different plants; g66-95, purple with green streaks; g6-95, g17c-94, g27-94 and g146-97, green: g3-94, g58-95 and g184-97, light green; g29b-94, very light green; g19b-94, green with light purple streaks; g47-94 e g101-97, green with violet spots; g124-95, g154-95 and g167-97, green with dark violet streaks; g18-95, green with dark violet spots; Anão, dark green and g127-97, dark green with dark violet spots.

The following mature pod colors were observed: g18-95 and g58-95, light brown; g124-95 and g167-97, brown with violet streaks; Anão, Fava Larga, g3-94, g17c-94, g27-94, g184-97, straw; Caqui, straw with dark violet streaks; g146-97, ocher straw; g101-97, g66-95, g154-95, g19b-94 and g127-97, straw with violet brown, purple, violet and dark violet streaks, respectively; g47-94, g6-95 and g29b-94 also straw, but with dark spots on the suture line and between the grains and with small violet spots for the latter two. Only Anão and g66-95 have glabrous pods.

IBPGR (1993) classified seed color pattern as plain, mottled, speckled, mottled and speckled and ringed. Anão, g3-94, g6-95, g27-94, g124-95 and g127-97 are of the first type, g29b-94 and g101-97 of the second type; g17c-94, g18-95, g58-95 and g66-95, belong to the third group, Fava Larga, g19b-94, g47-94 and g167-97 to the fourth and g184-97, g146-97 and g154-95 have a ringed pattern. Caqui presents plain and speckled and mottled seeds.

Out of ten possible color groups proposed by IBPGR (1993) for base and second seed color, six were found: g18-95, g29b-94, g47-94, g146-97 and g184-97 have white seeds (yellow-white group 158C); g17c-94, light gray (gray brown group 199B); Fava Larga, cream (grayed-white group 156C). Anão, g3-94, g6-95, g27-94, g58-95, g66-95 and g127-97, reddish-brown (reddish-brown group 200D), and so does Caqui, which also has white seeds (yellow-white group 158C). g19b-94, g101-97, g124-95, g154-95 and g167-97 have light brown seeds (yellow-orange group 22C). The second seed color of g17c-94 and g146-97 is light gray (gray-brown group 199B); Fava Larga, g19b-94, g29b-94, g47-94, g101-97, g154-95, g167-97 and Caqui (white seed plants), have it reddish-brown (reddish-brown group 200D); g18-95, g58-95, g66-95 e g184-97, light brown (yellow-orange group 22C).

The majority of the lines present reddish brown seed eye (reddish-brown group 200D). Anão has it dark gray (black group 202B); g19b-94 and g101-97, light brown (yellow-orange group 22C); g 146-97, dark purple (black group 202A).

Table 1. Some characteristics of pigeon-pea genotypes*.

Genotype	Growth Habit	Stem Thickness (mm)	Plant height (cm)	Number of branches Primary	Number of branches Secondary	Leaflet Shape	Flower Streak pattern	Flower Flowering pattern	Pod Form
Anão	Erect	Intermediate	105	14	-	NE	U	D	Cylindrical
Caqui	Erect	Thick	167	12	-	BE	U, S	I	Flat
Fava Larga	Erect	Thick	167	14	2	BE	M	I	Flat
g3-94	Erect	Intermediate	195	11	2	BE	U	I	Flat
g6-95	Erect	Intermediate	155	12	1	NE	U	D	Cylindrical
g17c-94	SS	Intermediate	120	12	-	L	U	D	Cylindrical
g18-95	Erect	Intermediate	163	11	-	L	U	D	Flat
g19b-94	Erect	Thick	163	19	6	BE	M	I	Flat
g27-94	Erect	Intermediate	180	11	-	NE	U	D	Flat
g29b-94	SS	Intermediate	190	10	3	L	U	I	Flat
g47-94	Erect	Intermediate	150	10	-	BE	M	D	Flat
g58-95	Erect	Thin	65	7	-	NE	U	D	Cylindrical
g66-95	Erect	Intermediate	187	10	rare	BE	S	D	Flat
g101-97	Erect	Intermediate	187	9	2	NE	D	I	Flat
g124-95	Erect	Intermediate	180	14	2	NE	M	I	Flat
g127-97	Erect	Intermediate	90	12	-	NE	S	D	Cylindrical
g146-97	Erect	Thick	185	17	2	NE	U	I	Flat
g154-95	Erect	Intermediate	195	17	-	NE	U	I	Flat
g167-97	Erect	Intermediate	188	21	1	NE	S	I	Flat
g184-97	Erect	Intermediate	180	19	3	NE	U	I	Flat

* Growth habit: erect, semi-spreading (SS), spreading and trailing. stem thickness (thin < 5 mm, intermediate: 5 mm - 13 mm or thick: >13 mm]; Leaflet shapes: lanceolate (L), narrow elliptic (NE), broad elliptic (BE) and obcordate; Flower streak pattern: sparse streaks (S), medium amount of streaks (M), dense streaks (D) and uniform coverage of second color (U); Flowering patterns: determinate (D), semi-determinate and indeterminate (I); Pod form: cylindrical or flat. (IBPGR, 1993)

This seed eye is narrow for g27-94, g47-94, g154-95 and g184-97, medium for Anão, g6-95, g17c-94, g29b-94, g58-95, g66-95, g101-97, g146-97 and g167-97, and wide for the other lines.

Anão, Caqui, g18-95, g19b-94, g127-97, g146-97, g154-95 and g167-97 have elongated seeds. Fava Larga, g17c-94, g27-94, g29b-94, g101-97 and g184-97 have oval seeds. Caqui and the others, square seeds.

All lines have glabrous leaves and only five genotypes with cylindrical pods were found.

Fava Larga presented two characters for stem color and flower second color, and Caqui, for most of the characters and that did not occur for Anão and the selected lines. This description also shows that the seventeen lines are different from one another and from the commercial cultivars and provide tools for their identification.

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The use of cafeteria trials for the selection of *Desmodium ovalifolium* genotypes

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ABSTRACT

For the selection of tropical legumes which contain anti-nutritive components such as tannins, relative acceptability of genotypes to ruminants is of particular importance, since these plant components may influence selective grazing behaviour and subsequent animal productivity. Plant-animal interactions are not predictable from laboratory analyses. Involving grazing animals through the conduction of relative-acceptability (=cafeteria) trials at early stages of the germplasm selection process might therefore provide a convenient tool to adjust and confirm genotype selection based on laboratory quality analyses data. As part of a multi-locational germplasm evaluation project, cafeteria-experiments were conducted at two contrasting environments in Colombia with a core collection of *Desmodium ovalifolium*, a tropical legume species containing tannins. The objective of these experiments was to assess the usefulness of such acceptability trials in the selection of *D. ovalifolium* genotypes. Relative acceptability indices for the 18 accessions confirm genotype selection based on a series of laboratory quality analyses during earlier stages of the project and indicate pronounced genotype-environment interactions. Moreover, animal activity profiles confirm the influence of plant-environment-animal interactions and thus the usefulness of cafeteria-trials for germplasm selection projects.

KEYWORDS: GxE interactions, tannins, acceptability index, tropical legumes, germplasm evaluation, activity profile

INTRODUCTION

The importance of involving grazing animals at early stages of the germplasm selection process had already been stressed by McMeekan (1960) during the 8th International Grassland Congress in Reading, UK. In the last decades, considerable progress was made in the improvement of laboratory techniques to predict forage quality and intake by ruminants (Reid, 1994). Therefore, species and genotype selection of pasture plants is often exclusively based on cutting experiments and laboratory analyses, not taking into account possible forage plant-animal interactions. In the case of tropical legumes that contain anti-nutritive components such as tannins, relative acceptability of genotypes to ruminants is nevertheless of particular importance, since these plant components may influence selective grazing behaviour (plant-animal interactions) and subsequent animal productivity, which are not predictable from laboratory analyses (Launchbaugh, 1996). *Desmodium heterocarpon* subsp. *ovalifolium*, better known under its earlier name *Desmodium ovalifolium*, is such a legume where genotype-environment (GxE) interactions seem to determine forage quality. As part of a multi-locational germplasm evaluation project, a core