

## FRUITS VARIABILITY OF *CYNODON DACTYLON* (L.) PERS. WEED

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### Abstract

Considered a persistent and very aggressive weed, quick grass (*Cynodon dactylon*) has seen a steady constantly spread. Its control is done with some difficulty, being a monocot species (grass) and perennial. Studies of fruit diversity is considered important to describe cross-type both existing and for new ways of management. The average data obtained showed that the species formed finger-panicle of 6.2 cm length, with each 5.71 spike number and 57.2 cm spike length. Spikelets were no. of 43/spike, had length 1.97 mm and width 0.81 mm. Between the different characters of the panicle obtained in positive/negative correlations we used the comparison with theoretical significant levels. Significant related were between no. of spike/panicle with panicle length,  $r=0.437^{**}$ ; between spikelet number/spike with spike width,  $r=0.492^{***}$ ; between spikelet dimensions (length and width),  $r=0.543^{***}$ ; between spike length with spikelet length  $r=0.261^{**}$  and between spike length with spikelet width,  $r=0.305^{**}$ . The variability of this weed fruit characters showed a good adaptability to agricultural lands.

Keywords: *Cynodon dactylon*, diversity, finger-panicle, spike, spikelet.

### 1. INTRODUCTION

Among the important perennial grasses of farm fields there is also couch grass (*Cynodon dactylon* (L.) Pers.) [pro syn. *Capriola dactylon* (L.) Kuntze, *Panicum dactylon* L., CYNDA code Bayer] Alternative common names are Bahama grass, Bermuda grass, couch grass, devil grass, dog's tooth grass, green couch, quick grass, star grass. The plant is a variable perennial category (Karaka et al., 2000; Farsani et al., 2012), being creeping through stolons and rhizomes in soil (Fernandez, 2003), but also of those 8-40 strains (culm type), like air part (Labrada, 1994). The leaves are hairy to glabrous, gray green like colours, relatively short 2-15 cm long, with rough edges. Erect stems grow from 1 to 30 cm tall, rarely more, being less flattened, usually with purple hue (Lescano de Rfos, 1982; Liu Jian Xiu et al., 2002). The inflorescence is terminal on one culm of type finger-panicle with 3-7 spikes, 3-8 cm long each, arranged in a whorl. Robuste forms have over 10 spikes, usually in two whorls. Spikelets have 2.0-2.5-3.0 mm in length, in two rows near the rachis adressed (Perez et al., 1985a, 1985b; Oakley, 1999). Rachilla often has a reduced appearance of floret. The plant differs from other grass (*Digitaria scalarum* - african couch) because it has no obvious membranous ligulae where the leaf-blade joins the sheath (Rocheouste, 1962). From genetically this species is variable, with  $2n = 18, 27, 30, 36, 40$  chromosomes, by the diploid populations and polyploide (Farsani et al., 2012). The cause is that the plant being used in animal feed, suffered a range of characters with a large heritability of characters in time (Overman et al., 2001). Currently there are six known varieties: *C. dactylon* var. *dactylon* (4X) as a forage grass, *C. dactylon* var. *aridus* (2X)

in arid zones, *C. dactylon* var. *afganicus* (2X, 4X) in Afganistan, *C. dactylon* var. *coursii* (4X) in Madagascar, *C. dactylon* var. *elegans* (4X) in the south latitude of Africa under 12<sup>0</sup>C, and *C. dactylon* var. *povelansii* (4X) next Barkerspan, South Africa. In the annual cycle, weed grows quickly and spread easily buds at temperatures between 7<sup>0</sup>C and 10<sup>0</sup>C (Sattore et al., 1996). New rhizomes are formed at 15-20<sup>0</sup>C. Large aerial biomass on formed in autumn period and old rhizomes are heavier than the new ones (Ramarkrishnan and Singh, 1966; Guglielmini and Satorre, 2002; Fernandez et al., 2002). *C. dactylon* tolerate a range of temperatures, particularly large ones near desert conditions. There is no tolerance to cold, the temperatures of -2<sup>0</sup> – 3<sup>0</sup>C freezes plant: new buds die from extreme temperatures (Shi et al., 2012).

In this study were performed determinations of *C. dactylon* finger-panicle. There were measured: finger-panicle length, the number of spikes and their length, the number of spikelets/spike and spikelet size: length and width.

## 2. MATERIALS AND METHODS

Measurements were made at the end of September, the last two years, on the *C. dactylon* plants. They chose areas with different crops in the Southern Highlands. There were chosen randomly among areas (precincts) weed-infested, with 100 strains of *C. dactylon*. Each of the stems were cut finger-panicle formed, after which they were brought to the laboratory. Measurements and determinations of finger-panicle included: absolute length, the total number of spikes/panicle, length of spikes, number of spikelets/spike, length and width of spikelets. Expressing diversity analyzed characters was done through a proper and specific statistical method using polygon frequency (histogram). Evolution of a histogram values were determined by drawing class intervals and absolute values as-is specific to each character analyzed. Thus, each character specific histogram of weed revealed modal value (higher frequency) and variation limits concerned. Further, between the main characters were established some correlations (r). The significance of these coefficients obtained was compared with Erna Weber  $r_{\max}$  values for 5%, 1% and 0.1% transgression probability levels. Such correlations can be obtained by observing important trends in the developments of these characters cross-type studied. In preparing graphics was used Excel. In the light of the measurements and tests carried out, it has been proceeded to their statistical processing, by means of analysis of variance (Anova test). Absolute values were considered as strings processed by the variation. By this method, the indices calculated were: mean ( $\bar{a} = \frac{\sum x_i}{n}$ ),

variance ( $s^2 = \frac{1}{n-1} \left[ \sum x_i^2 - \frac{(\sum x_i)^2}{n} \right]$ ), standard error ( $s = \sqrt{s^2}$ ) and variation coefficient ( $s \% = \frac{s}{\bar{a}} \cdot 100$ ).

Finally, they were determined variability values obtained with cross-type evaluated.

## 3. RESULTS AND DISCUSSIONS

Variability characters of finger-panicle, spike and spikelet. Finger-panicle of *C. dactylon* generally have variable lengths. It consists of a bundle of 2-8 spikes located at the top of the stem (culm type). Measurements have shown that the inflorescence had lengths between 4 and 9 cm. Length frequency distribution thereof was different, being such and specific (figure 1). The highest frequency of the finger-panicle had a length of 6.7 cm (42%), followed by the 5-6 cm (26%), and one with 7-8 cm (17%). Longer panicles, 8-9 cm were 3% in total.

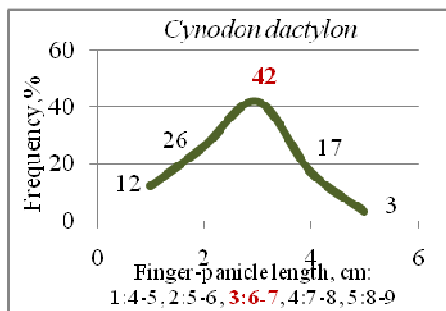


Figure 1. Frequency of finger-panicle length



Figure 2. Finger-panicles of *C. dactylon*

*C. dactylon* formed in a panicle different numbers of spikelets (figure 2). At maturity the spike have the purple or brown colour, as is the entire plant above ground. The number of ears (spikes) which are formed varies. From determinations were found between 4 and 8 ears. The highest frequencies were obtained from 5 ears (40%), and 6 ears (36%). Spikes number of 8 represented only 2% (figure 3). The ear/spike length of *C. dactylon* ranged between 31 and 80 mm (figure 4). The highest frequency had spekes with a length of 51-60 mm (43%). This was followed by the ears with length of 61-70 mm (29%) and those with 41-50 mm (19%). The shortest ears of 31-40 mm were 1%, and the longest of 71-80 mm, For the longest ears the frequency was 8%.

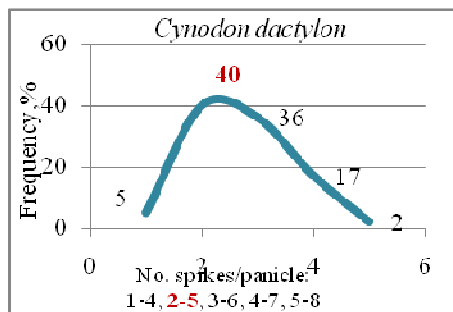


Figure 3. Frequencies of spikes no./finger-panicle

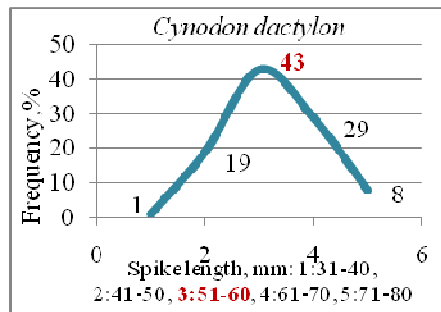


Figure 4. Frequencies of spike length

Spikelets/spike (ear) they formed by the weed in the environment have grown up between 21 to 70. The higher frequencies were obtained from 31 to 40 (35%) and 41-50 (36%). They were followed by the ears with 51-60 spikelets/spike (18%) (figure 5). Lower frequencies were the ears with 21-30/ear (7%) and those with 61-70/spike (4%). The spikelet is an important component in the composition of *C. dactylon* ear (figure 6). Its dimensions are relatively small, the oblong shape, sometimes elliptical, sessile and placed on two lines to close on the same axis. The glumes are lanceolate, membranous, yellowish-green-purple. The paleas are ovate, no-awn, purple-green, hairy, wide bottom and on the top cover. Spikelet hides caryopsis of shape elliptical, compressed, brown to golden colour. From measurements resulted in spikelet lengths ranging from 1.5 mm to 2.3 mm. Greater frequency had a long spikelet of 1.9 mm (27%). This was followed by the 2.0 mm (22%) and 2.1 mm (20%). Smaller lengths and the highest were in total 4% (figure 7). Spikelet width was between 0.6 and 1.1 mm limits. The distribution was different values. Thus, spikelets width of 0.8 and 0.9 mm have been prevailing (26% and 25%). They followed the widths of 0.7 mm (21%) and by 1.0 and 0.6 mm (14% and 12% respectively). The largest of *C. dactylon* spikelets widths (1.1 mm) were only 2% (figure 8).

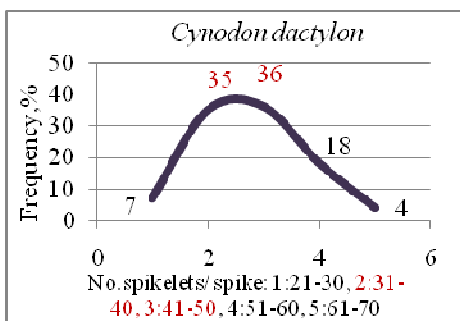


Figure 5. Frequency of spikelets no./ spike



Figure 6. C. dactylon spikelets on spikes

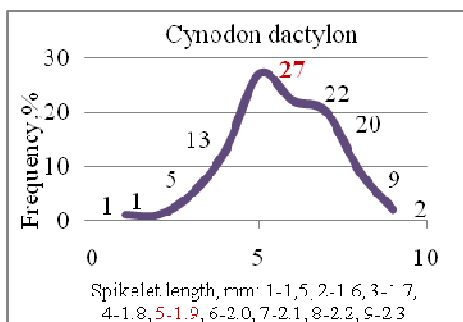


Figure 7. Frequency of C. dactylon spikelets length

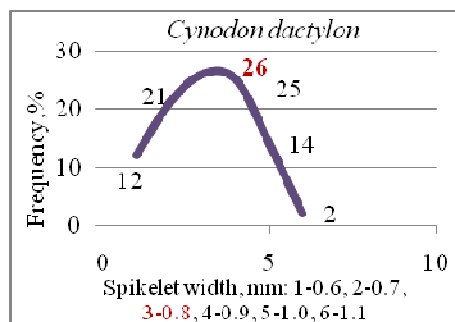


Figure 8. Frequency of spikelets width

Correlations between different characters of weed. The relationship between number of ears/panicle with the panicle length show a tight situation ( $r=0.437^{***}$ , by comparison with the 0.300 high statistical level-  $r_{max}$ ), which demonstrates a very favorable dependency between them. Thus, the plant forms several ears/panicle, they have the greater length (figure 9). Between the number of spikelets/ear with ear length, it obtained a very favorable and positive correlation ( $r=0.492^{***}$ ), which also highlights the direct dependency between them: the plant forms possible more spikelets, favored by culture conditions, they have length, as evident higher (figure 10).

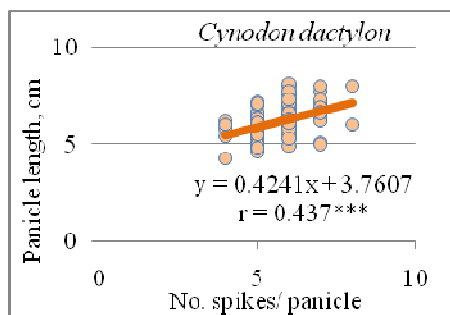


Figure 9. Correlation between spikes no./finger-panicle with panicle length

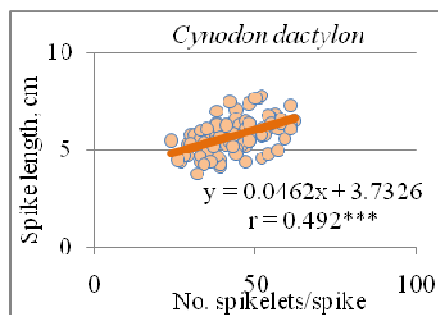


Figure 10. Correlation between spikelets no./spike with spike length

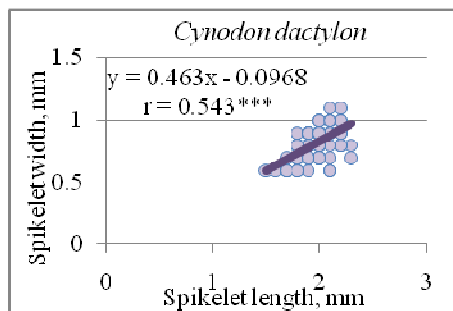


Figure 11. Correlation between the length and the width of spikelets



Figure 12. Aspect of C. dactylon spikelets

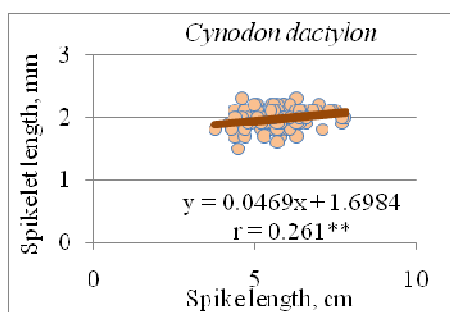


Figure 13. Correlations between spike length and spikelet width

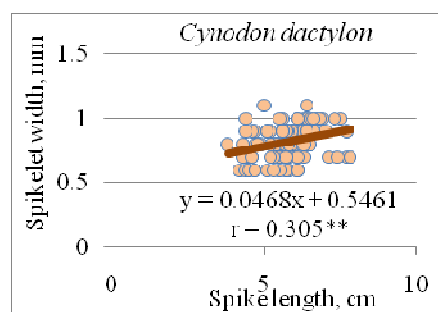


Figure 14. Correlation between spike length and spikelets length

Between the *C. dactylon* length and width of spikelets was obtained a highly significant positive correlation ( $r=0.543^{***}$ ) (figure 11). Longer spikelets formed under culture conditions have had a greater width (figure 12).

Between the spike/ear length and the spikelet length was a weaker correlation ( $r=0.261^{**}$ ) (figure 13). Also between ear length and spikelet width correlation was similar, with slightly better supported ( $r=0.305^{**}$ ) (figure 14). Causes in both cases show that it is not mandatory to form the longest ears and spikelets whose dimensions are the largest.

A summary of links between different characters emerged generally considered very favorable situations. Less close correlation was obtained between the number of spikes with the number spikelets ( $r=0.108$ ), the spikelet length with ( $r=-0.020$ ) and the spikelet width ( $r=0.071$ , by comparison with the 0.190 down statistical level-  $r_{max}$ ). From the table 1, the LSD=level of statistical difference. Each value ( $r$ ) was compared with the three statistical LSD.

Table 1. Correlations between different characters of *C. dactylon* weed fruits

Characters	Panicle length	No. ears/ panicle	Ear length	No. spikelets/ ear	Spikelet length	Spikelet width
Panicle length	1	0.437***	0.962***	0.507***	0.218*	0.333***
No. ears/panicle		1	0.396***	0.108	-0.020	0.071
Ear length			1	0.492***	0.261**	0.305**
No. spikelets/ear				1	0.417***	0.472***
Spikelet length					1	0.543***
Spikelet width						1

LSD 5 = 1.90    LSD 1 % = 0.25    LSD 0.1 % = 0.32

Other aspects of *C. dactylon* fruit variability. Data obtained could express the specific way in which weed was adapted to the local ecology. With the mean and the variability of the characters studied, one can say that they take specific aspects. Thus, the length mean of finger-panicle was 6.182 cm, the number of ears/panicle 5.71 and ear length of 5.72 mm. The number of spikelets of the ear was 43.08, the length of spikelet have 1.97 mm and spikelet width of 0.814 mm (table 2). The coefficient of variation (CV,%) was low (below 10%) only for spikelet length (7.62%). Values around 15% variability (medium between 10 and 20%) were for: panicle length (13.80%), ear length (14.76%), spikelet width (15.52%) and number of spikes/panicle (15.40%). Big variability (of more than 20%) had a number of spikelets of an average ear (20.891%). It appears that the diversity of *C. dactylon* fruit characters dressed specific issues, possibly by adapting to this type of soil from southern territory.

**Table 2. Statistic indices of *C. dactylon* fruits**

Indices	Digital panicle length, cm	Spikes		Spikelets		
		No./panicle	Length, cm	No./spike	Length, mm	Width, mm
Mean, $\bar{a}$	<b>6.182</b>	<b>5.71</b>	<b>5.72</b>	<b>43.08</b>	<b>1.97</b>	<b>0.814</b>
Variance, $s^2$	0.728	0.774	0.714	81.004	0.022	0.016
Std. error, $s$	0.853	0.880	0.845	9.000	0.150	0.126
Var. coef., %	<b>13.80</b>	<b>15.40</b>	<b>14.76</b>	<b>20.891</b>	<b>7.62</b>	<b>15.52</b>

#### 4. CONCLUSIONS

A weed difficult to control farmland is *Cynodon dactylon*. Data on reproductive morphology of its characters are less known. To be able to control in a new environmental conditions (with environmental protection), can occasionally promote morphological variability studies. For these reasons, *C. dactylon* weed variability studies were done for some morphological characters of finger-panicle, spikes and spikelets. How these characters have expressed variability, it is shown in table 3. The digit-panicle length had more frequency at 6-7 cm (42%), 40% of panicle have had 5 spikes, and the dominated spikes length was at 51-60 cm (43%). Spike have had 31-50 spikelets with 35-36% high percentages. The dimensions of spikelets were more for 2.0-2.1 mm (22-20%) length, and 0.8-0.9 mm (26-25%) for width.

To control this weed species by its management (Uygun, 2000; Webster et al., 2003) it is good to know as many characters. Recently, it has been found that species expressing a higher variability, it may be more easily tackled, possibly to be stopped by different methods. Morphological variability, especially reproductive, being less known, could express here-existing cross-type (table 4). We found finger-panicle of 4.3-8.1 cm long, the number of ears (spikes)/panicle of 4-8, and of spikelength of 4.2-7.8 cm. The number of spikelets/spike was 24-61, the length of spikelet have had 1.5-2.3 mm, and the width of spikelet of 0.6-1.1 mm.

The variability of the *Cynodon dactylon* weed morphological characters was made by differing complex investigations: i) the frequency of each botanical part, ii) the correlations between the main characters, iii) the statistical indices: mean and variation coefficient (VC%), and iv) the limits of botanical characters studied. The results show better the weed botanical statement, both for biologists and for agriculture.

**Table 3. Structure and analysis values of *C. dactylon* fruits**

Digit-panicle		Spikes/ears				Spikelets					
length		no./panicle		length		no./spike		length		width	
cm	%	no.	%	cm	%	no.	%	mm	%	mm	%
4-5	12	4	5	31-40	1	21-30	7	1.5	1	0.6	12
5-6	26	<b>5</b>	<b>40</b>	41-50	19	<b>31-40</b>	<b>35</b>	1.6	1	0.7	21
<b>6-7</b>	<b>42</b>	6	36	<b>51-60</b>	<b>43</b>	<b>41-50</b>	<b>36</b>	1.7	5	<b>0.8</b>	<b>26</b>
7-8	17	7	17	61-70	29	51-60	18	1.8	13	<b>0.9</b>	<b>25</b>
8-9	3	8	2	71-80	8	61-70	4	1.9	27	1.0	14
								<b>2.0</b>	<b>22</b>	1.1	2
								<b>2.1</b>	<b>20</b>		
								2.2	9		
								2.3	2		

**Table 4. Values of fruit characters variability, *C. dactylon* weed**

No.	Determinations	Limits
1	Finger-panicle length, cm	4.3 – 8.1
2	No. spikes/panicle	4 - 8
3	Spikes length, cm	4.2 – 7.8
4	No. spikelets/spike	24 - 61
5	Spikelet length, mm	1.5 – 2.3
6	Spikelet width, mm	0.6 – 1.1

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