

FRUIT CHARACTERISTICS OF DIGITARIA SANGUINALIS (L) SCOP. WEED FROM MAIZE CROP

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ABSTRACT

Being an annual monocotyledonous (AM) *D.sanguinalis* known widely spread thanks to the pronounced adaptability in maize crop. This weed competition takes place in particular by high densities due to bigger reserve of the kernels from the ground (Jiang DeFeng et al, 1997; Barberi et al, 1998). Weed management could be improved by conducting studies by reproductive variability (Hidayat& Preston, 1997; Culpepper et al, 1998; Wu JuYing et al, 1999). Characters studies had a pronounced degree of variability. Thus, the finger-like panicle had 1- 6 floors with ears, on formed 4-13 fingers-like ears (or spikes), being 6- 17 cm in length. In a ear on formed 20- 70 spikelets. They have a length between 2.0 and 4.1 mm and width of 0.3- 1.3 mm. Upper glume measured between 0.6 and 1.5 mm, and TSW- thousand spikelet weight of 0.20- 1.20 g. The correlations obtained had increasing trends, positive between no. of ears/ finger-like panicle with panicle length ($r = 0.244^{***}$), and between finger-like panicle with no. of spikelets/ ear ($r = 0.339^{***}$). Negative links found between spikelet dimensions ($r = -0.061$) and between no. of spikelets/ ear with thousand spikelets weight (TSW) ($r = -.0118$). Observed characteristics showed the *D.sanguinalis* species has a high capacity to adapt in maize crop.

INTRODUCTION

Being one of the most well-known species of the genus *Digitaria*, *D.sanguinalis* is also well known weed plant in the world. *D.sanguinalis* (pro syn *Panicum sanguinalis* L, *Syntherisma vulgare* Baumg, DIGSA Bayer code, hairy crabgrass, large crebgrass, crab finger grass, purple crabgrass, fonio) grows and compete maize plants every year (Laudien & Koch, 1972). Being an annual monocotyledonous, plant can also be used in animal feed, both green and dry (hay) (USDA-NRCS, 2004). Sometimes its kernels are obtained by crop plant (Germany and Poland- polish millet), feeding by concentrated form (Laudien & Koch, 1972). The plant is an annual species with terminal inflorescence composed of radiating branches. Each branch has a linear shape, with hairs and small spikelets. The inflorescence can be red or purple. The *Digitaria* genus to catch about 300 species native to tropical and warm temperate areas. *Digitus* is a latin word for "finger" and is distinguished by a digital flower it produces. All species of the genus have similar habitats and structure of flowers, but are distinguished by minor differences in the structure of flowers and hairy leaves (Gleason & Cronquist, 1991). The inflorescence of *D.sanguinalis* is a panicle with branches arranged in a digital format. The plant flowering period is from June to October. The flower can be confused with the species *Cynodon dactylon*. The difference is that the inflorescence of *D.sanguinalis* has digital ears at several points on the shaft, while the *C.dactylon* they are connected to a single point. Spikelets are arranged in two rows. Each spikelet has two flowers, of which only one is

fertile. Inflorescence has 4-10 finger-like ears, each 2-16 cm long, not always caught by one point, but at 1-2 cm below the other. Spikelet is elliptical, convex complains of about 3 mm in length. Spikelet is observed on the upper glume higher and lower glume very short. Upper lemma is like spikelet long, ribbed to the top, and bottom lemma is glabrous, hairy, pale green or brown (Photo 1).



Photo 1. *Digitaria sanguinalis* fruits from maize crop

D.sanguinalis is a weed that competes maize, sugar beet, vegetables, orchards, vineyards, rice and flowers (King & Oliver, 1994; Cardina et al, 1996; Chen WuSi et al, 1998; Li ShanLin et al, 1999). In the present study was aimed variability fruit of the species in maize crop. Thus we determined characteristics: number of floors with finger-like ear no./ panicle, no. of ears/ panicle, the length of finger-like panicle, no. of ears/ panicle, length and width of spikelet, the length of upper glume, and TSW- thousand of spikelet weight.

MATERIAL AND METHODS

Mesurements were made in mid-Sept., in the past 3 years in various plants of *D.sanguinalis* from maize crops, high plateaux Argeș county areas. They were chosen randomly among the ranks 100 strains of weed *D.sanguinalis*. Each of the stems were cut panicle formed after which they were brought to the laboratory. Finger-like panicle measurements and determinations included: no. of floors with ears, no. ears/ finger-like panicle, absolute length of panicle, total number of spikelets/ ear, spikelets length and width, length of upper glume and thousand spikelet weights (TSW).

1.For expression of the diversity of the characters was analyzed using an appropriate statistical method and the frequency- specific polygon or histogram. The evolution of the values was determined either by class intervals, either by absolute values as such. The specifics of each character ecotype analyzed revealed the modal value (higher frequency) and variation limits concerned. Among the main characters were established and some correlations. These are important developments of these characters by observing the trend in newly stued ecotype. Charts were developed using Excel.

2.On the other hand, measurements were statistically processed by analysis of variance method strings, namely the variation. Indices were calculated:

$$\text{Media, } \bar{a}, \text{ where } \bar{a} = \frac{\sum x}{n}(a),$$

$$\text{Variance, } s^2, s^2 = \frac{1}{n-1} \left[\sum x^2 - \frac{(\sum x)^2}{n} \right] (b),$$

$$\text{Standard error (SE), } s, s = \sqrt{s^2} (c), \text{ and}$$

$$\text{Variation coefficient (VC), } s \%, s \% = \frac{s}{\bar{a}} \cdot 100 (d).$$

3. Finally it was developed a summary of the data on the study of variability of *D. sanguinalis* characters established by determinations.

RESULTS AND DISCUSSIONS

Features of finger-like panicle. Typically a panicle of *D. sanguinalis* has between 2 and 16 cm. As it is digital, 4-10 ears caught in rachis more points and more spikelets/ ear. From what was obtained in the current study it is found that no. of floors with ears from finger-like panicle was 0- 6. The highest frequency was 1 node on the stem next to the terminal ears (41%). Of all digitate panicle analyzed, 16% had no spice node on rachis, but they were located only on the top of digital panicle. Panicle had higher frequency of 2 and 3 knots of panicle, were 23% and 15% respectively. Low frequency had inflorescences with 4- 6 nodes on the main stem (3- 1%). No of ears of finger-like panicle was between 4- 13 and highest frequency was 6- 7 ears/ panicle (43%)- Fig. 1. 4- 5 ears panicle were 22%, the 8- 9 26% and from 10 to 13 ears 8% and 1% respectively.

Finger-like panicle absolute length was between 6 and 17 cm. The highest frequency was 12- 14 cm high (40%), followed by the 10- 12 cm (30%). Average frequency was 14 to 16 cm (18%) with values lower 6- 8 cm (1%) to over 17 cm (3%). Spikelets number from a medium ear was between 20 and 70. The highest frequency was 40- 50 spikelets/ ear (56%). Medium frequencies were 30- 40 (20%) and 50- 60 (19%). Low levels were 20- 30 (1%) and 60- 70 (3-1%) spikelets/ ear- Fig. 2.

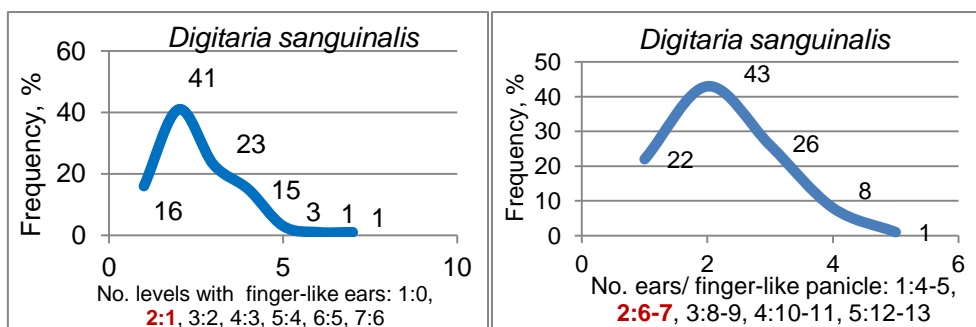


Fig. 1. Evolution of finger-ears levels from fruit (left) and spikelets no./panicle, DIGSA weed

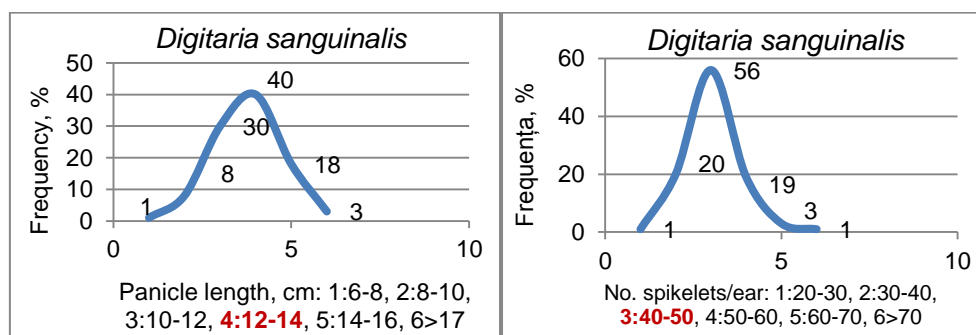


Fig. 2. Evolution of finger-panicle length (left) and of spikelets number/ ear, DIGSA

Spikelets sizes have different characteristics. Thus, the length of spikelet was between 2.0 and 4.1 mm. The highest frequency was 2.9- 3.1 mm (60%), followed by 2.6- 2.8 mm (29%). The frequency of 2.3- 2.5 mm were small (3%), 2.0- 2.2, 3.2- 3.4 mm and 3.5- 3.7 mm (both 2%) and between 3.8 and 4.1 mm (1%). Spikelet width was between 0.3 and 1.3 mm. Large values were 0.5- 0.6 mm (43%) and 0.7- 0.8 mm (31%). Averages were at 0.9- 1.0 mm (16%) and 0.3- 0.4 mm (8%). Low frequency of 1.1- 1.3 mm had the widths (2%)- Fig. 3.

At *D.sanguinalis* spikelet, upper glume had some variations and frequencies. Its size was between 0.6 and 1.5 mm. Higher frequencies were 1.0 mm (23%) and 1.1 mm (22%). Average values were between 0.7- 1.2 mm and 0.6 mm lower (2%), and 1.3-1.5 mm (2 and 1%). The absolute weight of spikelets expressed by TSW fluctuated between 0.20 g and over 1.20 g. Frequencies were large at 0.60- 0.80 g (42%) and 0.40- 0.60 g (35%). Middle values were sized to 0.20- 0.40 g (10%) and 0.80- 1.00 g (9%). Oscillations were lower at 1.00- 1.20 g (3 1nd 1%)- Fig. 4.

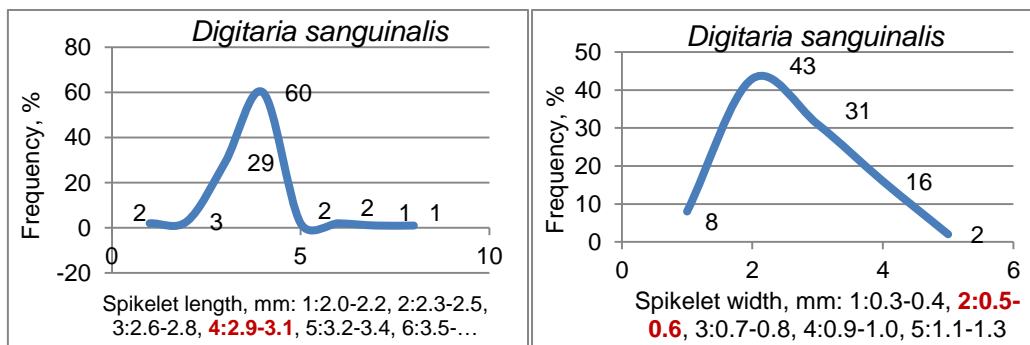


Fig. 3. Evolution of spikelet length (left) and spikelet width, DIGSA weed

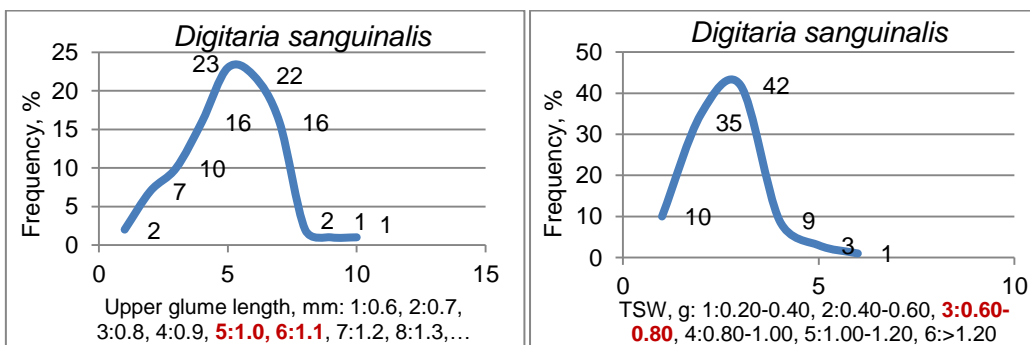


Fig. 4. Evolution of upper glume length (left), and of TSW- thousand spikelets weight, DIGSA

Correlations between the main characters. Positive correlations were obtained in two cases and negative in the other cases. Thus, between the number of ears/ finger-like panicle and panicle length it was very positive and statistically better ($r = 0.244^{***}$). The panicle when it was longer, so formed more ears (spikes). The link between the length and width of spikelet was negative and statistically less ($r = -0.061$). The correlation shows that it is not mandatory spikelets longer to be with large width- Fig. 5.

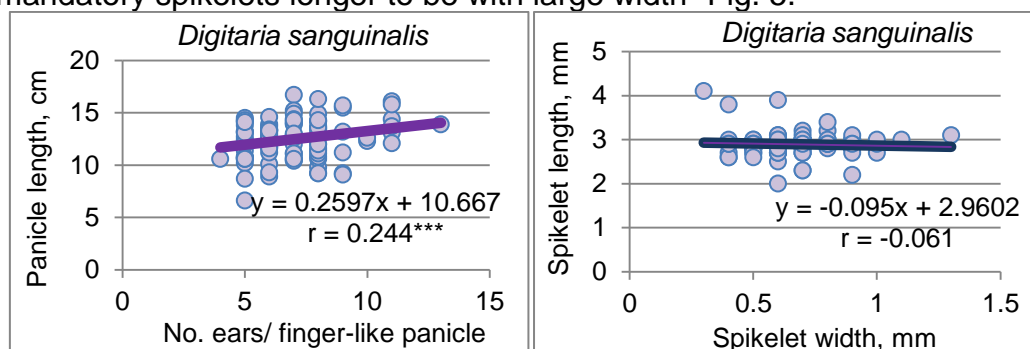


Fig. 5. Correlations between ears no. with panicle length(left) and spikelet length with spikelet width

The link between no. of spikelets/ ear and TSW was negative and statistically uninsured ($r = -0.118$). It was possible that between no. of spikelets/ ear and absolute weight thereof is

not in a direct relationship advantageous. Instead, spikelets less on an ear may have higher absolute weight. Finger-like panicle length correlated directly and positively with no. of spikelets/ ear ($r = 0.339^{***}$). This means that the species which formed longer panicle favored the formation of a greater number of spikelets each ear component (Fig. 6).

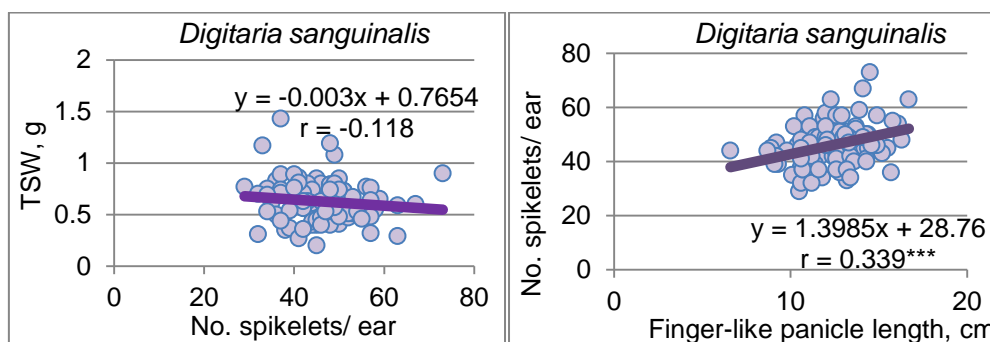


Fig. 6. Correlations between spikelets no./ear with TSW (left), and panicle length with spikelets no./ear, DIGSA

Statistical analysis of the variability of *D.sanguinalis* fruits. Were calculated for each character analyzed: mean (\bar{a}), variance (s^2), standard error of mean (s), and coefficient of variation (CV%). Statistical estimates made have highlighted the characteristic values of the species *D.sanguinalis* increased maize. The values obtained were characteristic. Thus, finger-like panicle formed 7 ears, with 12.5 cm length. Medium ears (spikes) contained 46.2 spikelets, spikelet length was 2.9 mm and spikelet width 0.7 mm, upper glume measuring 1.0 mm, and TSW was 0.63 g (Table 1). Low variability was in spikelet length (9%), and TSW a large (31%).

Table 1

Statistical indices of *Digitariasanguinalis* fruits

| Indices | No. ears/ finger- panicle | Panicle lengthl, cm | No. spikelets/ spike | Spikelet length, mm | Spikelet width, mm | Upper glume Length, mm | MMS, g |
|----------------------|---------------------------------|---------------------------|-------------------------|---------------------------|--------------------------|------------------------------|---------------|
| Media, \bar{a} | 7.00 | 12.485 | 46.22 | 2.896 | 0.676 | 1.004 | 0.6271 |
| Variance, s^2 | 3.1313 | 3.5409 | 60.0622 | 0.0721 | 0.0942 | 0.0299 | 0.0386 |
| Standard error, s | 1.7696 | 1.8817 | 7.7500 | 0.2685 | 0.0970 | 0.1729 | 0.1964 |
| Variability coef., % | 25.279 | 15.072 | 16.768 | 9.271 | 14.349 | 17.218 | 31.325 |

CONCLUSIONS

A common species that cause significant damage of crops is *D.sanguinalis* (L)Scop. The weed is widespread in the southern territory, because this ecotype may be well adapted by its special biology in maize crop. In order to control through proper management is good to know as many characters. It was found that a species expressing widest variability may find it easier means of control and stop eventually. Morphological variability, especially reproductive, being less known, could express eco-existing type here- Table 2. We have had finger-like panicle little longer, more ears/ panicle, large no. of spikelets/ ear, and spikelet dimensions little long and large.

Thus, morphological characters were analyzed on the fruits by the length of finger-like panicle, no. ears/ panicle, no. spikelets / ear, dimensions (length and width) of spikelets, upper glume length, and thousand spikelets weight (TSW). Data of variability revealed that the most frequency (%) had an no. ear/ finger-like panicle with 6- 7, 12- 14 cm of finger-like panicle length, no. of spikelets/ ear 40- 50, 2.9- 3.1 mm spikelet length, 0.5- 0.6 mm spikelet width, upper glume length 1.0 mm, and TKW 0.60- 0.80 g- Table 3.

Table 2

Values of fruits characters variability, DIGSA weed

| No. | Fruit characters | Literature | Determinations |
|-----|----------------------------------|------------|----------------|
| 1. | Finger-like panicle length, cm | 2.0 – 16.0 | 6.6 – 16.7 |
| 2. | No. ears/ panicle | 4.0 – 10.0 | 4 – 13 |
| 3. | No. spikelets/ ear | - | 29 – 73 |
| 4. | Spikelet length, mm | 1.7 – 3.4 | 2.0 – 4.1 |
| 5. | Spikelet width, mm | - | 0.3 – 1.3 |
| 6. | Upper glume length, mm | - | 0.6 – 1.5 |
| 7. | Down glume length, mm | 1.0 | - |
| 8. | TSW- thousand spikelet weight, g | - | 0.20 – 1.43 |

Table 3

Structure and analysis values of *Digitariasanguinalis* fruits

| No. spikes/ finger- panicle | Panicle length, cm | No. spikelets/ spike | Spikelet length, mm | Spikelet width, mm | Upper glume length, mm | MMB, g |
|-----------------------------------|-----------------------|-------------------------|------------------------|-----------------------|---------------------------|----------------------|
| 4-5 22% | 6-8 1% | 20-30 1% | 2.0-2.2 2% | 0.3-0.4 8% | 0.6 2% | 0.20-0.40 10% |
| 6-7 43% | 8-10 8% | 30-40 20% | 2.3-2.5 3% | 0.5-0.6 43% | 0.7 7% | 0.40-0.60 35% |
| 8-9 26% | 10-12 30% | 40-50 56% | 2.6-2.8 29% | 0.7-0.8 31% | 0.8 10% | 0.60-0.80 42% |
| 10-11 8% | 12-14 40% | 50-60 19% | 2.9-3.1 60% | 0.9-1.0 16% | 0.9 16% | 0.80-1.00 9% |
| 12-13 1% | 14-16 18% | 60-70 3% | 3.2-3.4 2% | 1.1-1.3 2% | 1.0 23% | 1.00-1.20 3% |
| | >16 3% | >70 1% | 3.5-3.7 2% | | 1.1 16% | >1.20 1% |
| | | | 3.8-4.0 1% | | 1.2 2% | |
| | | | 4.1 1% | | 1.4 1% | |
| | | | | | 1.5 1% | |

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