PARTIAL RESULTS REGARDING THE BEHAVIOR OF SOME MILLET GENOTYPES IN THE PEDOCLIMATIC CONDITIONS OF A.R.D.S. SECUIENI

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Abstract

At the national level, the areas cultivated with millet are very small, this species is not in the attention of researchers and farmers, therefore the information and studies about millet are limited. Starting from 2022, at the Agricultural Research – Development Station Secuieni, research was initiated on the behavior and productivity of five millet genotypes (*Panicum miliaceum* L.), the results obtained are presented in the present paper. Among the genotypes studied (the variety Marius, the local population Secuieni and the three genotypes from the Vegetal Genetic Resources Bank "Mihai Cristea" Suceava is noted a good adaptability of the species to the A.R.D.S. Secuieni area's pedology and the 2022's climatic conditions. Thus, the average grain yield of the tested millet genotypes was 2528 kg/ha - for the variants sown at 12,5 cm distance between rows, 2328 kg/ha - for variants sown at 25 cm distance between rows and 2221 kg/ha – for the varieties sown at 50 cm distance between rows.

Key words: millet, adaptability, yields, *Panicum miliaceum* L

Specialist studies support as an effective strategy to cover the food requirement worldwide, against the background of global warming, the replacement of grain crops that have a high water requirement with others adapted to drought, to ensure a high productive and nutritional value through efficient use of natural resources (Amadoubr I., 2013; Ndiku M.H., 2014; Seghatoleslami M.J., 2008).

Panicum miliaceum L. it is one of the first domesticated crops in the world, cultivated before the spread of rice, corn and wheat (Crawford G.W, 2006; Sage R.F., 2011). Ten thousand years ago, it appeared as a staple food in semi-arid regions of East Asia and later spread throughout the Eurasian region (Lindquist J.L., 2005; Cavers P.B., 2016). Today, millet grains are still an important food, source of energy and protein for millions of people living in (semi)arid areas.

In the Western world, *Panicum miliaceum* L. is considered a minor cereal and is usually used as animal feed (Crawford G.W, 2006; Lindquist J.L., 2005).

Millet has recently received attention due to its nutraceutical properties: the grain has a high protein content (12.5%) and is generally rich in essential amino-acids (e.g.: methionine and cysteine), except for lysine and threonine (Amadoubr I., 2013; Sage R.F., 2011).

Foods containing millet are promoted for their low glycemic index and high fiber content, as well as being free of gluten. (Kettler T.A., 2001; Meier U., 2001).

In Romania, millet has been cultivated since ancient times, being an important element in the diet, but gradually, the surfaces of the millet crop have been reduced, being replaced by that of corn. By comparison, in the years 1930-1939, 47.5 thousand ha of millet were cultivated (average grain production 812 kg/ha), in 1965 millet was still cultivated on only 10-20 thousand ha in the dry areas of the country (Muntean L.S., 2003) and currently in the FAO statistics we no longer find areas declared to be sown with millet, this crop being of secondary importance, showing some interest in successive crops for grains or hay, due to its high resistance to drought and the short vegetation period.

In Romania, and in general on the European continent, millet is an ignored crop, but it is not devoid of potential. It can represent the salvation of farmers in compromised agricultural years, it shows good stability and ecological adaptability, increased resistance to drought and adverse

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pedological conditions, and the consumption of millet grains brings a substantial contribution to the health of the body.

The areas cultivated with millet are very reduced, this species not being in the attention of researchers and farmers so information and studies about this species are limited.

Millet, shows potential and interest for the area of influence of A.R.D.S. Secuieni, reason for starting from 2022, was introduced it into the thematic research plan.

In this paper we present data on the behavior of some millet genotypes in the pedoclimatic conditions of the area, but also the influence of some technological factors on grain yield.

MATERIAL AND METHOD

In 2022, at the Agricultural Research - Development Station Secuieni was initiated research which aimed at:

- establishing the adaptability of five millet genotypes to the pedoclimatic conditions in Central Moldova;
- establishing the optimal distance between plant rows.

The rate of seed used for sowing the experiment was 10 kg/ha and no fertilization was carried out.

Today, in the official list of cultivated varieties in Romania, for the species *Panicum miliaceum* L. is registered only the variety Marius, this fact fully reflects the synthetic and at the same time plastic specifications made by Prof. Dr. Eng. Ioan Haş, regarding the essence of the work of breeders from vegetable field: "varieties and hybrids in field crops (...) have a life cycle similar to living organisms/ they are born (with the registration in the Official List of varieties), live (the period of time while they are cultivated) and die (with their removal from the Official List)".

The genotypes used in the field experience were made up of:

- the Marius variety from N.A.R.D.I. Fundulea;
- a local population - hereinafter referred to as "Secuieni";
- three genotypes from the Vegetal Genetic Resources Bank "Mihai Cristea" Suceava - hereinafter referred to as BG 1, BG 2 and BG 3.

All those genotypes were sown at three different distances between rows: 12,5 cm, 25 cm and 50 cm.

The soil in which the experimental field was placed is a cambic phaeozoum, weakly acidic (pH 6.14), with a low content of humus (2.3%), being a weakly fertile soil, little supplied with nitrogen (0.134%), but with a considerable content of phosphorus (74 ppm) and potassium (221 mg/kg) in forms accessible to plants.

The millet crop was sown in the first decade of May, in a dry soil, as a result of the increasingly present and more accentuated rainfall deficit from year to year and against on the basis of rising temperatures, which change the multi-year average constantly and in an ascending way.

The harvest was carried out at the beginning of the second decade of August, the millet crop growing under the conditions of Agricultural Research - Development Station Secuieni a number of 95 days.

The obtained data were processed and statistically interpreted according to the variation analysis method (Jităreanu G., 1994).

RESULTS AND DISCUSSIONS

From a climatic point of view, the millet vegetation period in 2022 was characterized as being hot and very dry, for the area of influence of A.R.D.S. Secuieni, the tendency being aridification.

The average temperatures recorded at the weather station of A.R.D.S. Secuieni during the millet vegetation period had a deviation of +1.9^{o} C compared to the multiannual average for the same period of the year (*table 1*).

Regarding the rainfall regime, in the period from the sowing of the millet crop to its physiological maturity, there was a total of 127.8 mm unevenly distributed, comparing this value with the multiannual average of 291.2 mm, we note that the deviation has a value of -163.4 m (*table 2*).

The level and stability of production in field crops is given by varieties with a high yield potential, with a superior quality of yield and with a better adaptation to biotic and abiotic environmental conditions.

Regarding the behavior of the tested genotypes, the highest yield was registered with the Marius variety, of 2984 kg grains/ha sown at a distance of 12.5 cm between rows (*table 3*).

The five genotypes studied in 2022 had average yields between 2984 kg/ha (Marius – sown at 12,5 cm distance between rows) and 1664 kg/ha (BG 1 – sown at 50 cm distance between rows).

Table 1

Average temperatures recorded at the weather station of A.R.D.S. Secuieni, 2022

	Temperature ^{0}C				Average vegetation period	Characterization
	V	VI	VII	VIII		
Monthly average	16.3	20.7	22.2	22.7	20.5	warmly
Multiannual average	15.4	18.9	20.4	19.6	18.6	
Deviation	0.9	1.8	1.8	3.1	1.9	

Table 2

Average precipitation recorded at the weather station of A.R.D.S. Secuieni, 2022

	Precipitation (mm)				Amount of precipitation during the growing season	Characterization
	V	VI	VII	VIII		
Monthly amount	20.8	56.6	35.2	15.2	127.8	very dry
Multiannual sum	65.6	85.3	81.9	58.4	291.2	
Deviation	-44.8	-28.7	-46.7	-43.2	-163.4	

Table 3

Average grain yield obtained in millet genotypes, 2022

Genotype	Average production (kg/ha)			Difference from the witness (kg/ha)			Signification		
	12.5 cm	25 cm	50 cm	12.5 cm	25 cm	50 cm	12.5 cm	25 cm	50 cm
Marius	2984	2423	2298	404	95	77			
Secuieni	2905	2636	2485	325	308	264			**
BG 1	1878	1720	1664	-702	-608	-557	o	oo	ooo
BG 2	2393	2236	2203	-187	-92	-18			
BG 3	2738	2623	2452	158	295	231			*
Average experience	2580	2328	2221	-	-	-			

From table 3 and figure 1 we observe that the average grain yield of the tested genotypes is inversely proportional to the distance between the rows of plants.

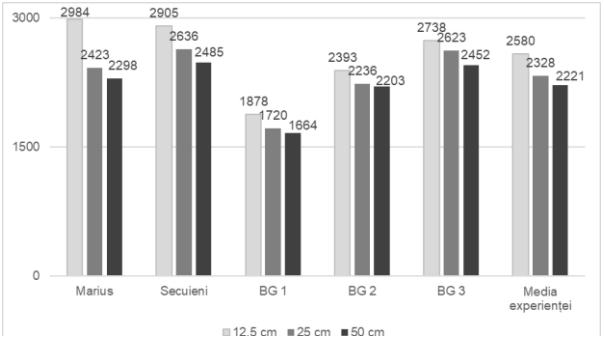

Figure 1 – **Average grain yields obtained in millet genotypes, 2022**

The highest yields values were between 1878 kg/ha (BG 1) and 2984 kg/ha (Marius) for the variants sown at a distance of 12,5 cm between rows, and the lowest, between 1664 kg/ha (BG 1) and 2485 kg/ha (Secuieni population) in the variants sown at a distance of 50 cm between rows.

This aspect confirms the results of research from Sidney, Nebraska (1995) which concluded that millet productivity, number of brothers and straw weight decreased as the row spacing increased (Muhlis A. *et al*, 2006).

The yields differences between the experimental and the control variants (average of the experience) were interpreted statistically as:

- very significant for the genotypes sown at 50 cm between rows for Secuieni population (264 kg/ha,) and BG 3 genotypes (231 kg/ha);
- negative significant for BG 1 genotype sown at 12.5 cm (702 kg/ha),
- negative very significant for BG 1 genotype sown at 25 cm (608 kg/ha);
- negative distinctly significant for BG 1 genotype sown at 50 cm (557 kg/ha) (*figure 2*).

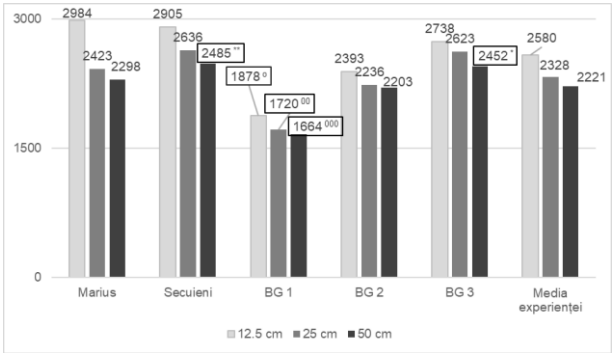

Figure 2 – **Statistical interpretation of average millet yields, 2022**

CONCLUSIONS

In 2022 year, the millet genotypes tested at the Agricultural Research and Development Station Secuieni behaved well even in the conditions of a dry and warm climate.

The yields obtained had values between:

- 2984 kg/ha (Marius) and 1878 kg/ha (BG 1) when the variants were sown at 12,5 cm distance between rows;
- 2636 kg/ha (Secuieni local population) and 1720 kg/ha (BG 1) when the variants were sown at 25 cm distance between rows;
- 2485 kg/ha (Secuieni local population) and 1664 kg/ha (BG 1) when the variants were sown at 50 cm distance between rows.

The distance between rows influenced the yield of the studied millet genotypes.

The highest average yield (2580 kg/ha) was obtained in the variants sown at 12,5 cm distance between rows and the lowest (2221 kg/ha) in the variants sown at 50 cm distance between the rows.

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