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NEW GRAIN SORGHUM GENOTYPES ADAPTED TO SPECIFIC ECOPEDOLOGICAL CONDITIONS OF SANDY SOILS

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ABSTRACT

Research conducted at Research - Development Centre for Field Crops on Sandy Soils, Dabuleni, concerning 8 hybrids behavior grain sorghum, highlights the specificity of this plant for sandy soils. Value of leaf area index (LAI = 6.5-7) and the production of grain (7821- 8415 kg / ha) shows a very good valorisation of the environment registered in southern Oltenia by grain sorghum crop. Have been distinguished with the best results the grain sorghum hybrids: Arcanciel, Arak, Arfrio

INTRODUCTION

The grain sorghum is considered a drought resistant plant and with future outlook of the dry areas in Romania (Antohe I.et all., 1998, 2002, I. Draghici I., 2006), having regard to atmospheric and soil drought accentuation lately, which obliges us to finding an alternative to the assortment of plants which are cultivated at present. Species with the C4 photosynthesis cycle, sorghum, dryland cereal (below 450 mm rainfall / year) and very moist of the areas (over 700-800 mm rainfall / year), are grown in small areas in Romania.

The largest area of sorghum (about 250,000 ha) of which 75,000 ha of sorghum grain was grown in the decades of the last century 7th and 8th decades of the last century (Gumaniuc et al., 1979).

Cultivated in more than 90 countries spread out across 5 continents, between 25 ° south latitude and 55° north latitude, on a surface of about 44 million. hectares, the grain sorghum is used in human nutrition (approximately 53.3%) in feed animals (about 39.4%) and industry (particularly the food, about 2%) (Hulse et al., 1980). After extent of use in human food, the grain sorghum is ranked third (after rice and wheat), providing about 16% of the total consumption of cereals in the world (Arnould and Miche, 1971), and in some areas the second, after rice (some areas of India, the south and west Asia and east and west Africa) (Doggett, 1986).

MATERIAL AND METHOD

The research was conducted during 2013-2014, at Research - Development Centre for Field Crops on Sandy Soils, Dabuleni and concerned the behavior of a number of 8 hybrid grain sorghum, under sandy soils with humus content of less than 0.5%. Experience has been placed in irrigation conditions, by randomized block method and experimental variants are presented in Table 1.

The observations and measurements carried out have targeted the physiological plant resistance to cold, to drought, to falling and to aphids, the growth rate in the first 4 weeks of the emergence, the biometrical elements and sorghum plant productivity. The results were calculated and interpreted statistically by variance analysis method.

RESULTS AND DISCUSSIONS

The results obtained of the sorghum plant physiological, behavior at the climatic conditions of the sandy soil, shows a good adaptability to all sorghum hybrids included in the study (Table 1). Thus, distinguished themselves the good uniformity of plant at

emergence and good resistance to cold sorghum hybrids, to drought, to falling and breaking and to aphids.

Table 1

The behavior of grain sorghum hybrids against biotic and abiotic environmental factors, under the sandy soils conditions from Dăbuleni

No.	Hybrids	*Emergence uniformity (grades 1-9)*	Resistance to cold *(grades 1-9) in phase*		Resistance to drought *(grades 1-9)*	Resistance to falling and breaking *(grades 1-9)*	Resistance to *aphids (grades 1-9)*
			germination - emergence	*plantlet*			
1	F - 21	2	1	1	1	1	2
2	E.S. Alizei	1	1	1	1	1	2
3	Arcanciel	1	1	1	1	1.5	1
4	Arak	1	1	1	1	1	2
5	Arfrio	1	1	1	1	1.5	1.5
6	Typhon	1	1.5	1	2	1,5	2
7	Arsky	1	1	1	1	2	2
8	EUG 101 - Albanos	1	1	1	2	1.5	1

As regards the growth rhythm of sorghum plant during the first four weeks, it is noted that in the first two weeks it was reduced at experienced all hybrids (0.72 to 0.85 cm / day), the plant size recording values of 5.2 to 6.5 cm in the first week and 10-12 cm in the second week (table 2). The growth rhythm of the plant has increased starting from the 3rd and 4th week (1.89 to 2.14 cm / day), when the sorghum plants showed a height of 24.8 to 26.8 cm, at week 3 and 37.5-40 cm at week 4th after emergence. The growth rhythm of the plant is differentiated according to the hybrid. In the first week they were stood out through a growth rhythm higher hybrids Typhon and EUG 101 - Albanos. In week 2 of the most intense daily growth rhythm waist recorded a hybrid plant Arsky. In weeks 3 and 4, the growth rhythm has doubled, compared to the first two weeks, revealing in this respect hybrids F-21, Arfrio, Typhon, E.S. Alizei and Arsky.

Table 2

Observations on the growth rhythm of grain sorghum hybrids during the first four weeks after emergence

No.	Hybrids	**The size sorghum plant during the first four weeks after emergence (cm)**			
		week 1	week 2	week 3	week 4
1	F - 21	5.2	10.5	25.5	38.8
2	E.S. Alizei	6	10.5	25	40
3	Arcanciel	5.5	11	26	39.2
4	Arak	6.2	12	26.5	38.8
5	Arfrio	6	10.6	26.8	37.5
6	Typhon	6.4	10	25.5	38.4
7	Arsky	5.8	12	26.8	39.6
8	EUG 101 - Albanos	6.5	11	25.2	38.8

In the sandy soils conditions, the grain sorghum hybrids have attained a size plants between 115 cm by F21 hybrid, and 138 cm by Arsky hybrid, which registered a more rapidly growth rhythm in the first 4 weeks (Table 3). The plant diameter was between 3-4 cm, with a low differentiation between hybrids included in the study. The capacity shoots of sorghum hybrids were evidenced by the number as shoots registered per plant, which was between 1-2 shoots with a size of 98-132 cm and a diameter of 3-4 cm. The sorghum grain

has a high capacity for assimilation given by leaf area high enough. In sandy soils conditions the sorghum hybrids included in the study have registered high values of leaf area index (L.A.I.) ranging from 6.5 to 7.

Table 3

Biometrical determinations of the grain sorghum hybrids studied under sandy soils conditions

Hybrids	The plant siye (cm)	The plant diameter (cm)	No shoots/ plant (cm)	The shoots size (cm)	The shoots diameter (cm)	L.A.I.
F 21	115	3.4	2	98	2.6	6.5
E.S. Alizei	135	4	2	125	2.6	6.5
Arcanciel	130	3.6	2	120	2.4	6.8
Arak	137	3.8	2	132	2.5	7
Arfrio	125	3.5	2	118	2.2	6.9
Typhon	136	3	1	128	2	7
Arsky	138	4	2	132	2.4	6.8
EUG 101 - Albanos	133	3.5	2	129	2.5	7

At harvest were registered a number of 26 -27 plants / m². The main elements of productivity: panicle length, average production per panicle, 1000 grain weight (1000 GW) and hectoliter weight (HW), were different from hybrid to hybrid, depending on their genetic potential and the adaptability to ecopedological conditions, specific of sandy soil (Table 4). The panicle length ranged from 24 cm to hybrid E.S. Alizei and 28 cm at F21 hybrid. The average yield of grains per panicle has registered the highest value at hybrid Arsky - 31 g / panicle and the lowest, 26.8 g / panicle, at hybrid F21. 1000 grain weight ranged from 24.4 to 25.2 g and the Hectolite Weight between 70.8 to 74.5 kg . The production levels of sorghum hybrids, under specific ecopedological sandy soils in the years 2013-2014, have highlighted the productive potential in thermic and hydric stress conditions and the adaptability of hybrids to the unfavorable circumstances, frequently encountered on sandy soils (Table 5). Compared with the control (F21), all other hybrids have achieved production increases assured from the point of view statistically. Were marked by high productivity hybrids: Arfrio (8415 kg / ha), Arak (8287 kg / ha), Arcanciel (8266 kg / ha), which registered, compared to the control, production differences very significant, ranging 445-594 kg / ha.

Table 4

Elements of productivity and yields of grain sorghum hybrids obtained in sandy soils conditions from Dăbuleni

Hybrids	No. plants / m^2 at harvest	Panicle length (cm)	Average production per panicle (g)	1000 GW (g)	HW (kg)
F 21	27	28	26.8	25.2	71
E.S. Alizei	27	24	29.8	25	70.8
Arcanciel	26	24.5	28	24.8	71
Arak	26	27	30	25.2	70.6
Arfrio	26	24.5	28.5	24.4	74.5

Typhon	26	24	28	24.8	70.8
Arsky	27	26	31	25.2	71.2
EUG 101 - Albanos	27	25	30	25.6	71.5

Table 5

Synthesis of production results obtained for grain sorghum hybrids cultivated in sandy soil conditions from Dăbuleni

Hybrids	Grain yield		Difference from control kg/ha	Significance
	Kg/ha	*%*		
F 21	7821	100	0	Control
E.S. Alizei	8129	104	308	xx
Arcanciel	8266	106	445	xxx
Arak	8287	106	466	xxx
Arfrio	8415	108	594	xxx
Typhon	8148	105	327	xx
Arsky	7998	103	177	x
EUG 101 - Albanos	8024	103	203	x

LSD 5% = 164 kg/ha; LSD 1% = 226 kg/ha; LSD 0.1% - 398 kg/ha

CONCLUSIONS

1. The grain sorghum hybrids experienced in the period 2013-2014 have recorded a good behavior under the conditions of sandy soils from southern Oltenia;
2. The growth rhythm of the sorghum plant was from 0.72 to 0.85 cm / day in the first two weeks, with a plant height of 5.2 to 6.5 cm, increasing from 1.89 to 2.14 cm / day for weeks 3 and 4, when the plants have reached a height of 24.8 to 26.8 cm;
2. Under the sandy soils conditions of southern Oltenia, the experienced sorghum hybrids have registered high values of leaf area index (L.A.I.), ranging from 6.5 to 7;
3. Through high productivity were highlighted the sorghum hybrids: Arfrio (8415 kg / ha), Arak (8287 kg / ha), Arcanciel (8266 kg / ha), which registered compared to hybrid control (F21) production differences 445 - 594 kg / ha, very significant in statistical point of view.

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