ASPECTS REGARDING THE BEHAVIOUR OF SOME SORGHUM (*Sorgum bicolor L. Moench*) GRAIN HYBRIDS IN THE SOIL AND CLIME CONDITIONS OF OLTENIA CENTRAL

URECHEAN VIORICA[1], BONEA DORINA[2]

[1] *Agricultural Research and Development Station Simnic, road Balceşti, no. 54, 200721, Dolj, Romania, + 40 - 0251 – 417534;*

[2] *Faculty of Agriculture and Horticulture, University of Craiova, street Libertatii, no 19, 200583, Dolj, Romania, + 40 – 0251 – 418475;*

Key words: sorghum grain, morphological features, grain yield, correlation.

ABSTRACT

Sorghum (Sorghum **bicolor** *(L.) Moench) is a drought tolerant crop. In the Central zone of Oltenia region, drought is a common phenomenon and this is the reason why this crop should be reconsidered for cultivation in the future within this area. The present paper presents the behaviour of 6 sorghum grain hybrids (from Australia and USA) in the soil and clime conditions of ARDS Simnic (Dolj). The experiment was laid out in randomized block design with spacing of 70 x 10 cm along with three replications. There have been made observations and remarks n the main phenophases of the crop, the morphological features and the grain yield as well as the correlation between them. The highest yields have been recorded with the NS 5305, NS 7501 and NS 5304 which are considered early as vegetation period.*

INTRODUCTION

Sorghum crop has multiple uses and expanded on almost every continent, the staple food of many peoples. The highest surfaces cropped by sorghum are in India, China, USA, Argentina and some African countries (Starodub V., 2008). It is the fifth leading cereal crop in the world after wheat (Triticum aestivum L.), rice (Oryza sativa L.), corn (Zea mays L.) and barely (Hordeum vulgare L.)- (Dawood W.M., 2011). Hybrid sorghum crop outlook is for dry areas and sandy or salty lands, where corn production gives small or fails (Mureşan T. et al., 1961). Sorghum is one of the main staples for the worlds poorest and most food insecure people. The crop is genetically suited to hot and dry agro-ecologies, where it is difficult to grow other food grains and these are also areas subject to frequent drought (Tariq M. et al., 2007). In crop production, drought stress can be classified into pre- or post-flowering. Even though the world collections of sorghum contain over 35,000 accessions, the genetic base currently used in breeding programs is very small (about 3%). Thus, it is important to identify diverse breeding lines for crop improvement (Mutava R., 2009). Evolution to climate warming and aridity during 2001-2050 in the Balkans, which is located in Romania, require a reconsideration of sorghum as food grains, forage plant and technical plant (Antohe I., 2007). The current conditions in our country, very capricious in terms of weather, plant stress from high temperatures in summer, often associated with drought, agricultural production may compromise substantially large area. To avoid this, farmers and breeders have to find effective solutions from several points of view, for use this crop in food rations for farm animals and other sources of energy cereal grains such as sorghum instead of classical cereals as corn, barley, wheat, etc. Nutritional qualities of sorghum grain has been demonstrated in experimental research revealed energy-protein content approaching that of traditional cereals (Dorica Voicu, 2011). Identification of easily measured physiological traits contributing to yield under specified environmental conditions would benefit genotypic selection for grain sorghum (Soltani A. et al., 2001). In this paper we propose a comparative study of sorghum hybrids under preluvosoil conditions of ARDS Simnic for better knowledge and phoenological aspects of their yielding capacity.

MATHERIAL AND METHODS

From a climate perspective agricultural year 2009 - 2010 was a very good year for growing sorghum (table 1).

Table 1

The climatic conditions expressed through the deviations towards the multiannual average

Year agricultural 2009-2010	The months of the year						
	The cold period 1.X-31.III.	IV	V	VI	VII	VIII	IX
Rainfalls (mm)							
(Multiannual average)	241.3	50.5	63.1	75.1	90.6	55.2	65.5
Total	440.9	48.0	122.0	112.0	82.0	33.0	11.0
Deviations	+199.6	-2.5	+58.9	+36.9	-8.6	-22.2	-54.5
Temperature 0 C							
(Multiannual average)		11.9	16.8	22.1	23.6	24.6	18.2
Total		11.9	17.7	21.7	23.8	23.6	17.3
Deviations		0	-0.9	+0.4	-0.2	+1.0	+0.9

The experiments were placed in field experiences of the Laboratory of Plant Breeding of the ARDS Şimnic method of setting the latin rectangle, 6 types x 3 repetitions on 4 rows of 9 m long plant sowing density was 145000 plants / ha (70 cm distance between rows and 10 cm between plants in the row). There were tested six foreign grain sorghum hybrid. The study has envisaged the following aspects: main phenophases depending on sowing date, time of emergence, time of panicle appearance, flowering and date of physiological maturity, yielding capacity, correlations between yield and main phenophase duration. Results for grain yield were performed using analysis of variance and differences limit and analyze the links between yield and during the main vegetation phenophases was achieved by simple correlation method (Săulescu N.A. and Săulescu N.N., 1967).

RESULTS AND DISCUTIONS

Although seeding was done on the same day the emergence took place on 12, 13 or 14 days after sowing depending on germination capacity and germination energy of each hybrid (Table 2). Panicle appearance occurred to second decade of July (14.07 - 20.07). The panicle appeared earlier at NS 5303 hybrid (56 days) and appeared later than the NS 5304 hybrid (62 days).

Flowering occurred after 3-6 days of the onset paniculata.

Sorghum is a short-day plant and bloom is hastened by short days and long nights and high temperatures.

From this point of view hybrids differ among themselves as sensitive to day length hence the differences in the flowering.

The physiological maturity was reached in late August - early September after 98-105 days since emergence. The earlier genotype was NS 5305 and the latest, NS 5304.

Production achieved by each hybrid is determined by genetic potential, which may be expressed or not in some climatic and soil conditions.Yielding capacity of six genotypes of sorghum was good and very good, and it was clearly influenced by climatic conditions of 2010 (Table 3).

Table 2

Phenological data from 6 grain sorghum hybrids grown in ARDS Şimnic, 2010

Phenological data	Hybrids					
	NS 7501	NS 5301	NS 5302	NS 5303	NS 5304	NS 5305
Sowing date	6.05.	6.05.	6.05.	6.05.	6.05.	6.05.
Emergence date	18.05.	19.05.	19.05.	19.05.	19.05.	20.05.
No. days sowing - emergence	12	13	13	13	13	14
Panicle appearance date	15.07.	15.07.	16.07.	14.07.	20.07.	16.07.
No. days emergence – panicle appearance	58	57	58	56	62	56
Flowering date	18.07.	19.07.	21.07.	20.07.	23.07.	20.07.
No. days emergence - flowering	61	61	63	62	65	60
Physiological maturity date	29.08	30.08	31.08	28.08	1.09	26.08
No. days emergence – physiological maturity	103	103	104	101	105	98

Table 3

Yielding capacity of 6 grain sorghum hybrids cultived at ARDS Simnic, 2010

Hybrid	kg/ha	%	Difference (kg/ha)	Semnification
NS 7501	9520	111	+915	*
NS 5301	9240	107	+635	ns
NS 5302	4040	47	-4565	000
NS 5303	9380	109	+775	ns
NS 5304	9510	111	+905	*
NS 5305	9940	116	+1335	**
Mean (control)	8605	100	-	-
LSD 5%	894.24 kg /ha			
LSD 1%	1271,17 kg /ha			
LSD 0.1%	1840.59 kg /ha			

Table 4

Correlations between the characters studied in 6 grain sorghum hybrids grown at ARDS Şimnic

	Yield	No. days sowing – emergence	No. days emergence – panicle appearance	No. days emergence - flowering	No. days emergence – physiological maturity
Yield	-	0.059	-0.284	-0.177	-0.631
No. days sowing - emergence		-	-0.049	-0.302	-0.390
No. days emergence – panicle appearance			-	0.853*	0.765
No. days emergence - flowering				-	0.759
No. days emergence - physiological maturity					-

* = significant at 0.05probability

STAS production /ha ranged from 4040 kg grain /ha (NS 5302) to 9940 kg grain /ha (NS 5305) and the average of all 6 genotypes was 8605 kg grain /ha. So for our area of culture would be wise to cultivate early sorghum grain hybrids. They recover very quickly in the short time needed to reach maturity. The NS 5305 hybrid stands statistically speaking, significantly to the control (group mean), and hybrids NS 7501 and NS 5304 are

significantly positive remarks from the control.The lowest production was given by hybrid NS 5302 (4040 kg/ha) and the production is clearly very significantly negative compared to the control (but the germination was not good, not enough plants per plot). Analyzing the correlation between the maturation period (number of days from emergence to physiological maturity) and the grain yields of 6 sorghum hybrids (Table 4) shows a negative correlation (r = - 0.631), which means that the more time of growing, the lower the production. Similar conclusions were also made by Surwenshi A. et al. (2007). Positive correlations, there were nearly significant between number of days from emergence to panicle appearance and the maturation period, and between the number of days from emergence to flowering and maturation period. The only significant positive correlation was recorded between the number of days since emergence to panicle appearance and number days since emergence to flowering.

CONCLUSIONS

Agricultural year 2009-2010 was a favorable year for grain sorghum culture;

The best production of grain hybrids was given by NS 5305, NS 7501 and NS 5304. Correlating the maturation period with the yield given by the six sorghum hybrids a slight negative correlation was observed, which means that a longer growing season determines a production decrease. For the are of influence of ARDS Şimnic it seems that it would be advisable to grow earlyer sorghum grain hybrids. They may represent an alternative to corn in dry years or when the best time for planting corn is delayed. When the climatic conditions remained uncultivated land, early sorghum hybrids recovered very quickly short time needed to reach maturity.

BIBLIOGRAPHY

Antohe, I. – 2007, *Realizări în ameliorarea sorgului la Fundulea*. Analele INCDA Fundulea, LXXV : 137-157.

Belum, V.S., Reddy, Ramaiah B., Ashok A. Kumar and Sanjana P. Reddy - 2007 - *Evaluation of sorghum genotypes for the stay-green trait and grain yield*

Dawood, W. M. – 2011, *Relatonships between grain filling duration and grain yield in sorghum*. Diyala Agricultural Sciences Journal, 3(1) 60:66

Mureşan, T., Cosmin, O., Sarca, T. – 1961, *Importanţa culturii sorgului şi comportarea unor hibrizi încercaţi la Baza experimentală Fundulea*, în anii 1958-1960. Probleme agricole no.8 : 19-26.

Mutava, R. – 2009, *Characterization of grain sorghum for physiological and yield traits associated with drought tolerance*. Thesis, Kansas State University, Manhatan.

Voicu, D. - 2011, *Sorgul boabe, o alternativă la porumbul sau orzul utilizat în nutreţurile concentrate din hrana rumegătoarelor*. Revista Lumea Satului, no. 24, http://www.lumeasatului.ro.

Săulescu, N.A, Săulescu, N.N. – 1967, *Câmpul de experienţă*. Editura Agrosilvică, Bucureşti.

Soltani A, Rezai A. M, Khajeh Pour M.R. – 2001, *Genetic Variability for Some Physiological and Agronomic Traits in Grain Sorghum (Sorghum bicolor L.).* JWSS - Isfahan University of Technology. 2001; 5 (1) :127-137.

Starodub, V. – 2008, *Tehnologii în fitotehnie*, Ed. UASM, Chişinău.

Surwenshi A., Chimmad V.P., Ravikumar R.L. – 2007, *Physiological studies on hybrids and parents in relation to morpho-phenological parameters, yield and yield components in sorghum*. Journal of Agricultural Science, 20 (1):128-130.

Tariq, M., Awan, S.I., Irshad-Ul-Haq, M. – 2007, *Genetic Variability and Character Association for Harvest Index in Sorghum under Rainfed Conditions* Int. J. Agri. Biol., Vol. 9(3) : 470-472.