RESULTS ON THE YIELD AND CORRELATIONS BETWEEN CHARACTERS IN SOME SUNFLOWER (*Helianthus annuus* L.) HYBRIDS GROWN IN OLTENIA

BONEA DORINA[1], URECHEAN VIORICA[2], MÎNDRILĂ GHEORGHIŢA[1], IANCU D[3].
[1] University of Craiova, Faculty of Agriculture and Horticulture, streed Libertatii, no 19, Dolj, Roumania
[2]Agricultural Research and Development Station, road Balceşti, no. 54, Dolj, Romania
[3] County Office for Soil Survey and Testing, road Nicolae Romanescu, no. 39, 200738, Dolj, Romania

Keywords: head diameter, seed yield, sunflower, 1000 seed weight

ABSTRACT

*This paper presents preliminary results on the yields obtained of ten sunflower hybrids grown in drought conditions, in Oltenia, respectively ARDS Simnic. Because the study area is frequently affected by drought, a priority objective of breeding plant drought tolerance of crop plants. Elements of yielding and yields levels studied hybrids were strongly influenced by climatic conditions. Hybrids PR 63 A83 and NK BRIO had the best seed yields, recommending their expansion in culture for this area. The strongest correlations were seen between seed yield and hectoliter weight (+0.797**) and between 1000 seed weight and number of days from flowering to physiological maturity (+0.798**).*

INTRODUCTION

Sunflower is a plant with many uses in human food, animal feed and industry, therefore ranks third in area cultivated in Romania (http://www.madr.ro).

Among the various problems faced by all crops, water stress is considered to be the most critical (Boyer, 1982).

Because Oltenia region is frequently affected by drought, crop sunflower in this area may be compromised. As a result, field testing of sunflower hybrids may lead to identification of valuable genotypes that can be used in future breeding programs of this plant. Also, knowledge of plant requirements and vulnerability specific to each phase of vegetation, allow an appropriate culture technologies.

The identification of the correlation between morphological and yielding traits to sunflower is very important, because makes selection of most valuable genotypes easier and reduces the time necessary for obtaining new cultivars (Bonciu, 2007).

Yielding of sunflower is much affected by drought, however it is considered moderately tolerant to drought stress (Tahir *et al*., 2002).

All elements of yielding are influenced by environmental conditions, including water supply has a major role, the greatest influence on head having it (Ion, 2010).

Reducing seed yield under water stress, head diameter was noted, the plant height, the weight 1000 seed and weight hectoliter have been previously reported (Erdem *et al*. 2006; Bonea *et al*. 2008; Urechean *et al.* 2008; Matei *et. al* 2009; Hossain *et al*. 2010; Bonea *et al*. 2012).

MATERIAL AND METHOD

Experience has been placed in the field of improvement of the ARDS Simnic using randomized plots method, the storey blocks with three repetitions.

Each experimental plot had an area of 28 m^2, which resulted in four rows of plants at a distance of 70 cm between rows.

From a climate perspective, year 2012 was dry, less favorable crop sunflower. In April and May a surplus of rainfall was recorded, which made the sunflower plants have enough water in the early stages of vegetation, then June, July and August were dry, with rainfall below average multiyears.

To test the significance of differences between hybrids was used analysis of variance (Săulescu, 1967). The relationship between seed production and studied traits was expressed by the correlation coefficient (Săulescu, 1967).

RESULTS AND DISCUSSIONS

Yielding of the ten hybrids studied was strongly influenced by conditions climate of year 2012. There was an average yield of 1575.1 kg/ha (table 1).

Statistical analysis of seed yield shows that hybrid PR 63 A83 achieved a very significant positive (+433.9 kg/ha) compared to control (mean experience) and hybrid NK BRIO made a distinct significant positive difference (+255.9 kg/ha) .

Lowest seed yield was recorded in hybrids BELUGA (-238.1 kg/ha compared to control) and HURACAN (-184.1 kg/ha).

Table 1

Seed production of hybrids studied, 2012, ARDS Simnic

No. crt	Hybrids	Seed yield kg/ha	%	Difference
1	BAROLO RO	1590	101	+14.9
2	HURACAN	1391^{0}	88	-184.1
3	GRANERO	1614	102	+38.9
4	BELUGA	1337^{0}	85	-238.1
5	SWEET	1436	91	-139.1
6	PR 63 A90	1538	98	-37.1
7	PR 63 A83	2009***	128	+433.9
8	NK BRIO	1831**	116	+255.9
9	HELIACAN	1564	99	-11.1
10	KW 6302	1441	91	-134.1
	MEAN (control)	1575.1	100	-
LSD 5%				182.7 kg/ha
LSD 1%				250.5 kg/ha
LSD 0,1%				341.0 kg/ha

Plant height (Table 2), considered to be an indirect factor productivity was strongly influenced by environmental conditions, an average of 126.1 cm . The highest plant height recorded HURACAN hybrids (139.7 cm) and HELIACAN (141 cm) .

Head diameter has averaged 14.7 cm, is a element that seems to be influenced more by genotype than environment. The difference from the other hybrid is not significant.

Weight of 1000 seed (Table 2) is an element which has been severely affected of high temperature and water shortage in the period of formation and seed filling, averaging 49.3 cm. The highest values of the weight of 1000 seed were recorded HELIACAN hybrids, KW 6302 (58 g) and PR 63 A83 (56 g).

Seed shape than hectoliter weight influence. For hybrids studied, hectoliter weight recorded an average of 35.3 kg, remarking hybrid PR 63 A83 (40 kg).

Table 2

Values morphological characters studied, 2012, ARDS Simnic

No. crt	Hybrids	Plant height (cm)	Head diameter (cm)	1000 seed weight (g)	Hectoliter weight (kg)
1	BAROLO RO	120.5	14.7	50	36
2	HURACAN	139.7*	14.7	40^{00}	33
3	GRANERO	115	15	52	36

4	BELUGA	122.3	13.8	54	35
5	SWEET	133.4	14.3	40^{00}	30^{0}
6	PR 63 A90	120.8	15.6	43^{0}	35
7	PR 63 A83	128.4	15.4	56*	40*
8	NK BRIO	121.8	14.2	42^{00}	38
9	HELIACAN	141*	14.7	58**	37
10	KW 6302	118.1	14.8	58**	35
	MEAN (control)	126.1	14.7	49.3	35.3
	LSD 5%	12.6	1.4	5.0	3.5
	LSD 1%	17.2	2.0	6.9	4.8
	LSD 0,1%	23.8	2.7	9.4	6.6

In the flowering hybrids studied, there were no morpho-anatomical abnormalities or unevenness in development receptacle genotype level, evidence that water shortage has less influence floral initiation.

Urechean *et al*. (2008), show that the„ In the conditions of accentuated hydric stress, the whole metabolic and physiological complex of the plant of sunflower is modified, shortening the phonological phases and rushing the physiological maturity of the plants".

Flowering begins when temperatures provides a biologically active amount of time emergence (75% plants sprung) between 800 and 925 ^{0} C (64-70 days) (Ion *et al*. 2007)

Studied hybrids, flowering time, was between 26.06 and 1.07 respectively at 57-62 days after plant emergence.

Generally, at sunflower is desirable that vegetation period from emergence to flowering to be as short as possible. The selection for the shortening of this phase can help deliver the early forms without significantly reducing oil yield (Bonciu, 2009).

The earliest hybrid was GRANERO, which registered 57 days from plant emergence to flowering, while hybrids were late as HURACAN, PR and KW 63 A83 6302, which registered 62 days from plant emergence to flowering (table 3).

Physiological maturity was determined by the classical method when the back of the head was yellow- brown, and between 20.08 (SWEET) and 29.08 (6302 KW) to 112 days or 121 days from plant emergence.

Studying correlations between different characters allows the identification of biological features related to the interaction of hereditary factors.

Table 3

Phenological data from hybrids studied , 2012, ARDS Simnic

No. crt	hybrids	Flowering data	No days emergence to flowerin	Physiological maturity data	No. days flowering to physiological maturity	No. days emergence to physiological maturity
1	BAROLO RO	28.06	59	26.08	59	118
2	HURACAN	1.07	62	27.08	57	119
3	GRANERO	26.06	57	26.08	61	118
4	BELUGA	27.06	58	25.08	59	117
5	SWEET	27.06	58	20.08	54	112
6	PR 63 A90	30.06	61	24.08	55	116
7	PR 63 A83	1.07	62	28.08	58	120
8	NK BRIO	30.06	61	25.08	56	117
9	HELIACAN	28.06	59	27.08	60	119
10	KW 6302	1.07	62	29.08	59	121

Plant emergence 30.04

Correlation coefficient values recorded in 2012, shows that climatic conditions can greatly influence the relationship between characters (Table 4).

Table 4

The values of correlation coefficients between the characters studied, 2012

Characters	Seed yield	Plant height	Head diameter	1000 seed weight	Hectoliter weight	No days emergence to flowering	No. days flowering to physiological maturity	No. days emergence to physiological maturity
Seed yield	-	-0.125	+0.409	+0.146	+0.797**	+0.304	+0.018	+0.249
Plant height		-	-0.105	-0.174	-0.233	+0.148	-0.212	-0.078
Head diameter			-	+0.107	+0.318	+0.400	+0.003	+0.310
1000 seed weight				-	+0.538	-0.076	+0.798**	+0.661*
Hectoliter weight					-	+0.288	+0.453	+0.630*
No days emergence to flowering						-	-0.289	+0.505
No. days flowering to physiological maturity							-	+0.680*
No. days emergence to physiological maturity								-

p5% =0.63; p1% = 0.76

The seed yield correlates quite strongly just hectolitre weight (+0.797**).

Other strong relationships were recorded between 1000 seed weight and number of days from flowering to physiological maturity (+0798**), between 1000 seed weight and number of days from emergence to physiological maturity (+0661*), between hectoliter weight and number of days from emergence to physiological maturity (+0630*) and between number of days from flowering to physiological maturity and number of days from emergence to physiological maturity (+0680*).

CONCLUSIONS

Water stress in sunflower affects primarily morphological characteristics of the plant, causing the plant to reduce waist and leaf area, and secondly productive characteristics, ie 1000 seed weight and hectoliter weight.

The climate of the agricultural year 2011-2012 was less favorable sunflower crop.

Under these conditions the average achieved by hybrids studied was 1575.1 kg/ha.

The best yields were recorded for hybrids PR 63 A83 and NK BRIO, hybrids that are recommended to be expanded in culture for the study area.

Soil water shortage associated with atmospheric drought, vegetation influenced shortening phases 7- 8 number of day period from plant emergence to flowering.

BIBLIOGRAPHY

1. Bonciu, Elena, 2007 - *The correlations between morphological and productivity traits to sunflower.* Cercetări ştiinţifice, seria a XI-a, Horticultură şi Inginerie genetică, USAMVB Timişoara, 93-96.

2. Bonciu, Elena, 2009 - *Aspecte de genetica si ameliorare a florii-soarelui*. Editura Sitech, Craiova.
3. Bonea Dorina, Viorica Urechean, Emilia Constantinescu, Olimpia Pandia, 2008 - *The interrelations between the capacity of production and the component elements at the sunflower.* Bulletin UASVM, Agriculture 65(1), 355.
4. Bonea Dorina, Urechean Viorica, Constantinescu Emilia, Iancu, D., *2012 - The behaviour of some sunflower (helianthus annuus) hybrids from abroad under water and heat stress at ARDS Simnic.* Scientific Papers. Series A. Agronomy, Vol. LV, 129 -132.
5. Boyer, J.S., 1982 - *Plant productivity and environment*. Science 218: 443 - 448.
6. **Erdem, T., Erdem, Y., Orta A.H., Okursoy, H.,** 2006 - *Use of a crop water stress index for scheduling the irrigation of sunflower (Helianthus annuus L.)*. Turk. J. Agric. For. 30: 11- 20.

7. Fernandez, P., Di Rienzo, J., Fernandez, L., Hopp, H.E., Paniego, N., Heinz, R.A., 2008, *Transcriptomic identification of candidate genes involved in sunflower responses to chilling and salt stresses based on cDNA microarray analysis*. BMC Plant Biol. http://www.ncbi.nlm.nih.gov/pubmed/18221554

8. **Hossain, M.I., Khatun, A., Talukder, M.S.A., Dewan, M.M.R., Uddin, M.S.,** 2010 - *Effect of drought on physiology and yield contributing characters of sunflower.* Bangladesh J. Agric. Res. 35:113 -124.

9. **Ion V., Ştefan, V., Ion, Nicoleta**, 2007. - *Results on the flowering stage in the Romanian-grown sunflower hybrids*. Scintific Papers, Faculty of Animal Sciences and Biotechnologies Timişoara, vol. 40 (2).

10.**Ion V..** 2010, *Fitotehnie:* http://www.horticultura-bucuresti.ro/fisiere/file/Manuale%20An%20I%20Horti%20invatamant%20la%20distanta/Fitotehnie.pdf

11**Matei, Gh., Roşculete, Elena, Petrescu, E., Iancu, Paula**, 2009 - *Research regarding the behaviour of some sunflower hybrids cultivated in non irrigated conditions at SDE Banu Maracine*. Analele Universitatii din Craiova-seria Agricultura, Montanologie, Cadastru. vol.39 A.

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

13. **Tahir, M.H.N., Muhammad, I., Hussain, M.K.,** 2002 - *Evaluation of sunflower (Helianthus annuus L.) inbred lines for drought tolerance*. Int. J. Agric. Biol. 3: 398–400.
14. **Urechean, Viorica, Bonea, Dorina, Constantinescu, Emilia,** 2008 - *The influence of the hydric stress on the capacity of growth and development on the sunflower.* Bulletin UASVM, Agriculture 65(1), 315-319.
15. ***MADR**, 2013*: Date privind evoluţia suprafeţelor şi a producţiei în România http://www.madr.ro/ro/culturi-de-camp.html*