STUDIES REGARDING THE PRODUCTIVE POTENTIAL OF CERTAIN SUNFLOWER HYBRIDS IN THE CURRENT AGROPEDOCLIMATIC CONDITIONS OF THE DOBROGEA PLATEAU

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Abstract: *According to FAO, sunflower is cultivated in 65 countries, being present on all the continents. The global surface cultivated with this plant is continually increasing. In 2002 it was cultivated on over 19 million ha, while in 2008 it was cultivated on over 25 million ha. The average international production is also on the increase (12.6 q/ha in 2002, 14.2 q/ha in 2008). In Europe, the situation is similar to the international one, both the cultivated surfaces and the productions obtained being on the increase. Taking into account the particular importance held by this plant at international and European level, this paper presents the behavior of certain sunflower hybrids, which exist in the official list of types and hybrids of cultivated plants in Romania. The paper follows the manifestation of the productive potential of this plant in the current agropedoclimatic conditions of the Dobrogea Plateau. It is known that sunflower has the highest water consumption from the occurrence of inflorescence to seed formation, when water consumption can rise to 5 mm/day and even more. From the calendar point of view, the critical phase in regards to water is in July and the first part of August. However, in Dobrogea Plateau, this period is poor in precipitations. Considering that all the technological elements contribute to the manifestation of the productive potential of a hybrid/type, but also that sunflower has the capacity to adapt to different environmental conditions and to high temperature oscillations (it resists at low temperatures, especially at the beginning of the vegetation period, as well as at drought), the paper refers to the manifestation of the productive potential of certain sunflower hybrids, depending on morpho-physiological characters, such as size, calathidium diameter, seed size or duration of the vegetative cycle, which depend to a large extent on temperature, photoperiod, humidity, but also agrotechnical means used. Knowledge of the reports between the vegetation factors and plants offers the cultivator the possibility, by means of the technical elements he has, to control, regulate and direct their action within certain limits, to provide the optimum conditions for the normal biological cycle and thus to obtain the estimated harvest.*

Key words*: floarea soarelui, hibrizi, potențial productiv, condiții agropedoclimatice*

INTRODUCTION

It is known that sunflower has the highest water consumption from the occurrence of inflorescence to seed formation, when water consumption can rise to 5 mm/day and even more. From the calendar point of view, the critical phase in regards to water is in July and the first part of August. However, in Dobrogea Plateau, this period is poor in precipitations. Considering that all the technological elements contribute to the manifestation of the productive potential of a hybrid/type, but also that sunflower has the capacity to adapt to different environmental conditions and to high temperature oscillations (it resists at low temperatures, especially at the beginning of the vegetation period, as well as at drought), the paper refers to the manifestation of the productive potential of certain sunflower hybrids, depending on morpho-physiological characters, such as size, calathidium diameter, seed size or

duration of the vegetative cycle, which depend to a large extent on temperature, photoperiod, humidity, but also agrotechnical means used. Knowledge of the reports between the vegetation factors and plants offers the cultivator the possibility, by means of the technical elements he has, to control, regulate and direct their action within certain limits, to provide the optimum conditions for the normal biological cycle and thus to obtain the estimated harvest.

MATERIAL AND METHODS

The experiments were organized in production conditions, in the vicinity of Mereni, the county of Constanta. The studied hybrids were: PR 64 A 83, PR 63 A86 and MAS 97 A. hybrid PR 63 A 86 is ea simple early hybrid, with high production potential and good production stability. The oil content in the seeds is 50%. It has good tolerance to sunflower broomrape (*Orobanche cumana*) – breed E and *Plasmopara helianti* – breed 304 and 710. it behaves well in stress conditions (drought and scorcher).

PR 64 A83 is a simple semy-tardy hybrid, with high production potential and high oil content in the seeds (48-49%). It tolerates sunflower broomrape (*Orobanche cumana*) – breed E, as well as falling, breaking, drought and scorcher. It has a high degree of self-fertility, with considerable productions in area with reduced pollinating entomofauna.

MAS97A is a simple, semi-tardy hybrid, with excellent production potential in all agronomical conditions, even drought. It was recorded in Romania in 2007. It tolerates sunflower broomrape (*Orobanche cumana*) - breed A-E and has good resistance to diseases (*Plasmopara helianthi, Phomopsis macdonaldii şi Sclerotinia sclerotiorum*). It is recommended for sustainable agriculture. Demonstrative lots were organized with these hybrids on typically chernozem soil.

RESULTS AND DISCUSSIONS

In order to have a more complete image on the behavior of sunflower hybrids in production conditions, zonated for cultivation in Dobrogea, as well as to validate into production a cultivation technology that can be used by the farmers in the studied area, three sunflower hybrids were studied, namely, PR63A86, PR64A83 and MAS97A. They were cultivated both in condition of great culture and in conditions of sustainable agriculture. The first two mentioned hybrids were cultivated in conditions of great culture, in two different periods, while the third was cultivated only in conditions of sustainable agriculture. The fields cultivated with these hybrids were monitored over the entire vegetation period, from sowing to harvesting. Thus, observations were made regarding phenology. Also, samples were collected and analyzed in the laboratory in what regards the accumulated biomass. Microscope analyses of the tissues were accomplished to see if there are any differences in regards to the anatomical structure of the hybrids cultivated in both types of culture conditions. Before harvesting, plant samples were collected and analyzed in the laboratory.

Sunflower is fastidious about rotation because it cannot tolerate monoculture, a return to the same field occurring after minimum six years. It is necessary to take into account the soil properties, namely texture and nutritive supply. In the studied fields, the previous plant was maize. Regarding fertilization, sunflower consumes high quantities of nutritive substances in order to reach its total biomass. In experience, the entire quantity of nitrogen and phosphorus was applied as complex fertilizers N : P (20:20) in a quantity of 100 kg raw substance/ha.

Soil tillage. Plowing is the main soil tillage work which influences the physical, chemical and biological processes in the soil. In order to ensure a rapid and uniform springing, deep roots and an efficient pest control, it is necessary for the soil to be well loosened, structured and without hardpan. In what regards soil tillage, in experience, the plowing was done at 22 cm. in order to obtain vigorous plants with rapid and uniform springing, it is

necessary to use at sowing a seed material with superior qualitative indexes and high biological and cultural value. The seed corresponded to the quality indexes, namely purity 97%, germinative capacity 87%, and high the mass/1000 seeds. Two sowing periods were chosen for hybrid HS PR64A83, namely April 4, 2008 and April 19, 2008. For hybrid HS PR63A86, the sowing dates was April 22, 2008 and April 25, 2008, while for hybrid MAS 97 A, the date was April 24, 2008. The sowing density was 70000 germinable seeds/ha at a distance between the rows of 70 cm.

Maintenance works. Sunflower is very sensitive to weeds till the stage with five pairs of leaves. In an interval of 30-40 days, sunflower must be thus protected by means of herbicide treatments and weeding. In weed control, the main work is weeding. Three mechanical weeding sessions took place: the first one very early when the plants formed the first pair of leaves; the second 15 days later, while the third was done 15 days after the second sessions. The following herbicides were used for the same purpose: Express/50 SG, Anaconda-graminee. The treatment with Express SG (30g/ha) was done when sunflower had 4-6 leaves. All the weeds with broad leaves, including thistle, disappeared from the crop, which allowed sunflower to develop very well. Harvesting was done by combine for cereals (CLAAS-TUCANO 340), equipped with special devices for sunflower harvesting and adjusted properly.

Results regarding the plant characteristics

Results regarding stem length. The height of the plants was determined for every 10 plants in a row, from five determination points established on the field diagonal, by measuring the distance from the soil to the superior part of the growing tip. The number of determination points is minimum 5 for crops with surfaces under 100 ha and minimum 8 for crops with surfaces over 100 ha.

Table 1

Results regarding the stem length in the hybrid PR 64 A83 sown on April 4, 2008

Determination points	Stem length -mean for 10 plants- (cm)
1	151
2	149
3	147
4	150
5	153
Mean	*150*

Table 2

Results regarding the stem length in the hybrid PR 64 A83 sown on April 19, 2008

Determination points	Stem length -mean for 10 plants - (cm)
1	147
2	144
3	143
4	143
5	148
Mean	*145*

Table 3

Results regarding the stem length in the hybrid PR 63 A86 sown on April 22, 2008

Determination points	Stem length -mean for 10 plants - (cm)
1	134
2	133
3	134
4	130
5	129
Mean	*132*

Table 4

Results regarding the stem length in the hybrid PR 63 A86 sown on April 24, 2008

Determination points	Stem length -mean for 10 plants - (cm)
1	129
2	132
3	131
4	130
5	128
Mean	*130*

Table 5

Results regarding the stem length in the hybrid MAS 97A
Sown on April 24, 2008

Determination poi	Stem length -mean for 10 plants - (cm)
1	122
2	120
3	118
4	121
5	119
Mean	*120*

Table 6

Results regarding the stem weight in hybrid PR 64 A83 sown on April 14, 2008

Determination points	Stem weight (g) -mean for 10 plants-
1	84
2	80
3	82
4	81
5	83
Points mean	*82*

Table 7

Results regarding the stem weight in hybrid PR 64 A83 sown on April 19, 2008

Determination points	Stem weight (g) -mean for 10 plants -
1	77
2	74
3	75
4	76
5	73
Points mean	*75*

Table 8

Results regarding the stem weight in hybrid PR 63 A86 sown on April 22, 2008

Determination points	Stem weight (g) -mean for 10 plants -
1	69
2	65
3	69
4	64
5	68
Points mean	*67*

Table 9

Results regarding the stem weight in hybrid PR 63 A86 sown on April 25, 2008

Determination points	Stem weight (g) -mean for 10 plants -
1	63
2	66
3	64
4	62
5	65
Points mean	*64*

Table 10

Results regarding the stem weight in hybrid MAS 97A
Sown on April 24, 2008

Determination points	Stem weight (g) -mean for 10 plants -
1	62
2	60
3	59
4	58
5	61
Points mean	*60*

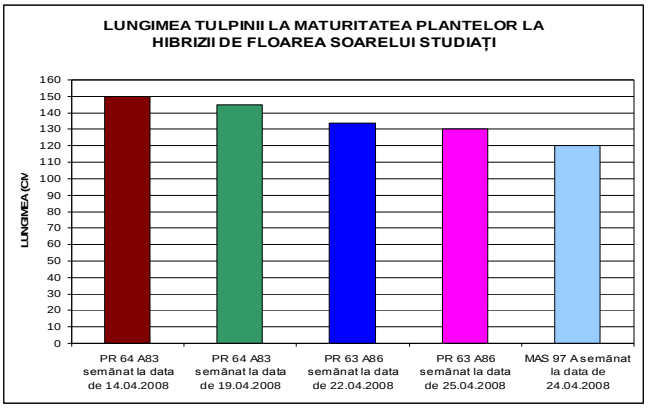

Figure 1. Stem length at maturity in the sunflower hybrids studied in Dobrogea

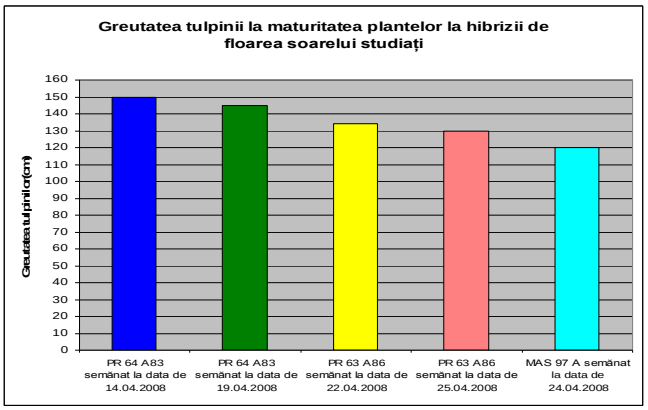

Figure 2. Stem weight at maturity in the sunflower hybrids studied in Dobrogea

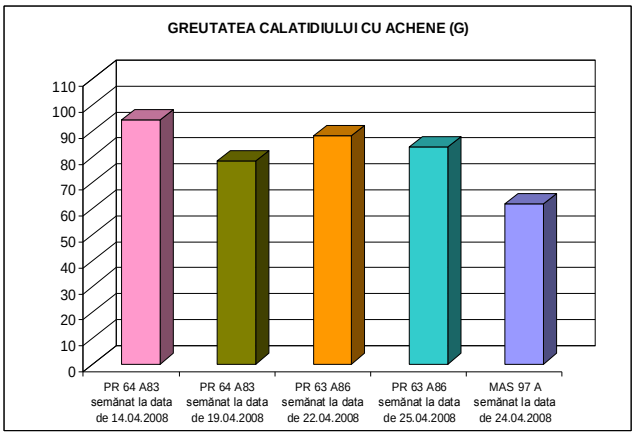

Figure 3. The weight of calathidium with achenes at maturity in the sunflower hybrids studied in Dobrogea

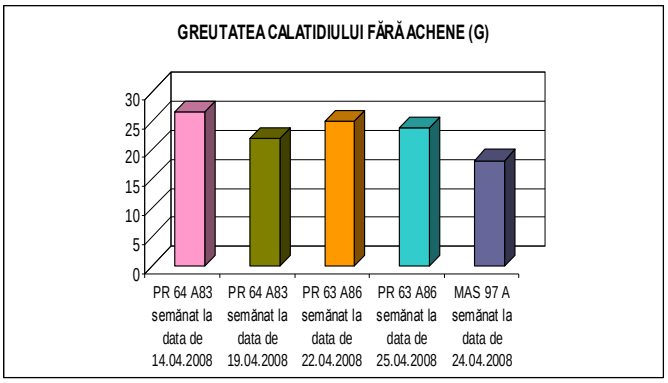

Figure 4. The weight of calathidium without achenes at maturity in the sunflower hybrids studied in Dobrogea

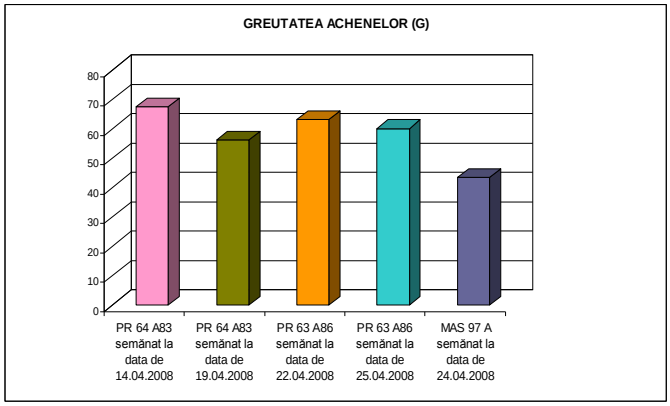

Figure 5. The weight of achenes in calathidium at maturity in the sunflower hybrids studied in Dobrogea

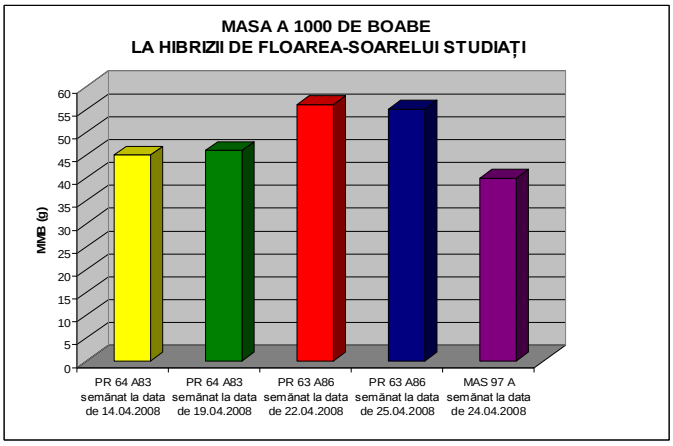

Figure 5. The mass of 1000 seeds in the sunflower hybrids studied in Dobrogea

Table 11

Phenological data in the studied sunflower hybrids

Crt. No.	Hybrid	Sowing date	Springing date	No. of true leaves on May 27, 2008	No. of true leaves on June 10, 2008
1	PR 64 A83	14.04.2008	25.04.2008	6	8-10
2	PR 64 A83	19.04.2008	28.04.2008	4	8-10
3	PR 63 A86	22.04.2008	30.04.2008	4	8-10
4	PR 63 A86	25.04.2008	2.05.2008	4	8-10
5	MAS 97A	24.04.2008	2.05.2008	4	8-10

Table 12

Results regarding biomass in the studied sunflower hybrids

Crt. No.	Hybrid	Plant weight on May 27, 2008 (grams)		Plant weight on June 10, 2008 (grams)	
		green	dry	green	dry
1	PR 64 A83- period 1	10	0.6	86.8	13.9
2	PR 64 A83- period 2	7.1	0.4	106.8	18.6
3	PR 63 A86 – period 1	8.9	0.8	107.4	21.7
4	PR 63 A86 – period 2	4.1	0.4	76.8	15.1
5	MAS 97A	6.0	0.4	35.2	7.0

The productions obtained varied depending on the cultivated hybrids: PR63A86 = 1600 kg/ha; PR64A83 = 1800 kg/ha; MAS97A = 1500 kg/ha.

CONCLUSION

In the hybrid PR64A83, sown on April 14, 2008, the stem length was on average 150 cm, while in the one sown on April 19, 2008, it was 145 cm. In the hybrid PR63A86, sown on April 22, 2008, the stem length was on average 123 cm, while in the one sown on April 25, 2008, it was 130 cm. In the hybrid MAS97A, sown on April 24, 2008, the stem length was 120 cm.

In the hybrid PR64A83, sown on April 14, 2008, the stem weight was 82 g, while in the one sown on April 19, 2008, it was 75 g. In the hybrid PR63A86, sown on April 22, 2008, the stem weight was 67 g, while in the one sown on April 25, 2008, it was 64 g. In the hybrid MAS97A, sown on April 24, 2008, the stem weight was 60 g.

In the hybrid PR64A83, sown on April 14, 2008, the weight of the calathidium with achenes was 94 g, the weight of the calathidium without achenes was 26.5g, while the weight of the achenes was 67.5 g. In the version sown on April 19, 2008, the weight of the calathidium with achenes was 78.1g, the weight of the calathidium without achenes was 21.9g, while the weight of the achenes was 56.2g.

In the hybrid PR63A86, sown on April 22, 2008, the weight of the calathidium with achenes was 88g, the weight of the calathidium without achenes was 24.8g, while the weight of the achenes was 63.2g. In the version sown on April 25, 2008, the weight of the calathidium with achenes was 83.7g, the weight of the calathidium without achenes was 23.6g, while the weight of the achenes was 60.1g.

In the hybrid MAS97A, sown on April 24, 2008, the weight of the calathidium with achenes was 61.6g, the weight of the calathidium without achenes was 18.1g, while the weight of the achenes was 43.5g. the mass of 1000 seeds in the studied hybrids was between 40 and 56 g.

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