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YIELD RESULTS OBTAINED AT AN ASSORTMENT OF SUNFLOWER HYBRIDS CULTIVATED AT MOARA DOMNEASCĂ RESEARCH FARM IN THE PERIOD 2006-2008

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Abstract

Within the present paper there are presented the research results with respect to the yield components and seed yield carried out at an assortment of twenty four sunflower hybrids in the years 2006, 2007 and 2008. The researches were carried out in field experiments located on a reddish preluvosoil within Moara Domnească Research Farm belonging to the University of Agronomic Sciences and Veterinary Medicine of Bucharest (15 km faraway from Bucharest on North-East direction). The less favourable climatic conditions from the years 2006 and 2007 affected the yield components and the seed yield, especially in the year 2007 which can be characterised as been a very drought year. Practically, the average seed yield for the studied hybrids in 2007 was three and a half times less than in 2008. The sunflower hybrids with the highest seed yield as average for the three experimental years were Saxo, Fly and Lindor, while the hybrids with the smallest seed yield were Rigasol OR, Alexandra and Opera PR. The highest seed yield in 2007 was realised by the hybrid Mateol, which shows a good drought resistance.

INTRODUCTION

Sunflower grower has to choose the hybrids for his crops among a so much diversified offer of Romanian and foreign hybrids accepted for cultivation in our country and which is changing from one year to another. Therefore it is absolutely necessary for him to know the yielding characteristics of sunflower hybrids, especially of the foreign ones and new ones that are less known or even unknown. Also, it is absolutely necessary for the sunflower grower to know the behaviour of different hybrids under soil and climatic conditions specific from his cultivation area. The cultivated hybrid has a great importance among factors that influence the yielding capacity, and knowing its characteristics contributes in a large extent to the quantitative and qualitative achievement of the yield.

MATERIAL AND METHODS

In the years 2006, 2007 and 2008, researches in field experiments were carried out on twenty sunflower hybrids, respectively: Huracan, Kasol, Lindor, Masai, Mateol,

Podium, Saxo, Sunko, Fly, Rigasol, Rigasol OR, Fleuret OR, Arena, Melody, NK Armoni, Alexandra, NK Dolbi, NK Ferti, Opera PR, Sanay. Additional to these twenty hybrids, in the years 2007 and 2008 researches in field experiments were carried out on Rocky hybrid and, in plus in the year 2008 on the hybrids Delfi, Brio and Rumbasol.

The field experiments were located on a reddish preluvosoil located 15 km faraway North-East from Bucharest (Ilfov county), within Moara Domnească Research Farm belonging to the University of Agronomic Sciences and Veterinary Medicine of Bucharest. The experiments had random plots with four replications in the year 2006 and three replications in the years 2007 and 2008. The surface of each plot was 29.4 m^2 in 2006 (6 rows at 0.7 m between rows and 7 m along the rows), 21.0 m^2 in 2007 (6 rows at 0.7 m between rows and 5 m along the rows) and 17.5 m^2 in 2008 (5 rows at 0.7 m between rows and 5 m along the rows).

The sowing was performed on 11 of April in 2006, on 18 of April in 2007 and on 11 of April in 2008. The crop technology was the regular one for sunflower in South Romania, with an application of 200 kg of complex fertiliser (18:48:0).

To the studied sunflower hybrids, determinations were performed in view to establish the seed yield, but also the yield components, which are the density of plants per surface unit, number of seeds on sunflower head, the weight of the seeds expressed through the weight of thousand seeds (MMB), and the weight of seeds per head.

RESULTS AND DISCUSSION

For the experimental area the climatic conditions of the years 2006, 2007 and 2008 were not so favourable to sunflower (figure 1, figure 2).

In the year 2006, the temperatures were not so high compared to the multiannual average values, but the rainfall was much less then the multiannual average values. Thus, a drought period was recorded in May, June and July.

The year 2007 was completely unfavourable to sunflower because of the severe drought during April, May and June, as well as because of the extremely high temperatures recorded all over the year, but especially in the period May – August.

The year 2008 was not very favourable to sunflower because of the drought during June and July, and because of the high temperatures recorded all over the year. The soil water content was very low in spring because of the missing rainfall in January (0.5 mm) and February (0.5 mm) and the very low amount of rainfall in March. But the rainfall in April and May was more than the multiannual average compensating the missing water in the soil and providing a good reserve for the next months.

The plant density was about 52,000 plants per hectare for all the studied hybrids, with an average of 51,300 plants per hectare in 2006, 52,700 plants per hectare in 2007 and 51,600 plants per hectare in 2008.

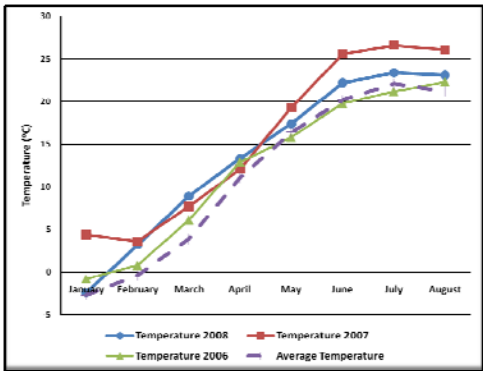

Fig. 1. The temperatures registered at Moara Domnească Research Farm

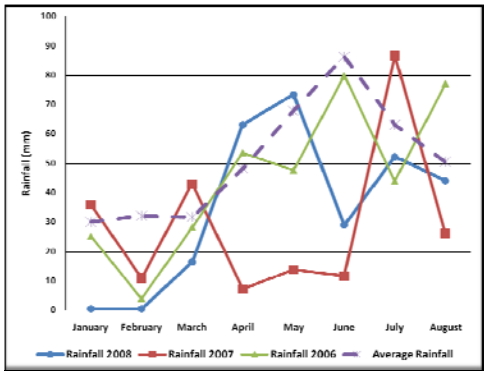

Fig. 2. The rainfalls registered at Moara Domnească Research Farm

The average number of seeds on sunflower head for the studied hybrids was the highest in 2008 (1361 seeds per head), and the smallest in 2007 (750 seeds per head). In the three experimental years (2006, 2007 and 2008) the number of seeds on sunflower head varied from 588 (Fleuret OR hybrid, in 2007) to 1633 (Saxo hybrid, in 2008). Among the studies hybrids, the highest number of seeds per head in all the three experimental years was realised by the hybrids NK Dolbi and NK Ferti, while the smallest number of seeds per head in all the three experimental years was realised by the hybrids Rigasol and Rigasol OR (table 1).

As the number of seeds on sunflower head, the average weight of thousand seeds (MMB) for the studied hybrids was the highest in 2008 (50.7 g), and the smallest in 2007 (27.1 g). In the three experimental years (2006, 2007 and 2008), the weight of thousand seeds varied from 19.7 g (NK Armoni hybrid, in 2007) to 65.6 g (Lindor hybrid, in 2008). In the year 2007, when there were registered the smallest values of weight of thousand seeds, the hybrids which realised the highest values of weight of thousand seeds were Fleuret OR (43.0 g) and Rigasol (36.1 g). In average for all the three experimental years, the sunflower hybrids with the highest values of weight of thousand seeds were Lindor and Rigasol, while the hybrids with the smallest values of weight of thousand seeds were Arena, Rocky, NK Dolbi, Alexandra, NK Ferti. A good value of the weight of thousand seeds is associated with a small value of the number of seeds on sunflower head (as for example for Lindor and Rigasol hybrids), while a small value of the weight of thousand seeds (MMB) is associated with a good value of the number of seeds on sunflower head (as for example for NK Dolbi and NK Ferti hybrids) (table 1).

As the number of seeds on sunflower head and the weight of thousand seeds, the average weight of seeds per head for the studied hybrids was the highest in 2008 (70.4 g), and the smallest in 2007 (19.8 g). In the three experimental years (2006, 2007 and 2008) the weight of seeds per head varied from 13.1 g (Opera PR hybrid,

in 2007) to 87.8 g (Fly and Delfi hybrids, in 2008). In 2008, Rumbasol hybrid also had a good value of the weight of seeds per head (87.7 g). In average for all the three experimental years, the sunflower hybrids with the highest values of the weight of seeds per head were Fly, Mateol, Saxo, Lindor, which lead to the idea that a good value of the weight of seeds per head is obtained from good values of number of seeds on sunflower head and of weight of thousand seeds. In view to produce a high quantity of seed per head, it is not enough to have high values only for the number of seeds on sunflower head or for the weight of thousand seeds, but to have good values for both of these tow yield components (table 2).

Table 1

Number of seeds on the head and weight of thousand seeds (MMB) at different sunflower hybrids (Moara Domnească Research Farm)

Sunflower hybrid	Number of seeds on the head						Weight of thousand seeds (MMB)					
	2006		2007		2008		2006		2007		2008	
	g	t test	g	t test	g	t test	q/ha	t test	q/ha	t test	q/ha	t test
1. Huracan	895	-73	-	-	1289	-72	35.8	- 4.5	-	-	45.6	- 5.1
2. Kasol	1296	328**	665	-85	1481	120	37.4	- 2.9	24.8	-2.3	54.2	3.5
3. Lindor	811	-157	598	-152	1380	19	47.7	7.4*	34.2	7.1*	65.6	14.9*
4. Masai	1098	130	870	120	1319	-42	39.4	-0.9	19.9	-7.2^{o}	51.8	1.1
5. Mateol	967	-1	746	-4	1430	69	48.9	8.6*	35.1	8.0*	55.7	5.0
6. Podium	843	-125	770	20	1364	3	41.4	1.1	22.8	-4.3	49.0	-1.7
7. Saxo	881	-87	773	23	1633	272	41.0	0.7	30.3	3.2	49.0	-1.7
8. Sunko	1200	232*	694	-56	1462	101	35.1	-5.2	28.2	1.1	49.0	-1.7
9. Fly	926	-42	803	53	1443	82	34.7	-5.6	26.2	-0.9	57.5	6.8
10.Rigasol	700	-268	665	-85	1171	-189	48.6	8.3*	36.1	9.0**	54.4	3.7
11.Rigasol OR	722	-246	599	-151	-	-	46.0	5.7	33.1	6.0*	-	-
12.Fleuret OR	869	-99	588	-162	1430	69	37.8	-2.5	43.0	15.9***	48.5	-2.2
13.Arena	1347	379**	722	-28	1491	130	30.8	-9.5^{o}	22.1	-5.0	47.5	-3.2
14.Melody	933	-35	748	-2	1274	-87	40.1	-0 2	23.9	-3.2	48.2	-2.5
15.NK Armoni	914	-54	781	31	1209	-152	40.1	-0.2	19.7	-7.4^{o}	51.4	0.7
16.Alexandra	973	5	681	-69	1314	-47	37.6	-2.7	26.2	-0.9	42.7	-8.0
17.NK Dolbi	1171	203	1078	328**	1319	-42	37.3	-3.0	21.1	-6.0^{o}	45.7	-5.0
18.NK Ferti	1105	137	984	234	1355	-6	40.7	0.4	23.0	-4.1	46.6	-4.1
19.Opera PR	845	-123	601	-149	1319	-42	44.4	4.1	21.8	-5.3	54.5	3.8
20.Sanay	873	-95	694	-56	1146	-215	40.6	0.3	27.7	0.6	56.5	5.8
21.Rocky	-	-	943	193	1402	41	-	-	22.2	-4.9	45.6	-5.1
22.Delfi	-	-	-	-	-	-	-	-	-	-	51.9	1.2
23.Brio	-	-	-	-	-	-	-	-	-	-	44.8	-5.9
24.Rumbasol	-	-	-	-	-	-	-	-	-	-	50.6	-0.1
Average	***968***	***-***	***750***	***-***	***1361***	***-***	***40.3***	***-***	***27.1***	***-***	***50.7***	***-***

As the yield components, the average seed yield for the studied hybrids was the highest in 2008 (36.1 q/ha), and the smallest in 2007 (10.4 g). Practically, the average seed yield for the studied hybrids in 2007 was three and a half times less

than in 2008, which shows how less favourable was the year 2007 for growing sunflower in South of Romania (table 2).

In average for all the three experimental years (2006, 2007 and 2008), the seed yield varied from 7.6 q/ha (Kasol and Opera PR hybrids, in 2007) to 45.7 q/ha (Brio hybrid, in 2008). Also in average for the three experimental years, the sunflower hybrids with the highest seed yield were Saxo, Fly and Lindor hybrids, while the hybrids with the smallest seed yield were Rigasol OR, Alexandra and Opera PR. In the very dry year 2007, Mateol hybrid produced the highest seed yield (13.8 q/ha), which shows the drought resistance of this hybrid (table 2).

Table 2

Weight of seeds on head and seed yield at different sunflower hybrids (Moara Domnească Research Farm)

Sunflower hybrid	Weight of seeds on head						Seed yield					
	2006		2007		2008		2006		2007		2008	
	g	t test	g	t test	g	t test	q/ha	t test	q/ha	t test	q/ha	t test
1. Huracan	36.2	1.4	-	-	59.9	- 10.5	19.4	1.6	-	-	30.3	- 2.3^{o}
2. Kasol	35.4	0.6	16.6	- 3.2	73.0	2.6	18.2	0.4	7.6	-2.8	36.6	0.5
3. Lindor	38.6	3.8	20.2	0.4	75.7	5.3	19.0	1.2	9.6	-0.8	40.9	4.8
4. Masai	36.5	1.7	17.3	- 2.5	68.6	- 1.8	19.3	1.5	8.4	-2.0	36.2	0.1
5. Mateol	35.0	0.2	26.2	6.4	79.7	9.3	14.9	-2.9 o	13.8	3.4	39.7	3.6
6. Podium	32.5	- 2.3	17.6	- 2.2	74.6	4.2	17.3	0.5	9.7	-0.7	40.6	4.5
7. Saxo	33.6	- 1.2	23.3	3.5	77.5	7.1	17.1	-0.7	10.3	-0.1	43.1	7.0**
8. Sunko	45.3	10.5***	19.5	- 0.3	65.1	- 5.3	22.4	4.6***	9.8	-0.6	29.3	- 6.8^{oo}
9. Fly	34.8	-	21.1	1.3	87.8	17.4	18.2	0.4	10.8	0.4	41.4	5.3
10.Rigasol	28.1	- 6.7^{ooo}	23.9	4.1	59.0	- 11.4	14.5	-3.3^{oo}	12.9	2.5	30.7	- 5.4^{o}
11.Rigasol OR	26.7	-8.1^{ooo}	19.6	- 0.2	-	-	14.0	-3.8^{oo}	10.7	0.3	30.3	- 5.8^{o}
12.Fleuret OR	33.2	- 1.6	23.8	4.0	64.0	- 6.4	18.0	0.2	10.6	0.2	34.0	- 2.1
13.Arena	36.6	1.8	16.0	- 3.8	66.5	- 3.9	18.9	1.1	8.9	-1.5	35.2	- 0.9
14.Melody	33.1	- 1.7	18.3	- 1.5	77.0	6.6	17.6	-0.2	10.6	0.2	35.8	- 0.3
15.NK Armoni	34.2	- 0.6	15.7	- 4.1	58.8	- 11.6	19.0	1.2	8.5	-1.9	29.2	- 6.9^{oo}
16.Alexandra	31.0	- 3.8	17.8	- 2.0	51.9	- 18.5^{o}	16.5	-1.3	9.7	-0.7	30.2	- 5.9^{o}
17.NK Dolbi	37.4	2.6	22.7	2.9	62.4	- 8.0	20.2	2.4	12.7	2.3	32.9	- 3.2
18.NK Ferti	36.9	2.1	22.2	2.4	61.0	- 9.4	19.1	1.3	11.9	1.5	34.7	- 1.4
19.Opera PR	33.7	- 1.1	13.1	- 6.7	68.1	- 2.3	16.7	-1.1	7.6	-2.8	32.2	- 3.9
20.Sanay	37.7	2.9	19.7	- 0.1	63.5	- 6.9	15.8	-2.0	11.8	1.4	36.7	0.6
21.Rocky	-	-	21.0	1.2	64.5	- 5.9	-	-	11.6	1.2	34.8	- 1.3
22.Delfi	-	-	-	-	87.8	17.4	-	-	-	-	39.9	3.8
23.Brio	-	-	-	-	84.1	13.7	-	-	-	-	45.7	9.6***
24.Rumbasol	-	-	-	-	87.7	17.3	-	-	-	-	40.2	4.1
Average	***34.8***	-	***19.8***	-	***70.4***	-	***17.8***	-	***10.4***	-	***36.1***	-

CONCLUSIONS

1. The less favourable climatic conditions from the years 2006 and 2007 affected the yield components and the seed yield, especially in the year 2007

which can be characterised as a very drought year. Good values for the yield components and seed yield were obtained in 2008.

2. In the three experimental years, the number of seeds on sunflower head varied from 588 (Fleuret OR hybrid in 2007) to 1633 (Saxo hybrid in 2008).
3. In the three experimental years, the weight of thousand seeds (MMB) varied from 19.7 g (NK Armoni hybrid, in 2007) to 65.6 g (Lindor hybrid, in 2008).
4. A good value of the weight of thousand seeds (MMB) is associated with a small value of the number of seeds on sunflower head and vice-versa.
5. In the three experimental years, the weight of seeds per head varied from 13.1 g (Opera PR hybrid, in 2007) to 87.8 g (Fly and Delfi hybrids, in 2008).
6. For a high weight of seed per head, it is necessary to have good values both for the number of seeds on sunflower head and the weight of thousand seeds.
7. In the three experimental years, the seed yield varied from 7.6 q/ha (Kasol and Opera PR hybrids, in 2007) to 45.7 q/ha (Brio hybrid, in 2008).
8. In average for the three experimental years, the sunflower hybrids with the highest seed yield were Saxo, Fly and Lindor, while the hybrids with the smallest seed yield were Rigasol OR, Alexandra and Opera PR.
9. Mateol hybrid produced the highest seed yield in 2007 (13.8 q/ha), which shows the drought resistance of this hybrid.

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