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BASIC CHARACTERISTICS OF NEWLY DEVELOPED YUGOSLAV SUNFLOWER HYBRIDS AND VARIETIES

The potential of sunflower fertility is much higher than the actual yields. The most important role in the yield decreases in Yugoslavia is played by diseases. In order to secure high and stable yields, the work has started on the development of sunflower hybrids with wider ecological adaptability, high seed and oil yields, and disease resistance.

A new stage in sunflower growing was the development of hybrids and their introduction into large-scale production. Hybrids have numerous advantages over varietal populations. The most important one is the heterosis effect and an easier acquirement of disease resistance. An immediate application of the heterosis effect into large-scale production is presently prevented by the lack of the genetic sources of resistance towards diseases. The determination of the resistance sources in wild sunflower forms is among the primary objectives in sunflower breeding.

In 1975, newly developed Yugoslav sunflower hybrids were examined in all sunflower-growing regions of the country for the first time. The experimental network included 11 small-plot trials and 14 large-plot trials. They were performed in different agroecological conditions. The Soviet varieties VNIIMK 8931 and Peredovik and the Romanian hybrids RO-52 and RO-53 were also included into the tests.

The obtained results indicate that certain hybrids (not always the same ones) had, in different localities, higher seed yields than the standard varieties VNIIMK 8931 and Peredovik. In some localities, the seed yields of these hybrids were

significantly higher than the yields of the varieties presently grown on a large scale production (Table 1). The best results were obtained with the hybrid NS-H-65-RM. It is unfortunate that this hybrid was not examined in all experimental plots due to a limited quantity of seed material. The average seed yield of this hybrid was higher by 8-9 c/ha than the yields of the presently grown varieties. It was resistant to downy mildew (*Plasmopara helianthi*) and white rot (*Sclerotinia libertiana*). Although its oil content in seed was somewhat lower than the contents of the standard varieties (Table 2), the total oil yield was high (Table 3).

The hybrid NS-H-67-RM had significantly higher seed yields than the standard varieties and other hybrids in three plots. It was genetically resistant to downy mildew and tolerant to white rot. In spite of a lower oil content in seed (Table 2), it had the highest oil yield per area unit (Table 3).

The hybrid NS-H-25-RM had high seed yields on two plots. As this hybrid was examined only on three plots, reliable information about this hybrid cannot be given.

The research in 1975 indicated that the hybrids NS-H-62-RM and NS-H-63-RM were susceptible to white rot (*Sclerotinia libertiana*), being infected through medium leaves and stem. As this type of infection is only characteristic for extremely rainy years, such as 1975, one-year results are not sufficient to make conclusion as to the value of these hybrids. It was obvious that they were genetically resistant to downy mildew and more tolerant than other hybrids to the leaf spot diseases. They also had high genetic potentials for oil content in seed (Table 2). These hybrids may be introduced into certain regions in which the soils are not heavily infected by the agents of white rot. The analyses of parental pairs of these hybrids, performed in 1975, showed that there were sub-lines with a higher degree of tolerance to white rot within

Table 1

Seed Yield in Large-Plot Trials in 1975 (c/ha)

No.	Hybrid* (variety)	Locality										Rank	
		Pančevo	Kikin- da	Novi Bečej (Soko- lac)	Bečej	Sombor (A. San- tic)	Stara Pazo- va	Župan- ja	Zaje- car	Lesko- vac	Rugo- vica (Zag- reb)		\bar{x}
1.	VNIIMK 893)	14.07	25.67	9.54	26.81	24.14	28.70	17.67	13.84	27.97	24.58	21.29	8
2.	(check)	18.63	11.56	14.61	-	23.63	23.70	27.25	12.54	22.76	24.24	19.88	9
3.	Peredovik	13.38	24.60	16.87	27.86	12.84	23.40	25.50	19.31	26.28	26.19	21.62	6
4.	RO-53	12.28	29.35	15.61	25.03	20.66	25.00	19.00	14.79	28.79	24.27	21.47	7
5.	NS-H-62-RM	26.55	20.89	13.08	-	19.26	28.70	20.62	21.18	28.40	22.76	22.38	5
6.	NS-H-63-RM	28.49	16.13	7.95	27.23	21.30	26.00	26.25	20.56	31.04	19.47	22.44	4
7.	NS-H-65-RM	-	-	-	32.73	27.28	29.00	-	28.93	28.96	34.11	30.16	1
8.	NS-H-67-RM	18.12	35.18	31.26	-	25.42	27.00	44.20	-	-	25.27	29.49	2
9.	NS-H-25-RM	25.97	-	-	32.14	25.31	-	-	-	-	-	27.80	3

Table 2

Oil Content in Seed in Large-Plot Trials in 1975 (%)

No.	Hybrid (variety)	Locality							Rank			
		Pančevo Kikinda	Novi Bečej (Soko- lac)	Bečej	Sombor (A. Šan- tić)	Stara Pazova	Župan- ja	Zaje- čar		Leskovac	\bar{x}	
1.	VNIIMK 8931 (check)	48.32	49.53	46.04	48.15	48.70	48.29	50.67	53.06	51.87	49.40	3
2.	Peredovik	48.60	48.18	46.83	-	47.64	48.86	-	51.49	51.91	49.07	4
3.	RO-52	44.26	45.41	45.24	46.20	45.36	46.46	47.28	49.28	49.44	46.54	6
4.	RO-53	45.60	47.37	45.31	48.48	46.21	47.49	50.14	50.19	50.57	47.92	5
5.	NS-H-62-RM	50.00	49.42	45.44	-	48.24	51.63	50.37	52.98	52.93	50.12	1
6.	NS-H-63-RM	50.80	47.87	48.05	50.39	48.60	47.38	-	52.44	50.48	49.50	2
7.	NS-H-65-RM	-	-	-	44.72	43.44	47.59	-	46.06	47.81	45.92	8
8.	NS-H-67-RM	45.27	45.73	45.57	-	45.12	47.68	48.64	-	-	46.33	7
9.	NS-H-25-RM	45.90	-	-	45.86	44.03	-	-	-	-	45.26	9

Table 3

Oil Yield in Large-Plot Trials in 1975 (kg/ha)

No.	Hybrid (variety)	Locality						Rank				
		Pančevo	Kikinda	Novi Bečej (Soko- jac)	Bečej	Sombor (A. San- tić)	Stara Pazova		Župan- ja	Zaje- čar	Lesko- vac	Σ
1.	VNIMK 8931 (check)	591	1106	382	1123	1022	1205	778	638	1262	900	6
2.	Peredovik	787	484	595	-	979	1007	-	561	1027	777	9
3.	RO-52	515	971	663	1119	506	945	1048	827	1130	858	8
4.	RO-53	487	1209	615	1055	830	1032	828	645	1266	885	7
5.	NS-H-62-RM	1154	898	517	-	808	1289	903	976	1307	981	5
6.	NS-H-63-RM	1259	671	832	1193	900	1071	-	938	1363	1028	4
7.	NS-H-65-RM	-	-	-	1273	1030	1200	-	1159	1204	1173	2
8.	NS-H-67-RM	713	1398	1239	-	997	1120	1870	-	-	1222	1
9.	NS-H-25-RM	1037	-	-	1282	969	-	-	-	-	1096	3

Table 4

Breeding Characters of Some New High - Oil Sunflower
O.P. Varieties

No.	Variety or hybrid	Seed yield c/ha			% of oil in absol. dry seed			Oil yield kg/ha					
		1973	1974	1975	\bar{x}	1973	1974	1975	\bar{x}	1973	1974	1975	\bar{x}
1.	Peredovik	42.32	30.63	32.91	35.29	48.54	48.83	48.34	48.57	1782	1299	1386	1489
2.	NS-P-20	42.54	30.18	32.09	34.94	50.26	50.48	50.00	50.25	1859	1325	1394	1526
3.	NS-P-61	43.63	30.18	31.30	35.04	50.19	49.26	47.68	49.04	1903	1292	1299	1498
4.	PO-52	38.99	29.11	28.20	32.10	48.60	46.89	46.00	47.16	1648	1190	1130	1323

their paternal lines. These results indicate the possibility of improvement of these two hybrids regarding their resistance to *Sclerotinia libertiana*.

Larger quantities of seed of the above five hybrids will be produced in 1976 in order to introduce them into large-scale production in 1977.

The small-plot trials rendered the results similar to those obtained in the large-plot trials. Our extended FAO trial may be used as an illustration. In this trial too, the hybrids NS-H-67-RM and NS-H-65-RM had the best results. Of the foreign hybrids, the Romanian hybrid HT-50-CRM, American 891, and French Relax had also good results.

After a large-scale research in 1976, it may be expected that the hybrids will entirely replace the presently grown varieties in two years.

The work on domestic high-oil varietal populations resulted in the development of NS-P-20 and NS-P-61 varieties which are presently in the final phases of the approval by the Federal Varietal Commission. These varieties were developed by the method of the Academician Pustovoi and originate from the Soviet breeding material. The chief characteristics of these varieties are given in Table 4 and compared with the standard variety Peredovik. Three-year small-plot trials were conducted from 1973 to 1975, in different agroecological conditions of Yugoslavia. The research years differed regarding the climatic conditions. It can be said that 1973 was favourable for sunflower production and the diseases could not develop. It was not the case with 1974 and 1975 which had precipitation levels much above the long-term average. The results indicate that the varieties NS-P-20 and NS-P-61 were superior in relation to the standard variety regarding the oil content in seed and oil yield per ha, particularly in the first research year when the increases of oil yields in NS-P-20 and NS-P-61 were 7% and 4%, respectively.

A particular advantage of NS-P-20 was the vegetation period, which was five days shorter than that of the variety Peredovik. These varieties showed certain tolerance to *Sclerotium bataticola*, particularly NS-P-61. If they are approved by the Commission they will be grown in a transitional phase until new hybrids are introduced into large-scale production in the regions of the country in which the sunflower has been grown on small areas that are still not infected by diseases.