A. Covor, A. Vrânceanu,
Romania

TESTING OF ROMANIAN SUNFLOWER HYBRIDS IN INTERNATIONAL TRIALS

The extensive sunflower breeding programme carried on at the Research Institute for Cereals and Industrial Crops at Fundulea in the last 15 years allowed to obtain the first commercial sunflower hybrids with remarkable yielding capacity and high oil content. These hybrids were included into the national testing network in 1968. In 1971 the single hybrids Romsun 52 and Romsun 53, which now cover some 40% of the total sunflower area in Romania, were commercialized.

Many other single and three-way hybrids were studied in 1975. They belong to different maturity groups and display some new features, e.g. resistance to downy mildew (Plasmopara helianthi). Most of them were produced on the basis of cytoplasmic male sterility and pollen fertility restoration. The first hybrid of this type, of Sorem 80 resistant to downy mildew, was commercialized in 1975.

Romanian sunflower hybrids were also tested in other countries interested in boosting sunflower production.

The first series of hybrids tested abroad between 1970 and 1973 included hybrids obtained on the nuclear male sterility basis, known under the commercial denomination of Romsun. Among them, Romsun 52 was the first hybrid tested and traded abroad, particularly in the USA and Italy.

The second series of hybrids, tested in the period of 1974-1975, was made up of single and three-way hybrids produced on the basis of cytoplasmic male sterility and pollen fertility restoration. Some of these hybrids, e.g. Sorem 80, contain the gene Pl_1 which

is responsible for resistance to the European race of downy mildew. Other hybrids, e.g. HT 60 CRM, possess an additional gene Pl_2 known to effect resistance to the American race "Red River".

In terms of the vegetation period, most hybrids are medium late, being similar in this respect to the open pollinated varieties widely used on production. To this category belong: Romsun 52, Romsun 53, Romsun 59, Romsun 301, Romsun 62 RM, HS 80 CRM (Sorem 80), HS 82 CRM, HT 50 CRM, HT 60 CRM. Among the hybrids with a shorter vegetation period, having at the same time a more reduced height of the plants, the following early and medium early hybrids were included in trials: Romsun 18, Romsun 19, Romsun 20, Romsun 21, Romsun 42 RM, Romsun 90.

All hybrids are characterized by high oil content in the seeds and low husk percentage.

The hybrid trials were carried out both by seed companies and firms interested in trading sunflower hybrids and by some universities and institutes or research stations, using the common experimental technique. In most cases experimental plots had 40-80 harvested plants each and the number of replications was three or four.

The open pollinated variety Peredovik was used as check, due to its large extention in all zones of sunflower cultivation.

In the United States of America, where sunflower is becoming more and more popular, the Romanian hybrids Romsun 52 and Romsun 53 were tested both in the northern states Minnesota and North Dakota and in Texas and California in 1970-1972. Romsun 52 gave the best results in Minnesota and North Dakota, while in California and Texas the greatest yields were obtained from the single hybrid Romsun 53. The yield gains of these varieties

are generally very high in comparison with the open pollinated variety Peredovik and absolute yields range from 1600 to 4020 kg/ha. The rather low yields of Peredovik (1580-2950 kg/ha) could be explained in part by lack of improved seed production abroad in the case of this cultivar.

Among the second series of hybrids produced on the CMS basis the first place was occupied by the single hybrids HS 80 CRM (Sorem 80) and HS 82 CRM, which surpassed Romsun 52 and Romsun 53 in seed yield and oil content both at Stanton-Minnesota and at Casselton-North Dakota.

Their seed yield was 2,170 kg/ha, 2,105 kg/ha - 1,610 kg/ha and 1,600 kg/ha, respectively in Stanton and oil content 50.0%, 49.5 - 49.0 and 47.7%. In Casselton the seed yield of the 80 SRM hybrid was also over 2,585 kg/ha and that of Romsun 53-2,290 kg/ha, with the oil content being 44.3% and 43.5%, respectively.

The first Romanian sunflower hybrids were tested in France in 1970-1972 by the Interprofessional Technical Center of the Metropolitan Oil Crops (CETIOM) in a large research network. The single hybrid Romsun 52 gave average yield gains of 7-16%, proving to be very constant in all the experimentation years. Under soil-climatic conditions of France, the Romsun 52 and Romsun 53 hybrids accumulated large quantities of oil in the seeds: 54.7 and 56.3%, respectively, in 1970. Among the new hybrids developed on the basis of nuclear male sterility, Romsun 59 was the most remarkable at Clermont-Ferrand, and among the hybrids obtained on the CMS basis and resistant to downy mildew - Sorem 80, which yielded more than 3,000 kg/ha in the two experimental years (see Table).

In Spain the best results have been obtained under irrigated conditions. The HS 82 CRM hybrid gave a seed yield of 3,525 kg/ha

Table

Romanian Hybrid Trial, Clermont-Ferrand, France (Data supplied by dr. P. Leclercq, INRA-Clermont-Ferrand)

Hybrid or variety	1974		1975		
	Seed yield		Seed yield		% oil
	kg/ha	%	kg/ha	%	
HS 80 CRM (Sorem 80)	3030	110	3090	124	50.4
HS 82 CRM	-	-	3060	123	50.3
HT 50 CRM	2920	106	3040	122	50.8
Romsun 53	3030	110	2990	120	52.2
Romsun 59	3470	126	2615	105	50.0
HT 60 CRM	-	-	2565	103	48.8

Table (continued)

1	2	3	4	5	6
Romsun	52	3210	116	2540	102	50.7
Check[1]					

1) Check 1974 - Peredovik,
1975 - average of Issanka + Remil + INRA 7702 + Peredovik.

at Finca El Torbiscal in 1975, overyielding Peredovik with 87%. In dry zones, without irrigation both hybrids and the variety Peredovik gave low seed yields. The only satisfactory results were obtained with the early hybrids. Thus, Romsun 20 surpassed the check variety by 10-33%, as regards the seed yield and by 6-26% for oil yield. The same hybrid ranked the first at Cordoba too, in dry land trials, with an absolute yield of 1,712 kg/ha as compared to 1,325 kg/ha of Peredovik. It is conspicuous the oil content, was generally low both under irrigation and rainfed conditions in Spain.

Romanian sunflower hybrids have been studied in many other countries and showed high productivity. Preliminary results show a larger adaptability of Romsun 53, Romsun 52, Sorem 80 and HS 82 CRM, especially in the favourable regions for this crop.

Hybrid trials have been carried out in different soil-climatic conditions to identify the optimal hybrid with adequate photo-periodical and physiological reaction, capable of using the local conditions to the best advantage. The great variation of seed yield and oil content of the same hybrid in different zones necessitates a large-scale experimentation of sunflower hybrids in micro-trials, preferably starting from the preliminary phase of testing the combining ability of the inbreds. In dry regions, with a low frequency of pollinator insects during flowering, highly selfcomatible hybrids are needed for a good seed set of the heads.

International trials have permited a wide-scale evaluation of Romanian sunflower hybrids for their response to the main deseases in different zones. These hybrids presented a very good resistance to rust (Puccinia helianthi), wilt (Verticillium sp.), rot (Sclerotinia sclerotiorum, Botrytis cinerea) and broom rape

(Orobanche sp.). The resistance of the RM Romanian hybrids to the European downy mildew race was demonstrated in France, Yugoslavia, Bulgaria and Spain.

Beginning from 1977, a new group of Romanian hybrids will be included in international trials. These hybrids are obtained on the CMS basis, and have a large resistance spectre to downy mildew, containing Pl_1 gene in the mother form and Pl_2 or other Pl genes in the father genotype. It is espectable that the new single and three-way hybrids have a larger genetic background and superior productivity. Their response to different soil-climatic conditions will be more constant due to their better adaptability and plasticity.

Conclusions

Romsun 52 and Romsun 53 are the first commercial sunflower hybrids that have proved to be of a sufficient productivity to induce farmers from many countries to cultivate them instead of open pollinated varieties. The large breeding programme at the Institute for Cereals and Industrial Crops (Fundulea) made it possible to obtain a new type of hybrids resistant to downy mildew and produced on the CMS basis. The first hybrid from this group is known under the name of Sorem 80.

At present, seed production is performed for a great number of new hybrids, with a large downy mildew resistance spectre and integrating with different groups of maturity. These new hybrids will be available for the experimental trials starting from 1977.