

# INTERNATIONAL TRIALS WITH SUNFLOWER HYBRIDS (THE SIXTH CYCLE 1986—1987)

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## INTRODUCTION

The subnetwork on the experimentation of sunflower hybrid cultivars in international trials - one of the four subnetworks of the F.A.O. Research Network on Sunflower - has already completed the sixth biennial cycle, 1986—1987. The results of the previous five cycles were published in the numbers 1/1978, 2/1979, 3/1980, 5/1982, 7/1984 and 9/1986 of this Bulletin.

The experimental works of the sixth international cycle were conducted by 28 governmental research institutions from 21 countries, which cover almost the entire world sunflower area. The names of the participants who provided the scientific results presented in this paper are listed in Annex 1.

## MATERIALS AND METHODS

The thirty sunflower hybrid cultivars (Annex 2) tested under various ecological conditions originated from Australia, Bulgaria, Federal Republic of Germany, Hungary, Romania, Spain, Turkey and U.S.A. and represented the most recent achievements of sunflower breeders from these countries. All but one three-way hybrid were single crosses. The hybrids Dobritch, Izgrev, GT-788, GT-832 and 160/83 were not tested in both years and all localities due to the delay in shipping the seed samples by the respective supplying centres. The experimental design was the complete randomized blocks with 5 replications.

The plot size was established so that after discarding two marginal rows and frontal plants in each row, a minimum number of 80 plants per plot be harvested. The cultural practices were adapted to the local conditions. The plant population ranged from 40 to 55 thousand plants per hectare, with the inferior limit under dryland conditions and higher levels under irrigation. Most of trials were conducted in dry land.

The experimental results were statistically interpreted using the variance analysis both for seed yield and oil content. The average hybrid differences were checked by Duncan's test.

The reaction to diseases and adverse environmental conditions was estimated only in the field. The response to broomrape attack (*Orobanche cumana* Wallr.) was evaluated additionally by controlled inoculations only at Fundulea, Romania.

## RESULTS AND DISCUSSION

The results obtained in the sixth biennial trial outlined a similitude of the climatic conditions in 1986 and 1987, excepting Austria and the Federal Republic of Germany, as well as a large diversity of the response of sunflower genotypes to the environmental variations. In spite of this however, certain sunflower hybrids showed a relatively good adaptation to the most localities, in both years.

The mean seed yield of the whole set of hybrids ranged within quite large limits, from 12.4 q/ha at Elvas, Portugal, in 1986 to 39.2 q/ha at Fundulea, Romania, in the same year (Table 1). Satisfactory results, with yield values over 30 q/ha, were recorded in Bulgaria, Czechoslovakia, France and Romania in both years. High yields were also obtained in the Federal Republic of Germany, Italy and Cyprus in 1986, and in Austria, Hungary and Yugoslavia in 1987.

Judging from the general seed yield means, a number of 15 hybrids were statistically similar, yielding from 26.2 to 29.7 q/ha. The highest mean yield in this group was produced by RO-66. However, certain hybrids performed quite well in some localities and years, showing thus a good environmental adaptability, as for instance RO-66 (at Fundulea, Podu-Iloaie, Szeged, Bicsérd, Ruzyné, Morocambos), Multi-best 1 (at Fundulea, Podu-Iloaie, Bicsérd,

General Toshevo, Gross-Gerau), IBH-166 (at Fundulea, Podu-Iloaie, Novi Sad, General Toshevo, Ruzyné, Gross-Gerau, Morocambos), Barbara (at Fundulea, Podu-Iloaie, Gross-Gerau, Sindos).

Oil content in dried seeds also varied greatly from location to location and from year to year, ranging from 36.7% at Awasa, Ethiopia, to 52.5% at Novi Sad, Yugoslavia (Table 2). The average oil content determined over years and locations for each hybrid under testing pointed out the large genetic variability of this trait which ranged from the lowest 43.6% (Cargill 208) to the highest 49.7% (Dahlgren 730).

In comparison with the previous testing cycles, the genetic progress recorded in respect of the oil content was quite modest, so that only a small number of hybrids, under certain environmental conditions, surpassed the level of 55%, as Dahlgren 730 (at Podu-Iloaie, Novi Sad and Morocambos in 1986), Monroe 45 (at Novi Sad and Morocambos, in 1988), Florida 2000 (in France and at Morocambos, in 1986), 136/83 (at Morocambos, in 1986), RO-66 (at Novi Sad and Morocambos, in 1986), NS-H-90 (at Ruzyné and in France, in 1987), Blumix (at Novi Sad, 1986), Seed Tec 316 (at Morocambos, 1986), Barbara (at Novi Sad, 1986). The general mean of the first five hybrids was comprised in the same group of values, between 49.7-47.9%, statistically differentiated from the other 20 hybrids.

The husk content varied within quite large limits (20 - 25%) suggesting that this variability could be further exploited by breeders with the purpose of raising the oil content in sunflower achenes.

Table 3 presents the main morpho-physiological traits of sunflower hybrids tested in international trials.

With respect to the growing period and plant height, the majority of hybrids were medium-late to late and medium-tall to tall. The large variation of the growing period and plant height suggests the influence of photoperiod and thermoperiod on some genotypes. It is worthy of mention that, although tall, most of hybrids exhibited a good resistance to lodging (136/83, Multibest 1, RO-158, NS-H-90), due to their deep and strongly branched root system.

As for the other morpho-physiological traits—head diameter, volumetric weight, 1000 seed weight—the variation limits displayed normal values.

The self-fertility degree was determined in two localities: Fundulea and Novi Sad. From this standpoint, there were very marked differences from one locality to the other and from year to year, suggesting a strong interaction between

self-fertility and environment. Nevertheless, the great differences between the self-fertility degree registered at Fundulea and Novi Sad could be attributed not only to different climatic conditions, but also to different procedures used for determining self-fertility, as for instance the type of bags used to prevent cross-pollination. For a more reliable identification of sunflower high self-fertile hybrids, it appears necessary to increase the number of localities for self-fertility testing as well as the utilization of the same type of bags and same methodology of determination.

The host reaction to the attack of the main sunflower pathogens is shown in Table 4. The best behaviour towards the root attack of *Sclerotinia sclerotiorum*, both under natural and artificial inoculation, exhibited the hybrid NS-H-87. Concerning the stem and head attack of this fungus, the most hybrids behaved as moderately susceptible. A more accentuated susceptibility exhibited GT-788, Izgrev and Heliandalus (head attack).

A few hybrids showed a better reaction to the attack of other important pathogens: *Phomopsis helianthi* (NS-H-86, NS-H-87), *Phoma* ssp. (Izgrev), *Botrytis cinerea* (RO-15, NS-H-87, Blumix, RO-158, RO-66), *Puccinia helianthi* (Pacific 336, Pacific 354).

The resistance to the attack of the parasite *Orobanche cumana* was tested under natural infestation conditions at Edirne and under controlled conditions at Fundulea, using a blend of broomrape seeds collected from Edirne, Turkey and from different regions of Romania. The results of this examination outlined the good behaviour of the hybrid Multibest 1 in both types of infestation and the hybrid Türk-Ay-1 under natural infestation conditions (Table 5).

## CONCLUSIONS

A great variation with respect to the environmental adaptability, genetic yield potential and oil content was registered in the sixth biennial cycle of international trials with sunflower hybrids. An important group of hybrids exhibited a satisfactory stability over a multitude of locations in both experimental, while certain hybrids were better differentiated only within limited areas. A significant genetic progress has been achieved in improving sunflower hybrids for resistance to diseases, with special mention for stem canker incited by *Phomopsis helianthi* and rust (*Puccinia helianthi*).

Seed yield (q/ha, 0 % moisture)

Cultivars	Romania		Hungary		Yugoslavia		Bulgaria		Austria		Czechoslovakia		Germany F. R.		France		Spain		Portugal		Italy		Greece		Cyprus		Turkey		Egypt		Ethiopia		U.S.A.		Mexico		Argentina		Chile		Philippines		Mean q/ha	Grouping*								
	Fundulea		Szeged		Bicsérd		Iregszemcse		Novi Sad		General Toshevo		Fuchsenbigl		Ruzynke		Grossa-Gerau		CETIOM		Cárdoba		Elvas		Osimo		Sindos		Morocambos		Edirne		Sakha		Nu-barta		Awasa		Fargo		Ciango				Pergamino		Mira-mar		La Platina		Nueva Ecija	
	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987			1986	1987	1986	1987				
RO - 66	44.9	34.1	42.0	38.0	35.0	40.8	40.2	33.7	26.8	41.2	33.5	32.1	19.6	41.1	40.1	40.4	37.6	16.4	—	44.9	36.7	12.6	16.3	11.5	16.5	31.1	26.3	31.4	22.9	37.4	31.5	26.0	22.3	—	14.3	—	23.1	27.4	33.8	27.1	22.1	23.9	16.4	27.7	26.0	—	29.7	A				
RO - 109	42.0	36.3	40.8	39.6	—	41.8	38.4	29.7	23.7	40.6	36.7	31.6	11.0	—	34.0	33.6	37.4	15.6	—	42.2	41.0	11.6	17.8	16.3	24.5	32.9	31.0	26.8	25.0	27.8	30.0	23.7	20.0	—	15.2	—	22.7	29.4	30.3	18.9	19.5	24.7	17.6	31.2	27.9	—	28.6	A B				
Multibest 1	43.7	34.9	35.3	38.6	32.4	37.8	37.7	33.1	26.9	38.9	36.1	32.6	16.5	40.9	34.3	36.2	40.7	23.1	33.6	42.2	28.7	13.6	13.0	11.9	17.6	34.5	28.4	32.6	21.3	38.4	29.3	25.0	18.0	20.2	13.0	—	—	31.4	28.7	21.7	—	17.6	23.4	26.9	—	28.5	A B					
Blumix	41.6	36.5	34.9	37.2	26.9	34.9	40.5	32.3	26.1	38.9	36.9	31.3	20.0	42.7	37.1	36.2	38.4	21.0	—	38.3	38.4	15.7	12.4	13.3	19.7	32.7	27.8	34.9	22.9	33.1	26.6	24.6	17.9	20.0	12.4	—	—	30.6	28.1	19.7	—	19.2	25.0	—	16.1	28.2	A B C					
IBH - 166	41.5	36.8	32.9	38.3	33.2	29.9	32.8	28.5	24.8	37.1	36.7	31.6	16.0	42.0	40.9	31.9	37.6	20.8	32.6	39.5	36.7	15.6	15.7	12.3	19.7	33.8	29.9	26.9	24.9	28.0	30.8	22.1	18.7	27.9	15.7	—	—	29.3	26.1	16.4	27.9	18.4	29.4	30.7	—	28.1	A B C					
RO - 158	41.0	37.5	36.3	36.8	18.7	42.2	36.8	20.0	21.9	34.6	37.6	31.8	17.9	31.8	28.5	28.1	41.2	22.5	—	31.3	37.7	12.9	15.8	17.4	22.3	32.8	29.2	33.7	22.8	33.7	29.0	23.8	23.0	—	15.8	—	18.1	19.5	19.6	25.6	23.1	26.3	26.8	—	27.6	A B C						
Multibest 2	44.0	37.1	35.0	38.5	28.6	30.8	36.9	34.9	29.7	36.3	35.6	31.6	14.9	33.6	31.4	34.7	42.0	12.8	—	37.0	36.1	13.9	17.0	17.1	19.2	32.5	25.2	26.9	27.6	31.9	28.0	24.2	18.8	21.2	17.0	—	—	28.6	25.4	16.2	—	20.6	24.2	24.5	—	27.5	A B C					
Barbara	40.4	34.4	33.2	39.4	26.9	36.4	33.1	28.4	26.4	29.1	33.7	30.2	16.0	37.5	34.5	35.6	43.5	16.1	37.5	39.4	32.2	14.7	16.8	12.2	17.1	33.4	27.4	35.9	20.5	31.2	29.2	24.9	18.6	14.7	16.8	—	—	28.8	26.9	23.6	27.7	18.5	22.3	24.9	—	27.4	A B C					
Pacific 354	37.4	36.4	31.9	38.9	31.1	42.9	31.6	24.8	22.9	30.1	30.1	27.9	18.4	37.9	32.7	—	34.4	11.8	—	43.9	29.5	13.8	10.5	5.8	16.5	35.4	26.7	29.5	19.8	35.7	29.8	23.9	18.2	19.0	10.5	—	—	30.5	30.9	—	27.2	21.9	—	19.4	27.0	—	27.0	A B C				
RO - 33	37.4	34.4	37.5	35.9	28.4	32.4	31.1	34.5	26.3	34.5	27.1	31.3	14.6	31.5	31.2	29.9	41.0	21.6	27.4	35.1	36.4	11.8	17.2	13.5	17.8	32.2	27.6	30.0	21.8	32.7	25.2	23.9	22.0	—	15.1	—	20.6	23.6	26.6	27.4	19.5	22.1	16.8	24.9	24.1	—	26.6	A B C				
3340/81	39.0	34.6	31.5	40.8	9.0	33.9	30.8	27.6	20.6	37.7	32.9	30.5	21.4	35.9	33.1	29.2	46.1	20.1	—	25.0	38.6	13.2	12.3	18.9	17.2	34.6	26.8	29.7	20.6	32.8	26.6	23.6	16.3	23.7	12.3	—	—	25.6	24.6	28.4	18.9	24.7	—	25.7	25.7	—	26.6	A B C				
Cargill 208	39.5	36.5	35.2	36.3	30.3	36.1	33.6	27.2	25.5	28.9	35.9	30.8	16.8	—	26.6	—	37.4	9.5	—	34.9	—	16.8	14.3	12.0	—	—	27.2	35.9	—	34.4	24.6	23.5	18.8	16.0	14.3	—	—	21.8	26.0	30.1	29.5	20.0	—	15.2	23.6	—	21.1	26.3	A B C			
RO - 15	38.4	35.6	39.2	38.2	28.6	37.5	32.0	27.5	23.6	29.4	35.2	31.1	13.5	30.7	32.7	28.6	46.0	13.3	26.8	29.9	35.2	13.1	16.3	16.2	22.3	35.4	26.1	32.4	22.3	32.0	21.7	24.4	18.6	—	0.7	—	17.3	26.4	24.3	24.2	19.9	25.3	19.8	20.2	18.8	—	26.3	A B C				
NS-H-90	33.9	37.4	30.9	39.4	26.0	37.2	32.4	25.2	21.3	31.6	36.4	28.6	11.8	—	23.3	36.6	38.9	22.0	—	40.1	29.2	10.0	14.1	7.1	16.1	35.9	30.5	19.0	21.6	28.0	31.2	21.5	18.5	—	14.1	—	17.9	23.8	26.7	27.6	19.2	26.4	16.7	—	15.8	26.2	A B C					
Türk-Ay-1	39.8	30.9	32.9	34.5	25.8	32.0	35.2	31.0	26.0	34.4	33.2	29.3	14.8	36.7	35.0	33.9	39.4	17.0	—	35.8	28.1	12.4	14.8	17.9	21.4	32.5	20.2	29.7	24.9	—	—	24.3	16.9	19.8	14.8	—	—	17.3	23.4	30.8	21.8	17.5	23.5	—	25.6	26.5	—	18.8	26.2	A B C		
Dahlgren 730	39.9	33.5	35.3	38.8	24.1	37.5	32.8	27.1	21.0	34.9	36.9	28.3	15.6	—	26.7	—	31.8	12.0	—	—	—	14.2	12.3	16.8	—	—	24.7	34.3	—	37.5	26.9	26.6	18.2	21.4	12.3	—	—	18.2	25.3	28.7	29.1	20.6	—	18.9	25.5	—	15.9	26.0	B C			
NS-H-91	41.6	35.2	31.3	37.4	22.8	38.0	30.9	27.4	25.2	38.4	34.7	32.1	16.0	27.9	31.4	28.8	39.6	16.2	—	32.2	26.8	13.2	17.9	13.0	19.1	29.5	21.2	25.6	18.3	31.4	22.6	21.7	16.8	—	17.9	—	15.2	23.9	28.8	25.3	16.9	24.7	18.5	—	17.1	25.9	—	17.1	B C			
Florida 2 000	36.7	33.9	30.1	35.9	—	—	—	32.0	23.7	19.9	28.3	35.4	27.7	14.6	37.4	33.1	39.7	11.7	—	—	24.4	33.3	13.5	17.1	17.9	19.7	33.1	28.2	26.3	23.2	28.7	27.3	19.8	27.6	—	17.1	—	18.1	20.6	23.8	25.6	23.1	22.3	21.6	17.8	27.4	29.1	—	25.8	B C		
Monroe 45	41.5	30.0	35.9	32.6	—	38.4	37.5	16.9	21.6	36.1	35.1	30.8	11.5	35.9	30.8	24.3	41.4	12.4	34.7	39.4	24.3	14.6	15.4	5.0	16.9	35.3	23.7	18.9	22.8	31.6	26.9	25.9	19.9	16.5	15.4	—	—	15.1	19.5	24.4	31.3	27.5	21.0	25.8	13.8	26.3	29.1	—	25.8	B C		
Helindalus	35.7	37.1	32.8	34.0	22.7	34.8	26.7	10.6	17.3	26.0	31.7	25.6	17.7	28.2	27.9	26.1	35.4	10.7	—	29.3	39.4	14.3	15.5	24.4	22.3	31.6	30.0	33.8	23.9	36.2	28.4	25.6	18.9	22.4	15.5	—	—	16.5	17.7	16.5	21.6	22.6	24.5	19.5	28.1	18.9	24.3	28.6	—	25.4	B C	
Seed Tec 316	36.4	33.3	32.4	37.7	24.9	35.1	31.4	22.8	21.9	28.1	35.1	26.7	16.3	—	31.6	—	39.7	15.5	27.4	—	—	14.4	11.5	9.3	—	—	26.1	34.4	—	31.1	28.9	23.9	18.8	19.7	11.5	—	—	17.8	19.8	27.9	31.4	29.6	19.1	—	19.6	21.4	—	18.8	25.4	B C D E		
NS-H-86	39.7	32.1	34.2	36.6	30.2	38.4	33.1	29.2	26.6	38.6	35.0	30.9	11.6	35.1	30.9	31.4	34.9	17.0	—	31.0	29.6	15.7	10.8	4.0	7.8	33.8	26.6	27.6	18.1	14.6	21.1	22.6	18.2	—	10.8	—	—	20.8	18.6	22.5	21.9	0.4	19.8	14.2	—	15.9	24.3	C D E				
Pacific 336	33.3	35.6	32.3	36.6	28.4	40.0	27.0	18.9	21.3	33.6	29.4	29.3	17.1	29.3	31.4	—	34.0	4.7	—	31.3	31.7	16.3	13.3	8.5	18.1	33.3	27.5	28.4	20.9	32.7	22.9	24.2	17.7	16.2	13.3	—	—	17.5	17.9	11.7	22.7	28.6	—	19.6	19.1	22.1	—	19.9	24.0	C D E		
NS-H-87	38.6	32.3	32.0	35.7	25.3	39.2	21.2	27.2	18.0	34.6	36.7	27.2	14.2	29.6	25.0	38.8	38.2	19.2	—	27.6	27.9	11.5	0.8	3.9	14.1	32.6	24.0	21.8	17.0	14.9	15.2	20.3	17.4	—	0.8	—	—	15.7	26.1	25.0	18.7	18.5	13.9	14.1	—	16.3	23.5	—	22.9	D E		
136/83	35.0	31.0	26.8	27.0	29.5	29.5	26.3	19.8	22.4	23.1	31.9	31.3	16.2	29.1	36.2	22.8	41.4	13.3	27.5	33.9	26.4	14.4	0.5	2.6	9.4	32.8	24.8	21.4	19.5	30.0	23.6	21.3	16.4	11.1	0.5	—	—	17.6	20.6	23.4	20.3	22.0	16.2	18.8	—	19.2	23.7	—	22.9	E		
MEAN	39.2	34.7	34.1	36.9	26.8	36.6	32.9	26.1	23.5	33.8	34.4	30.1	15.8	34.7	32.0	32.0	39.1	15.9	31.4	35.2	32.9	13.8	13.6	12.4	17.9	33.3	26.7	29.1	31.1	26.6	23.8	25.4	19.8	12.6	—	—	16.5	19.3	23.6	27.7	25.9	18.6	23.8	18.0	24.8	26.2	17.					

Oil content in dry matter (%)

Cultivar	Romania			Hungary			Yugoslavia		Bulgaria		Austria		Czechoslovakia		Germany		France		Spain		Italy		Greece		Cyprus		Turkey		Egypt		U.S.A.		Mexico		Argentina		Chile		Mean	Grouping*
	Fundulea 1986	Podu-Iloaie 1986	Podu-Iloaie 1987	Szeged 1986	Szeged 1987	Iregszemence 1987	Bic-seid 1987	Novi Sad 1986	Novi Sad 1987	General Toshevo 1986	General Toshevo 1987	Fuchsenbühl 1986	Fuchsenbühl 1987	Ruzyně 1986	Ruzyně 1987	Gross-Derau 1986	Gross-Derau 1987	CETIOM 1987 A	CETIOM 1987 B	Cordoba 1986	Cordoba 1987	Ostimo 1986	Ostimo 1987	Sindos 1986	Sindos 1987	Moro-zambos 1986	Moro-zambos 1987	Edirne 1986	Edirne 1987	Sakha 1986	Sakha 1987	Ethiopia 1986	Ethiopia 1987	Fargo 1986	Fargo 1987	Ciano 1986	Ciano 1987	Perito-mar 1986		
Dahlgren 730	54.3	54.4	55.0	54.7	53.6	53.2	47.9	50.7	56.6	51.4	51.1	44.6	42.6	—	52.6	46.5	—	46.5	49.8	—	49.3	—	55.5	45.3	51.2	42.5	38.6	50.2	52.5	37.8	—	45.3	56.4	—	49.7	A				
Montre 45	53.0	54.5	53.9	53.2	—	53.5	50.8	54.5	56.7	53.4	49.3	46.0	41.4	53.5	53.7	45.6	56.9	44.9	46.3	48.0	50.7	47.1	44.1	55.8	44.4	48.1	41.0	37.5	49.5	53.3	38.8	46.2	43.6	53.9	54.7	49.5	A B			
RO — 33	51.9	54.9	55.5	54.7	51.4	51.6	50.1	51.9	52.3	52.7	49.4	46.4	41.1	42.8	50.7	47.8	56.2	45.5	45.2	50.0	48.6	46.6	42.4	48.3	44.3	48.3	40.9	36.7	49.6	49.5	39.0	46.0	45.5	55.0	53.1	48.8	A B C			
Florida 2 000	51.4	53.4	51.7	51.0	—	—	45.7	48.6	53.5	47.3	46.8	46.4	45.9	52.8	53.8	51.5	42.8	45.0	45.1	48.8	49.2	47.4	41.8	41.8	55.5	44.4	50.8	42.8	37.4	48.4	50.0	39.5	46.5	46.4	52.3	51.7	48.3	A B C D		
Helandalus	51.5	54.5	—	50.5	49.8	48.2	44.7	48.5	52.3	47.7	49.2	45.4	46.5	51.3	51.4	38.8	54.5	45.0	46.7	49.8	48.3	46.1	44.3	50.1	42.5	48.8	41.5	36.9	48.2	49.5	40.9	48.8	49.1	53.1	52.7	47.9	A B C D E			
RO — 109	50.7	54.2	51.9	54.5	51.4	49.4	48.2	49.3	54.2	49.2	46.1	46.9	41.9	—	50.4	43.4	54.8	45.4	44.6	48.5	48.8	44.9	42.5	52.8	40.2	45.7	38.9	37.2	46.8	49.5	38.1	54.7	44.9	51.4	51.5	47.8	B C D E			
136/83	50.3	52.1	52.4	51.5	50.0	49.2	46.9	51.8	51.0	51.0	47.2	46.3	43.7	52.3	46.4	51.1	44.9	44.6	45.3	45.5	49.2	45.4	38.9	55.7	39.5	45.6	41.1	40.7	48.4	51.3	37.5	44.3	—	52.4	52.9	47.6	C D E F			
RO — 158	53.1	53.7	53.9	53.5	51.4	50.4	45.9	51.1	54.3	49.1	48.7	47.1	45.3	50.6	49.7	43.4	54.4	45.0	47.9	49.0	48.2	50.4	43.3	52.5	43.7	48.8	43.3	37.9	43.3	43.3	40.4	51.0	48.9	52.7	49.8	47.5	C D E F			
RO — 15	51.2	51.5	53.1	53.5	49.4	49.6	48.0	51.4	49.8	48.9	46.2	42.2	42.5	52.6	51.9	50.7	45.5	52.7	43.4	44.1	47.1	48.2	45.5	41.4	54.2	43.4	47.0	38.5	34.8	47.0	49.0	41.3	45.2	41.2	51.0	50.1	47.3	C D E F G		
RO — 66	50.3	51.7	52.1	51.8	49.8	48.6	48.7	50.4	55.1	49.9	45.0	43.9	39.2	49.1	51.7	45.1	54.7	43.9	42.9	44.8	46.9	46.9	41.0	55.9	41.9	44.6	42.3	37.8	47.5	48.8	37.7	45.1	40.8	51.5	50.7	47.1	C D E F G			
NS-H-90	50.8	48.3	53.3	54.7	50.6	49.8	44.8	48.9	53.5	49.3	46.7	46.3	38.3	—	56.0	44.8	55.3	44.4	43.5	—	50.8	44.2	41.7	48.6	39.6	49.5	38.6	36.3	45.7	49.3	37.5	42.4	42.3	—	—	46.7	D E F G H			
Pacific 354	48.5	53.7	51.3	52.4	48.2	50.5	42.3	49.2	52.9	47.2	43.5	45.3	43.4	51.0	—	51.8	44.5	53.8	44.5	46.2	—	49.7	45.3	42.4	52.6	40.0	48.5	38.4	37.5	46.8	30.9	—	45.5	46.0	—	46.6	D E F G H			
Blumix	48.2	48.9	48.8	48.1	46.8	46.5	46.3	47.5	55.4	48.2	43.9	42.4	44.6	50.4	51.1	48.6	44.1	51.7	42.7	46.2	—	47.0	45.2	37.8	50.7	38.7	47.5	41.1	—	43.3	47.3	37.9	—	43.9	50.6	50.6	46.4	E F G H I		
NS-H-86	47.8	49.3	49.4	51.9	49.0	49.2	49.2	50.6	53.0	50.3	45.0	45.6	45.6	51.9	53.7	50.1	47.7	52.7	43.2	42.7	—	47.0	44.1	36.4	49.5	39.1	46.3	33.9	34.6	46.5	46.8	37.5	42.1	41.9	—	46.4	E F G H I			
Pacific 336	47.9	52.7	53.1	49.4	49.4	49.0	43.7	48.6	52.5	47.2	43.3	44.9	44.4	50.7	—	52.3	42.9	52.4	45.6	47.3	—	49.3	45.7	40.4	53.1	41.2	47.8	41.3	35.0	48.1	28.6	—	45.0	46.9	53.5	—	46.3	E F G H I		
IBH — 166	48.6	50.8	49.7	49.7	48.6	43.2	45.4	46.8	54.8	50.8	43.3	44.9	41.9	51.5	51.6	49.2	42.7	52.8	43.4	42.9	—	46.3	42.7	41.9	49.4	40.6	47.3	39.2	—	45.0	46.8	35.7	44.6	44.1	49.3	49.2	46.3	E F G H I		
Seed Tec 316	46.9	51.1	51.2	56.4	47.8	47.4	40.3	48.0	48.3	44.3	45.2	42.5	42.9	—	—	49.7	45.5	—	—	48.0	—	46.5	—	58.1	40.4	47.0	38.9	37.2	45.5	49.0	38.1	—	42.9	51.8	—	46.2	E F G H I J			
NS-H-91	49.3	50.4	49.5	52.4	48.8	50.6	46.0	48.6	53.5	49.6	44.9	44.9	42.8	47.5	50.5	50.5	52.4	42.9	41.5	—	45.7	44.5	38.8	48.8	39.7	49.7	42.7	35.8	44.2	49.0	35.4	43.7	41.8	—	—	46.1	E F G H I J			
Multibest 1	48.0	50.5	47.8	50.4	47.4	46.7	47.1	49.6	51.2	48.4	42.9	45.2	40.5	49.2	51.7	48.7	46.2	52.2	42.1	41.8	45.2	46.1	43.9	37.5	51.5	38.3	46.1	38.6	—	44.7	46.5	38.3	—	41.2	50.3	49.1	46.0	F G H I J		
Barbara	46.6	49.1	48.5	47.3	47.0	45.8	44.5	48.6	56.8	45.2	43.1	44.3	39.8	50.1	48.2	47.5	41.1	50.3	42.4	40.3	43.6	45.7	43.4	40.3	51.8	39.1	44.6	40.1	—	45.3	46.3	34.7	43.3	41.7	49.5	47.9	45.2	H I J K		
NS-H-87	47.8	50.6	49.0	49.8	47.8	47.6	48.8	45.9	50.7	47.0	45.9	44.1	44.8	49.6	51.7	50.1	46.0	51.9	43.7	44.3	—	44.7	42.3	38.8	48.5	39.3	45.6	32.1	36.8	45.7	46.5	34.6	41.3	42.8	—	45.2	H I J K			
Türk-Ay-1	47.9	49.1	49.8	52.3	49.0	47.8	45.4	48.6	50.5	44.9	44.4	41.9	39.1	49.4	50.1	49.0	42.1	51.4	43.0	40.5	44.1	44.8	45.2	42.4	—	40.2	44.5	34.6	34.5	43.7	45.5	36.0	43.2	—	50.4	48.7	45.1	H I J K		
Multibest 2	47.2	49.1	47.9	48.2	45.4	45.2	43.7	47.6	50.6	47.1	43.0	44.7	38.6	49.3	49.0	46.4	43.0	51.4	44.5	40.9	44.0	44.4	42.6	41.8	49.2	40.1	45.0	38.5	—	43.7	45.5	39.4	—	42.4	48.7	47.3	45.1	H I J K		
3340/81	45.7	47.7	46.4	46.1	—	45.0	41.2	43.5	45.2	45.4	43.5	43.2	38.6	46.2	47.0	42.3	49.1	42.4	41.7	44.6	43.4	42.4	37.3	47.4	38.1	43.9	41.2	36.1	42.7	44.8	37.6	41.9	—	48.4	47.6	43.7	K L			
Cargill 208	45.8	47.3	47.9	49.5	47.2	44.8	42.8	46.9	48.3	45.9	42.7	43.3	40.2	—	8	49.0	34.4	—	—	44.1	—	42.9	—	52.4	34.7	41.9	38.5	34.3	43.3	46.3	46.9	37.8	45.3	44.2	49.7	—	43.6	K L		
MEAN	49.4	51.3	51.0	51.5	49.1	48.4	45.9	49.1	52.5	48.3	45.6	44.8	42.2	50.1	51.3	50.2	43.9	53.2	44.0	43.9	46.7	47.3	45.2	40.8	52.4	40.7	46.9	39.6	36.7	46.3	46.9	37.8	45.3	44.2	51.6	50.5	—	—		
L.S.D. 5%	1.1	1.0	4.1	2.0	1.9	1.5	1.3	1.2	1.0	2.2	1.1	1.0	1.4	1.8	1.2	1.8	2.4	5.0	1.1	1.8	1.6	1.0	3.3	3.2	1.3	1.2	1.0	0.5	3.0	2.6	1.2	1.4	3.9	1.5	1.7	1.6	1.8	—	—	
Dobrlich	50.2	49.8	47.1	46.8	47.8	45.7	—	54.2	51.0	46.0	45.3	43.0	—	—	50.6	—	—	—	—	42.7	—	—	38.8	—	—	—	44.4	—	—	45.5	29.7	37.0	—	43.1	—	—	—	—		
Izrev	50.1	50.0	49.8	49.7	48.2	47.5	—	49.9	50.0	45.2	45.0	39.1	—	—	50.5	—	—	—	—	46.0	—	—	43.1	—	—	—	43.3	—	—	47.2	27.6	—	—	41.3	—	—	—	—		
GT — 788	46.7	47.2	46.9	47.8	45.8	45.5	—	50.0	48.4	46.4	46.0	38.5	—	—	47.9	—	—	—	—	44.6	—	—	40.6	—	—	—	44.4	—	—	42.7	27.3	35.7	—	40.2	—	—	—	—		
GT — 832	48.4	49.1	50.2	50.5	48.2	48.2	—	50.4	49.9	46.8	44.																													

Table 3

Morpho-physiological characteristics

Cultivars	No. of days from emergence to : flowering			maturity			Head diameter		Plant height (cm)		Volumetric weight (kg/ha)		1 000 seed weight (g)		Husks (%)		Protein (%)	Self fertility degree (%)			Resistance to lodging (mean appreciation)
	limits	mean	limits	mean	limits	mean	limits	mean	limits	mean	limits	mean	limits	mean	Novi Sad 1986	Novi Sad 1987		Fun- dulca 1987	mean		
																				limits	
Pacific 336	51-97	72	94-175	121	12-29	19	118-190	153	36-64	41	43-78	54	16-30	22	20	34	22	25	47	Good	
Pacific 354	50-91	69	98-169	126	11-27	20	105-190	149	35-66	41	42-61	47	16-26	23	18	10	2	66	26	Good	
Dobritsch	50-79	67	94-143	114	14-27	19	99-190	154	39-58	44	37-77	52	15-26	22	14	8	1	29	13	Feeble	
Izrev	47-79	64	97-134	110	15-26	20	97-180	152	41-64	47	49-70	56	16-26	20	18	58	6	82	49	Good	
GT - 788	48-75	65	95-136	112	14-26	20	95-190	150	39-60	46	47-71	56	17-28	25	17	21	4	84	36	Feeble	
GT - 832	48-75	65	90-136	112	11-27	18	95-190	153	40-57	46	37-73	54	15-27	23	17	3	1	44	16	Feeble	
136/83	50-95	70	92-166	122	12-27	18	95-160	139	34-58	41	35-63	47	17-28	22	17	8	15	89	37	Very good	
160/83	62-86	69	95-169	121	21-30	23	112-170	140	38-64	44	38-61	53	16-30	25	-	-	14	54	-	Feeble	
3340/81	52-94	70	96-147	122	11-24	17	129-190	159	38-66	41	33-74	53	17-31	24	21	10	10	68	29	Good	
Barbara	52-93	69	95-165	116	10-26	19	131-190	153	39-54	42	41-77	52	16-28	24	16	12	2	92	35	Feeble	
I B H-166	50-92	69	93-175	123	11-26	19	100-200	168	39-63	43	35-71	52	17-28	23	22	30	0	84	38	Good	
Multibest 1	51-95	70	94-169	122	10-28	19	99-190	154	39-54	43	40-69	51	15-26	23	13	25	0	88	37	Very good	
Multibest 2	50-90	68	93-166	118	12-28	19	111-180	146	36-56	44	42-63	51	15-29	24	23	29	10	82	40	Good	
Blumix	53-100	72	98-169	118	11-26	19	101-200	144	38-58	44	37-65	53	15-30	23	26	48	1	88	46	Good	
RO - 15	50-92	69	94-138	121	11-28	19	74-172	113	30-50	43	39-64	50	13-31	23	17	1	2	11	5	Good	
RO - 33	50-97	70	91-138	121	10-29	19	93-190	150	35-52	46	39-74	55	15-29	20	15	12	1	61	25	Good	
RO - 66	50-92	68	94-169	122	10-28	19	93-200	151	38-58	43	42-71	52	16-31	22	23	4	1	39	15	Good	
RO - 109	53-89	71	95-169	123	12-25	20	103-220	160	32-57	40	37-74	58	15-26	21	14	4	0	8	4	Good	
RO - 158	53-100	72	95-147	119	11-28	20	103-204	166	38-56	43	42-68	58	15-26	20	26	3	16	22	14	Very good	
Heliandalus	50-97	70	97-175	123	11-28	19	99-210	168	29-52	41	39-71	50	14-25	21	16	3	1	23	9	Good	
Monroe 45	48-85	69	90-143	118	12-24	19	93-200	152	29-53	43	47-62	51	13-26	21	14	14	1	39	18	Good	
Florida 2 000	52-99	72	98-148	124	10-24	19	108-210	171	34-56	42	42-62	53	15-28	22	14	9	15	69	31	Good	
Türk-Ay-1	51-96	71	94-170	123	9-26	19	101-210	157	36-54	42	41-65	51	16-27	23	18	2	3	39	15	Good	
Cargill 208	51-84	71	92-145	122	11-28	19	83-160	126	34-49	42	43-69	50	13-28	25	18	2	3	84	30	Good	
Seed Tec. 316	50-82	70	93-145	124	11-27	20	103-190	145	31-56	41	35-66	53	16-28	23	18	28	1	97	42	Good	
Dahlgren 730	49-82	69	94-145	123	11-27	20	107-200	159	35-64	43	38-64	54	15-22	20	16	2	1	20	8	Good	
NS-H-86	53-100	73	96-142	125	13-29	20	105-220	175	35-61	41	37-69	55	16-26	22	19	26	21	31	26	Feeble	
NS-H-90	52-93	72	90-139	123	9-31	20	105-240	165	30-62	42	40-69	53	16-25	22	22	6	1	84	30	Very good	
NS-H-87	54-100	72	97-143	124	12-30	20	111-225	192	36-65	41	37-65	51	15-27	22	27	10	18	19	16	Feeble	
NS-H-91	54-99	70	91-135	125	10-33	19	103-204	163	32-67	42	47-62	55	15-26	23	18	36	1	12	16	Good	

Resistance to diseases (naturally infected plants, %)

Cultivars	Sclerotinia sclerotiorum										Phomopsis helianthi										Phoma spp.										Botrytis cinerea										Macrophoma phaseolina		Puccinia helianthi	
	Fur-dules * 1987		Novi Sad 1986		Podu-Ioale 1987		Mean 1986		Podu-Ioale 1986		Avasa 1986		General 1987		Mean 1986		Szeged 1986		Novi-Sad 1987		General 1987		Mean 1986		General 1986		Toshevo 1987		Podu-Ioale 1987		Mean 1986		Ruzyne 1987		Podu-Ioale 1987		Mean 1986		Ostmo 1987		Szeged 1987			
Pacific 336	20	36	18	14	22	6	0	1	2	29	10	4	—	6	0	—	20	30	42	8	25	20	19	1	13	30	—	6	—	70	0													
Pacific 354	7	28	24	15	18	10	2	1	4	38	7	5	—	4	4	—	40	55	38	7	35	22	15	1	13	18	—	2	—	76	0													
Dobritch	19	66	10	13	27	27	0	0	9	45	1	6	—	4	0	—	34	46	24	3	27	21	13	2	12	13	—	1	—	—	20													
Izhev	23	87	10	16	34	33	0	0	11	54	2	1	—	2	0	—	54	62	16	4	34	18	13	2	8	25	—	1	—	—	5													
GT — 788	9	37	8	31	21	51	0	1	17	67	1	5	—	0	0	—	17	45	14	3	20	21	15	1	12	16	—	1	—	—	5													
GT — 832	17	67	10	20	28	24	0	1	8	49	4	1	—	3	0	—	66	62	18	9	39	27	15	1	14	11	—	1	—	—	4													
136/83	0	43	14	28	21	9	0	4	4	43	4	14	—	2	0	—	38	70	54	13	44	23	23	2	16	56	26	1	—	88	3													
160/83	—	—	16	11	—	0	0	1	0	0	1	0	—	0	0	—	—	—	32	9	—	—	20	1	—	—	21	0	—	82	—													
3340/81	—	27	18	15	—	5	3	1	3	35	4	6	—	3	5	—	80	65	38	8	48	20	19	1	13	16	25	2	14	54	20													
Barbara	—	34	8	21	—	8	0	1	3	33	2	11	—	2	0	—	34	64	56	9	41	19	22	1	14	32	30	1	21	94	1													
1 BH — 166	—	78	16	22	—	16	0	1	6	49	1	4	—	6	0	—	15	59	28	10	28	23	20	1	15	14	18	0	11	62	26													
Multibest 1	25	26	12	23	21	10	0	1	4	51	2	7	—	4	0	—	30	46	48	13	34	23	20	1	15	24	25	2	17	84	5													
Multibest 2	40	19	8	9	19	14	0	1	5	34	4	3	—	3	0	—	28	52	36	12	32	25	20	2	16	23	34	0	16	84	1													
Blumix	21	36	8	27	23	10	0	1	4	43	1	5	—	3	0	—	48	31	76	10	41	24	20	1	15	14	13	1	9	60	3													
RO — 15	—	31	6	5	—	4	3	1	3	29	6	2	—	1	4	—	30	50	24	7	28	27	19	2	16	10	15	0	8	78	34													
RO — 33	—	22	10	17	—	5	0	1	2	27	2	6	—	0	6	—	22	52	30	8	28	22	26	2	17	25	17	0	14	82	1													
RO — 109	—	21	30	12	—	8	3	2	4	34	4	6	—	0	3	—	20	41	16	12	22	19	22	2	14	17	21	0	13	74	26													
RO — 158	—	26	24	19	—	11	0	2	4	36	0	3	—	2	8	—	68	39	22	10	35	22	19	1	14	8	16	2	9	54	4													
RO — 66	—	39	26	31	—	7	0	1	3	53	1	8	—	0	0	—	22	54	14	10	25	18	26	1	15	10	17	0	9	78	4													
Helandulus	53	73	44	21	48	16	21	1	13	54	8	4	—	6	8	—	58	62	68	11	50	19	25	2	15	44	43	10	32	58	1													
Monroe 45	25	61	24	22	33	6	2	1	3	42	4	7	—	14	7	—	60	60	12	12	—	21	26	2	16	46	10	1	19	98	20													
Florida 2 000	—	46	48	15	—	11	3	1	5	48	7	3	—	4	5	—	—	—	32	14	—	21	28	3	17	26	25	4	18	40	—													
Türk-Ay-1	12	21	16	30	20	11	0	1	4	36	4	5	—	3	0	—	54	55	44	17	43	20	22	2	15	23	21	1	15	68	8													
Cargill-208	—	47	22	15	—	11	0	1	4	47	3	2	—	0	0	—	18	52	34	9	28	22	23	0	15	9	—	1	—	88	3													
Seed-Tec-316	—	32	32	10	—	4	0	1	2	27	5	1	—	6	0	—	66	58	20	9	38	21	25	1	16	33	—	3	—	50	18													
Dahlgren 730	41	76	16	16	37	12	0	1	4	38	7	5	—	0	9	—	64	42	32	10	37	20	25	2	16	26	—	6	—	62	4													
NS-H-86	18	11	6	9	11	8	0	1	3	26	1	4	—	0	0	—	9	15	2	11	9	20	23	1	15	14	17	1	14	64	3													
NS-H-87	4	4	2	3	3	10	0	1	4	23	0	1	—	0	0	—	10	12	2	12	9	20	21	0	14	7	17	1	8	46	2													
NS-H-90	48	46	12	16	30	11	0	2	4	33	1	3	—	1	0	—	12	21	54	9	24	22	17	1	13	16	18	1	12	78	8													
NS-H-91	28	13	14	21	19	11	0	0	4	30	2	0	—	0	0	—	68	31	4	11	29	19	28	0	16	8	24	1	11	88	3													

\* Artificial infection

Degree of the attack of *Orobanche cumana* (%)

Table 5

ESSAIS COMPARATIFS INTERNATIONAUX AVEC DES HYBRIDES DE TOURNESOL (LE SIXIEME CYCLE, 1986-1987)

Résumé

L'actuel cycle bienal d'essais comprend 29 hybrides simples et un hybride triple. Tous ces hybrides ont été testés dans 21 localités des principaux pays cultivateurs de tournesol d'Europe et d'autres continents, avec une large diversité des conditions de climat et de sol.

Comme résultat de la base génétique large dans l'interaction génotype  $\times$  localité  $\times$  années, la variation de la réponse concernant le rendement en graines, la teneur en huile et la résistance aux principaux agents pathogènes a été de même très large. Toutefois dans la plupart des cas les valeurs moyennes de l'interaction des principaux caractères avec les localités ont été similaires, les hybrides testés montrant une bonne adaptabilité écologique. Certains hybrides de tournesol ont un comportement nettement différencié dans le cadre de zones limitées, ce qui offre aux cultivateurs la possibilité d'identifier les génotypes adaptés à ces territoires.

ENSAYOS INTERNACIONALES DE HIBRIDOS DE GIRASOL (SEXTO CICLO, 1986-1987)

Resumen

Este ciclo bienal incluía 29 híbridos simples y un híbrido triple, ensayándose en 21 localidades situadas en las áreas de más importancia para el cultivo del girasol en Europa y otros continentes, bajo una gran diversidad de condiciones climáticas y de suelo.

Como resultado de una amplia base genética en la interacción genotipo  $\times$  localidad  $\times$  año, las respuestas en rendimiento de aceite, contenido de este y las reacciones a los ataques de los más importantes patógenos fue también muy amplia. Sin embargo, en la mayoría de los casos, la media de los valores de los caracteres más importantes en las distintas localidades fueron similares, mostrando los híbridos correspondientes una buena adaptación.

Por otra parte, ciertos híbridos han sobresalido claramente dentro de algunos ambientes limitantes, permitiendo a los agricultores identificar los genotipos adaptados a tales áreas.

Cultivars	Edirne	Edirne	Novi	Fundulea *	
	1986	1987	Sad	1986	1987
Pacific 336	9.3	2.9	—	22	22
Pacific 354	7.2	1.8	—	46	36
Dobritch	—	1.6	30	28	11
Izgreve	—	0.7	—	29	26
GT — 788	—	2.0	—	25	13
GT — 832	—	0.7	—	15	5
136/83	2.1	0.7	—	18	12
160/83	—	0	14	36	—
3340/81	3.9	0	—	16	16
Barbara	2.3	0.7	—	—	—
I B H — 166	9.5	0.7	—	18	—
Multibest 1	4.5	0	—	13	8
Multibest 2	3.2	0.7	—	43	14
Blumix	7.4	0.9	15	34	23
RO — 15	4.7	0.7	—	16	—
RO — 33	7.3	2.8	—	11	—
RO — 66	5.5	1.3	—	19	—
RO — 109	7.3	1.5	—	30	—
RO — 158	16.2	1.3	—	22	—
Heliandalus	5.6	0.9	18	32	24
Monroe 45	11.6	0.7	—	19	31
Florida 2 000	8.1	2.0	50	34	—
Türk-Ay-1	1.8	0	—	26	19
Cargill 208	9.9	1.8	—	15	18
Seed Tec 316	7.2	1.0	—	24	36
Dahlgren 730	12.8	1.3	—	31	35
NS-H-86	6.1	0.7	—	25	31
NS-H-87	9.1	0	—	31	26
NS-H-90	10.5	0.7	—	25	36
NS-H-91	6.2	6.1	—	48	26

\* Artificial infestation

## LIST OF PARTICIPANTS IN F.A.O. CO-OPERATIVE TRIALS (1986—1987)

Country and location	Name and address	Experimental year
1	2	3
	<u>E U R O P E</u>	
Austria Fuchsenbigl	D. Wolffhardt Bundesanstalt f. Pflanzenbau und Samenprüfung, Allierten- strasse 1, Wienn II.	1986—1987
Bulgaria General Toshevo	Peter Ivanov Institute for Wheat and Sunflower General Toshevo 9 520, Tolbuhin	1986—1987
Czechoslovakia Ruzyne	A. Kováčik Research Institute for Crop Production, 161 06 Prague 6 — Ruzyne — 507	1986—1987
Cyprus Morocambos	A. Hadjichristodoulou Agricultural Research Institute, Nicosia	1986—1987
France CETIOM	F. Arnaud CETIOM, 174 Avenue Victor Hugo 75 116 Paris	1986—1987
Germany F. Rep. Gross-Gerau	W. Schuster Institut für Pflanzenbau und Pflanzenzüchtung, Universität Giessen, 23 Ludwigstrasse, 6300 Giessen	1986—1987
Greece Sindos	G. Kontas Cotton and Industrial Plants Institute, Thessaloniki, 57 400 Sindos	1986—1987
Hungary Iregszemcse	L. Takács Research Institute for Forage Crops Szentlőrinc P.O. Box 805, H—7940, Iregszemcse	1987
Hungary Szeged	F. Joséf Gabonatermestesi Kutató Intézet Cereal Research Institute, P.O. Box 6726, H—6701, Szeged, Pf. 391	1986—1987
Italy. Osimo	V. Pirani Istituto Sperimentale per le Coltive Industriali, Sezione operativa perifica Via Cinque Torri, 26 60 027 Osimo (Ancona)	1986—1987
Portugal Elvas	Maria I. Vivas Estacao Nacional de Melhoramento de Plantas, 7 351 Elvas	1986—1987
România Fundulea	A. V. Vrânceanu Research Institute for Cereals and Industrial Crops, 8 264, Fundulea, Județul Călărași	1986—1987
România Podu-Iloaie	Elena Andrei Agricultural Experimental Station, Podu-Iloaie 6 623, Județul Iași	1986—1987
Spain Córdoba	Juan Dominguez-Gimenez National Research Centre for Oil Crops INIA, Finca Ala- meda del Obispo 14 071, Córdoba	1986—1987
Turkey Edirne	Meliha Salihoglu Agricultural Research Institute, P. O. Box 161, Edirne	1986—1987
Yugoslavia Novi Sad	D. Skorić Institute of Field and Vegetable Crops, Maxima Gorkog 30, 21 000 Novi Sad	1986—1987

	<u>A F R I C A</u>	
Egypt Sakha	Badr A. Elahmar Agricultural Research Centre Field Crops Research Institute Oil Crops Research Section Orman — Giza	1986—1987
Ethiopia Awasa	Solomon Eshete Institute of Agricultural Research Awasa Research Center, PPO. Box 6 Awasa, Sidamo	1986—1987
	<u>SOUTH EASTERN ASIA</u>	
Philippines Muñoz	Mario B. Agustin Research & Development Center Central Luzon State University, Muñoz, Nueva Ecija	1986
	<u>CENTRAL AND NORTH AMERICA</u>	
Mexico Ciano	Leo Quilantan Villarreal Head Oil Crops Department INIA/SARH/CIANO (Ap. Postal 515) 85 000 Obregón, Sonora	1987
U.S.A Fargo	Jerry Miller Department of Agronomy Walster Hall, North Dakota State University Fargo, N.D. 58105	1986—1987
	<u>SOUTH AMERICA</u>	
Argentina Miramar	Ana Lilia Gonzales de Schelotto Chacra Experimental de Miramar Casilla Correo 35, Miramar 7 607 (Buenos Aires)	1986
Argentina Pergamino	Pedro Ludueña INTA, C.C. 31 2 700 Pergamino	1986
Chile La Platina	Vital Alfredo Valdivia B. Research Station la Platina Santa Rosa 11610, Paradero 33, Casilla 5 427, Santiago	1986—1987

ANNEX 2

**LIST OF SUNFLOWER SINGLE (SH) AND THREE-WAY  
(TH) HYBRIDS TESTED IN THE EXPERIMENTAL  
CYCLE 1986 AND 1987**

Cultivars	Genetic type	Supplying country	Cultivars	Genetic type	Supplying country
Pacific 336	SH	Australia	RO — 33	SH	Romania
Pacific 354	SH	Australia	RO — 66	SH	Romania
Dobritch	SH	Bulgaria	RO — 109	SH	Romania
Izgrev	SH	Bulgaria	RO — 158	SH	Romania
GT-788	SH	Bulgaria	Heliandalus	SH	Spain
GT-832	SH	Bulgaria	Monroe 45	SH	Spain
136/83	SH	Germany F.R.	Florida 2 000	SH	Spain
160/83	SH	Germany F.R.	Türk-Ay-1	SH	Turkey
3340/81	TH	Germany F.R.	Cargill 208	SH	U.S.A.
Barbara	SH	Hungary	Seed tec 316	SH	U.S.A.
IBH-166	SH	Hungary	Dahlgren 730	SH	U.S.A.
Multibest 1	SH	Hungary	NS-H-86	SH	Yugoslavia
Multibest 2	SH	Hungary	NS-H-87	SH	Yugoslavia
Blumix	SH	Hungary	NS-H-90	SH	Yugoslavia
RO — 15	SH	Romania	NS-H-91	SH	Yugoslavia