# RESULTS OF THE INTERNATIONAL TRIALS WITH SUNFLOWER CULTIVARS (THE FIFTH CYCLE 1984—1985)

*Authors :* see Annex 1.

*Data processing and interpretation : Liaison Centre of Fundulea, Romania* (A. V. VRÂNCEANU, Fl. M. STOENESCU *and* GABRIELA SOARE)

## INTRODUCTION

One of the most active and fruitful subnetworks of the F.A.O. Research Network on Sunflower has been the subnetwork on the experimentation of sunflower hybrid cultivars in international trials. It started this activity in 1976 and has already completed ten years of joint investigations divided in five biennial cycles.

The results of the previous four cycles were published in the Scientific Bulletins HELIA, Numbers 1/1978, 2/1979, 3/1980, 5/1982 and 7/1984.

This paper presents the results of the fifth biennial cycle 1984—1985 obtained by 22 governmental research institutions from 19 countries of Europe, North, Central and South America, Asia and Africa.

The names of the participants belonging to these institutions and who conducted the co-operative trials are listed in Annex 1.

## MATERIALS AND METHODS

The hybrid genotypes under testing, listed in Annex 2, originate from the most important sunflower breeding centres of Europe and North and South America and they represent the most recent achievements in this field. The investigated set of genotypes was made up of 30 single hybrids, 3 three-way hybrids and one open pollinated variety. The Argentine hybrids did not enter all trials due to the delay in shipping the seed samples by the respective supplying centres.

The trial instructions were improved in view of the simplification of data collection and interpretation.

The experimental design was the randomized blocks with 5 replications. Entry randomization for each location was established differently by each participating institution. The plot size was so established that after discarding the borders (the two marginal rows and two frontal plants in each row), a minimum of 80 plants per plot be harvested. The recommended population under dry land conditions was 40,000 plants per hectare, with variations concerning the local conditions up to 55,000 plants per hectare (under irrigation for instance). The other cultural practices were adapted to the local conditions. Certain trials were conducted under irrigation, but most of them in dry land.

The participants have adopted more or less the same experimental technique, which has facilitated the statistical interpretation of data. They sent field books of a F.A.O. type or elaborated papers to Fundulea Liaison centre. The analysis of variance was calculated for seed yield, oil content and oil fatty acids composition.

The reaction to diseases and unfavourable environmental conditions was estimated only in the field. The response to broomrape attack (*Orobanche cumana* Wallr.) was however evaluated both under controlled and natural infestations, in three locations.

Self-fertility degree was determined at Novi Sad in 1985, as the ratio between the mean number of filled seeds on the bagged heads and the mean number of filled seeds on the open pollinated heads, multiplied by 100.

In some cases, incomplete or unreliable data were obtained, due to either unfavourable climatic conditions or to certain accidental causes. Such data were not included in this paper. No results were received from 8 locations (Pisa — Italy, Sindos — Greece, Karadj — Iran, Beit-Dagan — Israel, Islamabad — Pakistan, Cochabamba — Bolivia and La Platina — Chile).

## RESULTS AND DISCUSSION

As in the previous experimental cycles, the results obtained in the last biennial trial displayed a large diversity of the response of sunflower genotypes to the environmental variations. Certain hybrids exhibited however a relative constant good behaviour from location to location and from year to year.

# LIST OF PARTICIPANTS IN F.A.O. CO-OPERATIVE TRIALS (1984—1985)

| Country and location | Name and address | Experimental year |
|---|---|---|
| | **EUROPE** | |
| Austria<br>Fuchsenbigl | D. Wolffhardt<br>Bundesanstalt f. Pflanzenbau und Samenprüfung,<br>Alliiertenstrasse 1, Wien II | 1984—1985 |
| Bulgaria<br>G. Toshevo | I. V. Ivanov<br>Institute for Wheat and Sunflower, General Toshevo 9520, Tolbuhin | 1984 |
| Czechoslovakia<br>Ruzyně | A. Kováčik<br>Research Institute for Crop Production, 161.06 Prague 6 — Ruzyně 507 | 1984—1985 |
| Cyprus<br>Morocambos | A. Hadjichristodoulou<br>Agricultural Research Institute, Nicosia | 1984—1985 |
| Germany F. Rep.<br>Gross-Gerau | W. Schuster<br>Institut für Pflanzenbau und Pflanzenzüchtung,<br>Universität Giessen, 23 Ludwigstrasse, 6300 Giessen | 1984—1985 |
| Hungary<br>Iregszemcse | Lajos Pintèr<br>Research Institute for Forage Crops,<br>Szentlörinc, P.O. Box 805, H-7940, Iregszemcse | 1984—1985 |
| Hungary<br>Szeged | Frank Jézsef<br>Gabonatermestési Kutató Intezet Cereal Research Institute,<br>Pf : 391, H-6701, Szeged | 1984—1985 |
| Italy<br>Osimo | V. Pirani<br>Istituto Sperimentale per le Colture Industriali,<br>Via di S. Biagio 600 27 Osimo (Ancona) | 1984—1985 |
| Portugal<br>Elvas | Maria I. Vivas<br>Estaçao Nacional de Melhoramento de Plantas, 7351 Elvas | 1985 |
| Romania<br>Fundulea | A. V. Vrânceanu and F. M. Stoenescu<br>Research Institute for Cereals and Industrial Crops,<br>8264 Fundulea, județul Călărași | 1984—1985 |
| Romania<br>Podu Iloaie | Elena Andrei<br>Agricultural Experimental Station, Podu Iloaie 6623, județul Iași | 1984—1985 |
| Spain<br>Córdoba | Juan Dominguez-Gimenez<br>National Research Centre for Oil Crops, INIA,<br>Finca Alameda del Obispo, Apartado 240, Córdoba | 1984—1985 |
| Turkey<br>Edirne | Bülent Kiral<br>Agricultural Research Institute, P.O. Box 161, Edirne | 1984—1985 |
| Turkey<br>Istanbul | Enver Hüsemoglu<br>Agricultural Research Institute, P.K. 18 Sefaköy — Istanbul | 1984 |
| Yugoslavia<br>Novi Sad | D. Skorić<br>Institute of Field and Vegetable Crops, Maxima Gorkog 30, 21000 Novi Sad | 1984—1985 |
| | **CENTRAL AND NORTH AMERICA** | |
| Mexico<br>Ciano | Leo Quilantan<br>INIA, Centro de Investigaciones Agricolas del Noroestre, CIANO,<br>Valle del Yaqui, Calle Norman E. Borlaug, Apartado Postal 515,<br>Ciudad Obregon, Son. Mexico | 1984 |
| U.S.A.<br>Fargo | Jerry Miller<br>U.S.D.A. Oilseeds Investigations, Walster Hall, Dept. of Agronomy,<br>N.D.S.U. Fargo, North Dakota — 58105 | 1984—1985 |
| | **AFRICA** | |
| Egypt<br>Sakha | Badr A. Elahmar<br>Oil Crops Research Section, Field Crops Institute, Orman-Giza | 1984—1985 |
| | **SOUTH AMERICA** | |
| Argentina<br>Miramar | Ana Lilia Gonzales de Schelotto<br>Chacra Experimental de Miramar,<br>Casilla Correo 35, Miramar 7607 (Buenos Aires) | 1984—1985 |
| | **ASIA** | |
| India<br>Bangalore | K. Giririraj<br>University of Agricultural Sciences, Bangalore 560065 | 1985 |
| Philippines<br>Muñoz | Filomena F. Campos<br>Director, Research and Development,<br>Central Luzon State University, Muñoz Nueva Ecija | 1985—1986 |

**Seed yield (q/ha, 0% moisture)**

| Cultivars | Romania | | | | Hungary | | | | Yugoslavia | | Turkey | | | Cyprus | | Italy | | France | | Spain | | Portugal | Germany F.R. | | Czechoslovakia | | Egypt | | U.S.A. | | Mexic | | Argentina | Mean | Grouping * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fundulea | | Podu Iloaie | | Iregszemcse | | Szeged | | Novi Sad | | Edirne | | Istanbul | Morocambos | | Osimo | | Clermont Ferrand | | Córdoba | | Elvas | Gross-Gerau | | Ruzyně | | Sakha | | Fargo | | Ciano dry-land | Ciano irrigated | Miramar | | |
| | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | | |
| Select | 39.7 | 40.0 | 29.3 | 27.3 | 36.7 | 37.8 | 42.4 | 53.7 | 28.5 | 29.0 | 19.9 | 21.4 | 16.6 | 18.7 | 26.8 | 20.3 | 14.4 | 26.7 | 27.9 | 22.5 | 24.9 | 14.9 | 27.3 | 36.9 | 30.3 | 30.5 | 28.9 | 33.4 | 21.5 | 34.2 | 19.4 | 19.3 | 21.8 | 28.0 | A |
| Cargill 207 | 34.5 | 40.4 | 29.7 | 19.3 | 38.4 | 32.1 | 40.4 | 57.4 | 19.6 | 20.4 | 18.4 | 20.5 | 16.5 | 28.0 | 31.4 | 18.2 | 14.0 | 28.7 | 27.5 | 20.5 | 25.0 | 16.4 | 30.3 | 32.1 | 32.4 | 32.9 | 27.8 | 32.2 | 24.8 | 36.8 | 23.1 | 24.0 | 22.7 | 27.8 | AB |
| IH-173 | 34.2 | 38.2 | 29.7 | 23.2 | 32.6 | 30.5 | 43.1 | 46.9 | 27.6 | 27.2 | 19.1 | 16.6 | 18.8 | 31.5 | 30.1 | 19.6 | 14.0 | 27.3 | 25.0 | 22.5 | 20.5 | 14.4 | 39.6 | 34.4 | 27.5 | 19.1 | 24.9 | 25.4 | 21.9 | 31.8 | 20.1 | 20.9 | 22.5 | 26.7 | ABC |
| Felix | 37.9 | 40.0 | 32.6 | 28.5 | 35.0 | 30.2 | 39.6 | 53.3 | 27.7 | 23.9 | 19.6 | 19.3 | 15.7 | 32.6 | 26.7 | 17.6 | 13.2 | 25.3 | 26.0 | 21.2 | 24.3 | 8.8 | 22.0 | 34.4 | 31.9 | 24.2 | 26.2 | 21.0 | 24.4 | 31.4 | 13.0 | 14.9 | 21.5 | 26.2 | ABC |
| Koflor 3 | 35.3 | 40.9 | 30.9 | 24.5 | 35.1 | 27.9 | 43.5 | 48.7 | 27.3 | 24.9 | 18.3 | 15.0 | 16.7 | 27.4 | 24.9 | 24.0 | 13.2 | 25.6 | 30.8 | 23.6 | 20.0 | 9.0 | 20.4 | 28.8 | 27.9 | 27.8 | 25.5 | 21.2 | 20.1 | 30.2 | 19.6 | 20.3 | 23.7 | 26.1 | ABC |
| NS-Helios | 36.8 | 41.5 | 27.3 | 22.1 | 33.7 | 35.3 | 44.7 | 44.9 | 33.8 | 30.0 | 20.1 | 20.2 | 16.2 | 20.7 | 27.5 | 19.1 | 13.0 | 28.8 | 24.9 | 17.8 | 17.0 | 15.0 | 30.9 | 30.5 | 31.9 | 31.1 | 22.3 | 19.4 | 17.2 | 28.6 | 18.5 | 16.9 | 23.0 | 26.1 | ABC |
| H-219/79 | 35.5 | 34.7 | 26.4 | 18.7 | 34.0 | 34.5 | 41.1 | 45.6 | 29.0 | 26.4 | 18.8 | 19.4 | 16.6 | 30.9 | 28.9 | 21.4 | 13.7 | 22.7 | 26.6 | 20.6 | 16.5 | 13.5 | 21.1 | 35.0 | 32.7 | 30.6 | 23.9 | 23.1 | 21.0 | 29.6 | 21.3 | 20.6 | 25.3 | 26.1 | ABC |
| Fundulea 55 | 37.9 | 38.7 | 29.4 | 23.9 | 33.2 | 29.4 | 36.9 | 43.5 | 23.4 | 25.6 | 19.4 | 19.5 | 15.2 | 37.9 | 31.8 | 16.9 | 13.8 | 25.7 | 27.9 | 22.7 | 24.8 | 12.6 | 28.0 | 34.7 | 23.9 | 22.3 | 19.1 | 21.3 | 22.1 | 34.3 | 18.6 | 19.0 | 22.1 | 26.0 | ABC |
| NS-Flower | 36.8 | 39.0 | 27.3 | 18.5 | 33.9 | 35.8 | 40.4 | 44.4 | 32.5 | 29.9 | 16.3 | 17.5 | 15.9 | 26.6 | 26.9 | 20.4 | 13.1 | 23.4 | 26.0 | 19.7 | 21.8 | 17.3 | 24.5 | 33.1 | 33.3 | 25.3 | 27.4 | 16.6 | 19.6 | 30.3 | 17.0 | 19.7 | 23.8 | 25.9 | ABC |
| Citosol 4 | 35.9 | 36.1 | 32.9 | 22.5 | 32.6 | 31.7 | 42.8 | 46.0 | 25.4 | 23.1 | 18.5 | 15.1 | 16.2 | 19.4 | 31.5 | 20.6 | 12.2 | 26.5 | 25.6 | 20.8 | 20.7 | 11.3 | 31.5 | 27.2 | 31.3 | 27.3 | 23.9 | 23.3 | 23.2 | 31.0 | 17.4 | 16.4 | 22.2 | 25.6 | ABC |
| IBH-160 | 29.5 | 36.6 | 24.0 | 21.3 | 32.5 | 35.2 | 40.5 | 44.0 | 19.4 | 20.4 | 18.9 | 14.8 | 17.0 | 30.6 | 30.1 | 22.5 | 15.5 | 22.5 | 25.0 | 21.3 | 22.0 | 7.3 | 31.5 | 35.5 | 33.7 | 26.6 | 23.9 | 26.4 | 22.0 | 32.4 | 25.1 | 18.9 | 12.7 | 25.5 | ABC |
| NS-Condor | 33.7 | 41.2 | 27.3 | 19.0 | 35.4 | 36.1 | 44.0 | 49.4 | 28.5 | 21.4 | 18.0 | 19.1 | 15.2 | 19.6 | 25.0 | 16.1 | 13.4 | 22.5 | 25.4 | 19.6 | 28.4 | 12.0 | 15.4 | 30.4 | 29.4 | 31.9 | 23.9 | 24.7 | 21.6 | 29.8 | 18.4 | 18.9 | 21.9 | 25.4 | ABC |
| Arbumg 353 | 33.6 | 40.2 | 18.5 | 16.5 | 27.0 | 36.1 | 38.3 | 48.9 | 22.7 | 23.5 | 19.3 | 20.6 | 16.2 | 25.1 | 31.6 | 21.5 | 15.1 | 26.4 | 27.7 | 23.5 | 22.3 | 13.7 | 22.2 | 33.6 | 29.7 | 22.2 | 22.0 | 28.7 | 24.9 | 29.8 | 21.5 | 16.0 | 16.4 | 25.4 | ABC |
| Triumph 570 | 30.0 | 37.3 | 30.7 | 19.2 | 33.9 | 32.0 | 34.3 | 48.0 | 22.0 | 20.4 | 20.2 | 20.2 | 14.2 | 19.6 | 28.2 | 19.4 | 13.2 | 25.7 | 27.0 | 21.3 | 25.4 | 11.6 | 22.7 | 36.1 | 32.5 | 34.2 | 25.5 | 22.6 | 17.9 | 28.8 | 23.9 | 20.0 | 20.3 | 25.4 | ABC |
| Super | 35.6 | 37.2 | 31.5 | 23.0 | 32.7 | 34.1 | 36.8 | 45.0 | 25.6 | 25.4 | 19.2 | 20.7 | 16.3 | 25.8 | 28.6 | 21.4 | 14.1 | 25.8 | 28.4 | 21.6 | 23.9 | 6.2 | 22.6 | 29.4 | 27.6 | 24.3 | 23.7 | 18.5 | 19.2 | 30.3 | 16.5 | 19.1 | 21.4 | 25.2 | ABC |
| Pacific 308 | 31.1 | 39.6 | 27.3 | 21.6 | 32.0 | 34.9 | 41.3 | 49.0 | 26.7 | 18.5 | 19.5 | 17.9 | 16.9 | 28.9 | 26.9 | 18.8 | 14.3 | 16.4 | 25.0 | 19.7 | 23.5 | 18.1 | 24.3 | 32.7 | 32.7 | 32.7 | 25.1 | 23.1 | 22.5 | 31.5 | 21.4 | 20.9 | 25.7 | 25.1 | ABC |
| Florom 305 | 37.4 | 36.1 | 26.7 | 22.5 | 41.0 | 34.0 | 38.9 | 42.2 | 28.8 | 21.1 | 13.9 | 17.1 | 14.0 | 31.6 | 25.1 | 19.4 | 15.3 | 22.9 | 22.2 | 22.6 | 25.4 | 11.7 | 22.3 | 12.8 | 32.9 | 33.3 | 26.8 | 24.5 | 18.9 | 28.9 | 19.4 | 13.9 | 24.4 | 25.1 | ABC |
| Citosol F-1 | 32.8 | 38.3 | 27.3 | 26.3 | 35.2 | 27.9 | 42.3 | 47.7 | 24.2 | 22.5 | 16.1 | 15.8 | 17.3 | 13.7 | 27.7 | 18.8 | 12.7 | 25.7 | 25.0 | 21.8 | 22.4 | 16.2 | 26.2 | 23.3 | 27.5 | 26.0 | 21.1 | 23.8 | 22.2 | 30.8 | 18.9 | 19.5 | 22.5 | 24.9 | ABC |
| Interstate 7111 | 33.1 | 37.1 | 21.8 | 17.0 | 30.7 | 30.6 | 35.6 | 41.5 | 22.9 | 21.8 | 19.2 | 17.6 | 14.8 | 27.1 | 28.2 | 18.7 | 12.4 | 23.9 | 27.4 | 21.9 | 17.9 | 11.6 | 23.6 | 32.4 | 29.8 | 20.8 | 22.2 | 23.1 | 23.0 | 28.7 | 25.6 | 21.1 | 26.8 | 24.6 | BCDE |
| Fundulea 56 | 36.8 | 34.1 | 29.4 | 27.1 | 29.4 | 25.0 | 35.3 | 43.7 | 27.5 | 22.5 | 18.1 | 21.0 | 15.5 | 30.9 | 27.1 | 18.6 | 13.7 | 25.6 | 27.4 | 17.7 | 21.0 | 14.4 | 24.0 | 33.1 | 26.4 | 16.2 | 19.4 | 19.0 | 23.0 | 25.7 | 21.9 | 20.4 | 17.2 | 24.5 | CDE |
| Hysun 32 | 34.0 | 32.8 | 27.3 | 18.9 | 28.8 | 28.4 | 40.6 | 44.8 | 26.4 | 28.2 | 19.7 | 15.8 | 14.5 | 23.1 | 29.1 | 18.8 | 14.7 | 24.3 | 26.5 | 21.3 | 19.3 | 11.1 | 20.7 | 30.0 | 21.8 | 28.2 | 23.8 | 23.9 | 22.4 | 31.0 | 19.9 | 16.9 | 22.0 | 24.5 | CDE |
| Adalid 8 | 31.6 | 38.9 | 23.6 | 21.0 | 32.8 | 29.1 | 33.1 | 47.8 | 22.6 | 23.4 | 20.1 | 17.5 | 12.7 | 25.7 | 32.1 | 22.6 | 14.1 | 26.4 | 25.3 | 18.5 | 21.3 | 8.8 | 21.8 | 32.1 | 28.5 | 18.7 | 24.1 | 20.4 | 22.3 | 29.6 | 21.6 | 18.0 | 18.4 | 24.4 | CDE |
| Sigco 448 | 35.5 | 37.3 | 26.6 | 19.3 | 29.3 | 29.7 | 37.6 | 42.8 | 24.6 | 22.1 | 18.3 | 17.9 | 15.8 | 20.7 | 27.2 | 22.0 | 13.6 | 24.9 | 25.9 | 22.1 | 19.2 | 10.7 | 19.7 | 31.7 | 29.8 | 19.7 | 21.8 | 23.1 | 20.6 | 32.2 | 16.5 | 21.7 | 20.3 | 24.3 | CDE |
| H-13/80 | 32.0 | 35.3 | 22.8 | 18.3 | 28.2 | 32.0 | 41.5 | 45.2 | 21.4 | 21.6 | 16.8 | 15.2 | 14.7 | 29.2 | 30.1 | 16.6 | 13.7 | 24.7 | 32.1 | 21.3 | 21.5 | 14.4 | 20.0 | 29.0 | 29.1 | 21.5 | 24.5 | 23.1 | 21.5 | 29.6 | 18.9 | 15.9 | 17.2 | 24.2 | CDE |
| H-1414/79 | 31.3 | 34.6 | 26.4 | 20.2 | 26.8 | 24.7 | 39.3 | 42.3 | 23.1 | 21.1 | 17.3 | 16.7 | 14.9 | 30.7 | 30.6 | 19.9 | 13.7 | 22.6 | 28.9 | 21.3 | 18.4 | 13.7 | 22.3 | 29.5 | 28.4 | 25.6 | 25.2 | 19.3 | 21.0 | 29.6 | 18.9 | 18.0 | 16.6 | 24.1 | CDE |
| IH-51 | 29.6 | 34.5 | 26.8 | 20.9 | 35.1 | 33.6 | 38.9 | 42.7 | 14.5 | 18.9 | 15.8 | 14.2 | 17.6 | 25.8 | 22.2 | 16.7 | 13.7 | 21.5 | 25.0 | 22.7 | 16.3 | 7.1 | 29.4 | 34.3 | 23.2 | 27.4 | 26.3 | 17.2 | 22.9 | 34.3 | 22.1 | 22.6 | 17.3 | 24.0 | CDE |
| Peredovik | 32.3 | 36.1 | 26.3 | 20.7 | 34.5 | 37.7 | 14.8 | 47.8 | 26.8 | 14.3 | 19.0 | 15.5 | 16.5 | 23.3 | 33.0 | 22.1 | 13.9 | 22.6 | 30.8 | 17.2 | 22.4 | 13.9 | 19.8 | 30.3 | 28.6 | 25.6 | 21.7 | 22.6 | 21.7 | 28.3 | 13.8 | 16.5 | 18.0 | 23.9 | CDE |
| NS-Shine | 31.3 | 38.8 | 27.3 | 22.4 | 29.0 | 33.7 | 37.9 | 45.2 | 18.7 | 22.6 | 16.8 | 17.5 | 14.5 | 25.6 | 27.4 | 18.8 | 12.1 | 24.5 | 23.8 | 20.6 | 19.4 | 9.5 | 20.4 | 18.7 | 27.9 | 23.9 | 23.8 | 20.8 | 17.8 | 30.5 | 17.9 | 12.1 | 23.7 | 23.5 | CDE |
| H.No. 617 | 31.6 | 31.9 | 23.5 | 16.9 | 29.3 | 28.1 | 35.4 | 41.7 | 22.8 | 21.6 | 15.6 | 11.9 | 15.6 | 10.0 | 20.5 | 13.9 | 11.4 | 26.1 | 29.0 | 20.7 | 17.8 | 6.8 | 17.5 | 19.2 | 22.1 | 23.6 | 23.4 | 19.8 | 18.9 | 26.3 | 16.5 | 18.3 | 18.0 | 21.4 | E |
| Mean | 33.3 | 35.0 | 27.3 | 21.4 | 32.8 | 32.8 | 38.7 | 46.4 | 25.0 | 23.2 | 18.3 | 17.7 | 15.9 | 25.6 | 27.9 | 19.5 | 13.7 | 24.7 | 26.8 | 21.0 | 21.5 | 12.2 | 24.2 | 30.4 | 29.2 | 26.8 | 24.1 | 23.1 | 21.4 | 30.6 | 19.6 | 18.7 | 21.1 | 25.2 | |
| L.S.D. 5% | 1.8 | 3.3 | 2.0 | 2.9 | 4.9 | 4.0 | 4.8 | 3.6 | 5.7 | 3.3 | 2.7 | 2.8 | 4.0 | 2.1 | 2.4 | 4.5 | 4.0 | 3.4 | 2.9 | 2.9 | 5.7 | 4.0 | 6.0 | 2.1 | 6.7 | 6.8 | 1.8 | 7.2 | 4.0 | 4.5 | 3.6 | 3.1 | 5.9 | 3.2 | |
| P — 75 | 31.9 | 37.5 | — | 20.8 | 37.9 | — | 41.8 | — | 25.5 | 17.6 | 16.7 | — | 16.2 | 31.9 | — | — | — | 24.1 | — | 24.1 | — | — | 22.3 | — | 28.1 | — | 24.4 | — | 23.4 | — | 22.4 | 22.7 | 23.5 | — | |
| P — 78 | 31.9 | 34.3 | — | 20.9 | 29.6 | — | 40.7 | — | 22.1 | 20.0 | 16.5 | — | 17.6 | 22.1 | — | — | — | 21.8 | — | 22.9 | — | — | 25.9 | — | 18.8 | — | 20.7 | — | 22.8 | — | 22.8 | 19.4 | 22.0 | — | |
| P — 88 | 25.4 | 37.4 | — | — | 36.5 | — | 37.6 | — | 19.6 | — | 17.0 | — | 17.7 | — | — | — | — | 28.8 | — | — | — | — | 19.7 | — | 31.4 | — | 23.5 | — | 17.3 | — | 19.5 | 19.8 | 21.6 | — | |
| G — 90 | — | — | — | — | 26.8 | — | 38.1 | 44.2 | 17.3 | 30.7 | 18.4 | — | 18.0 | — | — | — | — | 26.1 | — | 24.2 | — | — | 18.1 | — | 18.9 | — | 23.8 | — | — | — | — | — | 23.4 | — | |
| G — 100 | — | — | — | — | — | — | 39.5 | — | 26.4 | 31.0 | 18.3 | — | 16.2 | — | — | — | — | 25.9 | 18.7 | 21.5 | — | — | 22.0 | — | 18.2 | — | — | — | — | — | — | — | 23.5 | — | |

* Means with the same letter are not significantly different (Duncan's multiple range test)

Table 2

**Oil content in dry matter (%)**

| Cultivars | Romania | | | | Hungary | | | | Yugoslavia | | Turkey | | | Cyprus | | Italy | | France | | Spain | | Portugal | Germany F.R. | | Egypt | U.S.A. | | Argentina | Mean | Grouping * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fundulea | | Podu Iloaie | | Szeged | | Iregszemcse | | Novi Sad | | Edirne | | Istanbul | Morocambos | | Osimo | | Clermont Ferrand | | Córdoba | | Elvas | Gross-Gerau | | Sakha | Fargo | | Miramar | | |
| | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1985 | 1984 | 1985 | 1984 | 1984 | 1985 | 1984 | | |
| Select | 53.7 | 52.3 | 52.9 | 51.0 | 50.0 | 54.0 | 51.5 | 54.3 | 47.4 | 56.9 | 50.7 | 47.1 | 55.1 | 56.1 | 53.8 | 54.7 | 47.3 | 54.2 | 54.7 | 46.6 | 43.7 | 49.6 | 48.5 | 50.4 | 36.4 | 51.6 | 46.8 | 48.1 | 50.8 | A |
| Super | 52.5 | 52.3 | 51.9 | 50.5 | 46.0 | 53.0 | 51.5 | 51.9 | 48.2 | 54.1 | 49.8 | 46.1 | 55.0 | 58.0 | 56.8 | 52.2 | 49.7 | 54.2 | 56.6 | 45.9 | 46.0 | 47.3 | 48.7 | 52.9 | 33.6 | 52.2 | 48.2 | 46.8 | 50.5 | AB |
| Fundulea 56 | 55.3 | 50.7 | 52.8 | 48.6 | 49.0 | 51.0 | 52.9 | 53.2 | 49.8 | 54.2 | 53.0 | 42.5 | 54.3 | 57.6 | 56.8 | 51.5 | 50.2 | 53.8 | 57.5 | 46.3 | 44.0 | 50.6 | 47.5 | 51.2 | 32.0 | 54.3 | 48.0 | 44.9 | 50.5 | AB |
| Adalid 8 | 53.5 | 49.1 | 50.3 | 47.9 | 47.0 | 50.0 | 51.9 | 52.6 | 47.3 | 53.8 | 52.8 | 39.1 | 53.8 | 55.9 | 56.2 | 54.7 | 49.8 | 54.9 | 56.0 | 47.5 | 44.0 | 49.1 | 49.2 | 49.3 | 33.9 | 53.7 | 48.0 | 47.3 | 50.0 | ABC |
| Fundulea 55 | 54.9 | 48.9 | 48.6 | 48.8 | 49.0 | 51.0 | 51.6 | 51.2 | 47.5 | 52.1 | 50.0 | 43.1 | 54.1 | 54.1 | 56.7 | 47.9 | 49.3 | 54.4 | 55.7 | 45.7 | 44.2 | 52.3 | 48.1 | 50.1 | 32.6 | 52.7 | 47.6 | 46.2 | 49.6 | ABCD |
| Hysun 32 | 53.2 | 46.6 | 48.4 | 45.3 | 49.0 | 50.0 | 41.4 | 50.7 | 43.9 | 52.3 | 53.0 | 52.0 | 53.2 | 56.3 | 56.9 | 49.5 | 50.6 | 55.2 | 51.0 | 47.8 | 43.2 | 48.8 | 47.9 | 50.3 | 36.4 | 52.1 | 49.3 | 48.2 | 49.5 | ABCD |
| Peredovik | 51.7 | 48.5 | 49.5 | 48.8 | 45.5 | 49.0 | 48.8 | 49.4 | 46.2 | 49.8 | 54.2 | 50.0 | 53.8 | 55.4 | 55.1 | 52.1 | 48.1 | 54.1 | 51.8 | 45.3 | 43.0 | 50.1 | 48.6 | 50.1 | 37.8 | 52.0 | 45.5 | 43.2 | 49.3 | ABCDE |
| Sigco 448 | 54.7 | 49.8 | 49.6 | 44.7 | 50.0 | 49.0 | 51.7 | 52.9 | 47.0 | 51.4 | 51.9 | 40.1 | 52.9 | 49.6 | 54.9 | 54.9 | 47.6 | 54.7 | 56.0 | 44.9 | 45.7 | 45.1 | 46.3 | 50.6 | 34.7 | 52.8 | 47.7 | 48.7 | 49.3 | ABCDE |
| H-219/79 | 51.2 | 47.5 | 48.3 | 44.5 | 48.0 | 51.0 | 50.6 | 50.8 | 48.9 | 52.2 | 53.2 | 50.0 | 53.2 | 55.0 | 54.3 | 52.2 | 46.6 | 53.9 | 49.9 | 46.3 | 42.7 | 51.1 | 47.4 | 48.8 | 38.0 | 50.5 | 45.5 | 46.1 | 49.2 | ABCDEF |
| Felix | 53.2 | 48.6 | 51.0 | 51.7 | 51.0 | 53.0 | 49.9 | 52.6 | 46.2 | 53.3 | 50.9 | 43.2 | 53.9 | 56.7 | 54.8 | 50.1 | 44.8 | 52.6 | 54.5 | 43.0 | 42.2 | 45.5 | 45.3 | 49.2 | 36.6 | 52.1 | 47.2 | 41.4 | 49.2 | ABCDEF |
| Interstate 7111 | 52.6 | 47.8 | 51.4 | 45.7 | 47.0 | 48.0 | 52.3 | 52.3 | 45.9 | 51.1 | 47.8 | 39.2 | 52.8 | 56.0 | 53.3 | 49.5 | 48.1 | 52.5 | 56.2 | 44.8 | 43.5 | 47.9 | 48.3 | 48.2 | 37.7 | 52.0 | 46.0 | 48.3 | 48.8 | ABCDEF |
| NS-Helios | 51.7 | 46.4 | 48.4 | 45.0 | 50.0 | 51.0 | 49.5 | 50.2 | 47.4 | 51.6 | 49.1 | 42.9 | 51.0 | 54.1 | 54.7 | 49.1 | 49.0 | 53.0 | 53.1 | 45.5 | 43.7 | 49.1 | 45.3 | 44.4 | 38.5 | 49.9 | 45.5 | 45.7 | 48.4 | BCDEFG |
| H. No. 617 | 51.5 | 47.5 | 48.5 | 45.9 | 49.0 | 50.0 | 47.8 | 49.8 | 47.7 | 52.4 | 52.1 | 47.0 | 52.0 | 51.6 | 53.9 | 49.5 | 48.2 | 50.5 | 49.5 | 45.0 | 41.5 | 44.6 | 47.9 | 48.2 | 36.0 | 51.4 | 47.6 | 42.7 | 48.3 | BCDEFG |
| Triumph 570 | 49.6 | 46.8 | 47.8 | 47.0 | 46.0 | 49.0 | 49.7 | 49.7 | 42.9 | 49.7 | 49.7 | 44.9 | 52.1 | 52.7 | 53.3 | 51.0 | 48.4 | 53.8 | 54.2 | 46.6 | 43.7 | 47.9 | 47.4 | 46.8 | 36.5 | 49.3 | 45.0 | 44.3 | 48.1 | CDEFG |
| NS-Condor | 51.9 | 45.6 | 48.4 | 46.4 | 45.0 | 51.0 | 50.6 | 48.6 | 47.4 | 51.8 | 50.0 | 43.0 | 49.9 | 52.8 | 52.3 | 47.4 | 47.8 | 51.9 | 53.7 | 43.0 | 42.0 | 49.2 | 47.6 | 49.4 | 36.3 | 50.7 | 46.4 | 45.2 | 48.1 | CDEFG |
| IH-173 | 53.1 | 46.5 | 46.8 | 42.5 | 47.0 | 48.0 | 49.7 | 51.5 | 45.3 | 51.6 | 45.7 | 47.1 | 52.0 | 53.7 | 51.5 | 49.4 | 45.5 | 52.8 | 52.8 | 43.6 | 41.7 | 48.6 | 46.6 | 50.6 | 37.5 | 48.1 | 46.2 | 44.5 | 47.9 | CDEFG |
| Arbumg 353 | 50.6 | 45.5 | 45.4 | 42.5 | 46.0 | 47.0 | 49.7 | 50.6 | 43.6 | 50.0 | 49.9 | 46.2 | 53.0 | 54.4 | 53.8 | 48.7 | 46.7 | 50.8 | 54.3 | 44.6 | 45.0 | 50.6 | 46.7 | 45.6 | 34.1 | 52.1 | 44.4 | 45.1 | 47.9 | CDEFG |
| Koflor 3 | 51.5 | 48.5 | 49.8 | 45.8 | 46.0 | 45.0 | 49.2 | 47.8 | 45.5 | 45.6 | 48.1 | 44.1 | 53.0 | 51.2 | 52.3 | 51.0 | 45.5 | 54.0 | 50.0 | 44.6 | 42.5 | 48.3 | 46.5 | 49.6 | 37.1 | 49.9 | 44.8 | 44.3 | 47.7 | DEFGH |
| NS-Shine | 53.8 | 45.2 | 48.4 | 45.0 | 47.0 | 48.0 | 50.9 | 47.4 | 45.7 | 49.2 | 51.9 | 40.8 | 52.9 | 54.7 | 52.7 | 49.5 | 43.3 | 52.5 | 50.5 | 46.2 | 41.7 | 42.9 | 49.6 | 44.7 | 38.5 | 53.2 | 43.1 | 45.5 | 47.7 | DEFGH |
| H-13/80 | 51.1 | 47.1 | 44.9 | 44.8 | 45.0 | 47.0 | 48.1 | 49.7 | 44.0 | 46.5 | 47.9 | 47.0 | 50.8 | 50.9 | 53.1 | 46.6 | 46.6 | 51.6 | 49.9 | 42.3 | 42.7 | 48.7 | 45.1 | 44.3 | 38.2 | 48.7 | 45.5 | 48.3 | 47.1 | EFGHI |
| Citosol 4 | 49.7 | 45.1 | 47.0 | 44.5 | 46.0 | 46.0 | 49.1 | 46.7 | 43.7 | 45.3 | 48.1 | 46.2 | 52.2 | 52.3 | 53.6 | 49.4 | 44.1 | 54.7 | 49.9 | 43.6 | 39.5 | 49.2 | 50.3 | 48.4 | 36.6 | 48.4 | 45.6 | 41.3 | 47.1 | EFGHI |
| Pacific 308 | 48.0 | 45.4 | 48.4 | 42.4 | 45.0 | 46.0 | 47.6 | 46.9 | 41.8 | 46.1 | 52.0 | 48.0 | 52.0 | 53.1 | 53.0 | 49.5 | 49.5 | 54.2 | 52.8 | 46.5 | 41.7 | 49.3 | 44.0 | 45.2 | 32.5 | 46.9 | 42.0 | 44.0 | 47.0 | FGHI |
| Citosol F-1 | 48.7 | 45.0 | 48.4 | 45.4 | 45.0 | 44.0 | 48.8 | 47.9 | 42.7 | 43.6 | 45.9 | 45.1 | 51.8 | 53.2 | 52.1 | 49.5 | 42.9 | 53.3 | 52.8 | 42.3 | 40.0 | 50.6 | 46.6 | 45.2 | 35.8 | 46.1 | 44.2 | 45.8 | 46.5 | GHIJ |
| NS-Flower | 49.7 | 45.6 | 48.4 | 45.0 | 51.0 | 46.0 | 47.6 | 47.8 | 43.8 | 48.9 | 45.0 | 41.0 | 48.1 | 51.8 | 51.1 | 45.6 | 44.6 | 48.8 | 50.2 | 44.9 | 42.7 | 48.7 | 42.7 | 45.7 | 35.0 | 47.7 | 42.3 | 43.0 | 46.3 | GHIJ |
| H-1414/79 | 47.8 | 45.2 | 46.0 | 41.6 | 42.0 | 46.0 | 46.4 | 45.1 | 41.2 | 43.9 | 44.8 | 44.0 | 50.0 | 52.3 | 49.1 | 47.0 | 46.6 | 50.5 | 47.8 | 41.7 | 42.2 | 45.1 | 45.3 | 46.0 | 39.4 | 46.5 | 45.5 | 42.3 | 45.6 | HIJK |
| Florom 305 | 47.9 | 44.7 | 46.7 | 42.5 | 44.0 | 45.0 | 48.2 | 49.3 | 41.4 | 47.0 | 48.1 | 32.0 | 49.9 | 54.0 | 52.8 | 46.6 | 45.8 | 50.2 | 50.6 | 44.1 | 43.5 | 45.8 | 41.8 | 39.9 | 33.2 | 45.9 | 41.3 | 42.3 | 45.3 | IJK |
| Cargill 207 | 47.9 | 44.9 | 47.8 | 40.2 | 46.0 | 45.0 | 49.2 | 48.8 | 39.0 | 47.2 | 43.9 | 45.9 | 47.2 | 46.6 | 49.5 | 44.6 | 41.1 | 49.7 | 51.6 | 40.9 | 43.5 | 47.3 | 42.4 | 45.3 | 37.9 | 45.7 | 42.8 | 39.4 | 45.2 | IJK |
| IBH-160 | 45.0 | 43.2 | 44.5 | 43.4 | 41.0 | 43.0 | 47.6 | 46.0 | 38.9 | 42.6 | 44.8 | 44.3 | 49.0 | 49.4 | 49.5 | 47.5 | 41.5 | 50.4 | 52.8 | 41.6 | 39.2 | 44.3 | 43.9 | 45.6 | 38.4 | 45.4 | 42.1 | 41.6 | 44.6 | JK |
| IH-51 | 45.9 | 41.9 | 43.4 | 44.3 | 43.0 | 45.0 | 46.3 | 44.7 | 37.3 | 41.1 | 43.9 | 43.2 | 48.1 | 47.6 | 47.5 | 43.5 | 40.7 | 49.4 | 52.8 | 37.8 | 38.0 | 41.4 | 45.0 | 46.5 | 36.4 | 46.0 | 43.8 | 40.1 | 43.9 | K |
| Mean | 51.1 | 47.0 | 48.4 | 45.6 | 46.8 | 48.4 | 49.4 | 49.7 | 44.8 | 49.5 | 49.3 | 44.4 | 52.0 | 53.4 | 53.3 | 49.5 | 46.6 | 52.7 | 52.8 | 44.5 | 42.7 | 47.9 | 46.6 | 47.7 | 36.2 | 50.0 | 45.5 | 44.7 | 48.0 | |
| L.S.D. 5% | 1.8 | 3.8 | 2.0 | 2.9 | 1.4 | 2.0 | 1.8 | 1.3 | 2.6 | 3.9 | 2.2 | 2.2 | 2.2 | 1.7 | 2.2 | 3.0 | 1.3 | 1.4 | 1.6 | 1.8 | 2.6 | 2.2 | 2.1 | 2.1 | 2.0 | 2.2 | 2.4 | 2.3 | 2.2 | |
| P — 75 | 48.3 | 42.3 | — | 40.1 | 46.0 | — | 47.0 | — | 42.8 | 46.2 | 48.0 | — | 49.8 | 49.8 | — | — | — | 49.7 | — | 41.8 | — | — | 44.7 | — | 38.2 | 46.5 | — | 43.6 | — | |
| P — 78 | 49.8 | 43.8 | — | 43.8 | 47.0 | — | 46.3 | — | 45.3 | 47.1 | 45.0 | — | 50.8 | 50.1 | — | — | — | 52.3 | — | 44.6 | — | — | 45.8 | — | 32.6 | 47.8 | — | 43.1 | — | |
| P — 80 | 47.5 | — | — | — | 43.0 | — | 43.2 | — | 40.1 | — | 49.0 | — | 48.0 | — | — | — | — | 47.5 | — | — | — | — | 45.4 | — | 38.1 | 39.1 | — | 45.4 | — | |
| G — 90 | — | — | — | — | 41.0 | — | 41.4 | — | 40.1 | — | 43.7 | — | 51.8 | — | — | — | — | 45.0 | — | 42.6 | — | — | 38.3 | — | 33.4 | 39.9 | — | 42.5 | — | |
| G — 100 | — | — | — | — | 47.0 | 48.0 | — | — | 34.8 | — | 49.2 | — | 44.6 | — | — | — | — | 54.9 | 51.4 | 44.7 | — | — | 47.5 | — | 34.3 | 50.8 | — | 43.4 | — | |

* Means with the same letter are not significantly different (Duncan's multiple range test)

ANNEX 2

**List of sunflower single (SH) and three-way (TH) hybrids, and open pollinated varieties (OPV) in the experimental cycle 1984 and 1985**

| Cultivars | Genetic type | Supplying country |
|---|---|---|
| P-75 | SH | Argentina |
| P-78 | SH | Argentina |
| P-80 | SH | Argentina |
| G-90 | SH | Argentina |
| G-100 | SH | Argentina |
| Hysun 32 | SH | Austria |
| Pacific 308 | SH | Austria |
| H. No. 617 | SH | Bulgaria |
| Peredovik | OPV | Bulgaria |
| H-219/79 | SH | Germany F.R. |
| H-13/80 | TH | Germany F.R. |
| H-1414/79 | TH | Germany F.R. |
| Koflor 3 | SH | Hungary |
| Citosol 4 | SH | Hungary |
| Citosol F-1 | SH | Hungary |
| IBH-160 | SH | Hungary |
| IH-173 | SH | Hungary |
| IH-51 | SH | Hungary |
| Super | TH | Romania |
| Select | SH | Romania |
| Felix | SH | Romania |
| Fundulea 55 | SH | Romania |
| Fundulea 56 | SH | Romania |
| Florom 305 | SH | Romania |
| Adalid 8 | SH | Spain |
| Arbumg 353 | SH | Spain |
| Sigco 448 | SH | U.S.A. |
| Interstate 7111 | SH | U.S.A. |
| Cargill 207 | SH | U.S.A. |
| Triumph 570 | SH | U.S.A. |
| HS-Flower | SH | Yugoslavia |
| HS-Shine | SH | Yugoslavia |
| NS-Condor | SH | Yugoslavia |
| NS-Helios | SH | Yugoslavia |

The mean seed yield ranged greatly, from 12.2 q/ha at Elvas, in 1985 to 46.4 at Szeged, in the same year (Table 1). Good yield levels were recorded not only in zones with favourable conditions for sunflower cropping, as South-East of Europe, but also in France, Federal Republic of Germany, Cyprus, Czechoslovakia, Egypt and U.S.A. A major cause of the relative low yields in some locations could be considered the disease attack. So, *Sclerotinia sclerotiorum* affected heavyly sunflower at Novi Sad (1984, 1985), G. Toshevo (1984), Gross-Gerau (1984, 1985), Podu Iloaie (1984, 1985), Iregszemcse (1984, 1985) and Fundulea (1984) ; *Phoma oleracea* at G. Toshevo (1984); *Botrytis cinerea* at Iregszemcse (1984, 1985) and Gross-Gerau (1984, 1985) ; *Phomopsis helianthi* at Novi Sad (1984, 1985) and Fundulea (1984) ; *Sclerotium bataticola* at Szeged (1985) and Iregszemcse (1985) ; *Alternaria* sp. at G. Toshevo (1984), Iregszemcse (1985) ; *Orobanche cumana* at Novi Sad (1984) and Edirne (1985).

Taking into account the general seed yield means, 18 hybrids were statisticaly similar, yielding from 24.9 to 28.0 q/ha (Table 1). The hybrids Select and Cargil 207 from this group had significant seed yield differences from the group of the last 10 entries, in which the open pollinated variety Peredovik was included.

Some hybrids performed very well in more than four locations, showing thus a good environmental adaptability, as : Select (at Fundulea, Podu Iloaie, Iregszemcse, Szeged, Novi Sad, Edirne, Córdoba, Ruzyně and Sakha), Cargill 207 (at Iregszemcse, Szeged, Ruzyně, Sakha, Fargo, Ciano), NS-Helios (at Fundulea, Szeged, Novi Sad, Edirne, Ruzyně), NS-Condor (at Iregszemcse, Szeged, Córdoba, Ruzyně), Triumph 570 (at Edirne, Córdoba, Ruzyně, Ciano).

As seed yield, oil content in dried seeds also varied greatly from location to location and from year to year, but the classification of hybrids has repeated almost the same pattern in all environments, showing the hereditary stability of this character in spite of its large phenotypical variability (table 2).

*Table 3*

**Seed yield and oil content recorded at Fuchsenbigl (Austria)**

| Cultivars | Seed yield (q/ha, 0% moisture) | | % oil in dry matter |
|---|---|---|---|
| | 1984 | 1985 | 1985 |
| Hysun 32 | — | 33.2 | 51.5 |
| Pacific 308 | — | 35.2 | 47.2 |
| H. No. 617 | 15.4 | 29.3 | 51.1 |
| Peredovik | 16.7 | 27.3 | 51.8 |
| H-219/79 | 20.4 | — | — |
| H-13/80 | 19.8 | — | — |
| H-1414/79 | 18.5 | — | — |
| Koflor 3 | 20.6 | 31.4 | 50.0 |
| Citosol 4 | 19.4 | 32.5 | 48.0 |
| Citosol F-1 | 18.3 | 31.0 | 46.7 |
| IBH-160 | 21.5 | 32.6 | 46.9 |
| IH-173 | 20.2 | 33.1 | 49.3 |
| IH-51 | 20.2 | 31.5 | 46.4 |
| Super | — | 30.9 | 50.8 |
| Select | 19.1 | 32.8 | 52.0 |
| Felix | 19.2 | 32.4 | 51.9 |
| Fundulea 55 | 20.3 | 27.0 | 49.2 |
| Fundulea 56 | 17.9 | 25.1 | 49.1 |
| Florom 305 | — | 28.4 | 46.7 |
| Adalid 8 | 21.5 | 29.3 | 50.1 |
| Arbumg 353 | 20.7 | 33.7 | 48.3 |
| NS-Flower | 20.8 | 36.6 | 47.9 |
| NS-Shine | 18.0 | 31.0 | 46.7 |
| NS-Condor | 19.4 | 30.0 | 49.8 |
| NS-Helios | — | 35.3 | 48.3 |
| Mean | 19.4 | 30.4 | 49.0 |
| L.S.D. 5% | 2.9 | 3.9 | |

High oil values from 55 to 58% were recorded in Cyprus, France, Yugoslavia and Romania. The annual trial means were higher than 50% in four cases (Select, Super, Fundulea 56 and Adalid 8). Eleven hybrids were statistically similar, with the general means ranging from 43.8% to 50.8%. There have been also hybrids with a lower level of oil content, as for instance IH-51, IBH-160, Cargill 207, Florom 305 and H-1414/79 indicating the still existing low selection pressure for this important economic character in certain cases.

The data from Fuchsenbigl (Austria), which provide useful information for Central Europe, are presented separately for seed yield and oil content (Table 3), because a different

*Table 4*

**Seed yield and some seed and plant traits recorded at G. Toshevo (Bulgaria) in 1984**

| Cultivars | Seed yield (q/ha, 0% moisture) | % oil in dry matter | Husks % | 1 000 seed weight (g) | No. of days from emergence to maturity | Plant height (cm) |
|---|---|---|---|---|---|---|
| P-75 | 29.8 | 45.4 | 28.9 | 57 | 125 | 136 |
| P-78 | 28.8 | 47.0 | 27.9 | 57 | 123 | 141 |
| Hysun 32 | 30.9 | 50.8 | 24.8 | 53 | 124 | 146 |
| Pacific 308 | 29.8 | 47.6 | 27.7 | 61 | 126 | 166 |
| H. No. 617 | 20.9 | 48.9 | 23.1 | 53 | 112 | 151 |
| Peredovik | 23.3 | 49.2 | 24.6 | 67 | 133 | 183 |
| H-219/79 | 21.7 | 47.1 | 25.7 | 59 | 123 | 166 |
| H-13/80 | 19.0 | 45.6 | 28.8 | 62 | 128 | 139 |
| H-1414/79 | 21.9 | 44.5 | 29.4 | 60 | 126 | 138 |
| Koflor 3 | 19.2 | 45.3 | 26.7 | 50 | 126 | 138 |
| Citosol 4 | 20.2 | 43.9 | 28.7 | 46 | 117 | 146 |
| Citosol F-1 | 29.3 | 47.6 | 27.5 | 48 | 118 | 142 |
| IBH-160 | 20.0 | 40.3 | 31.3 | 55 | 125 | 156 |
| IH-173 | 21.3 | 44.9 | 28.6 | 59 | 128 | 128 |
| IH-51 | 21.6 | 45.1 | 28.3 | 62 | 120 | 143 |
| Super | 26.3 | 50.0 | 22.9 | 60 | 133 | 143 |
| Select | 27.1 | 49.9 | 25.9 | 60 | 127 | 151 |
| Felix | 29.1 | 51.8 | 24.0 | 74 | 127 | 149 |
| Fundulea 55 | 24.4 | 48.0 | 24.0 | 61 | 120 | 136 |
| Fundulea 56 | 25.4 | 52.5 | 22.0 | 51 | 126 | 126 |
| Florom 305 | 21.9 | 44.7 | 27.7 | 65 | 117 | 160 |
| Adalid 8 | 30.9 | 51.3 | 24.4 | 62 | 126 | 149 |
| Arbumg 353 | 32.9 | 50.3 | 25.3 | 64 | 123 | 148 |
| Sigco 448 | 21.1 | 45.3 | 26.5 | 49 | 114 | 141 |
| Interstate 7111 | 28.8 | 50.6 | 23.7 | 60 | 118 | 140 |
| Cargill 207 | 29.8 | 44.4 | 28.8 | 58 | 122 | 143 |
| Triumph 570 | 26.0 | 48.5 | 28.1 | 51 | 130 | 166 |
| NS-Flower | 31.7 | 51.7 | 24.3 | 65 | 131 | 173 |
| NS-Shine | 28.5 | 52.6 | 23.6 | 54 | 118 | 136 |
| NS-Condor | 30.6 | 48.6 | 27.7 | 66 | 128 | 166 |
| NS-Helios | 33.7 | 49.6 | 25.6 | 62 | 129 | 167 |
| Mean | 26.0 | 47.8 | 26.3 | 58 | 124 | 149 |
| L.S.D. 5% | 3.4 | 1.7 | 1.3 | 3.8 | — | 12.7 |

*Table 5*

**Seed yield and some seed and plant traits recorded at Bangalore (India) in 1985**

| Cultivars | Seed yield (q/ha, 0% moisture) | % oil in dry matter | 1 000 seed weight (g) | No. of days from emergence to flowering | Plant height (cm) |
|---|---|---|---|---|---|
| Hysun 32 | 17.5 | 40.0 | 41 | 64 | 168 |
| Pacific 308 | 26.5 | 41.4 | 54 | 68 | 191 |
| H. No. 617 | 12.7 | 36.7 | 45 | 56 | 132 |
| Peredovik | 20.4 | 37.3 | 57 | 65 | 197 |
| Koflor 3 | 16.5 | 39.9 | 34 | 63 | 178 |
| Citosol 4 | 17.8 | 39.5 | 33 | 68 | 194 |
| Citosol F-1 | 17.6 | 39.2 | 30 | 65 | 174 |
| IBH-160 | 19.9 | 36.6 | 42 | 64 | 190 |
| IH-173 | 17.2 | 34.3 | 40 | 59 | 152 |
| IH-51 | 12.6 | 33.5 | 42 | 55 | 137 |
| Super | 18.8 | 38.5 | 54 | 61 | 135 |
| Select | 23.9 | 42.1 | 54 | 62 | 141 |
| Felix | 20.8 | 38.1 | 56 | 60 | 147 |
| Fundulea 55 | 18.2 | 37.9 | 41 | 60 | 145 |
| Fundulea 56 | 17.3 | 36.7 | 42 | 62 | 162 |
| Florom 305 | 19.0 | 39.8 | 55 | 59 | 136 |
| Adalid 8 | 14.0 | 40.5 | 43 | 62 | 166 |
| Arbumg 353 | 20.9 | 36.4 | 50 | 57 | 153 |
| Sigco 448 | 18.3 | 39.1 | 40 | 57 | 135 |
| Cargill 207 | 25.3 | 36.6 | 41 | 60 | 154 |
| NS-Flower | 24.6 | 35.2 | 48 | 63 | 186 |
| NS-Shine | 17.6 | 37.1 | 45 | 58 | 161 |
| NS-Condor | 22.4 | 37.8 | 43 | 60 | 173 |
| NS-Helios | 22.4 | 37.1 | 51 | 62 | 185 |
| Mean | 19.3 | 38.0 | 45 | 61 | 162 |
| L.S.D. 5% | 4.8 | 4.6 | 0.7 | 2.9 | 18.3 |

*Table 6*

**Results obtained at Muñoz (Philippines) in 1985—1986**

| Cultivars | Seed yield (q/ha, 0% moisture) | No. of days from emergence to maturity | Plant height (cm) | Head diameter (cm) | 1 000 seed weight (g) | % unfilled seeds |
|---|---|---|---|---|---|---|
| Select | 20.4 | 85 | 86 | 14 | 76.7 | 27.4 |
| Sigco 448 | 20.3 | 85 | 74 | 13 | 76.4 | 27.0 |
| Peredovik | 19.8 | 89 | 123 | 15 | 74.2 | 27.9 |
| NS-Shine | 19.5 | 84 | 79 | 13 | 73.0 | 27.6 |
| H-13/80 | 18.7 | 87 | 106 | 16 | 70.2 | 31.4 |
| Florom 305 | 18.7 | 85 | 95 | 15 | 70.4 | 25.3 |
| IH-173 | 18.6 | 85 | 87 | 15 | 69.5 | 32.8 |
| Felix | 18.5 | 86 | 102 | 13 | 69.3 | 31.8 |
| NS-Helios | 18.3 | 89 | 113 | 18 | 68.4 | 40.6 |
| NS-Flower | 17.8 | 87 | 118 | 13 | 66.8 | 32.0 |
| IBH-160 | 17.6 | 86 | 108 | 15 | 64.7 | 27.2 |
| Super | 17.3 | 88 | 106 | 16 | 64.9 | 33.8 |
| Cargill 207 | 17.2 | 86 | 110 | 15 | 64.4 | 29.3 |
| Interstate 7111 | 17.0 | 87 | 91 | 12 | 64.1 | 27.6 |
| H-1414/79 | 16.6 | 85 | 129 | 15 | 62.4 | 41.6 |
| IH-51 | 16.6 | 84 | 92 | 14 | 62.4 | 27.4 |
| H-219/79 | 16.5 | 88 | 116 | 15 | 62.0 | 28.8 |
| Fundulea 56 | 16.5 | 85 | 109 | 16 | 61.9 | 32.1 |
| Arbumg | 16.3 | 87 | 110 | 15 | 61.1 | 31.6 |
| H. No. 617 | 16.1 | 82 | 79 | 11 | 59.0 | 31.6 |
| Adalid 8 | 15.6 | 88 | 101 | 16 | 58.5 | 36.2 |
| Fundulea 55 | 15.3 | 88 | 108 | 15 | 57.4 | 36.5 |
| Koflor 3 | 15.3 | 86 | 96 | 16 | 58.5 | 40.6 |
| HS-Condor | 15.2 | 87 | 119 | 14 | 57.0 | 41.2 |
| Triumph 570 | 14.9 | 89 | 129 | 16 | 56.0 | 42.6 |
| Citosol 4 | 13.6 | 87 | 116 | 16 | 51.3 | 42.8 |
| L.S.D. 5% | 2.4 | 0.8 | 9.9 | 1.6 | 8.9 | 2.4 |

number of hybrids was tested each year. Separately also (Table 4) are presented the results obtained at General Toshevo (Bulgaria) in one single year. An incomplete set of cultivars was tested at Bangalore (India). Table 5 gives interesting information not only on seed yield and oil content, but also on some seed and plant traits.

As concerns the experimentation at Muñoz (Philippines), we have been informed that the trial of the year 1984—1985 was depreciated by certain unfavourable environmental conditions. Table 6 comprises the results obtained in the year 1985—1986. Seed yield seems to be negatively correlated with the percentage of unfilled seeds. Two hybrids, Select and Sigco 448, with the best seedsetting, yielded over 20 q/ha.

The main morpho-physiological characteristics are presented in Table 7. A large variation of the growing period and plant height has been noticed among cultivars and localities, indicating the influence of photoperiod on some genotypes. Generally, sunflower hybrids tested in network trials ranged from medium-early to medium-late as far as the number of days from emergence to physiological maturity is concerned and from medium-short to tall regarding plant height.

In comparison with the open pollinated variety Peredovik, certain hybrids had superior values of volumetric seed weight and seed size, but some of them had smaller seeds and lower weight of 1,000 seeds. A better resistance to lodging was noticed almost to all hybrids. Plant uniformity of the single hybrids was very good

*Table 7*

**Morpho-physiological characteristics**

| Cultivars | No. of days from emergence to flowering | | No. of days from emergence to maturity | | Plant height (cm) | | Volumetric weight (kg/hl) | | 1 000 seed weight (g) | | Husks (%) | | Resistance to lodging (mean appreciation) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | limits | mean | limits | mean | limits | mean | limits | mean | limits | mean | limits | mean | |
| P-75 | 70—88 | 80 | 104—132 | 120 | 102—186 | 141 | 33—45 | 40 | 45—84 | 59 | 21—32 | 26 | very good |
| P-78 | 74—89 | 81 | 101—130 | 122 | 110—172 | 143 | 33—45 | 40 | 47—79 | 55 | 20—26 | 23 | very good |
| P-80 | 87—95 | 91 | 114—131 | 127 | 102—220 | 180 | 32—44 | 37 | 44—76 | 56 | 21—32 | 28 | very good |
| Hysun 32 | 64—90 | 81 | 101—131 | 121 | 117—189 | 157 | 37—50 | 43 | 26—71 | 51 | 18—39 | 25 | very good |
| Pacific 308 | 68—95 | 82 | 112—133 | 125 | 121—211 | 165 | 35—46 | 41 | 34—77 | 58 | 17—34 | 26 | good |
| H. No. 617 | 62—87 | 76 | 99—139 | 118 | 118—225 | 150 | 32—45 | 40 | 35—77 | 54 | 18—25 | 23 | feeble |
| Peredovik | 67—90 | 80 | 101—151 | 125 | 130—226 | 173 | 32—44 | 38 | 38—79 | 60 | 20—27 | 23 | good |
| H-219/79 | 66—95 | 80 | 104—143 | 124 | 128—222 | 169 | 39—48 | 43 | 49—77 | 62 | 20—26 | 23 | good |
| H-13/80 | 60—81 | 73 | 97—146 | 120 | 110—177 | 136 | 35—40 | 39 | 48—72 | 61 | 21—27 | 24 | good |
| H-1414/79 | 61—86 | 76 | 97—149 | 122 | 105—178 | 149 | 35—45 | 40 | 52—77 | 62 | 21—28 | 27 | good |
| Koflor 3 | 65—95 | 79 | 96—139 | 119 | 112—180 | 134 | 34—47 | 41 | 25—74 | 52 | 16—31 | 24 | good |
| Citosol 4 | 64—95 | 80 | 97—132 | 118 | 99—180 | 147 | 38—49 | 42 | 25—70 | 50 | 19—32 | 26 | very good |
| Citosol F-1 | 63—95 | 78 | 94—130 | 115 | 104—182 | 144 | 37—48 | 42 | 25—71 | 49 | 22—38 | 28 | very good |
| IBH-160 | 62—90 | 78 | 96—145 | 124 | 101—197 | 155 | 32—47 | 41 | 38—81 | 61 | 21—35 | 27 | very good |
| IH-173 | 60—90 | 77 | 94—153 | 120 | 193—192 | 135 | 35—46 | 40 | 47—76 | 59 | 18—29 | 23 | very good |
| IH-51 | 60—88 | 77 | 98—126 | 116 | 92—183 | 143 | 34—44 | 38 | 39—80 | 57 | 19—31 | 27 | very good |
| Super | 64—86 | 78 | 101—139 | 123 | 94—188 | 149 | 37—44 | 40 | 49—80 | 59 | 19—27 | 23 | very good |
| Select | 66—90 | 80 | 102—145 | 124 | 104—192 | 160 | 37—51 | 41 | 33—76 | 60 | 22—34 | 25 | very good |
| Felix | 65—89 | 79 | 104—132 | 120 | 97—195 | 156 | 33—48 | 40 | 41—80 | 66 | 19—27 | 23 | good |
| Fundulea 55 | 62—87 | 77 | 101—142 | 121 | 91—182 | 134 | 35—50 | 40 | 42—75 | 63 | 20—28 | 23 | good |
| Fundulea 56 | 60—90 | 77 | 97—134 | 118 | 106—191 | 132 | 37—46 | 44 | 42—82 | 53 | 15—23 | 23 | very good |
| Florom 305 | 60—89 | 78 | 97—148 | 120 | 103—181 | 149 | 33—44 | 39 | 44—94 | 69 | 21—29 | 25 | very good |
| Adalid 8 | 61—89 | 78 | 101—146 | 123 | 101—179 | 150 | 34—46 | 41 | 32—80 | 62 | 22—26 | 24 | good |
| Arbumg 353 | 61—86 | 67 | 99—135 | 117 | 103—181 | 145 | 32—46 | 43 | 36—82 | 61 | 21—27 | 24 | good |
| Sigco 448 | 61—90 | 78 | 101—145 | 121 | 100—172 | 147 | 34—46 | 39 | 31—66 | 53 | 23—31 | 25 | very good |
| Interstate 7111 | 60—86 | 75 | 95—143 | 118 | 101—178 | 141 | 35—44 | 39 | 35—77 | 60 | 19—31 | 25 | good |
| Cargill 207 | 61—86 | 76 | 99—139 | 118 | 107—198 | 148 | 33—46 | 42 | 34—74 | 61 | 20—29 | 26 | very good |
| Triumph 570 | 65—92 | 75 | 104—151 | 126 | 110—200 | 166 | 35—46 | 41 | 40—81 | 55 | 19—28 | 25 | good |
| NS-Flower | 63—90 | 78 | 101—152 | 123 | 109—205 | 167 | 35—46 | 41 | 39—83 | 60 | 18—32 | 24 | very good |
| NS-Shine | 63—87 | 77 | 95—129 | 115 | 99—196 | 142 | 29—48 | 40 | 29—70 | 52 | 20—26 | 24 | good |
| NS-Condor | 63—90 | 80 | 104—150 | 127 | 108—219 | 164 | 35—45 | 42 | 38—79 | 57 | 20—28 | 24 | very good |
| NS-Helios | 65—90 | 80 | 104—151 | 125 | 107—205 | 166 | 35—46 | 42 | 36—68 | 53 | 22—32 | 26 | very good |

and good, in contrast with the three-way hybrids and the open pollinated variety Peredovik which displayed a satisfactory and respectively poor uniformity. Head diameter varied within large limits, but the mean values were relatively close (Table 8). Many hybrids exhibited a high self-fertility degree. The high percentage of male sterile plants in certain hybrids (H-617, H-1414/79, H-13/80) indicates the heterozygosity of the Rf genes in the male parent or some deficiencies in hybrid seed production.

Table 9 shows the response to the attack of the main sunflower pathogens. The most resistant to *Sclerotinia sclerotiorum* were the hybrids NS-Flower, NS-Helios (root attack), Select, Triumph 570, H-219/79 (stem attack), Citosol 4, Select and IH-51 (head attack). A better response to *Phoma oleracea* displayed Sigco 448 and NS-Shine and to *Botrytis cinerea* NS-Condor, Florom 305, Citosol $F_1$ and Citosol 4. The Romanian hybrids Select and Felix and the Yugoslavian hybrids NS-Flower, NS-Helios, NS-Condor and NS-Shine manifested a clear cut resistance to the attack of *Phomopsis helianthi*, a recent harmful fungus in many European countries causing sunflower stem canker. Certain hybrids showed a good resistance to *Sclerotium bataticola*, *Puccinia helianthi* and *Alternaria* sp.

The reaction to *Plasmopara helianthi* could not be evaluated under natural or artificial infection, because most of seed samples were treated with metalaxyl before being mailed to the participants.

Because new, more virulent races of *Orobanche cumana* have spread in South-East Europe, a controlled infestation test with broomrape seeds collected from South-East Romania and West Turkey was performed at Fundulea in 1985 (Table 10). Adding to this test the ob-

*Table 8*

**Head and flower characteristics**

| Cultivars | Head diameter (cm) limits | Head diameter (cm) mean | Head bending * | Self-fertiliy degree (Novi-Sad, 1985) | % male sterile plants (means) |
|---|---|---|---|---|---|
| P-75 | 12—21 | 17 | 2 | 29 | 0 |
| P-78 | 12—21 | 17 | 2—3 | 8 | 1 |
| P-80 | 14—20 | 18 | 3 | — | 3 |
| Hysun 32 | 12—28 | 18 | 2 | 8 | 1 |
| Pacific 308 | 11—30 | 19 | 2 | 68 | 0 |
| H. No. 617 | 11—27 | 18 | 2—3 | 55 | 29 |
| Peredovik | 12—28 | 18 | 3 | 0 | 0 |
| H-219/79 | 12—27 | 17 | 3 | 26 | 2 |
| H-13/80 | 12—29 | 16 | 3 | 6 | 22 |
| H-1414/79 | 12—29 | 18 | 3 | 16 | 23 |
| Koflor 3 | 12—28 | 18 | 3 | 16 | 3 |
| Citosol 4 | 12—27 | 18 | 3 | 4 | 0 |
| Citosol F-1 | 12—24 | 18 | 2 | 38 | 0 |
| IBH-160 | 12—26 | 20 | 2 | 37 | 0 |
| IH-173 | 12—27 | 17 | 3 | 35 | 0 |
| IH-51 | 12—32 | 18 | 2 | 45 | 0 |
| Super | 12—29 | 19 | 3 | 27 | 0 |
| Select | 12—29 | 19 | 2 | 15 | 1 |
| Felix | 12—27 | 19 | 2 | 15 | 3 |
| Fundulea 55 | 13—27 | 18 | 3—4 | 28 | 1 |
| Fundulea 56 | 12—26 | 18 | 3 | 8 | 0 |
| Florom 305 | 12—29 | 20 | 2—3 | 3 | 5 |
| Adalid 8 | 12—27 | 18 | 3 | 9 | 4 |
| Arbumg 353 | 12—25 | 18 | 3—4 | 33 | 6 |
| Sigco 448 | 12—29 | 19 | 3 | 29 | 0 |
| Interstate 7111 | 12—25 | 18 | 2 | 12 | 2 |
| Cargill 207 | 11—26 | 18 | 2 | 25 | 5 |
| Triumph 570 | 11—29 | 18 | 3 | 11 | 0 |
| NS-Flower | 12—25 | 18 | 3 | 48 | 1 |
| NS-Shine | 11—30 | 18 | 3—4 | 7 | 1 |
| NS-Condor | 12—29 | 18 | 3 | 59 | 0 |
| NS-Helios | 12—29 | 19 | 3—4 | 5 | 0 |

* Scale : 1 = up right ; 2 = medium bended ; 3 = bended ; 4 = very bended

*Table 10*

**Number of *Orobanche cumana* stems per one sunflower plant**

| Cultivars | Fundulea (1985) (artificial infestation): Inoculum from South-Eastern Romania | Fundulea (1985) (artificial infestation): Inoculum from West Turkey | Natural infestation: Edirne 1985 | Natural infestation: Novi-Sad 1984 | Mean |
|---|---|---|---|---|---|
| P-75 | 30 | 22 | 10 | 66 | 32 |
| P-78 | 24 | 20 | 10 | 33 | 22 |
| Hysun 32 | 34 | 32 | 8 | 15 | 22 |
| Pacific 308 | 29 | 22 | 10 | 5 | 17 |
| H. No. 617 | 13 | 44 | 12 | 31 | 25 |
| Peredovik | 27 | 42 | 14 | 0 | 21 |
| H-219/79 | 10 | 13 | 8 | 7 | 10 |
| H-13/80 | 15 | 14 | 12 | 34 | 19 |
| H-1414/79 | 18 | 21 | 17 | 0 | 14 |
| Koflor-3 | 25 | 16 | 9 | 2 | 13 |
| Citosol 4 | 29 | 28 | 10 | 0 | 17 |
| Citosol F-1 | 14 | 24 | 3 | 4 | 11 |
| IBH-160 | 26 | 35 | 13 | 96 | 43 |
| IH-173 | 23 | 21 | 9 | 2 | 14 |
| IH-51 | 38 | 30 | 7 | 17 | 23 |
| Super | 10 | 34 | 10 | 0 | 14 |
| Select | 8 | 25 | 14 | 0 | 12 |
| Felix | 6 | 12 | 8 | 3 | 7 |
| Fundulea 55 | 19 | 23 | 8 | 2 | 13 |
| Fundulea 56 | 23 | 17 | 13 | 8 | 15 |
| Florom 305 | 20 | 34 | 18 | 14 | 22 |
| Adalid 8 | 13 | 36 | 16 | 20 | 21 |
| Arbumg 353 | 21 | 9 | 8 | 1 | 10 |
| Sigco 448 | 18 | 21 | 11 | 5 | 13 |
| Interstate 7111 | 25 | 11 | 10 | 2 | 12 |
| Cargill 207 | 11 | 17 | 7 | 0 | 9 |
| Triumph 570 | 36 | 32 | 12 | 15 | 24 |
| NS-Flower | 16 | 12 | 3 | 0 | 8 |
| NS-Shine | 14 | 20 | 11 | 2 | 12 |
| NS-Condor | 25 | 14 | 6 | 4 | 12 |
| NS-Helios | 13 | 15 | 8 | 6 | 11 |
| AD-66 (check) | 36 | 40 | — | — | — |
| Romsun 53 (check) | 0 | 0 | — | — | — |

**Resistance to diseases (naturally infected plants, %)**

| Cultivars | *Sclerotinia sclerotiorum* – root attack | | | | | | | *Sclerotinia sclerotiorum* – stem attack | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fundulea | Novi Sad | | Iregszemcse | Szeged | Gross-Gerau | Mean | Szeged | Gross-Gerau | | G.Toshevo | Mean |
| | 1984 | 1984 | 1985 | 1985 | 1985 | 1985 | | 1985 | 1984 | 1985 | 1984 | |
| P-75 | 10 | 82 | 58 | — | — | — | — | — | 15 | — | 1 | — |
| P-78 | 0 | 83 | 56 | — | — | — | — | — | 27 | — | 1 | — |
| P-80 | 0 | 80 | — | — | — | — | — | — | 1 | — | 1 | — |
| Hysun 32 | 12 | 85 | 34 | 11 | 1 | 0 | 24 | 0 | 14 | 25 | 1 | 10 |
| Pacific 308 | 5 | 86 | 55 | 20 | 2 | 0 | 28 | 1 | 16 | 26 | 1 | 11 |
| H. No. 617 | 0 | 89 | 42 | 11 | 3 | 14 | 27 | 3 | 47 | 44 | 2 | 24 |
| Peredovik | 15 | 80 | 62 | 14 | 2 | 11 | 31 | 3 | 21 | 24 | 2 | 13 |
| H-219/79 | 8 | 72 | 48 | 9 | 2 | 1 | 23 | 1 | 8 | 24 | 1 | 9 |
| H-13/80 | 0 | 89 | 33 | 18 | 3 | 3 | 24 | 4 | 33 | 71 | 2 | 28 |
| H-1414/79 | 15 | 88 | 52 | — | 4 | 6 | 28 | 1 | 11 | 34 | 1 | 12 |
| Koflor 3 | 10 | 89 | 42 | 23 | 0 | 10 | 29 | 0 | 32 | 28 | 2 | 16 |
| Citosol 4 | 15 | 88 | 40 | 13 | 2 | 10 | 28 | 2 | 39 | 22 | 1 | 16 |
| Citosol F-1 | 0 | 90 | 45 | 11 | 2 | 35 | 31 | 0 | 41 | 37 | 1 | 20 |
| IBH-160 | 10 | 93 | 86 | 26 | 6 | 10 | 39 | 0 | 44 | 30 | 1 | 19 |
| IH-173 | 5 | 76 | 52 | 11 | 0 | 3 | 25 | 3 | 20 | 37 | 0 | 15 |
| IH-51 | 20 | 93 | 89 | 31 | 3 | 2 | 40 | 3 | 67 | 49 | 3 | 31 |
| Super | 0 | 86 | 56 | 20 | 4 | 2 | 28 | 5 | 19 | 38 | 2 | 16 |
| Select | 0 | 82 | 49 | 12 | 5 | 8 | 26 | 4 | 14 | 12 | 0 | 8 |
| Felix | 0 | 84 | 56 | 17 | 1 | 9 | 28 | 2 | 38 | 12 | 1 | 13 |
| Fundulea 55 | 7 | 16 | 48 | 14 | 3 | 3 | 27 | 4 | 12 | 24 | 1 | 10 |
| Fundulea 56 | 5 | 81 | 41 | 9 | 3 | 4 | 24 | 7 | 19 | 53 | 0 | 20 |
| Florom 305 | 15 | 84 | 45 | 2 | 2 | 20 | 28 | 6 | 54 | 57 | 0 | 29 |
| Adalid 8 | 10 | 95 | 42 | 8 | 3 | 10 | 28 | 5 | 15 | 30 | 1 | 13 |
| Arbumg 353 | 12 | 86 | 56 | 10 | 3 | 17 | 31 | 7 | 41 | 37 | 2 | 22 |
| Sigco 448 | 15 | 16 | 48 | 16 | 3 | 17 | 31 | 9 | 37 | 14 | 1 | 15 |
| Interstate 7111 | 5 | 91 | 37 | 12 | 5 | 32 | 30 | 12 | 30 | 52 | 0 | 24 |
| Cargill 207 | 0 | 93 | 78 | 16 | 2 | 7 | 33 | 5 | 47 | 7 | 0 | 15 |
| Triumph 570 | 11 | 90 | 69 | 5 | 3 | 9 | 31 | 1 | 10 | 18 | 3 | 8 |
| NS-Flower | 6 | 49 | 30 | 10 | 1 | 6 | 17 | 2 | 2 | 44 | 2 | 13 |
| NS-Shine | 8 | 96 | 47 | 12 | 3 | 0 | 28 | 5 | 39 | 43 | 2 | 22 |
| NS-Condor | 5 | 67 | 47 | 4 | 2 | 9 | 22 | 2 | 1 | 54 | 1 | 15 |
| NS-Helios | 10 | 65 | 36 | — | 2 | 2 | 19 | 2 | 15 | 27 | 0 | 11 |

| Cultivars | *Sclerotinia sclerotiorum* – head attack | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fundulea | Podu Iloaie | | Novi Sad | | Iregszemcse | | Szeged | Gross-Gerau | | Miramar | Mean |
| | 1984 | 1984 | 1985 | 1984 | 1985 | 1984 | 1985 | 1985 | 1984 | 1985 | 1984 | |
| P-75 | 5 | — | 70 | 1 | 0 | 9 | — | — | 53 | — | 5 | — |
| P-78 | 4 | — | 68 | 0 | 1 | 11 | — | — | 56 | — | 3 | — |
| P-80 | 5 | — | — | 0 | — | 16 | — | — | 41 | — | 4 | — |
| Hysun 32 | 0 | 61 | 61 | 1 | 0 | 11 | 0 | 4 | 53 | 42 | 4 | 22 |
| Pacific 308 | 0 | 42 | 50 | 0 | 0 | 12 | 1 | 1 | 31 | 52 | 3 | 17 |
| H. No. 617 | 5 | 55 | 66 | 5 | 0 | 16 | 1 | 6 | 36 | 33 | 2 | 20 |
| Peredovik | 7 | 55 | 42 | 3 | 0 | 21 | 1 | 4 | 69 | 53 | 1 | 23 |
| H-219/79 | 8 | 75 | 71 | 0 | 0 | 12 | 0 | 1 | 45 | 51 | 2 | 24 |
| H-13/80 | 0 | 83 | 72 | 10 | 0 | 15 | 5 | 6 | 42 | 25 | 1 | 24 |
| H-1414/79 | 8 | 69 | 70 | 9 | 9 | 9 | 1 | 4 | 69 | 44 | 4 | 27 |
| Koflor 3 | 5 | 49 | 68 | 1 | 0 | 9 | 0 | 3 | 53 | 51 | 4 | 22 |
| Citosol 4 | 0 | 40 | 42 | 0 | 0 | 10 | 0 | 4 | 20 | 38 | 4 | 14 |
| Citosol F-1 | 3 | 55 | 57 | 0 | 0 | 9 | 1 | 2 | 39 | 33 | 3 | 18 |
| IBH-160 | 0 | 46 | 56 | 2 | 0 | 16 | 1 | 6 | 32 | 49 | 8 | 20 |
| IH-173 | 2 | 76 | 68 | 2 | 0 | 8 | 3 | 3 | 51 | 30 | 3 | 22 |
| IH-51 | 0 | 37 | 49 | 2 | 0 | 25 | 1 | 6 | 18 | 38 | 3 | 16 |
| Super | 0 | 57 | 43 | 3 | 0 | 14 | 1 | 3 | 64 | 52 | 2 | 22 |
| Select | 0 | 42 | 43 | 0 | 0 | 13 | 0 | 3 | 33 | 34 | 2 | 15 |
| Felix | 0 | 44 | 40 | 3 | 0 | 10 | 1 | 2 | 44 | 38 | 2 | 17 |
| Fundulea 55 | 0 | 42 | 62 | 2 | 0 | 9 | 0 | 4 | 52 | 46 | 2 | 20 |
| Fundulea 56 | 0 | 25 | 51 | 1 | 0 | 7 | 1 | 5 | 56 | 23 | 3 | 16 |
| Florom 305 | 0 | 33 | 49 | 1 | 1 | 18 | 0 | 5 | 29 | 42 | 4 | 17 |
| Adalid 8 | 1 | 69 | 68 | 3 | 12 | 17 | 2 | 7 | 47 | 62 | 4 | 27 |
| Arbumg 353 | 3 | 75 | 69 | 10 | 7 | 11 | 4 | 8 | 45 | 24 | 4 | 24 |
| Sigco 448 | 0 | 67 | 56 | 0 | 9 | 23 | 1 | 5 | 37 | 56 | 3 | 23 |
| Interstate 7111 | 0 | 61 | 55 | 8 | 0 | 16 | 2 | 4 | 52 | 19 | 2 | 20 |
| Cargill 207 | 0 | 32 | 40 | 1 | 0 | 13 | 0 | 6 | 49 | 69 | 2 | 19 |
| Triumph 570 | 9 | 78 | 52 | 1 | 0 | 14 | 1 | 2 | 43 | 73 | 3 | 25 |
| NS-Flower | 0 | 54 | 42 | 0 | 0 | 9 | 0 | 0 | 54 | 47 | 2 | 19 |
| NS-Shine | 5 | 55 | 47 | 6 | 0 | 16 | 0 | 1 | 46 | 24 | 3 | 18 |
| NS-Condor | 2 | 55 | 55 | 1 | 0 | 11 | 0 | 0 | 62 | 11 | 1 | 18 |
| NS-Helios | 3 | 54 | 55 | 0 | 0 | 6 | 0 | 0 | 77 | 59 | 3 | 23 |

| Cultivars | *Phoma oleracea* | *Botrytis cinerea* | | | | | | *Phomopsis helianthi* | | | | *Sclerotium bataticola* | | | *Puccinia helianthi* | | *Alternaria* sp. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | G. Toshevo | Iregszemcse | | Szeged | Gross-Gerau | | Mean | Fundulea | Novi-Sad | | Mean | Szeged | Iregszemcse | Mean | Szeged | G. Toshevo | Iregsem. | Mean |
| | 1984 | 1984 | 1985 | 1985 | 1984 | 1985 | | 1984 | 1984 | 1985 | | 1985 | 1985 | | 1985 | 1984 | 1985 | |
| P-75 | 41 | 10 | — | — | 84 | — | — | 10 | 30 | 44 | 28 | — | — | — | — | 15 | — | — |
| P-78 | 33 | 16 | — | — | 88 | — | — | 25 | 40 | 70 | 45 | — | — | — | — | 29 | — | — |
| P-80 | — | 4 | — | — | 80 | — | — | 90 | 40 | 44 | 58 | — | — | — | — | — | — | — |
| Hysun 32 | 41 | 12 | 11 | 9 | 95 | 43 | 34 | 40 | 98 | 90 | 76 | 29 | 31 | 30 | 1 | 19 | 16 | 18 |
| Pacific 308 | 41 | 11 | 8 | 2 | 97 | 35 | 31 | 90 | 60 | 83 | 71 | 26 | 33 | 30 | 0 | 42 | 17 | 30 |
| H. No. 617 | 28 | 22 | 6 | 18 | 92 | 39 | 35 | 90 | 98 | 62 | 83 | 13 | 52 | 33 | 7 | 9 | 39 | 24 |
| Peredovik | 25 | 13 | 11 | 8 | 91 | 41 | 33 | 25 | 50 | 50 | 42 | 16 | 47 | 32 | 6 | 25 | 21 | 23 |
| H-219/79 | 33 | 19 | 12 | 8 | 96 | 55 | 38 | 25 | 60 | 51 | 45 | 18 | 35 | 27 | 1 | 50 | — | — |
| H-13/80 | 34 | 31 | 12 | 8 | 80 | 53 | 37 | 40 | 80 | 43 | 54 | 23 | 39 | 31 | 21 | 13 | 16 | 15 |
| H-1414/79 | 19 | 26 | 13 | 9 | 91 | 40 | 36 | 35 | 30 | 90 | 52 | 13 | 41 | 27 | 17 | 21 | 31 | 26 |
| Koflor 3 | 27 | 14 | 24 | 5 | 94 | 38 | 35 | 60 | 20 | 70 | 50 | 25 | 47 | 36 | 3 | 17 | 34 | 26 |
| Citosol 4 | 22 | 5 | 11 | 4 | 82 | 27 | 26 | 75 | 15 | 63 | 51 | 10 | 31 | 20 | 2 | 16 | 19 | 18 |
| Citosol F-1 | 17 | 9 | 8 | 3 | 80 | 27 | 25 | 90 | 15 | 54 | 53 | 24 | 50 | 37 | 4 | 16 | 27 | 22 |
| IBH-160 | 20 | 4 | 11 | 12 | 79 | 51 | 31 | 80 | 15 | 71 | 55 | 13 | 55 | 34 | 17 | 8 | 36 | 22 |
| IH-173 | 27 | 25 | 5 | 9 | 90 | 47 | 35 | 20 | 15 | 43 | 26 | 19 | 42 | 30 | 3 | 12 | 38 | 25 |
| IH-51 | 27 | 7 | 15 | 5 | 81 | 59 | 33 | 90 | 2 | 73 | 55 | 30 | 61 | 45 | 36 | 16 | 46 | 31 |
| Super | 28 | 17 | 18 | 7 | 90 | 43 | 35 | 25 | 1 | 2 | 9 | 13 | 50 | 31 | 6 | 46 | 29 | 43 |
| Select | 27 | 7 | 12 | 6 | 99 | 23 | 29 | 0 | 1 | 2 | 1 | 4 | 24 | 14 | 2 | 27 | 22 | 25 |
| Felix | 35 | 11 | 26 | 9 | 93 | 37 | 35 | 10 | 1 | 1 | 4 | 10 | 34 | 22 | 3 | 38 | 21 | 30 |
| Fundulea 55 | 38 | 9 | 24 | 8 | 94 | 52 | 37 | 10 | 13 | 12 | 12 | 10 | 39 | 25 | 5 | 17 | 33 | 25 |
| Fundulea 56 | 33 | 7 | 20 | 9 | 90 | 51 | 35 | 20 | 13 | 60 | 31 | 24 | 47 | 36 | 4 | 22 | 38 | 30 |
| Florom 305 | 33 | 4 | 6 | 4 | 78 | 29 | 24 | 30 | 15 | 12 | 19 | 8 | 26 | 17 | 3 | 15 | 20 | 23 |
| Adalid 8 | 21 | 33 | 20 | 12 | 94 | 51 | 42 | 80 | 80 | 37 | 66 | 13 | 32 | 23 | 5 | 13 | 19 | 16 |
| Arbumg 353 | 22 | 46 | 13 | 11 | 86 | 62 | 44 | 40 | 40 | 60 | 47 | 7 | 37 | 22 | 3 | 19 | 20 | 20 |
| Sigco 448 | 9 | 27 | 11 | 10 | 74 | 51 | 35 | 35 | 20 | 34 | 30 | 6 | 44 | 25 | 4 | 6 | 28 | 17 |
| Interstate 7111 | 16 | 17 | 6 | 7 | 85 | 28 | 29 | 90 | 20 | 72 | 61 | 23 | 44 | 34 | 3 | 13 | 36 | 25 |
| Cargill 207 | 16 | 7 | 3 | 7 | 88 | 29 | 27 | 90 | 30 | 26 | 49 | 16 | 57 | 37 | 0 | 34 | 36 | 35 |
| Triumph 570 | 37 | 13 | 12 | 8 | 86 | 61 | 36 | 80 | 80 | 72 | 77 | 18 | 38 | 28 | 1 | 22 | — | — |
| NS-Flower | 32 | 6 | 18 | 3 | 78 | 61 | 33 | 0 | 0 | 0 | 0 | 4 | 13 | 9 | 3 | 36 | 7 | 22 |
| NS-Shine | 11 | 31 | 6 | 3 | 90 | 39 | 34 | 20 | 0 | 0 | 7 | 6 | 40 | 23 | 2 | 6 | 23 | 15 |
| NS-Condor | 20 | 6 | 4 | 2 | 77 | 22 | 22 | 15 | 0 | 1 | 5 | 10 | 21 | 15 | 2 | 41 | 8 | 25 |
| NS-Helios | 30 | 6 | 8 | 2 | 91 | 72 | 36 | 10 | 1 | 1 | 4 | 13 | 7 | 10 | 2 | 30 | 3 | 17 |

servations recorded under natural infestation at Edirne (1985) and Novi Sad (1984), one can conclude that the hybrids Felix, NS-Flower and Cargill-207 exhibited the best resistance.

Table 11 provides information on fatty acids composition based on seed samples received from three locations situated at different latitudes. The analyses carried out at Fundulea revealed a great similitude among hybrids from this point of view, but some variations were noticed especially with regard to the oleic and linoleic acids.

*Table 11*

**Oil quality expressed by fatty acid composition — mean values (seed samples from : Fundulea, Edirne, Gross-Gerau, 1984—1985)**

| Cultivars | Fatty acid composition in percentage of total acids | | | Lino-leic/oleic ratio | Iodine value |
|---|---|---|---|---|---|
| | Palmitic + + stearic | Oleic | Linoleic | | |
| P-75 | 9.1 | 17.6 | 73.3 | 4.16 | 142.25 |
| P-78 | 9.3 | 17.6 | 73.1 | 4.15 | 141.90 |
| P-80 | 7.9 | 14.0 | 78.1 | 5.57 | 147.47 |
| G-90 | 8.9 | 17.4 | 73.7 | 4.23 | 142.77 |
| G-100 | 10.3 | 17.6 | 72.1 | 4.09 | 140.17 |
| Hysun 32 | 9.0 | 17.9 | 73.1 | 4.08 | 142.16 |
| Pacific 308 | 8.7 | 18.8 | 72.5 | 3.85 | 141.90 |
| H. No. 617 | 9.9 | 18.5 | 71.6 | 3.87 | 140.08 |
| Peredovik | 8.9 | 16.0 | 75.1 | 4.69 | 143.99 |
| H-219/79 | 9.6 | 17.9 | 72.5 | 4.05 | 141.12 |
| H-13/80 | 10.7 | 18.4 | 70.9 | 3.85 | 138.78 |
| H-1414/79 | 10.1 | 19.6 | 70.3 | 3.58 | 138.77 |
| Koflor 3 | 9.8 | 17.9 | 72.3 | 4.03 | 140.78 |
| Citosol 4 | 10.5 | 18.0 | 71.5 | 3.97 | 139.47 |
| Citosol F-1 | 9.8 | 17.7 | 72.5 | 4.09 | 140.95 |
| IBH-160 | 9.4 | 17.5 | 73.1 | 4.17 | 141.82 |
| IH-173 | 10.1 | 17.5 | 72.4 | 4.13 | 140.60 |
| IH-51 | 9.4 | 17.8 | 72.8 | 4.09 | 141.56 |
| Super | 9.6 | 15.6 | 74.8 | 4.79 | 143.13 |
| Select | 9.9 | 17.3 | 72.8 | 4.20 | 141.13 |
| Felix | 10.5 | 14.9 | 74.6 | 5.00 | 142.18 |
| Fundulea 55 | 10.3 | 17.4 | 72.3 | 4.15 | 140.34 |
| Fundulea 56 | 9.5 | 16.0 | 74.5 | 4.65 | 142.95 |
| Florom 305 | 9.3 | 15.6 | 75.1 | 4.81 | 143.65 |
| Adalid-8 | 9.7 | 19.2 | 71.1 | 3.70 | 139.81 |
| Arbumg 353 | 10.3 | 17.7 | 72.0 | 4.06 | 140.08 |
| Sigco 448 | 10.3 | 15.5 | 74.2 | 4.78 | 142.00 |
| Interstate 7111 | 10.8 | 17.0 | 72.2 | 4.24 | 139.83 |
| Cargill 207 | 10.7 | 16.9 | 72.4 | 4.28 | 140.09 |
| Triumph 570 | 8.7 | 16.5 | 74.8 | 4.53 | 143.90 |
| NS-Flower | 9.2 | 16.3 | 74.5 | 4.57 | 143.21 |
| NS-Shine | 10.2 | 18.8 | 71.0 | 3.77 | 139.30 |
| NS-Condor | 9.5 | 17.5 | 73.0 | 4.17 | 141.64 |
| NS-Helios | 9.6 | 15.6 | 74.8 | 4.19 | 143.13 |

## CONCLUSIONS

The set of 34 sunflower cultivars tested in the fifth biennial cycle of international trials displayed a great variation with respect to environmental adaptability, yield genetic potential, oil content and quality, as well as the main morpho-physiological traits. An important number of hybrids exhibited however a satisfactory stability over a multitude of locations in both experimental years. Some hybrids were better differentiated within limited areas allowing farmers to identify the best locally adapted genotypes. As compared to the previous biennial testing cycles, a significant genetic progress has been achieved in the improvement of sunflower hybrids for resistance to diseases, one of the main concern in sunflower cultivation all over the world.

RÉSULTATS DU CINQUIÈME CYCLE D'ESSAIS INTERNATIONAUX AVEC DES CULTIVARS DE TOURNESOL (1984—1985)

*Résumé*

Dans ce cycle expérimental biennal 30 hybrides simples et 3 hybrides à trois-voies aux provenances et origines différentes ont été testés, à côté du cultivar à pollinisation libre Peredovik. Vingt instituts ou stations de recherches d'Europe, ainsi que des pays intéressés au développement de cette culture, de l'Amérique Centrale et du Nord, Amérique du Sud, Afrique et Asie, ont participé.

La diversité des conditions de milieu a déterminé une large variation du rendement en graines, de la teneur en huile des graines et des autres caractéristiques agronomiques. Cependant, des génotypes au comportement supérieur en moyenne par localités et années expérimentales peuvent être identifiés, ainsi que des génotypes à réaction spécifique, significativement supérieure dans certaines zones géographiques.

Ayant en vue les performances des hybrides, par rapport au cultivar Peredovik, le témoin commun de tous les cycles expérimentaux organisés jusqu'à présent, on peut apprécier qu'une partie importante des hybrides étudiés dans ce cycle représentent des créations supérieures à ceux antérieures, surtout à l'égard de la teneur en huile des graines, du degré d'autofertilité, de la résistance vis-à-vis de certaines maladies importantes et de la verse des plantes.

La variation similaire des valeurs enregistrées à la plupart d'hybrides dans les différentes conditions de milieu, suggère, toutefois, l'existence d'une diversité gététique assez limitée et donc d'une vulnérabilité génétique potentielle. Celle-ci est également indésirable si l'on a en vue d'établir les structures d'hybrides pour une certaine zone, ayant pour but d'assurer une meilleure stabilité de la récolte. Ainsi, il s'impose le développement continuel des travaux d'amélioration visant la diversification des bases génétiques des hybrides de tournesol.

## RESULTADOS DEL QUINTO CICLO DE LAS CULTURAS COMPARATIVAS INTERNACIONALES CON CULTIVARES DE GIRASOL

(1984—1985)

*Resúmen*

Durante este ciclo experimental se testaron 30 híbridos simples y 3 híbridos trilineários, de proveniencia e origenes diferentes, junto a la variedad-población de polinización libre Peredovik. Participaron 20 institutos o estaciones de investigaciones de Europa, así como de los países interesados en el desarrollo de esta cultura de America Central y del Norte, America del Sur, Africa y Asia.

La diversidad de las condiciones de medio determinó una variación en limites muy amplias de la producción de semillas y de los demás caracteristicas agrónomicos. A pesar de esto, se pueden identificar genotipos con un comportamiento superior en media por localidades y años experimentales, así como genotipos con una reacción específica, significantemente superior en ciertas zonas geográficas.

Teniendo en cuenta las performancias de los híbridos comparando con la variedad Peredovik, que fue testigo común en todos los ciclos experimentales organizados hasta el presente, se puede apreciar que una parte notable de los híbridos estudiados durante este ciclo representa creaciones superiores a los anteriores, sobre todo en cuanto al contenido de aceite de las semillas, del grado de autofertilidad, de la resistencia a ciertas enfermedades importantes y a la caída de las plantas.

La variación semejante de los valores registrados en la mayoría de los híbridos en diferentes condiciones de medio sugiere en cambio la existencia de una diversidad genética bastante limitada y por lo consiguiente de una vulnerabilidad genética potencial. Esta no es deseable ni en el caso cuando se persigue establecer las estrauturas de híbridos para cierta zona, con la meta de asegurar una estabilidad mayor de la cosecha. Por lo consiguiente se va imponiendo a continuación el desarrollo de los trabajos de mejora que se refieren a la diversificación de las bases genéticas de los híbridos de girasol.