

A SHORT REPORT ABOUT THE SUNFLOWER IN AUSTRIA

D. WOLFFHARDT

Federal Institute for Plant Production,
Vienna, Austria

Sunflower has been mentioned in the Austrian agricultural statistics since 1954, and the acreage of this crop was 254 ha in that year. The greater part of the sunflower area was situated in a small district in the south-east of Carinthia, between the Drau-river in the north and the Karawanken-mountains in the south, the so called Jauntal. Sunflower has been grown here for a long time on small fields of a few thousand squaremeters each, for the farmer's own need of oil.

During the years following 1954, the main sunflower cultivation area moved into another part of Austria, the so called "Seevinkel". It is a district in the north of Burgenland between the "Neusiedlersee" and the Hungarian border. The crop reached its largest extent of about 2,100 ha in 1967, and 97 percent of them were grown in the "Seewinkel". The kernels were used partly for the extraction of oil, the larger part were sold as bird feed. The sunflower area decreased after 1967 and reached the lowest level in the year 1973 with 91 ha only. The reasons for this decrease were the low prices for bird feed and the low yields caused by the increasing attacks of diseases, particularly of *Sclerotinia sclerotiorum*.

Sunflower cultivation was unknown outside of the mentioned two districts of Austria. After the "Protein lack" of 1973, the considerations about a better supply with protein and vegetable oils led to the assumption that the cultivation of sunflower would be possible in other parts of Austria too, especially in the east and north-east of lower Austria, which is influenced by the continental climate. The cultivation of wheat, barley, maize and in some locations of vine is usual in this region. The mean temperatures of the year are about 9–10°C, the mean temperatures of July about 18–19°C. The precipitation — on the multi-annual average — is about 550–630 mm, the weather is dry, usually during the autumn. The soils are tchernosems and brown soils. In an unpublished study, Mr. Faure from the Unilever Research Center in Duiven, Nether-

lands, came independently in 1974 to the conclusions, that some parts of the Eastern Austria could be appropriate for sunflower cultivation and underlined so the Austrian ideas.

To verify these considerations, the Federal Institute for Plant Production in Vienna has started a programme of sunflower varietal testing since 1974 and, in addition, so called "trials of large scale cultivation" were carried out on farmers fields from 1974 until 1980. The experiences from the first years showed that the experimental fields on farms must have a minimum extent of 5 to 10 ha and the varietal trials should be protected by nets, otherwise the damage caused by birds would falsify the results of the experiments.

The yields of the trials of the large scale cultivation during the first years were very low. The experiences in the crop technology increased, better suited varieties were chosen in the following years and by that the average yields increased. However, the low yields of the year 1980 showed that in years with bad climatic conditions the sunflower cultivation in Austria were at the limits of profitability. The extent of trials of large scale cultivation and the range of yields are shown in Table 1.

The arable land covers about 1.4 million hectares in Austria, the area of cereals, including grain-maize, about 1 million hectares. Consequently, the part of cereals in the crop rotation is very high and reaches up to 80% of the arable land in some regions of eastern Austria. Therefore the farmers are looking for an alternative crop, but this crop must give a good gross return too.

The prices for cereals are regulated, they are newly established each year. The farmers got in 1984 about 453 Austrian Shillings for a quintal of wheat with high baking quality, 350 for barley and 340 for maize. The average yields — calculated using the statistical harvest data of Lower Austria over 5 years — was 40 quintals for winter wheat, 38 spring barley and 69 for maize. That means gross returns of 18,100, 13,300, and 23,500 Austrian

Table 1

Sunflower trials of large scale cultivation in the eastern part of Austria

(Number of achieved yields)

Yields	Years						
	1974	1975	1976	1977	1978	1979	1980
1,000 kg/ha	13	8	2	1	4	1	1
1,000—1,500 kg/ha	12	7	6	8	3	2	1
1,500—2,000 kg/ha	8	6	12	5	11	3	2
2,000—3,000 kg/ha	3	1	4	10	7	10	1
3,000 kg/ha	—	—	—	2	2	—	—
extent of the trials (ha)	42.6	47.9	88.6	120.5	135.6	125.5	31.4
average yield, kg/ha	1,250	1,220	1,630	2,030	1,840	2,200	1,480

Shillings. To get the same profit from the sunflower crop with an average yield of about 20 quintals/ha, its price should be between 665 and 175 Austrian Shillings per quintal — and this is more than the prices for sunflower on the international market.

Thus, it is necessary to peg the sunflower price, but at the time being there is no money for it. Only in 1979 the Austrian fat industry supported the cultivation of oil crops by paying certain prices, the farmers got 780 Austrian Shillings for a quintal of sunflower in that year and so it was possible to grow this crop at an extent of about 1,650 ha. In the following year, the fat industry stopped their subvention in this direct way and the sunflower area decreased continuously again and hit a new low level of 41 ha in the year 1983, of which 20 ha were grown in the Jauntal in Carinthia, in the old Austrian sunflower region.

As mentioned before, variety testing have been carried out by the Federal Institute for Plant Production since 1974. This experiments were located in two experimental stations of the institute and additionally until 1980, such

tests were distributed to the sunflower farm fields. During the last years the tests were reduced because experiments with sunflower are very expensive. At the moment there are no real chances to transfer the experimental results into practice and high costs are not justifiable. It is intended to continue only the "FAO cultivar trials" and additionally to test a small number of further hybrids at two stations of the Federal Institute.

To go into details about all results of the variety tests is not possible. Making a summary, it could be reported that the French hybrid Relax was the best one as far as seed yield was concerned in many of our trials and this hybrid showed high yields also on the farmers fields. Unfortunately, its oil content is very low. The Romanian hybrid Florom 305, the Yugoslav NS-H-26 RM and the French Remil were good too, but Remil and NS-H-26 RM seemed to be somewhat late in years with poor climatic conditions. The mentioned hybrids as well as Airelle, Clairsol, Flambeau, Luciole, Mirasol, Primasol, HS 90, NS-H-27 RM and Peredovik were grown in the large scale cultivation trials and gave more or less good yields.

The breeding of new hybrids makes good progress, this is obvious by the number of entries the Federal Institute got for testing during the last years. Unfortunately, many of these new hybrids were sent only one time and replaced in the next year. For this reason it was impossible to judge by multiannual results if such hybrids were suited under Austrian conditions or not.

Some of the new hybrids from France, Hungary and Italy tested in more than one year seem to be good for the Austrian sunflower cultivation. We are hopeful that in future times it will be possible to grow these hybrids or newer, better ones not only in the small trials of the Institute but in the whole area of about 10,000 to 15,000 ha in which sunflowers could be cultivated in respect of the climatic conditions and the possibilities of the crop rotation.

FIRST TRIALS WITH SUNFLOWER CULTIVARS IN CYPRUS

A. HADJICHRISTODOULOU

Agricultural Research Institute,
Nicosia, Cyprus

INTRODUCTION

Cyprus does not produce any seed-oils and its imports amount to 15,000—20,000 tons annually at a cost of around US\$ 10 million. Recently the Agricultural Research Institute has started work on oilseed crops, such as safflower, sunflower, soybeans and rape.

In most European and Mediterranean countries sunflower is grown in summer time. In Cyprus the summer months, May—October, are practically dry and the most rainy months are December, January and February. Evaporation is very high during the period May to October. There is a scarcity of irrigation water because the annual precipitation is low and there are no big rivers.

The studies on sunflower were initiated in 1983 with the aim to select the best varieties, to determine the agronomic requirements of this new crop and to provide adequate data in order to decide on the feasibility of sunflower growing and processing.

MATERIALS AND METHODS

The first material was introduced in 1983 mainly from Romania (Dr. A. V. Vrânceanu), FAO Regional Office (Beirut) and Seedtec Company from California. Sowing was done at Akhelia, South-West Cyprus, between 21 April and 28 June, because the seed arrived at different dates.

Harvesting was completed by the end of September. There was no rainfall during the growing season of sunflower. The cultivars were sown in four groups, three trials and one nursery (Table 1). The experimental design of trials was RCB with three replications. Plot size was 27 m² (3 rows × 0.9 m × 10 m long). Spacing within the row was 15 cm. However, the number of plants established per m² varied with cultivar and trial. The range of trial mean was 3.5—4.7 plants per m², and the range

for cultivar means was wider, as shown by the number of heads per m² (Table 1). Fertilizer rates applied were: 23 kg N/ha, 89 kg P₂O₅ and K per ha. Data were recorded on the traits given in Table 1.

In 1984 three trials, with 12, 12 and 34 cultivars, respectively, were sown on 27 April, 1984 in RCB design with three replications. Plot size for the first two trials was the same as in 1983, but spacing between rows was 45 cm and for plants within row 30 cm. In the third trial the number of rows was 7 and row length 6 m. Fertilizer rates were 48 kg N/ha, 142 kg P₂O₅/ha and 68 kg K/ha. Data will be recorded as in 1983.

Two new trials were sown in 1984.

(a) *Sowing date.* The hybrid HS 52 was sown at different dates starting from 1 March and will cover the period until 27 July. The aim of this study was to compare yield and irrigation water requirements in order to decide on optimum sowing date.

(b) *Spacing trial.* The hybrid HS 52 was tested at four spacings within row, namely 30, 40, 50 and 60 cm at a constant spacing between rows, 45 cm. The populations tested ranged from 3.7 to 7.4 plants per m². In one trial the hybrid X1002 (Seedtec) was sown at two spacing, namely 90 × 15 cm and 45 × 30 cm, in order to compare the two different arrangements.

RESULTS

The growth of sunflower was satisfactory, indicating that the climate of Cyprus is suitable for this new crop. Data on several traits recorded are given in Table 1 (ranges of varieties in the three trials and one nursery). Tables 2 and 3 give the detailed data for the best cultivars.

Grain yield. Significant differences were found between cultivars (Table 1). The highest yielding hybrids were HS 52 (Table 2), and HT 141 and RO 59 (Table 3). The yield of

Table 1

Ranges of cultivar means in four trials at Morocambos, Akhelia, 1983

	Trial A U.S.A.	Trial B Romania (Company)	Nursery C F.A.O.	Trial D Romania (Vranceanu)
Number of cultivars	9	5	13	20
Date of sowing	21 April	3 May	3 May	28 June
Date of harvesting	17—23 August	September	September	26/9—2/10
Grain yield (t/ha)	1.5—2.4 NS	1.9—4.1 *	0.6—4.7	1.4—2.5 *
1 000-grain weight (g)	44—78 *	59—64 NS	42—77	37—71 *
Volume weight (kg/hl)	35—45 *	35—40 NS	35—41	30—38 *
Number of heads per m ²	2.1—4.8 *	2.2—6.7 *	0.4—8.6	3.1—5.1 NS
Head diameter (cm)	15—22 NS	18—27 *	18—23	16—21 NS
Number of grains per head	654—1 481 *	880—1 421 *	860—3 261	545—1 580 *
Plant height (cm)	154—191 *	197—213 *	140—215	154—200 *
Bending length (cm)	23—46 *	31—49 *	10—52	25—44 *
Oil content (%)	43—51 *	46—52 *	43—51	40—47 NS
N content (%)	2.7—3.1 NS	2.1—2.5 NS	2.3—3.2	2.8—3.4 NS

* Significant differences among cultivars.
NS Not significant differences among cultivars.

Table 2

Sunflower trial „B“, Akhelia, 1983

Cultivars (F ₁ hybrids)	Grain yield (kg/ ha) *	1 000 — grain wt (g)	Volume weight (kg/hl)	Number of heads per 1 m ²	Head diameter (cm)	Number of grains per head	Length of plant (cm)	Length of down- wards bending (cm)	Oil content on dry matter basis (%)	N %
Sorem 80	3,450 b	61 a	35.0 a	5 a	19.3 a	1,259 a	197 ab	40 a	51.4 a	2.12 a
Sorem 82	3,047 b	56 a	39.0 a	7 a	18.4 a	880 a	204 ab	31 a	50.3 a	2.47 a
HS 52	4,130 a	59 a	39.5 a	5 a	18.7 a	1,421 a	175 b	33 a	51.6 a	2.50 a
CV (%)	10.8	27	5.9	31	11.8	37	6.9	28	11	4.4

* Moisture content 5%.

Table 3

Sunflower trial „D“, Akhelia, 1983

Cultivars (F ₁ hybrids)	Grain yield (kg/ ha) *	1 000 — grain wt (g)	Volume weight (kg/hl)	Number of heads per 1 m ²	Head diameter (cm)	Number of grains per head	Length of plant (cm)	Length of down- wards bending (cm)	Oil content on dry matter basis (%)	N %
Sorem 80	1,905 a	47 bcde	30.3 cd	3 a	20.8 a	1,315 a	193 ab	25 b	40.0 a	3.17 a
Sorem 82	1,793 a	45 bcde	34.0 abc	5 a	16.1 a	841 a	202 a	33 ab	41.6 a	3.31 a
HT 141	2,495 a	58 abc	35.8 ab	3 a	18.0 a	1,355 a	171 abc	36 ab	44.5 a	3.32 a
RO 59	2,473 a	46 bcde	36.3 ab	4 a	18.7 a	1,447 a	155 c	23 b	46.9 a	2.81 a
Felix	2,346 a	60 ab	32.8 bcd	5 a	16.9 a	864 a	167 abc	37 ab	42.6 a	2.98 a
HT 144	2,121 a	60 ab	35.3 ab	3 a	18.6 a	1,450 a	163 bc	28 ab	43.9 a	3.09
CV (%)	16.4	12.7	5	20	10.7	27	9	24	7.5	7.8

* Moisture content 5%.

Sorem 80, a check in both trials was 3.4 t/ha in B trial and 1.9 t/ha in D trial. The yield of HS 52 (4.1 t/ha) was 20% higher, and that of HT 141 and RO 59 31% and 30% higher, respectively, than Sorem 80.

Plant height. The total length of the plants was 140—215 cm, but that of the highest yielding cultivars was around 170 cm (Tables 1, 2 and 3). Head inclination during grain filling (the heads bended down) was around 30 cm.

Thus the actual plant height was by around 30 cm lower. Irrigation by sprinkler was difficult and special risers were needed for uniform distribution of the water.

Head diameter. It varied with cultivar from 16 to 27 cm, for the highest yielding cultivars it was around 18 cm. Calculation based on the number of heads per plot, 1000-grain weight and yield gave around 1400 seeds per head for the highest yielding cultivars (Tables 2 and 3).

Volume weight. It was higher in B trial than the late sown D trial, as shown by the volume weight of Sorem 80 and Sorem 82, which were checked in both trials. The volume weight of HS 52 was 39.5 kg/hl, and of HT 141 and RO 59, 36 kg/hl (Table 2 and 3).

1,000-grain weight. As in the case of volume weight, it was higher in B than D trial. For HS 52 it was 59 g and for other high yielding cultivars in D trial 46–60 g (Table 2 and 3).

Oil content. As in the case of volume weight and 1,000-grain weight, oil content was higher in B than D trial. It was 50% when Sorem 80 and Sorem 82 were sown on May 3 (B trial, Table 2) and only 40–42% when sown on June 28 (D trial, Table 3). The differences among the highest yielding cultivars were not significant. Oil content of HS 52 was 51.6%.

N content of grain. The differences among cultivars were not significant (Table 1). For the highest yielding cultivars it was 2.5% (Table 2) and 3% (Table 3).

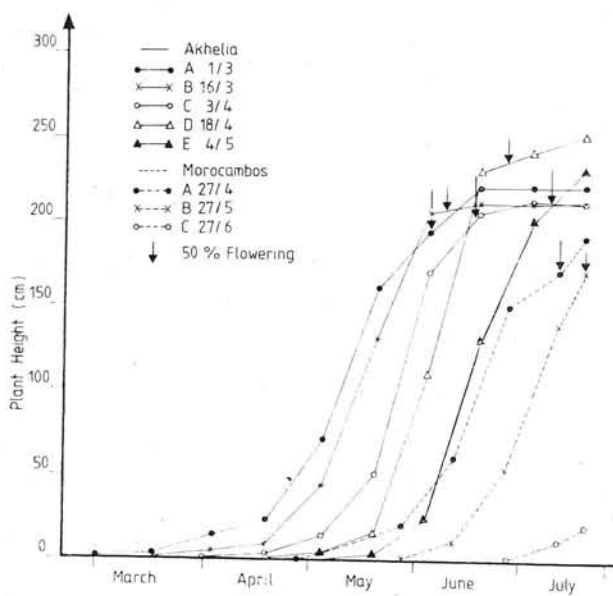


Fig. 1 — Effect of different sowing data on height and date of flowering of sunflower hybrid HS 52

The 1984 trials have not yet been harvested*. Flowering was completed by 15 July. At this stage there are differences in plant height and other traits among cultivars. The sowing date trial showed that early sowing is possible in Cyprus. The plots sown on March 1 are almost ripe. Figure 1 gives the height and date of flowering of different sowings, until July 18.

The difference in flowering is smaller than in sowing date.

* Until the end of July 1984, when the present report was presented at the Novi Sad Consultation (Editor's note).

DISCUSSION

The growth of sunflower was satisfactory and yields obtained from the best hybrid varieties (4 t/ha) compare favourably with yields obtained in 10 other countries cooperating with the FAO Research Network on Sunflower (*Helia*, No. 5, 1982, p. 9). The highest average yield over all countries was 2.3 t/ha and that of the best cultivar 2.7 t/ha. Top mean yields were obtained at Fundulea, Romania, 3.67 t/ha.

The highest single yield was recorded at Pisa, Italy, for RO 19 (4.55 t/ha). Oil content was also very high; the 50–52% values recorded in the trial B were among the highest reported in *Helia* No. 5, 1982. The plants grew too tall for normal sprinkler irrigation. Therefore, short stem cultivars and other methods of irrigation, such as trickle irrigation, are necessary to overcome the irrigation problems. Both these approaches are examined by specialists in the field of breeding and irrigation with encouraging results. Furrow or other irrigation methods, which do not make an economical use of water, cannot be applied in Cyprus where there is an extreme scarcity of water.

The first observation and trials on sowing date indicated that there is a wide range of sowing time available to the grower, i.e. during February to July. Next season, sowing date will be tested, starting from December 1984. If it is proved that sunflower can be grown as a winter crop, this will be a great step forward in the cultivation of the crop in Cyprus, because it will depend more on rainfall than on the expensive spring or summer irrigation. Furthermore evaporation is much lower in the winter.

Though 4 plants per m² are considered optimum, in our trials the number of plants varied with variety from 0.4–8.6. This was attributed to the low germination of some cultivars, especially those in C nursery (Table 1) which were sent to us after long period of storage. In the material sent from Romania (Trial D, Table 1), there were no significant differences in number of heads (or plants) among cultivars, and the mean was 4 plants per m².

The 1984 trials were sown at a density of 7 plants per m², in order to obtain the maximum yield under optimum agronomic conditions. The four spacings tested this season will give information on the optimum population density for maximum yield and lodging resistance under Cyprus conditions.

PREMIERS ESSAIS AVEC DES CULTIVARS
DE TOURNESOL EN CHYPRE

Résumé

Des différentes cultures comparatives, contenant 47 cultivars de tournesol, ont été effectuées à Akhelia, Paphos, en 1983. L'hybride HS 52 a donné le plus haut rendement en semences, 4,1 t/ha. D'autres caractéristiques importantes de cet hybride ont été : la teneur en huile 51,6%, la taille des plantes 1,75 cm, le diamètre du capitule 19 cm, le nombre de semences per capitule 1421, le poids hectolitrique 39,5 kg et le poids de 1000 semences 59 g.

Les performances du tournesol en Chypre sont comparables à celles d'autres pays. Le semis peut être fait à partir du 1-er mars jusqu'à la fin de juin. Les plantes ont été trop hautes pour l'irrigation normale par aspersion. Des nouvelles expériences ont été organisées en 1984, contenant l'étude de la date du semis, la densité des plantes et les méthodes d'irrigation goutte-à-goutte.

PRIMEROS INTENTOS CON CULTIVARES
DE GIRASOL EN CHIPRE

Resúmen

Varias culturas comparativas comprendiendo 47 cultivares de girasol fueron efectuadas en Akhelia, Paphos, en 1983. El híbrido HS 52 dió la mayor producción de semillas, 4,1 t/ha. Otras características importantes de este híbrido fueron: contenido de aceite 51,6%, altura de las plantas 1,75 cm, diámetro del capítulo 19 cm, número de semillas por capítulo 1421, peso hectolitrico 39,5 kg/ha y peso de 1000 granos de 59 g.

Las performances del girasol en Chipre son comparables a las de otros países. La sembra se puede emprender en el período comprendido entre el 1 de marzo y finales del mes de junio. Las plantas fueron demasiado altas para el riego normal por aspersion. Nuevos experimentos fueron organizados en 1984 comprendiendo el estudio de las fechas de sembra, densidad de las plantas y métodos de riego por goteo.