BREEDING AND RESEARCH WORK ON OIL SUNFLOWER IN POLAND

By

Zbigniew Kloczowski
Plant Breeding and Acclimatization Institute
Department of Oil Plants
POLAND, Poznan, ul. Sieroca 1 a
(In absentia)

In my work for the Second International Sunflower Conference held at Morden (Manitoba, Canada) in 1966, I provided a characteristic of the main trends and achievements reached so far in the breeding of the oil sunflower in Poland. In this communication, I should like to present a part of my investigations concerning some sunflower varieties, out of a world collection, as the initial material for the breeding of the sunflower in Poland. During 1960-1966 some scores of foreign varieties were studied, the majority of them coming from the USSR. In recent years, four Russian varieties - especially Woroneski 64, Armawirec, Jenisej, and Czernianka 66 attracted attention.

Table 1 presents the characteristics of more important features and properties of these varieties in 1964-1966. The first three of them had a relatively short vegetative season, whereas Czernianka 66 was clearly later, but of interest because of its small height and markedly higher oil content in seeds, and conspicuous in its rich foliage.

As to the duration of vegetative season, the above varieties did not much deviate from demands made of sunflowers in Poland; but, though the yield was better than that of a few other varieties with a similar length of vegetation, it was insufficient to meet the demand.

In order to recognize the combining ability of the compared varieties, reciprocal crosses of 4 varieties were carried out by the technique "each with each". The inter-varietal crossing is one of simpler ways of making use of heterosis. Examples of this type of crossing performed between various species of cultivable plants indicate the efficacy of this method. The crossing between populations - formed so far by the majority of varieties - gives virtually a picture of the general combining ability of the separate individuals. Irrespective of the possibility of using the inter-varietal hybrids for practical purposes, the aim of this type of crossing is also to gain information as to the choice of the inbred line. The likelihood of a choice of well-combining lines out of varieties of verified high combining ability is greater than in varieties not conspicuous in this respect in trial crossings. Results of reciprocal crossings of 4 varieties are given in Tables 2 and 3. The effect of

heterosis in some combinations was noted almost exclusively in crops of achenes and in the yield of oil. In these cases the output of F_1 was higher than in the more fertile parental variety:

in the crop of achenes by 21,4 - 35,7%
in the yield of oil by 22,9 - 27,9%

Out of 12 combinations, most promising reults were attained from reciprocal crossing of the varieties Czernianka 66 and Armawirec, whose hybrids differed from parental varieties both in the crop of achenes and yield of oil. A clear increase of output of achenes was noticed also in the cross of Jenisej x Czernianka 66. The general combining ability of varieties in reciprocal crossings /after Griffing, 1956, Table 3 / was lower in the crop of achenes and oil for the varieties of Woroneski 64 and Jenisej, and considerably higher in the varieties of Czernianka 66, especially in the yield of oil.

On the basis of varieties characterized, chiefly Woroneski 64, Armawirec and Czernianka 66, a series of interesting strains were derived which in the years 1966-1967 were chracterized by features and properties listed in Table 4. Some of these strains /e.g. 1283, 1287, 1288 /with a relatively short vegetation season showed a high - for Polish conditions - oil content in achenes within the limits of 43 - 44%. In 1967, the strain 1283 sown in experimental plots yielded, from an area of 3059 m^2, a crop of 20,3 g/ha of achenes and 8,9 g/ha of oil. On the basis of selected single individuals and lines derived from these strains we aim at further improvement of properties of the material gained.

Table 1. Characteristics of 4 Russian Varieties of Oil Sunflower in Polish Conditions in 1964-1966

Variety	Length of Vegetation / days /	Foliage Area in cm^2 / for 1 cm of stalk /x	Oil Yield g/ha	Husk Content in achenes %	Oil Content
Woroneski 64	119	38	5,7	27,5	37,6
Armawirec	120	41	6,1	28,5	37,9
Jenisej	120	37	5,7	30,8	34,8
Czernianka 66	126	62	7,1	29,4	40,4

x/ Data of 1965. The foliage area was measured by Derco method in 30 plants.

Table 2. Characteristics of more important features of F_1 of inter-varietal hybrids in 1966

No.	Parental varieties ♀	Parental varieties ♂	Length of vegetation / days /	Height of plants in cm	Achenes yield q/ha	Oil yield q/ha	Oil content in seeds %	Husk content in achenes %
1	Woroneski 64	Jenisej	114	127,8	13,9	5,4	53,2	29,3
2	Jenisej	Woroneski 64	116	139,0	14,6	5,8	55,0 h	27,9
3	Woroneski 64	Czernianka 66	117	123,0	15,1	6,0	52,7	28,7
4	Czernianka 66	Woroneski 64	121	135,4	17,1 h	7,1	57,5	27,4
5	Woroneski 64	Armawirec	118	127,2	15,5	6,1	52,8	27,6
6	Armawirec	Woroneski 64	119	136,2	13,8	5,7	55,4	26,0
7	Jenisej	Czernianka 66	118	130,5	18,3 h	7,2	57,1	30,7
8	Czernianka 66	Jenisej	122	137,0	18,7 h	7,3	56,8	30,6
9	Jenisej	Armawirec	117	136,3	11,8	4,6	53,9	28,3
10	Armawirec	Jenisej	119	137,5	17,0 h	7,0 h	56,1 h	27,5
11	Czernianka 66	Armawirec	119	137,5	19,0 h	7,8 h	58,7	28,3
12	Armawirec	Czernianka 66	122	139,8	18,0 h	7,5 h	56,9	27,3
13	Woroneski 64		114	130,2	13,1	5,2	52,7	28,4
14	Jenisej		115	133,1	13,7	5,1	52,3	30,5
15	Czernianka 66		123	104,0	13,4	6,1	58,8	29,2
16	Armawirec		119	135,2	14,0	5,6	53,7	26,6
Least significant difference			1,8	6,73	2,73	1,24	2,05	2,21

h - heterosis

Table 3. General combining ability of varieties within reciprocal crossings in 1966

Variety	Achenes yield	Oil yield
Woroneski 64	- 0,042	- 0,018
Jenisej	- 0,010	- 0,013
Armawirec	- 0,003	0,000
Czernianka 66	+ 0,055	+ 0,031
Least significant difference	0,061	0,028

Table 4. Characteristics of some oil sunflower strains in 1966 - 1967

Strain No.	Length of vegetation / days /	Plant load of achenes in g	Husk content in achenes in %	Oil content in achenes in %
1283	123	79,8	29,3	43,6
1284	117	75,9	25,2	41,4
1286	122	75,1	25,6	41,4
1287	122	70,4	24,7	44,0
1288	122	80,0	25,3	43,0
1291	115	79,7	31,0	36,5
1292	115	69,2	31,6	34,6
1293	124	91,7	30,5	41,2

* * *