

## OIL CONTENT IN DIFFERENT TYPES OF SUNFLOWER HYBRIDS

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### SUMMARY

Crossings between 16 sunflower parent lines (8A, 4B and 4R) were carried out and as a result 16 single, 16 three-way and 16 doublecross hybrids were produced. After three years of testing it was found that the doublecross hybrids possess a higher oil content and are less influenced by the growing conditions in comparison with the simple and double-cross ones. The expression of the oil content trait is specific for the different parent lines in their participation as components of the various types of hybrids. An economic characteristic of some single, three-way and doublecross hybrids is presented.

**Key words:** sunflower, oil content, sunflower hybrids

### INTRODUCTION

The use of the male sterility in sunflower breeding gives the opportunity for hybrid combinations to be developed including different number of parent lines. Vulpe (1974) and Vranceanu and Stoenescu (1979) had created single, three-way and doublecross hybrid combinations through the usage of nuclear male sterility, marked by the gene "T" and cytoplasmic male sterility (CMS). The different types of hybrids produced by these authors did not differ significantly in productive potential and biomorphological characters. They had pointed out as advantages their better ecological plasticity and a higher seed yield in the process of the hybrid seed production.

Schemes for production of simple, three-way and doublecross hybrids on the base of CMS-*Helianthus petiolaris* had been worked out by Velkov and Stoyanova (1974).

The aim of the present study is to investigate the heterotic expressions regarding the oil content in the seeds of simple, three-way and doublecross sunflower hybrid combinations.

### MATERIAL AND METHODS

Crosses between 16 parent lines (8A, 4B and 4R) were carried out in 1985 and 1986. As a result, 16 simple, 16 three-way and 16 doublecross hybrids were produced. The simple and three-way hybrids are with 100% fertility restoring, while the doublecross ones have 50% restoring. The schemes, according to which the crosses were conducted, are presented in Figure 1.

The parent lines and the hybrid combinations were tested in the course of three years (1987-1989) in a trial carried out according to block method.

The oil content in the completely dry seeds was determined by nuclear magnetic resonance.

## RESULTS AND DISCUSSION

The variation limits and the mean values for oil content in the parent lines and their hybrid combinations during the three years of study are presented in Table 1.

The highest variation was recorded in the parent lines, the slightest one in the doublecross hybrids. The range of variation during the different years was preserved in approximately equal limits, both in the lines and in the three hybrid groups. More significant variation of the mean values for oil content was recorded in the parent lines compared with that of the hybrids.

Table 1 – Variation limits and mean values for the oil content in parent lines and hybrid combinations.

Type of the hybrid	Parameter	Oil content [%]		
		1987	1988	1989
PL	Variation limit	35.9 – 46.6	33.2 – 46.8	32.5 – 44.4
	Mean value	42.0	40.9	39.3
SH	Variation limit	39.7 – 46.6	38.0 – 47.0	39.3 – 45.1
	Mean value	43.0	42.6	42.5
	Average to MP (%)	103.9	106.5	111.0
TH	Variation limit	41.2 – 47.6	40.4 – 47.2	40.8 – 47.5
	Mean value	44.2	43.1	43.7
	Average to MP (%)	104.7	105.1	110.9
DH	Variation limit	42.5 – 47.8	42.2 – 46.2	43.0 – 47.8
	Mean value	45.1	44.6	45.3
	Average to MP (%)	107.4	109.0	115.3

"PL" – Parent lines

"SH" – Single hybrids

"TH" – Three-way hybrids

"DH" – Double-cross hybrids

The superiority over the parent forms, determined as percentage over the mean parent quantities, was highest in the doublecross hybrids. The changes of these values in the three hybrid groups was one-way, while the differences during the single years of testing were due mainly to the greater variation of the mean values of the parent lines by keeping the stability of the mean values of the parent lines.

The mean values for oil content during the three years of testing of the parent lines and hybrid combinations in which these lines participate as components are indicated in Table 2. In this table distinctions are observed in the oil content of the parent lines, while in the hybrids the variation was lower. A higher oil content is recorded in the doublecross hybrids, and in many of the cases the values of the simple and the three-way hybrids are practically equal.

The expression of the parent lines is specific for each line in the different hybrid combinations regarding the oil content in seeds. Some of these lines have show a significant heterotic effect in the three hybrid groups, but in the others the level of the initial line is preserved.

As a result of the present study, hybrid combinations with high productive potentialities and good economic qualities were developed. Some of these and the standard hybrid Albena are described in Table 3. The three groups of hybrids have not significant

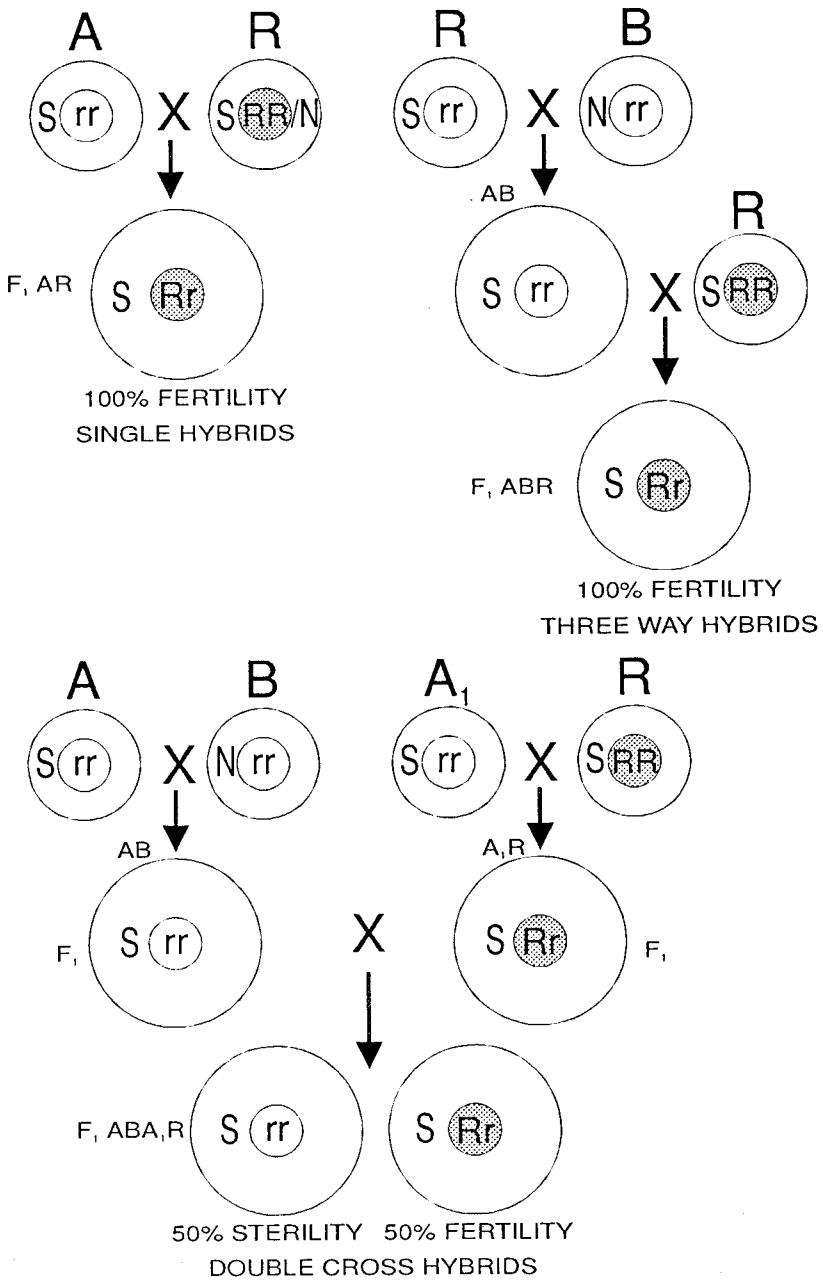


Figure 1 – Schemes of sunflower hybrid seed production on CMS basis (according to Velkov and Stoyanova)

Table 2 – Oil content in parent lines and hybrid combinations.

Parent lines	Oil content (%)			
	Parent line	Single hybrid	Three-way hybrid	Double-cross hybrid
1234 A	40.2	45.2	45.5	46.7
1607 A	40.6	42.2	42.9	44.1
3004 A	35.8	40.7	42.8	44.1
3064 A	34.8	43.0	43.7	45.2
147 R	45.1	44.6	45.6	44.7
210 R	42.3	42.5	43.8	45.0
26 R	39.9	42.0	42.7	45.6
274 R	39.6	41.5	42.7	44.8
295M B	44.6	–	42.8	44.1
874–6 B	43.6	–	43.7	45.2
3127 B	38.4	–	42.9	44.1
3631 B	45.4	–	45.5	46.7
3148 A <sub>1</sub>	41.3	–	–	45.0
2607 A <sub>1</sub>	37.8	–	–	44.7
3901 A <sub>1</sub>	37.6	–	–	44.8
3230 A <sub>1</sub>	44.5	–	–	45.6
Mean values	40.7	42.7	43.7	45.0

Table 3 – Economic characteristics of some single, three-way and double-cross sunflower hybrids.

Type of hybrid	Hybrid combination	Seed yield (kg/h)	Oil content (%)	Oil yield (kg/h)	1000 seeds weight (g)	Plant height (cm)	Days to maturity
SH	1234 x 147R	3544	46.2	1637	60.5	176	119
	1607 x 147R	3421	44.2	1512	60.9	183	117
	3004 x 147R	3290	42.5	1398	60.0	189	119
	3064 x 147R	3053	45.4	1386	56.2	166	111
TH	(1234 x 3631) x 147R	3238	47.0	1522	51.7	167	119
	(1607 x 3127) x 147R	3216	46.0	1479	55.1	177	117
	(3004 x 295M) x 147R	3113	44.6	1388	57.4	181	121
	(3064 x 874–6) x 147R	3097	44.8	1387	57.0	177	118
DH	(1234x3631)x(3230x26R)	3406	46.9	1597	47.4	166	121
	(1234x3631)x(2607x147R)	3175	46.6	1480	55.9	166	121
	(3004x295M)x(3230x26R)	3377	45.2	1526	58.4	177	120
	(3064x874–6)x(3901x274R)	3386	45.4	1537	62.5	181	119
SH	ALBENA – Check	3170	43.3	1373	54.4	175	116

differences in the main economic characters. The basic index – oil yield per area unit, is higher in all of the hybrids indicated, than in the hybrid Albena.

The best indexes are expressed in the single and three-way hybrids including the restorer line 147R as a component.

### CONCLUSIONS

The doublecross sunflower hybrids possess a higher oil content and are less influenced by the growing conditions in comparison with the single and the three-way ones.

The expression of the oil content trait is specific for the different parent lines in their participation as components of single, three-way and doublecross hybrids.

The various types of sunflower hybrids do not differ in their main economic qualities and they are of equal value in sunflower production.

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### CONTENIDO EN ACEITE EN DIFERENTES TIPOS DE HIBRIDOS DE GIRASOL

#### RESUMEN

Cruces entre 16 líneas parentales de girasol (8A, 4B y 4R) fueron llevadas a cabo y como resultado fueron producidos 16 híbridos simples, 16 tres vías y 16 híbridos dobles. Después de tres años de ensayos se encontró que los híbridos dobles poseen un contenido de aceite mas alto y son menos influenciados por las condiciones ambientales en comparación con los híbridos simples y tres vías. La expresión del contenido de aceite es específica para las diferentes líneas parentales y su participación como componentes de los varios tipos de híbridos. Las características económicas de algunos híbridos simples, dobles y tres vías son presentadas.

### TENEUR EN HUILE DANS LES DIFFÉRENTS TYPES D'HYBRIDES DE TOURNESOL.

#### RÉSUMÉ:

Des croisements entre 16 lignées parentales de tournesol (8A, 4B et 4R) ont été effectués et ont permis l'obtention de 16 hybrides simple voie, 16 hybrides double et triple voies. Après 3 années d'observations, il a été montré que les hybrides double voies possèdent une teneur en huile plus forte que les deux autres types d'hybrides et que leur teneur en huile est moins influencée par les conditions de culture. L'expression du caractère "teneur en huile" est spécifique à chacune des lignées parentales dans leur participation comme composante des divers types d'hybrides. Les caractéristiques économiques de certains hybrides simple, double et triple voies sont présentées.