

EFFECT OF SOWING TIME ON THE OIL CONTENT OF DIFFERENT SUNFLOWER HYBRIDS

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Introduction

The production of numerous hybrids with different adaptability, and improving the effectiveness of the sunflower production makes it reasonable to develop hybrid-specific technologies in the case of sunflower. In the range of the biological optimum changing the sowing time has a significant effect on the development of yields. It influences the growth of plant by changing directly the length of the vegetation period, this way influencing the quantity and quality of the crop, and indirectly affecting the extent of disease infections. The favorable effect of early sowing was observed by HARPER and FERGUSON (1979). According to them the early sowing has a positive effect on the crop and oil content. In sowing time experiments started from mid-March, sowing in May caused significant loss of yield and quality in PRODA's et al. (1985) Romanian experiments. Late (July) sowing produced small yield based on experiments conducted in the central areas of the USA. The early sowing supported higher oleic acid, while late sowing favored high linol acid content (OWEN, 1983). According to ENCSEVA (1984) the quantity of crop and the oil yield decreased as a result of postponing the sowing time. The overdue sowing in May caused considerable loss of yield in the experiments of ER and ISIK in Turkey (1988). The oil content was higher in the early sowing time (50 %), while it decreased to average 47 % in the later sowing time. The panicle and its oil content were the highest in the earliest sowing time (20 April) in the researches of KOTECKI and MALARZ in Poland. In the sowing time experiments performed in the interval of 4 to 16 °C of soil temperature, different soil temperatures did not have a significant effect on the height of plants, diameter of the plate and the oil content, but the significantly highest yield was produced on 10 to 12 °C soil temperature (BELEVTSSEV et al., 1990). By sowing in March, April and May GOKSOY et al. (1998) found that the yield decreased as a result of postponing the time of sowing similarly to the weight of thousand panicles, panicle weight by plates, oil content and oil yield.

Methods

Our experiments were conducted at Látókép, the Experiment Site of the University of Debrecen, Centre of Agriculture, Faculty of Agricultural Sciences, Department of Crop Production and Applied Ecology. The soil of the experiment field was calciferous chernozem. The experimental parcels were adjusted in casual block, in four repetitions. The size of the parcels was 20 m². The hybrids were produced in 6 years with the widely known technology in practice. The sowing times used in the experiments covered a wide range from early April (early sowing) through mid-April (normal sowing) until early May (overdue sowing). In the experiment 25 hybrids were examined in 6 years.

Results and discussion

By examining the effect of sowing time on the oil content, we found that its effect was greatly influenced by the year. In the early and normal sowing times we measured almost identical – well below significance level – oil content in the examined research period (48,5 % and 48,2 % in the average of the years and hybrids), substantial decrease only showed in the overdue sowing in early May (47,3 %), which verified that the early sowing did not come with decrease in oil content (Table 1). The difference between the hybrids was the smallest in the

early sowing (46,1 % and 54,1 % extremes), which grew in the normal sowing (40,1-54,2 %) and the highest variation was measured in the overdue sowing in early May (38,6-55,4 %). The highest oil content was measured in the average of the hybrids and sowing times in 2002 and 2003. The sowing time sensibility of the examined hybrids proved to be truly considerably strong in the *Fleuret*, *Magnum*, *Larisol*, *Alexandra/PR* hybrids (hybrid-specific sensibility), while the *Hysun 321*, *Diabolo*, *Lucil*, *Lympil*, *Loidor* and *Altesse* hybrids were less characterized by that variance (hybrid-specific stability).

Table 1. The development of oil content in sunflower in different sowing times (average of hybrids)

(Debrecen-Látókép, 1999-2004)

Year	Early sowing time			Normal sowing time			Overdue sowing time		
	minimum (%)	maximum (%)	Average (%)	minimum (%)	maximum (%)	average (%)	minimum (%)	maximum (%)	average (%)
1999	41,6	45,7	44,1	40,1	48,7	44,9	42,4	48,6	45,8
2000	41,9	48,7	46,1	44,9	53,9	48,7	38,6	50,4	44,8
2001	46,1	54,1	49,1	41,4	51,0	46,9	40,1	51,1	46,4
2002	45,0	52,6	50,5	45,5	54,2	49,8	43,8	55,4	49,6
2003	48,1	53,8	50,8	47,5	52,5	49,9	46,1	53,2	48,8
2004	45,7	53,0	50,1	46,6	51,5	49,2	43,6	49,7	48,2
Average	44,7	51,3	48,5	44,3	52,0	48,2	42,4	51,4	47,3

SzD_{5%} in the average of the hybrids between sowing times: 1,09%

In respect of the oil yield an obvious tendency can be observed in the average of the years and hybrids. The highest oil yield was produced in the early sowing time (1929 kg ha⁻¹), the value of the normal sowing time was somewhat smaller (1872 kg ha⁻¹), while the overdue sowing in early May considerably decreased the oil yield (1622 kg ha⁻¹). The *Hysun 321*, *Rigasol*, *LG 5385*, *PR63A82*, *Altesse* and *Alexandra/PR* hybrids were characterized a bit wavering oil yield (200-300 kg ha⁻¹). This same indicator showed great movement (500-700 kg ha⁻¹) regarding the *Fleuret*, *Magnum* and *Diabolo* hybrids (Table 2.)

Table 2. The development of the oil content of sunflower in different sowing times (average of hybrids)

(Debrecen-Látókép, 1999-2004)

Year	Early sowing time			Normal sowing time			Overdue sowing time		
	minimum (kg/ha)	maximum (kg/ha)	average (kg/ha)	minimum (kg/ha)	maximum (kg/ha)	average (kg/ha)	minimum (kg/ha)	maximum (kg/ha)	average (kg/ha)
1999	984	2126	1555	1138	2090	1634	1174	2092	1650
2000	1176	2148	1750	1867	2457	2161	997	1908	1426
2001	1437	1873	1687	1159	1766	1457	1044	1591	1289
2002	1690	2373	2077	1440	2362	1818	1340	1792	1575
2003	2144	2567	2376	1906	2530	2308	1931	2371	2173
2004	1781	2468	2127	1635	2137	1853	1213	1914	1620
Average	1535	2259	1929	1524	2224	1872	1283	1945	1622

SzD_{5%} in the average of the hybrids between sowing times: 31,66 kg ha⁻¹

The *Alexandra/PR* and *Arena/PR* hybrids were examined in every years of the six years research period. The performances of the two hybrids followed consequently the average of the hybrids in every examined parameter in every year, which allows us to deduct that the joined evaluation of the hybrids well represents the answers given by single hybrids to the different sowing times (Table 3.).

Table 3. The change of the oil yields (kg/hectare) in the examined sunflower hybrids in different sowing times
(Debrecen-Látókép, 1999-2004)

Year	Alexandra/PR				Arena/PR			
	early sowing	normal sowing	overdue sowing	average	early sowing	normal sowing	overdue sowing	average
1999	1728	1653	1664	1682	1841	1920	1969	1910
2000	1781	2045	997	1607	1833	2068	1430	1777
2001	1643	1383	1395	1473	1800	1508	1261	1523
2002	2147	1771	1581	1833	2340	1774	1525	1880
2003	2554	2398	2371	2441	2474	2248	2140	2287
2004	2273	1880	1881	2011	2022	1704	1717	1815
Average	2021	1855	1648	1841	2052	1870	1674	1865

SzD_{5%} between the sowing times in the average of hybrids: 108,92 kg ha⁻¹

SzD_{5%} between the hybrids in the average of sowing times: 88,93 kg ha⁻¹

SzD_{5%} between any of the two combination: 154,04 kg ha⁻¹

The year-effect of the examined years well indicates that for the *Alexandra/PR* hybrid between the minimum and maximum of the year its value in one sowing time was 1374 kg ha⁻¹ which reflects a considerable year-effect. Moreover, it can be observed that in a favorable year (2003) there was a small difference regarding the oil yield in the different sowing times (183 kg ha⁻¹ and 334 kg ha⁻¹), while in other years (e.g. 2000, 2002) this difference was considerably bigger (566 kg ha⁻¹-1048 kg ha⁻¹). In the *Arena/PR* hybrid, from the two hybrids, the difference regarding the sowing times, was smaller, therefore was characterized by better yield stability, while in the *Alexandra/PR* hybrid, the difference interval was bigger.

Conclusions

We stated by examining the effect of sowing time on the oil content that the effect of sowing time was greatly influenced by the year. The oil content was nearly similar in the early and normal sowing time, considerable decrease only showed in the overdue, early May sowing in which case there was a significant difference compared to the early sowing time. Regarding the oil yield the determining and significant effect of the years and hybrids were verified. The highest oil yield resulted from the early sowing, the value originating from the normal sowing was smaller and the oil yield from the overdue sowing in early May was noticeably smaller.

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