# EFFECT OF PLANT DENSITY ON YIELD AND OIL CONTENT OF DIFFERENT SUNFLOWER GENOTYPES

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## Introduction

In Hungary, sunflower has very significant role in the production of vegetable oil, therefore sunflower was converted into one of the most important field crop. The agro-ecological elements are suitable for sunflower production in Hungary (Dani-Pepó, 2005). Moreover, sunflower has important role in crop rotation and contribution to the biological diversity. Sustainable agriculture involves application of natural resources (Berecz et al. 2005).

The present hybrid portfolio is wide both from the viewpoint of the yields and quality of crop. The biggest problems are in the crop stability of hybrids (Pepó 1999).The numerous different hybrids have different genotypes and they react differently to the agrotechnical factors. The hybrid-specific technologies have determining role in the effective production (Zsombik 2004).

The effects of different cultivation techniques (e.g. sowing time, crop density) on the productivity of sunflower hybrids are very significant in different crop years (Borbély et al. 2005, Zsombik 2006). The agro-ecological and agricultural engineering necessity of different sunflower genotypes, furthermore their resistance to stress shows significant differences (Borbélyné et al. 2006). The sowing time and plant density, within biological optimum, have significant influence on the yield of sunflower hybrids (Zsombik 2005). Pepó and Szabó (2005) examined the effect of agrotechnical factors with different plant density on the sunflower standing crop. Their results proved the influence of improving crop density on the yields and oil contents of hybrids.

## Material and methods

The sunflower experiment at Látókép, the Experiment Site of the University of Debrecen, Centre of Agriculture, Institute of Crop Sciences was adjusted on calcerous chernozem soil. The plant density experiments were adjusted between 35.000 and 75.000 plant hectare$^{-1}$ density interval, with a grade of 10.000 plant hectare$^{-1}$. In the researches ten hybrids were used. The hybrids were applied with single agro-technology generally used in practise. The harvested yields were standardized after being corrected to 8% moisture content.

## Results and discussions

Due to the extreme weather condition the yields were low in 2005. Because of the climatic condition the yields ranged between 1850 kg ha$^{-1}$ and 3593 kg ha$^{-1}$ (Table 1). The lower plant density was optimal for sunflower hybrids because of the higher infection of diseases. In the case of PR 64A63 (2950 kg ha$^{-1}$), Diabolo (2628 kg ha$^{-1}$), LG 54.15 (2679 kg ha$^{-1}$), Rumbasol (3305 kg ha$^{-1}$) and Aréna PR (2845 kg ha$^{-1}$) hybrids the optimal plant density was 35.000 plant hectare$^{-1}$. Crops of NK Brio (3325 kg ha$^{-1}$), PR 63A82 (3593 kg ha$^{-1}$) and LG 56.65 (3527 kg ha$^{-1}$) hybrids the highest yields were at the rate of 55.000 plant hectare$^{-1}$. In the case of Alexandra PR (3202 kg ha$^{-1}$) and PR 64A63 hybrids

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the optimal plant density was 65.000 plant hectare$^{-1}$ (yields were 3202 kg ha$^{-1}$, 3011 kg ha$^{-1}$ respectively).

Table 1. The change of yields of examined hybrids with different plant density (Debrecen –Látókép, 2005)

| Density plant ha$^{-1}$ | PR 64 A 30 | NK Brio | PR 63 A 82 | Alexandra PR | Diabolo | LG 54.15 | Rumbasol | Arena PR | PR 64 A 63 | LG 56.65 |
|---|---|---|---|---|---|---|---|---|---|---|
| **35000** | 2950 | 3178 | 3411 | 2925 | 2628 | 2679 | 3305 | 2845 | 2896 | 3496 |
| **45000** | 2720 | 3325 | 3593 | 3140 | 2602 | 2553 | 3107 | 2690 | 2842 | 3527 |
| **55000** | 2612 | 3197 | 3237 | 3202 | 2296 | 2377 | 3033 | 2558 | 3011 | 3476 |
| **65000** | 2366 | 3032 | 2824 | 3080 | 2014 | 2136 | 2797 | 2610 | 2816 | 3302 |
| **75000** | 2080 | 2506 | 2358 | 2865 | 1875 | 2011 | 2786 | 2502 | 2611 | 3060 |

Examining the oil contents with the average of the ten hybrids it can be observed that the highest oil yields (45,34 %) were produced with 65.000 plant hectare$^{-1}$. Both increasing and decreasing of plant density resulted lower oil content. The oil contents of examined hybrids were the lowest in the case of plant density ranged from 35.000 to 55.000 plant hectare$^{-1}$. The highest oil contents were observed with 65.000 – 75.000 plant hectare$^{-1}$ density. The oil contents of Diabolo (48,3 %), NK Brio (47,8 %), PR 63 A82 (47,1 %), LG 54.15 (43,7 %), and LG 56.65 (42,8 %) hybrids were the highest with 65.000 plant hectare$^{-1}$. At the greatest crop density resulted the highest oil yield of Aréna PR (46,8 %), Rumbasol (46,7 %), Alexandra PR (45,6 %), PR 64A63 (44,7 %), and the PR 64A30 (43 %) hybrids. The Diablo hybrid gave the highest oil yield with 35.000 and 65.000 plant hectare$^{-1}$. In the case of plant density ranged from 45.000 to 55.000 plant hectare$^{-1}$ the highest oil content was measured in the NK Brio hybrid. At last, oil content of Arena PR was the highest with 75.000 plant hectare$^{-1}$ (Table 2). The examined hybrids reacted to the different levels of plant density in very different way. The lowest fluctuation of oil content (1.8%) was detected in PR 63A30 hybrid under the influence of plant density change. The effects of alteration in plant density on the oil content was the greatest in Aréna PR hybrid (Table 2).

Table 2. The change of oil contents of examined hybrids with different plant density (Debrecen –Látókép, 2005)

| Tőszám tő ha$^{-1}$ | PR 64A30 | NK Brio | PR 63A82 | Alexandra PR | Diabolo | LG 54.15 | Rumbasol | Aréna PR | PR 64A63 | LG 56.65 |
|---|---|---|---|---|---|---|---|---|---|---|
| **35000** | 41,80 | 45,00 | 45,30 | 43,50 | 46,70 | 40,80 | 40,80 | 39,60 | 43,50 | 38,60 |
| **45000** | 41,20 | 46,50 | 44,10 | 42,40 | 46,10 | 39,40 | 45,60 | 40,00 | 41,40 | 40,70 |
| **55000** | 41,70 | 46,70 | 43,90 | 44,30 | 45,80 | 40,90 | 46,20 | 46,10 | 43,40 | 38,80 |
| **65000** | 41,80 | 47,80 | 47,10 | 45,30 | 48,30 | 43,70 | 46,40 | 46,10 | 44,10 | 42,80 |
| **75000** | 43,00 | 46,10 | 44,90 | 45,60 | 45,90 | 43,30 | 46,70 | 46,80 | 44,70 | 42,50 |

In terms of oil contents the 2005 year was specific. The yield reducing effect of unfavourable weather conditions was more significant with greater plant density, therefore the highest oil yields were measured under lower plant density. The oil contents of hybrids were very low ranged between 876 kg ha$^{-1}$ – 1679 kg ha$^{-1}$. In the case of examined ten hybrids the lowest oil yield was measured under 75.000 plant hectare$^{-1}$ density. In the terms of oil yields of PR 64A63 (1378 kg ha$^{-1}$), Diabolo (1228 kg ha$^{-1}$),