NECTAR PRODUCTION OF SOME SUNFLOWER HYBRIDS

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S u m m a r y

This study analysed the results of nectar production, sugar concentration and calculated the sugar value of some sunflower hybrids in Hungary. The influence of the main climatic factors on the nectar production and sugar concentration was also studied. The experiment was carried out at two different sites in Hungary, in the Ecotoxicological Laboratory at Fácánkert and in the Institute for Small Animal Research at Gödöllő (samples were collected from Kerekharaszt, ABM-Gramina Ltd.).

The average nectar production per flower was 0.12-0.21 mg at Fácánkert and 0.08-0.15 mg at Kerekharaszt. The refraction values were 44.8-59.0% and 45.7-61.3%. Honey bees visited the fields all day, even in the hot midday hours. From the beginning of the year, the precipitation was less and the temperature was higher at Kerekharaszt, thus, the nectar production was lower but more concentrated at this site.

In the previous years in Hungary very low sunflower nectar collection of honey bees and honey yield was observed. However, the current results show that it did not directly relate to the introduction of new sunflower hybrids.

Keywords: Sunflower hybrids, nectar, sugar concentration, sugar value.

INTRODUCTION

In Hungary, sunflower is the most important oil crop. Its growing territory has varied between 300,000 – 500,000 hectares in the last couple of years. Nowadays, after black locust (*Robinia pseudoacacia* L.) (in Hungarian it is called „akác"), sunflower is the second-most important bee pasture in Hungary.

Although nectar production is highly influenced by environmental factors, a great number of measurements can give a proper base for determining the nectar production ability of given hybrids; thus indicating apicultural importance and yield stability.

Economic crops – such as sunflower – grown for their seeds, honey yield and need the pollination of bees (Nyárády 1958). Due to pollination by honey bees, better yields and better quality can be achieved (Benedek et al., 1974).

Nectar production of sunflower hybrids was evaluated by various researchers. In some studies flowers had high nectar production (0.405-0.487 mg/flower) with 49.5-51.3% sugar concentration (Halmágyi-Suhayda 1963), others reported 0.039-0.120 mg nectar (Nikovitz-Szalainé 1983), 0.02-0.06 mg/flower sugar value (Horváth 1999, Lajkó 2001).

Results of foreign studies indicate that a flower at 24 – 49% sugar concentration produces 0.19 – 0.50 mg nectar (Hedtke

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1998) at 0.11 – 0.25 mg of sugar value (Simidchiev 1977, 1987).

MATERIALS AND METHODS

Nectar production of some sunflower hybrids was measured on two different sites in Hungary. Fácánkert is situated in the south-west of the country and Kerekharaszt is situated to the north-east of Budapest. The soil at Fácánkert is Chernozem soil, while at Kerekharaszt it is Brown forest soil. Thirteen hybrids were studied in Fácánkert (AK 7101, Alexandra PR, Arena PR, Fantasol, Fleuret, Florix, KWS Helia 04, KWS Helia 04 RM, KWS Helia 05 RM, Opera, Pixel, Rigasol and Zoltan) and fifteen in Kerekharaszt (Alexandra PR, Arena PR, Cledor, Fantasol, Fleuret, Florix, Hysun 321 PR, KWS Helia 04 RM, LG 5645, Louidor, Lympil, Magog, Opera PR, Pixel PR, Rigasol PR).

During the flowering period, the amount of nectar and its sugar content were measured. At Fácánkert, between 06-12th of July 2002, at Kerekharaszt between 02-10th of July 2002. Plants were collected at random locations from the plots and the nectar was gathered by glass capillary. The sugar concentration was determined with a refractometer. The mass of the nectar was weighed on an analytical balance. The climatic parameters (air temperature and humidity) were also determined. The sampling of nectars was taken from previously isolated inflorescences for 24 hours.

RESULTS

At both sites, the flowering period of sunflower was shorter due to the hot weather and atmospherical drought. Thus, the period of honey-foraging was shorter. The flowering of most sunflower hybrids happened almost in the same time period. Mean temperature, air humidity during sampling and precipitation from January to August were the following in both experimental sites. At Fácánkert 24 – 31°C temperature, 39 – 85% air humidity, 404 mm precipitation. At Kerekharaszt 26 – 35°C temperature, 35 – 79% air humidity, 151 mm precipitation. At Kerekharaszt there was less rain, but the temperature was higher than at Fácánkert. These factors must have influenced nectar production.

The average nectar production, sugar concentration and calculated sugar value are displayed on the Table 1. Nectar production of hybrids did not show significant differences within the sites; only inter-site differences were observed.

Fig. 1 shows the sugar values of sunflower hybrids at Fácánkert. According to the order of the hybrids, Pixel is in first place, as it had good nectar production and sugar concentration. The average of total sugar value is the lowest in Florix (0.052). Florix had very low sugar values (0.042) during the measurements of the previous years (Zajácz et al., 2002).

Fig. 2 shows the sugar values of sunflower hybrids at Kerekharaszt. The average of total sugar value is the highest at Lympil, then comes Magóg. At the bottom

Table 1

The average nectar production, sugar concentration and calculated sugar value on the two sites.

Sites	Nectar production mg/1 flower	Sugar concentration %	Sugar value
Fácánkert	0.12 - 0.21	44.8 – 59.0	0.05 - 0.10
Kerekharaszt	0.08 - 0.15	45.7 - 61.3	0.04 - 0.08

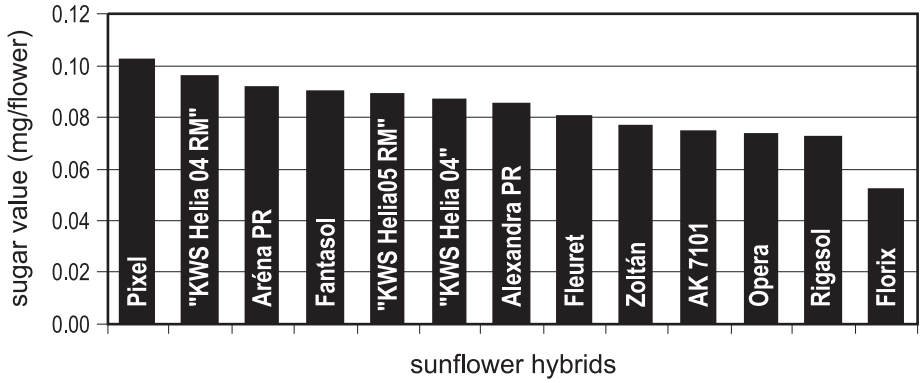

Fig. 1. Sugar value of sunflower hybrids, Fácánkert 2002.

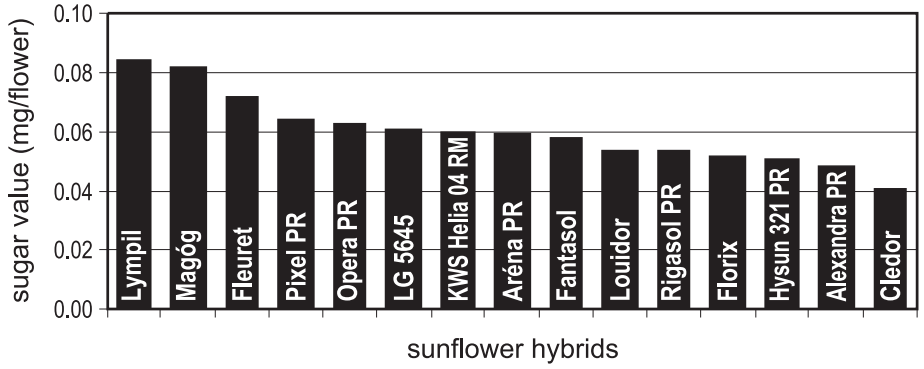

Fig. 2. Sugar value of sunflower hybrids, Kerekharaszt 2002.

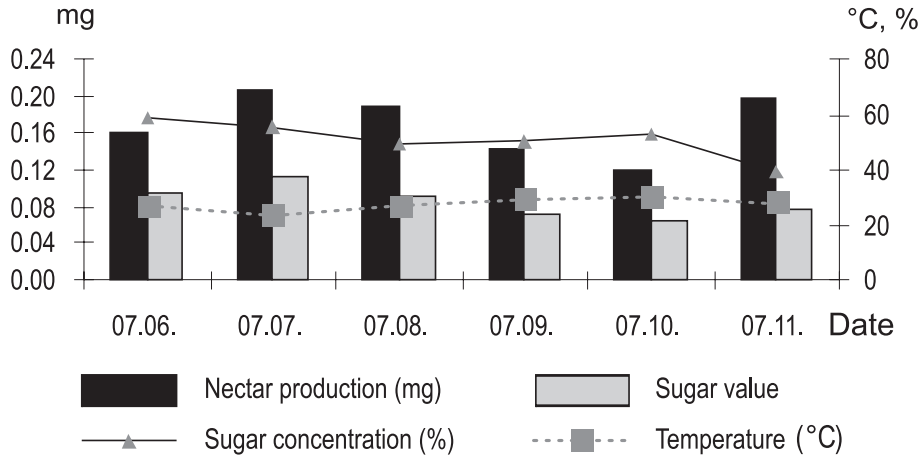

Fig. 3. Nectar production, sugar concentration and calculated sugar value of Alexandra PR hybrid, Fácánkert 2002.

the order is Cledor. The sugar value of Cledor is only half of Lympil's. There are no hybrids with a sugar value over 0.1 mg/flower.

Fig. 3 – 4 shows the correlation between the temperature and production of nectar

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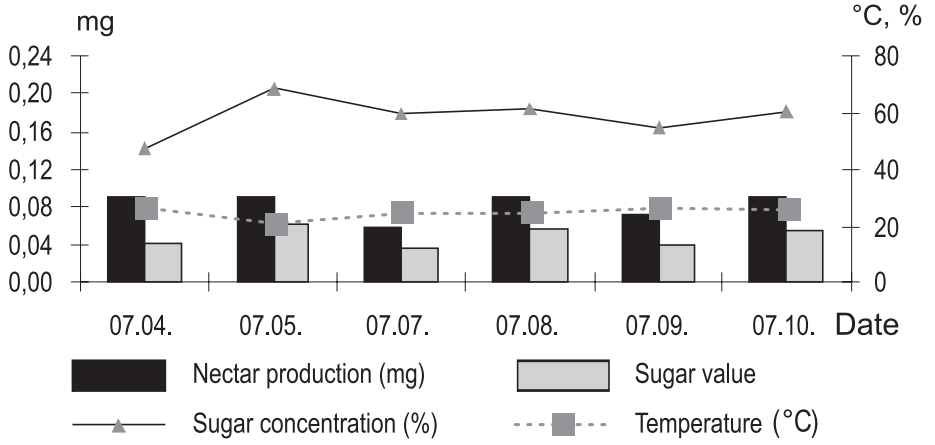

Fig. 4. Nectar production, sugar concentration and calculated sugar value of Alexandra PR hybrid, Kerekharaszt 2002.

and the sugar concentration of the nectar in the Alexandra PR hybrid. The nectar production at Fácánkert was balanced throughout the flowering period. At Kerekharaszt, the sugar values were correlated with the sugar concentration of nectar, though the maximum was when the temperature was the lowest. Sugar concentration is the most dependent on the relative air humidity.

Bees visited the field in the morning hours in the highest number because the pollen production and nectar secretion was the most intensive at that time. These factors – and not the new sunflower hybrids – could have resulted in the unsuccessful sunflower nectar collection of honey bees.

CONCLUSIONS

Mass nectar production was influenced by high temperature and air humidity.

It is probable that the very low sunflower nectar collection by honey bees in the previous years did not directly relate to the new sunflower hybrids.

Nectar production of hybrids did not show significant differences within the sites. Only inter-site differences were observed. It was found that nectar production was also good in hot days if the water supply for the sunflower was adequate from the soil.

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PRODUKCJA NEKTARU Z NIEKTÓRYCH KRZYŻÓWEK SŁONECZNIKA

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Streszczenie

W pracy zbadano wyniki produkcji nektaru, stężenie cukru oraz obliczono wartość cukrową kilku krzyżówek słonecznika rosnących na Węgrzech. Przeanalizowano również wpływ najważniejszych czynników klimatycznych na produkcję nektaru i stężenie cukru. Eksperyment przeprowadzono w dwóch różnych miejscach na Węgrzech, w laboratorium Ekotoksykologii we Fácánkert oraz w Instytucie Badań nad Małymi Zwierzętami w Gödöllő (próbki zebrano w Kerekharaszt, ABM-Gramina Ltd.).

Średnia produkcja nektaru na kwiat wynosiła 0,12-0,21 mg w Fácánkert oraz 0,08-0,15 mg w Kerekharaszt. Wartości refrakcyjne wynosiły 44,8-59,0% i 45,7-61,3%. Pszczoły przylatywały na pola przez cały dzień, nawet w ciągu gorących południowych godzin. Od początku roku w Kerekharaszt wystąpiło mniej opadów, a temperatura była wyższa, z tego względu w tym miejscu wyprodukowana została mniejsza ilość nektaru, choć był on bardziej skoncentrowany.

W poprzednich latach zaobserwowano na Węgrzech, że ilość nektaru słonecznikowego zebranego przez pszczoły oraz wydajność miodowa były bardzo niskie. Jednakże obecne wyniki wykazują, że nie miało to bezpośredniego związku z wprowadzeniem nowych krzyżówek słoneczników.

Słowa kluczowe: Krzyżówki słoneczników, nektar, stężenie cukru, wartość cukrowa.