RESULTS REGARDING THE MELLIFEROUS CHARACTERISTICS OF THE FOREIGN SUNFLOWER HYBRIDS CULTIVATED IN ROMANIA

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The climatic and soil conditions of Romania are favorable for growing sunflower, which represents one of the most important agricultural crop in Romania (about 10% of the arable land), as well as the most important oil crop. Thus, sunflower ranges the third place as cultivated surface, after maize and wheat.

From the melliferous point of view, sunflower flowers by the end of June and beginning of July, and provides the last important honey yield. In fact, sunflower is the most important melliferous cultivated plant for Romania even by the period and duration of flowering or by the large number of flowers and nectar secretion. The nectar produced by the sunflower flowers are gathered with great interest by bees insuring important honey productions.

The beekeepers are mainly interested in the specific melliferous characteristics of sunflower hybrids. This is very much due to the fact that the hybrids assortment admitted to be cultivated in Romania increased very much in the last years by breeding new sunflower hybrids, and also by cultivating some new hybrids from abroad. Thus, the assortment of sunflower hybrids currently accepted for cultivation in Romania has become extremely diverse (118 hybrids registered in the Official Catalogue of crop varieties grown in Romania for the year 2006). In the last years, numerous foreign sunflower hybrids (58 hybrids) were added to the list of Romanian hybrids, which were already registered in the Romanian Official Catalogue. To these foreign sunflower hybrids already registered into the Official Catalogue of crop varieties grown in Romania, there are added the sunflower hybrids registered into the National Official Catalogue of one of the European Union countries, which could be cultivated in Romania according to the law.

The foreign sunflower hybrids, but especially the ones that are not registered into the Official Catalogue of crop varieties grown in Romania but admitted to be cultivated because they are registered into one of the European Union countries are less known or even unknown with respect to the biological characteristics of the flowering stage and their melliferous potential.

The present paper presents the results of the researches carried out on 19 sunflower hybrids in southern Romania (15 km northeastern faraway from Bucharest), under the 2006 and 2007 climatic conditions. The studied sunflower hybrids were the following: Melody, Sunko, Sanay, Kasol, Nk Dolbi, NK Ferti, Nk Armoni, Opera PR, Rigasol, Podium, Fleuret OR, Rigasol Or, Mateol, Lindor, Fly, Arena, Alexandra, Masai, Saxo. The aim of the researches carried out was to establish the melliferous characteristics of the foreign sunflower hybrids cultivated in Romania.

MATERIAL AND METHOD

Researches were carried out in field experiments in the years 2006 and 2007, on a reddish brown soil (reddish preluvosoil) located 15 km northeastern faraway from Bucharest. The field experiments were located within the experimental farm of the Bucharest University of Agronomical Sciences and Veterinary Medicine – Faculty of Agriculture and they were part of a research project financed by the CEEX Research Program.

The research objectives were to study the melliferous potential of the foreign sunflower hybrids cultivated in Romania, respectively: Melody, Sunko, Sanay, Kasol, Nk Dolbi, NK Ferti, Nk Armoni, Opera PR, Rigasol, Podium, Fleuret OR, Rigasol Or, Mateol, Lindor, Fly, Arena, Alexandra, Masai, Saxo.

The field experiments had random plots with four replications in 2006 and three replications in 2007. Each plot had a surface of 29.4 m2, which meant six plant rows grown at a distance of 70 cm between rows and 7 m distance along the rows.

The nectar secretion was determined using the capillaries method, which is one of the direct methods. This method is often used in researches, being an operative and adequately accurate one, compared to other direct methods. At the same time, it enabled us to analyze the nectar both quantitatively (mg/flower), and qualitatively (sugar %), without tearing off the flowers from the plant.

The nectar was extracted by means of a capillary (figure 2), initially weighted on an analytical balance (fig. 1). After extracting the nectar from a certain number of flowers (in sunflower the nectar is extracted from 50 flowers), the capillary was again weighted, and by deduction we obtained the quantity of nectar (in mg/flower), which was then divided by the number of flowers used for the extraction. The result revealed the quantity, in mg, of nectar produced by a single flower. Then, by means of a refractometer we were able to determine the concentration of nectar in sugar (figure 3).

In order to find the nectar secretion in flowers to be analyzed we placed gauze covered over the head flowers 24 hours before the analysis.

Figure 1. Weighting the capillaries used for nectar extraction

Figure 2. Nectar extraction in sunflower by means of a capillary

Figure 3. Determination of sugar nectar concentration using a refractometer

The quantity of nectar obtained in this manner was conventionally considered to be the quantity secreted within 24 hours. To find out the nectar secretion in a sunflower flower, the quantity of nectar produced per flower, in one determination, multiplies by 3 (3 representing the number of flowering days of a fertile flower).

The quantity of nectar and its sugar concentration helped us to calculate the honey production per surface unit. Thus, while carrying out the nectar analysis, we calculated the number of flower/head for each hybrid. Then, knowing the number of plants per surface unit, we managed to determine the number of flowers per ha.

The sugar production per ha was estimated according to the following formula:

$$Z = z \times n \times d / 1000000$$

where: Z = sugar production per ha;
z = sugar production in mg per flower;
n = number of flowers per ha;
d = flowering duration, in days, of a single flower.

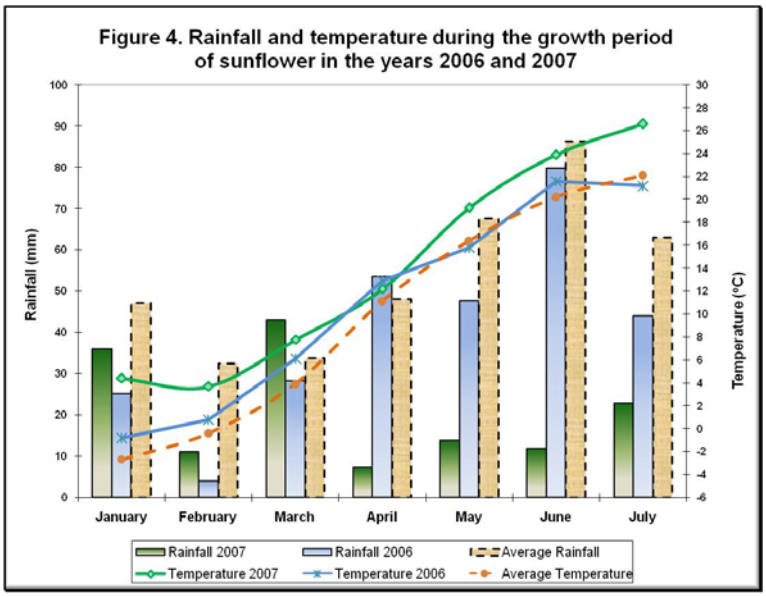
The sugar production per flower was estimated by multiplying the quantity of nectar (in mg/flower) with its sugar concentration. Hence, the glucidic index was calculated, this representing the quantity of sugar (in mg) per flower in 24 hours. The glucidic index is a parameter specific to each plant species, and to each variety/hybrid within the species. For this reason, it is a useful element in comparing various species and cultivars for their value as melliferous sources.

The estimated honey production/ha represents the potential quantity of honey theoretically obtained per ha of crops during a season, in an analyzed species. The following formula was used for the estimation of honey production of the sunflower hybrids:

$$M = Z \times 1.25$$

where: M = honey production per ha, in kg;
Z = sugar production per ha;
1.25 = coefficient of sugar transformation in honey

From the climatic point of view, the year 2006 was less favorable to sunflower because of the drought period recorded in May, June and July, and the high temperature recorded in June. The year 2007 was completely unfavorable to sunflower because of the severe drought during April, May, June and July, as well as because of the extremely high temperatures recorded all over the year, but especially in May, June and July. The climatic data in the years 2006 and 2007 (Figure 4) were registered by an automatic weather station, which was positioned within the experimental field.



Sowing was performed on 11 of April in 2006 and on 18 of April in 2007. The sowing density was 50,000 plants per ha.

In the year 2007, some sunflower hybrids (Fleoret OR, Melodi, Sunko and Arena) were sowed at 5 different moments, respectively:

- Moment I – sowing on 27 of March;
- Moment II – sowing on 6 of April;
- Moment III – sowing on 18 of April;
- Moment IV – sowing on 12 of May;
- Moment V – sowing on 2 of June.

RESULTS AND DISCUSSIONS

The honey yield is bigger during the first week of plain flowering process than in the second week in both experimental years, respectively in 2006 and 2007 (figure 5 and figure 6). Thus, in the year 2006, the honey yield in the first week of plain flowering process varied between 7.5 kg/ha (Saxo hybrid) and 25 kg/ha (Melody hybrid), but in the second week the honey yield varied between 4.6 kg/ha (Saxo and Rigasol OR hybrids) and 11.3 kg/ha (Sunko hybrid). In the

year 2007, the honey yield in the first week of plain flowering process varied between 11 kg/ha (Rigasol OR hybrid) and 26.2 kg/ha (Lindor hybrid), but in the second week the honey yield varied between 6.1 kg/ha (Sanay hybrid) and 21.7 kg/ha (Arena hybrid).

In the year 2007, the average honey yield was bigger than in the year 2006 (figure 7). Thus, in the year 2006 the average honey yield varied between 6.1 kg/ha (Saxo hybrid) and 16.1 kg (Sunko hybrid), but in the year 2007 the average honey yield varied between 9.5 kg/ha (Sanay hybrid) and 23.2 kg/ha (Lindor hybrid).

The highest average honey yields were obtained by the hybrids Lindor (23.2 kg/ha) and Arena (23.0 kg/ha) in the year 2007, but both of them were giving not so high honey yields in the year 2006 (9.0 kg/ha for Arena hybrid and 9.2 kg/ha for Lindor hybrid). That means the two sunflower hybrids have a high melliferous potential but in the same time an unstable one over the time, these been affected by the climatic conditions.

There are some sunflower hybrids with relatively high melliferous potential and stable over time, such as Sunko hybrid (14.5-16.1 kg/ha in the two experimental years), Dolby hybrid (14.2-17.5 kg/ha), Kasol hybrid (13.8-18.0 kg/ha), Armony hybrid (13.5-17.2 kg/ha), Melody hybrid (13.6-15.8 kg/ha), Ferti hybrid (12.9-14.1 kg/ha). Also, there are some sunflower hybrids with relatively high melliferous potential and unstable over time (with large variation from year to year), such as Opera hybrid (10.3-17.5 kg/ha in the two experimental years), Mateol hybrid (10.3-17.3 kg/ha), Fly hybrid (8.9-17.6 kg/ha).

There are some sunflower hybrids with relatively small melliferous potential and stable over time, such as Rigasol hybrid (12.6-12.0 kg/ha in the two experimental years), Podium hybrid (11.7-12.1 kg/ha), Sanay hybrid (9.5-13.0 kg/ha), Fleuret OR hybrid (10.3-10.6 kg/ha), Rigasol OR hybrid (8.9-10.9 kg/ha). Also, there are some sunflower hybrids with relatively small melliferous potential and unstable over time (with large variation from year to year), such as Saxo hybrid (6.1-11.3 kg/ha in the two experimental years), Alexandra hybrid (8.1-12.4 kg/ha), Masai hybrid (6.8-15.4 kg/ha).

The nectar secretion was bigger in the first week of plain flowering process than in the second week, in both experimental years (2006 and 2007) (figure 8 and figure 9). But, the sugar nectar concentration was smaller in the first week of plain flowering process than in the second week, in both experimental years (figure 10 and figure 11).

By sowing at different dates the melliferous potential is different according to climatic conditions, but also according to sunflower hybrid (figure 12). The sowing at different dates revealed the high melliferous potential of the hybrid Sunko. Under good climatic conditions the hybrid Melody has a good melliferous potential and under not so good climatic conditions the hybrid Arena has a good melliferous potential.

Figure 5. Honey yield at different moments during the flowering process at the foreign sunflower hybrids cultivated in Romania. Moara Domnească, 2006

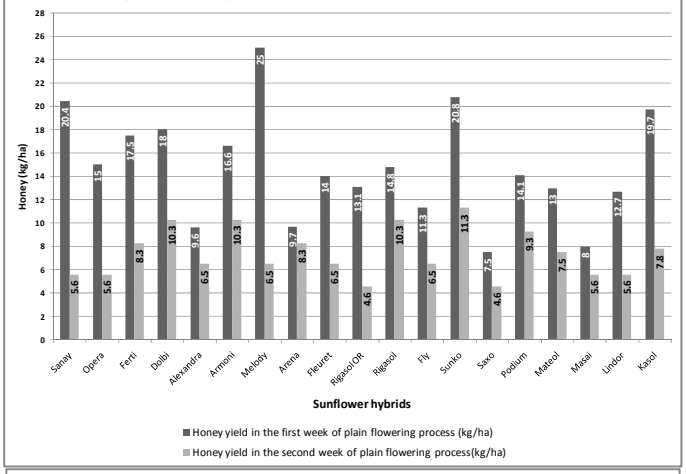


Figure 6. Honey yield at different moments during the flowering process at the foreign sunflower hybrids cultivated in Romania. Moara Domnească, 2007

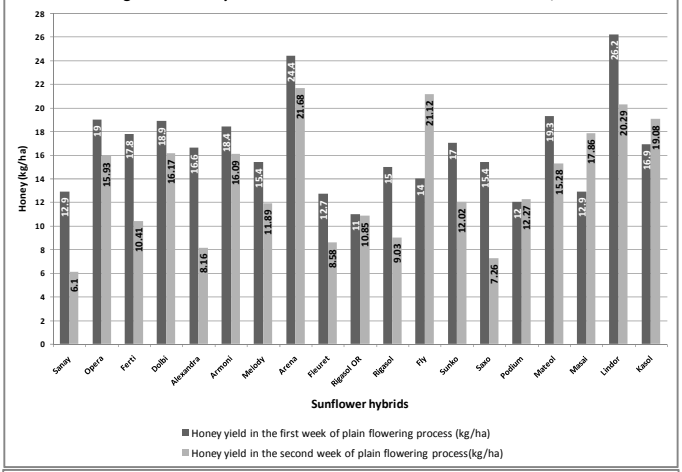
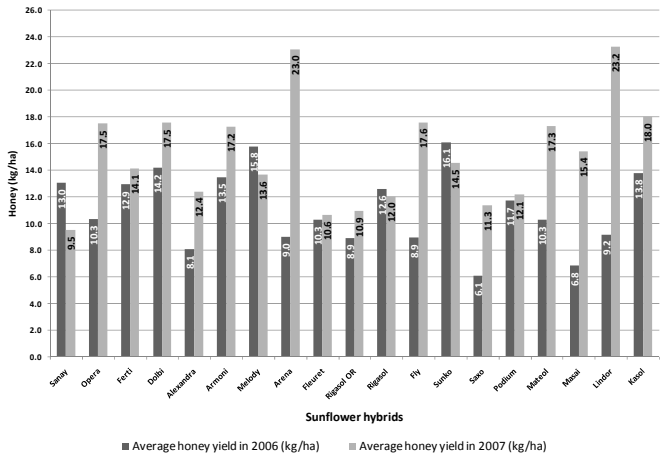


Figure 7. Average honey yield at the foreign sunflower hybrids cultivated in Romania. Moara Domnească, 2006-2007



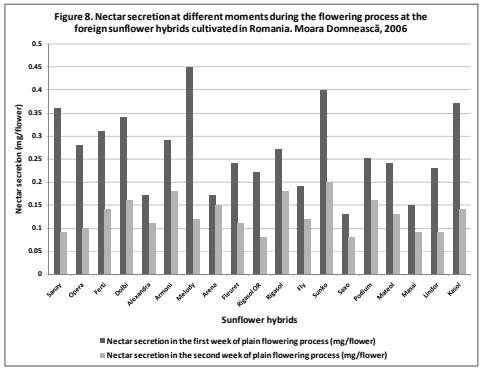


Figure 8. Nectar secretion at different moments during the flowering process at the foreign sunflower hybrids cultivated in Romania. Moara Domnească, 2006
Nectar secreton (mg/flower)
Sunflower hybrids
Nectar secretion in the first week of plain flowering process (mg/flower)
Nectar secretion in the second week of plain flowering process (mg/flower)

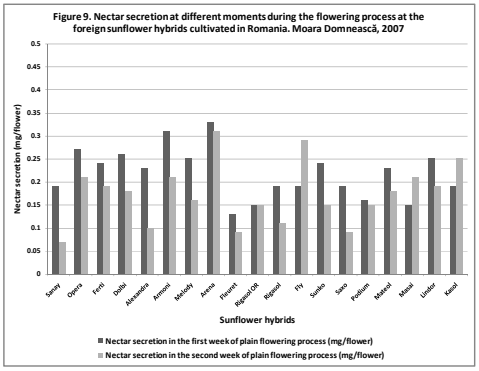


Figure 9. Nectar secretion at different moments during the flowering process at the foreign sunflower hybrids cultivated in Romania. Moara Domnească, 2007
Nectar secreton (mg/flower)
Sunflower hybrids
Nectar secretion in the first week of plain flowering process (mg/flower)
Nectar secretion in the second week of plain flowering process (mg/flower)

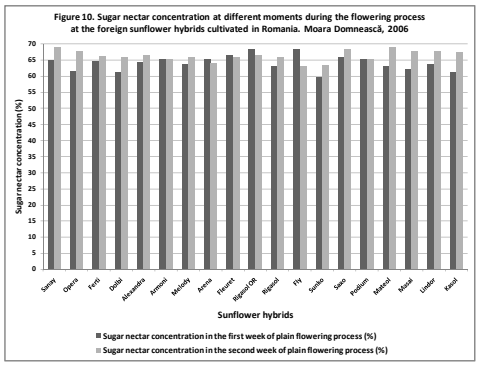


Figure 10. Sugar nectar concentration at different moments during the flowering process at the foreign sunflower hybrids cultivated in Romania. Moara Domnească, 2006
Sugar nectar concentration (%)
Sunflower hybrids
Sugar nectar concentration in the first week of plain flowering process (%)
Sugar nectar concentration in the second week of plain flowering process (%)

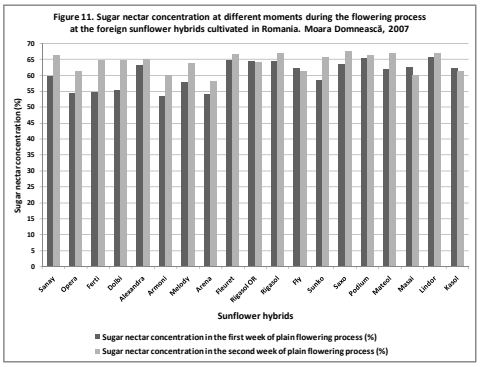


Figure 11. Sugar nectar concentration at different moments during the flowering process at the foreign sunflower hybrids cultivated in Romania. Moara Domnească, 2007
Sugar nectar concentration (%)
Sunflower hybrids
Sugar nectar concentration in the first week of plain flowering process (%)
Sugar nectar concentration in the second week of plain flowering process (%)

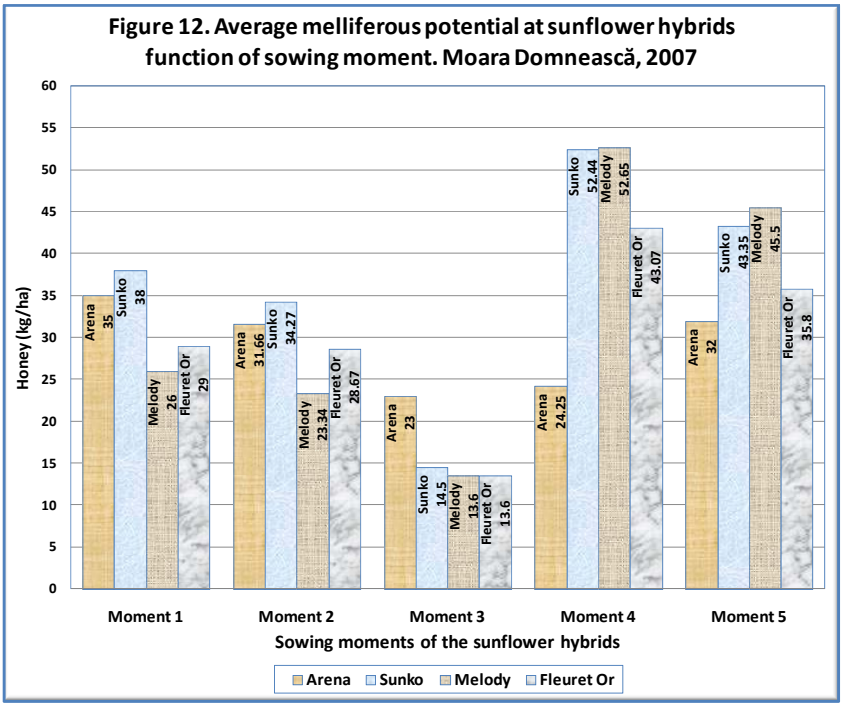


Figure 12. Average melliferous potential at sunflower hybrids function of sowing moment. Moara Domnească, 2007
Honey (kg/ha)
Arena 35
Sunko 38
Melody 26
Fleuret Or 29
Arena 31.66
Sunko 34.27
Melody 23.34
Fleuret Or 28.67
Arena 23
Sunko 14.5
Melody 13.6
Fleuret Or 13.6
Arena 24.25
Sunko 52.44
Melody 52.65
Fleuret Or 43.07
Arena 32
Sunko 43.35
Melody 45.5
Fleuret Or 35.8
Moment 1
Moment 2
Moment 3
Moment 4
Moment 5
Sowing moments of the sunflower hybrids
Arena
Sunko
Melody
Fleuret Or

CONCLUSIONS

1. The honey yield is bigger during the first week of plain flowering process than in the second week.
2. The nectar secretion is bigger in the first week of plain flowering process than in the second week.
3. The sugar nectar concentration is smaller in the first week of plain flowering process than in the second week.
4. In the year 2007 the average honey yield was bigger than in the year 2006.
5. The highest average honey yields were obtained by the hybrids Lindor (23.2 kg/ha) and Arena (23.0 kg/ha), in the year 2007.
6. The smallest average honey yields were obtained by the hybrids Saxo (6.1 kg/ha), in the year 2006.
7. The studied sunflower hybrids could be grouped by their melliferous potential as following:
   a. Hybrids with high melliferous potential, but unstable over time (Arena and Lindor hybrids);
   b. Hybrids with relatively high melliferous potential, but stable over time (Sunko, Dolby, Kasol, Armony, Melody and Ferti hybrids);
   c. Hybrids with relatively high melliferous potential, but unstable over time (Opera, Mateol and Fly hybrids);
   d. Hybrids with relatively small melliferous potential, but stable over time (Rigasol, Podium, Sanay, Fleuret OR and Rigasol OR hybrids);
   e. Hybrids with relatively small melliferous potential, but unstable over time (Saxo, Alexandra and Masai hybrids).
8. By sowing at different dates the melliferous potential is different according to climatic conditions, but also according to sunflower hybrid

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