Monitoring of Bee Colonies' Activity During the Major Gatherings in 2017

Silvia PĂTRUICĂ^{1*}, Daniel Severus DEZMIREAN², Marian BURA¹, Robert JURCOANE¹, Alex SPOREA¹

¹Faculty of Animal Sciences and Biotechnology. Banat's University of Agricultural Sciences and Veterinary Medicine „King Michael I of Romania” From Timișoara, Romania.

²Faculty of Animal Sciences and Biotechnology. University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Romania.

*Corresponding author, e-mail: patruica_silvia@yahoo.com

Bulletin UASVM Animal Science and Biotechnologies 74(2)/ 2017

Print ISSN 1843-5262; Electronic ISSN 1843-536X

DOI:10.15835/buasvmcn-asb: 0001

ABSTRACT

The assessment of the meteorological factors, in direct correlation with the nectar release and honey production, helps beekeepers with the organization of the technological activities within the apiary (determination of the pastoral schedule, supplementary feedings, reproduction of bee colonies, honey harvest, etc.). The study was carried out between 14th of April and 20th of July 2017, on 20 *Apis mellifera carpatica* bee colonies, maintained in multi-layer and Dadant beehives. The bee colonies were transported in field for rape, acacia and sunflower gathering and monitored with the help of the BeeWatch Professional device. The rape and acacia gatherings were negatively influenced by low temperatures and heavy rainfall, which impeded the capitalization of the melliferous potential. The bee colonies gathered only 5 kg rape honey and 3.9 kg acacia honey/bee colony/period. As regards the sunflower, the weather conditions were optimal for gathering, and the bee colonies gathered the supplies necessary for winter and also 5 kg honey extra. The honey production obtained by the bee colonies studied was not influenced by the beehive type; it was strongly influenced by the environmental factors, temperature and humidity.

Keywords: *bees, beehive type, honey production, meteorological factors, monitoring*

INTRODUCTION

The attentive monitoring of bee colonies' activity during the entire calendar year represents the major preoccupation of beekeepers. It is well known that the honey production is strongly influenced by the availability of food source, weather conditions along gathering and the strength of the bee family, as well (Pătruică, 2013).

The rapeseed (*Brassica napus oleifera*) provides nectar and pollen for bees during a period with poor melliferous flora. It blooms in April and covers, during the 40 days from blooming, the gathering gap from fructiferous trees and acacia (Bura et al., 2005). The rape flowers are intensely searched by bees, beginning with 8 o'clock a.m., and the maximal visiting intensity is around the hours 11.00 a.m. – 2.00 p.m. (Mesquida et al., 1988; Iordache, 2009).

The black locust (*Robinia pseudoacacia*) is one of most important melliferous plants due to its melliferous potential, and the bee families may achieve significant production growths if the weather conditions are favorable. Acacia blooms during the first days of May and continues up to the end of June (according to altitude); this could support 2-3 gatherings with an average period of 8-12 days/gathering (Madas et al., 2012; Pătruică, 2013). Nectar release in acacia starts at the temperature of 10°C, becomes optimal between 16 and 25°C, and decreases constantly up to 35 °C, when it stops (Cârnu, 1973; Lazăr, 2002; Farkas and Zajác, 2007).

The sunflower (*Helianthus annuus*) blooms in the last part of June, along 30 days, and it is the last significant gathering before bee hibernation. Nectar release in sunflower starts at

Tab. 1. Experimental organization scheme

Specification	Experimental variants	
	Experimental batch 1	Experimental batch 2
Hive type	Multi-layered	Dadant
No. of families/batch	10	10

Tab. 2. The development of bee families at the beginning of rape and acacia gatherings

No.	Statistical indices	Experimental batch 1		Experimental batch 2	
		Combs with sapling	Combs with bees	Combs with sapling	Combs with bees
Rape					
1	$\bar{x}$	5.7	9.1	5.7	8.9
2	$S\bar{x}$	±0.396	±0.482	±0.496	±0.567
3	S	1.567	2.322	2.456	3.211
4	CV	21.96	16.75	27.49	20.13
Acacia					
1	$\bar{x}$	7.3	10.7	7.8	10.6
2	$S\bar{x}$	±0.300	±0.367	±0.442	±0.447
3	S	0.949	1.160	1.398	1.506
4	CV	13.00	10.84	17.93	14.20

the temperature of 12°C, its intensity increases step-by-step between 20 and 26°C, and after this it decreases progressively and stops at 35°C (Ion Nicoleta *et al.*, 2004; Ion Nicoleta *et al.*, 2007; Ion V. *et al.*, 2007). Similar observations were recorded by Puškadija *et al.*, 2007, who found out that high humidity, heavy rainfall, wind and low temperature exert a negative influence on nectar release in sunflower, the optimal values being between 20 and 25 °C as regards the temperature and 65-75% for humidity.

MATERIAL AND METHODS

The biological material studied was represented by *Apis mellifera carpatica* bee families, with queens of similar ages, distributed in two experimental variants, according to table 1. The bee families were transported in field for rapeseed gathering (14.04.2017 – 8.05.2017), acacia (9.05.2017 – 18.05.2017) and sunflower (20.06-20.07).

During the experiment, we assessed the evolution of the weather factors (temperature and humidity), and the honey production after each

gathering. The evolution of temperature, humidity and hive weight was carried out with the help of the monitoring system BeeWatch Professional and of two weighing machines for each hive. The statistical processing of results successive to the assessment of honey production was performed with the help of the MINITAB 17 software.

RESULTS AND DISCUSSIONS

The bee families studied were transported at the beginning of blooming and placed at a 800 m distance near the rapeseed field, 50 m near the acacia forest and 1000 m near the sunflower field. The development of bee families, at the beginning of rape and acacia gatherings, is presented in Table 2.

During the first ten days of rape gathering (14-24 April 2017), the minimal temperature was 1.8-10.6 °C, being inadequate for nectar release, and the maximal one was 7.8-17 °C. The minimal humidity was 40-73%, and the maximal one was 68-97%. Therefore, this period characterized by low temperatures and heavy rainfall was not adequate for nectar release in rape; the bees

Fig. 1. Evolution of temperature, humidity and hive weight during rape gathering

stand close and consumed from hive's reserves. In the first experimental week, we recorded a minus of 410 g honey. The first part of the second week, in the period 21 April -24 April, the cold weather was still available with minimal temperatures of 2.3-9.5 °C and maximal of 11.4-13.8 °C, and the maximal humidity was of 83-90%. The bees continued to stay in hive, grouped in a ball, consuming from hive's reserves. There followed four days with temperatures between 10.7 °C and 28.4 °C and humidity of 47%-69%, meaning optimal conditions for nectar release and gathering for bees; they managed to gather a total of 2.34 kg honey/bee family. The last days of April were cold and rainy, with minimal temperatures of 4.6-8.4°C, and maximal of 10.8-11.4 °C, and this impeded the nectar release and the gathering; the bees remained in hives, grouped as a ball, and consumed from hive's reserves.

The peak of rape gathering was reached in the 1st of May 2017, when, due to the favorable weather conditions (temperatures of 11.1 °C - 24.9°C and mean humidity of 72%) we recorded optimal conditions for flight and nectar release; the bee families gathered an average of 1.36 kg honey. The period 4.05.2017-8.05.2017 was not favorable for rape gathering due to heavy rainfall which impeded bees from flying to the field, and they consumed from the reserves accumulated. During the entire period of rape gathering, the bee families managed to produce an average of 5 kg honey/bee family (graphic 1).

The acacia gathering started with very cold (minimal temperature of 4.3°C) and rainy weather, the bees stand grouped as a ball and consumed

from the reserves accumulated during rape gathering. In the third day, at midday, we recorded optimal conditions for gathering, so that the bees managed to gather an average of 620 g honey/family.

In the 12th of May 2017, although it was rainy up to midday, after 2 o'clock p.m. bees started to gather, and the temperature was optimal for nectar release, namely 13 – 31.4 °C. During the 5-6 hours of gathering, bees managed to total an average of 970 g honey/family. During the experimental period 9-13 May 2017, we recorded a plus at weighing of 1.31 kg honey.

The period 14th May – 15th May was characterized by minimal temperatures of 9.9-10.4 °C, maximal temperatures of 28.3 – 29.8 °C and maximal humidity of 96-98%; the bees got out for gathering from the early morning and managed to gather an average of 790 g honey, respectively 350 g honey.

During the period 16th May – 18th May, the minimal temperature of 10.6-15.2 °C, the maximal one of 28.3-29.8 °C and the maximal humidity of 91-92% created optimal flight conditions, although the acacia flowers were dry in a proportion of 75%; the bees got out in the early morning and managed to gather from the flowers left an average of 550 g honey/day.

The peak of acacia gathering was reached in the 12th of May 2017, when, due to the favorable weather conditions (temperature of 13 – 31.4°C and average humidity of 83%), we recorded optimal conditions for flight and nectar release; the bee families managed to gather an average amount of 1.01 kg honey, much reduced compared

Fig. 2. Evolution of temperature, humidity and hive weight at acacia gathering

Fig. 3. Evolution of temperature, humidity and hive weight at sunflower gathering

with acacia's releasing potential and with the power of bee families.

At the beginning of sunflower gathering, the bee families maintained in multi-layered hives presented an average number of 9.33 combs with sapling, and the ones maintained in Dadant hives - 9.44 combs with sapling, with a numerous population of young bees, which covered two levels in the multi-layered and in the Dadant hives, as well. Between the acacia gathering and the sunflower gathering, the melliferous sources were only a few; the bee families developed and consumed the biggest part of their rape and acacia honey.

At the beginning of sunflower blooming (23.06.2017), the temperature was 18.2 - 34.7 °C, and the average humidity was 70%; the bee families recorded a mean weighing growth of

260 g. The last week of June was characterized by minimal temperatures comprised between 14.7 and 23.8 °C, maximal temperatures of 28.8-35.7°C, and average humidity of 56 - 85%, and these were optimal conditions for nectar release; the bees managed to gather an average amount of 1.54 kg honey/day/bee family. The gathering peak was recorded in the day IV, when temperature had values of 20.5-30.6 °C, humidity was 42-92%, and the bee families gathered an average amount of 1.92 kg honey.

The first 5 days of July were characterized by minimal temperatures comprised between 12.1 and 20.2°C, maximal of 27.8-33.3 °C, and average humidity of 55-60%. The bee families produced an average amount of 1.25 kg honey/day/family. In the following period, the average temperature was 14.4 - 36.2°C, the relative humidity was comprised

Tab. 3. Honey production obtained from the bee families studied

Specification	Experimental batches	
	Experimental batch 1	Experimental batch 2
Rapeseed honey (kg)	4.86	5.14 ^{ns}
Acacia honey (kg)	3.79	4.01 ^{ns}
Sunflower honey (kg)	17.8	18.02 ^{ns}
Total	26.45	27.17 ^{ns}

ns – Statistically not significant

between 33% and 60%, and the bees managed to gather 400 g honey/family/day; after this, because of the high temperatures (minimum 20°C – maximum 38°C), the nectar release stopped.

CONCLUSION

1. In the conditions of 2017, the rapeseed and acacia gathering cannot be used at whole melliferous potential because of the weather conditions available during blooming. The temperatures that were much smaller than the minimal temperatures required for nectar release and the heavy rainfall that lasted for long created conditions that were not favorable for gathering, and the bee families managed to gather an average amount of 5 kg rapeseed honey and respectively 3.9 kg acacia honey/family/period.

2. The sunflower gathering lasted for 14 days, and the bees studied gathered an average amount of 17.91 kg honey/family.

3. During the experiment, we did not observe statistically significant differences of honey production, in the case of the two experimental batches, in relation with the hive type where the bee families were maintained.

Acknowledgements. This work was supported by financial grant from the Ministry of Agriculture, ADER project 9.1.1./28.10.2015.

REFERENCES

1. Bura M, Pătruică S, Bura V (2005). *Tehnologie apicolă*; Ed. Solness Timișoara.

2. Cârnu I (1973). *Plante melifere*, Editura Ceres, București.
3. Farkas A, Zajác E (2007). Nectar Production for the Hungarian Honey Industry. *The European Journal of Plant Science and Biotechnology* 1(2), p 125-151.
4. Ion Nicoleta, Roman GV, Ion V, Coman R (2004). Rezultate privind capacitatea meliferă a hibrizilor de floarea-soarelui cultivați în România, Delta Dunării II. Studii și cercetări de științele naturii și muzeologie, Tulcea.
5. Ion Nicoleta (2007). Potențialul melifer al hibrizilor de floarea-soarelui și condiții de valorificare a culesului, *România apicolă*, nr. 7, p. 2 – 7.
6. Ion V., V. Ștefan, Nicoleta Ion (2007). Results on the flowering stage in the Romanian-grown sunflower hybrids. *Scientific Papers*, vol. 40 (2), Faculty of Animal Sciences and Biotechnologies Timișoara, Editura AGROPRINT Timișoara.
7. Iordache P (2009). Rapița, primul cules de producție, *revista Lumea apicolă*, nr. 21, p. 22-23.
8. Lazăr Șt. (2002). *Bioecologie și tehnologie apicolă*, Editura Alfa Iași.
9. Madas N, Marghitas LAI, Dezmirean D (2012). Black locust (*Robinia pseudoacacia*): the most valuable source for monofloral honey in Romania, *Agricultura – Știință și practică*, nr. 3- 4, p. 83-84.
10. Mesquida J, Renard M, Pierre JS (1988). Rapeseed (*Brassica Napus* L.) Productivity: The effect of honeybees (*Apis Mellifera* L.) and different pollination conditions in cage and field tests. *Apidologie*, 19(1):51-57.
11. Pătruică S (2013). *Apicultură și Sericicultură-curs universitar*, Editura Eurobit, Timișoara.
12. Puškadija, Z; Štefanić E; Mijić A; Zdunić Z; Parađiković N; Florijančić T; Opačak A (2007). *Influence of weather conditions on honey bee visits (Apis mellifera carnica) during sunflower (Helianthus annuus l.) blooming period*, *Agriculture*, 13:1-5.