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Influence of the Beehive Type on the Quality of Honey

Zvonimir Tucak[1], Marin Periškić[2], Drago Bešlo[1] and Ivana Tucak[3]

[1] Faculty of Agriculture, University »J. J. Strossmayer«, Osijek, Croatia
[2] Croatian Veterinary Institute, Veterinary Department in Vinkovci, Vinkovci, Croatia
[3] Faculty of Low, University »J. J. Strossmayer«, Osijek, Croatia

A B S T R A C T

Agricultural producers apply numerous technological procedures, and enlarging efforts to produce the high-quality products. This initiative is present in the beekeeping, too. The quality of the honey produced by the honey bee colonies depends of various factors, but prevailing are the ecological conditions and the floristic composition of the honeyfull plants. The aim of our research was to discover the influence of the beehive type on the quality of honey, which is produced at apiaries under the similar environmental conditions. The whole studied honey bee colonies belong to the European race, Apis mellifera carnica, and they used the same honeyfull plants pastures. The results indicate that different beehive type used at apiaries influenced on the quality of honey.

Key words: *beehive, honey, ecological factors, disease*

Introduction

The Croatian Ministry of Agriculture and Forestry issued the Regulation concerning the quality of honey and other apiaric products in the Republic of Croatia. Honey and other products originated from honey bee colonies, must be in concordance with standards of quality, as the pre-condition for the sale on market[1–8].

The aim of our research was to determine the influence of the beehive type on the quality of honey. The samples for the analyses of honey were taken at the apiaries in Vukovar-Srijem County (Eastern Slavonija).

Material and Methods

Two types of beehive were used as the research objects. Alberti-Žnideršić (A-Ž), and Langstroth-Root (L-R) beehive, which are widely used by the Croatian beekeepers. The honeybee brood obtained food and nutrients by visiting various species

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of the honey vegetables: Oil-seed Rape (*Brassica oleracea* subsp. *Oleifera*), False-acacia (*Robinia pseudacacia*), Lime tree (*Tilia* spp.), Horse-chestnut (*Aesculus hippocastanum*), Sunflower (*Helianthus annuus*) Goldenrod (*Solidago* spp.), Mint (*Mentha* spp.), False indigo (*Amorpha fruticosa*), Meadow Sage (*Salvia pratensis*) and other meadow plants[9–11].

For the Nosema disease detection, sampled material (30 dead honeybees from the beehive's floor – winter mortality), was crushed in the mortar, adding 1 ml of water. A drop of the suspension was transferred by the pipette on a microscopic slide, covered by a cover glass and analyzed under microscope magnification. The spores of *Nosema apis* have elongate and oval shape with thick mantle disrupting the light intensity[12–14].

Fort the confirmation of *Varroa mite* honeybee parasite, samples consisting the waste from the beehive's floor were dried overnight in the thermostat. After that, the material was sieved – first with a sieve which holes are 2 mm^2 in diameter, then with a sieve with 1 mm^2 diameter holes.

A small portion of the material remained after the second sieving was put on the microscopic slide and analyzed under the microscope searching for the presence of parasite[14].

Chemical determination of honey

The invert (glucose + fructose) has been determined by the volumetric method with the Fehlings solution by Bertrand. This method is based on the proceeding, that the copper-oxidul (Cu_2O) is dissolved with the sour solution Feri-amonium sulphate ($(NH_4)Fe(SO_4)_2$) where Cu^{+2}, which is titraded with 0.1 M $KMnO_4$. From the got volume of $KMnO_4$ you calculate the Cu amounts and of the calculated Cu you see in the table the invert quantity. The achieved data of the invert amounts by the Rules of Republic of Croatia and the European union about the honey quality and the quality of other bee-products.

All foreseen data give us the fact, the quality of honey gained on the territory of Slavonija and Baranja fulfils all law norms of the Republic of Croatia and the European union, which has to say, that this area is good for the production branch, having in mind, that Slavonija and Baranja is very low, and more so because all natural sources for a greater production are existing here.

The entire proteins have been determined by modified method of the Biuretic reaction Folin-Zowry with a Follin-Ciocaltean reagent. The gained concentration of the entire Proteins vary in the frame of 3 – 0.3%. Having in mind, that this are various kinds of honey and that the samples are taken from a wider area of locations, this data says to us, that the quality and taste of honey are conditioned by the pasturage place, where bees gather the honey.

Water content was determined by the method of HPLC[10,15].

Results and Discussion

Using the standard methods for the determination of the quality of honey we are convinced, that they are in dependence from the climate (Figure 1) and other ecological factors the honey blossoms, the kind of bees and also of the beehive type. The honey quality, with its properties (color, smelt and taste) and also by the content of proteins, invert, water and other parameters, corresponds with its quality with the norms of the Rules of Republic of Croatia and the European Union.

The incidence of the illness at beehive was as usual (Table 1). The illness has no impact on quality of the honey, because the infected individuals in the honey bee brood doesn't produce honey[16,17].

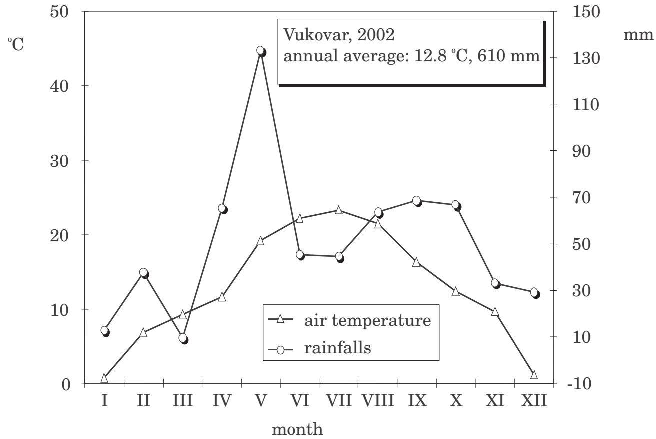

Fig. 1. Climatic diagram according to Walter for the meteorological stationVukovar and Vinkovci.

The following hypothesis that arithmetic means (Table 2) of the quality of honey are identical for two beehive types (L-R and A-Ž) were tested:

$H_0 : \mu_1 = \mu_2$ at the significance level 5%

Alternative hypothesis is: $H_A : \mu_1 \neq \mu_2$

$$\bar{x}_1 = \frac{1}{147} \sum_i f_{1i} Q_i = 66.98,$$

$$\sigma_1^2 = \frac{1}{147} \sum_i f_{1i} (Q_1 - \bar{x}_1)^2 = 1.07,$$

$$\bar{x}_2 = \frac{1}{193} \sum_i f_{2i} Q_i = 69.16,$$

$$\sigma_2^2 = \frac{1}{193} \sum_i f_{2i} (Q_1 - \bar{x}_2)^2 = 1.88.$$

If we tested the hypothesis abut the equality of arithmetic means at significance level 5%, then, if $x_1 - x_2 = -2.18$ fall into interval: (–1.96s + 1.96s) where:

$$s = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} = 0.131,$$

the hypothesis H_0 is accepted, which means that difference in the quality of honey are not statistically significant at significance level 5%.

However, -2.18 falls further out of the interval (–0.257, +0.257), and hypothesis H_0 has to be rejected.

At the significance level 5%, statistically significant is difference in the quality of honey in dependence of the various beehive type (L-R, A-Ž).

The A-Ž beehive type is characterized by the statistically significant higher quality of honey.

TABLE 1
THE HONEYBEE ILLNES DETECTED AT DIFERENT TYPES OF BEEHIVE

Beehive type	Number of examined samples	Honeybee illness			
		Nosema disease		Varroa disease	
		N	%	N	%
AŽ	193	55	28.50	165	85.50
LR	147	78	53.10	127	86.40

TABLE 2
INFLUENCE OF THE BEEHIVE TYPES ON THE QUALITY OF HONEY

Number	LR	AŽ	Glucose + fructose	Total proteins (%)	Water (%)
1	8		69.5	0.8	0.1
2	2		69.5	0.8	0.1
3	92		66.3	0.27	0.3
4	25		67.3	0.3	0.2
5	20		68.7	0.24	0.3
6		2	69.5	0.8	0.1
7		109	70.1	0.3	0.2
8		36	66.45	0.22	0.3
9		18	69.5	0.8	0.1
10		28	68.7	0.24	0.3

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Z. Tucak

Faculty of Agriculture, University »J. J. Strossmayer«, P. O. Box 719, Trg Sv. Trojstva 3, 31000 Osijek, Croatia

UTJECAJ TIPA KOŠNICA NA KVALITETU MEDA

S A Ž E T A K

U posljednje vrijeme proizvođači koristeći brojne tehnologije ulažu velike napore da bi proizveli što kvalitetniji proizvod. Takva tendencija nazočna je i u pčelarskoj proizvodnji. Kvaliteta (sekreta) meda, kojeg proizvodi pčelinja zajednica u ovisnosti je od brojnih čimbenika, prvenstveno ekoloških uvjeta i vrste medonosnog bilja. Naš rad imao je za cilj otkriti utjecaj tipa košnice na kvalitetu meda koju proizvodi pčelinja zajednica u istim ekološkim uvjetima. Sve pčele korištene u istraživanju pripadaju europskoj rasi pčela Apis mellifera carinicarace i koristile su istu medonosnu pašu u prehrani. Rezultati istraživanja ukazuju da različiti tipovi košnica utječu na kvalitetu meda kojeg producira pčelinja zajednica.