Floral Origin and Honey Quality from Packing Beehive

Valmir Ceschini[1], Carlos Vianna[2], Érika Sales[3], Sérgio Cataño[4], Ortrud Monika Barth[5], Maria Cristina Lorenzon[6]

1- Graduate–UFRRJ, Km 7, Rod 465, Seropédica, 23871-000, Brazil, 2- Post Graduating , Chemical Department-IB/UFRRJ, Km 7, Rod 465, Seropédica, 23871-000, Brazil, 3- Biologist, Lab de Palinologia, Brazil, 4- Med Vet.,Vallejo 1490 San Miguelito, CP 78339, San Luis Potosi, SLP, México, 5 - DSc., Lab de Palinologia, UFRJ, Rio de Janeiro, Brasil., 6- DSc, Animal Science Department-IZ/UFRRJ, Brazil
lorenzon@ufrrj.br

Abstract

The Brazilian beekeeping is an sideline activity of family farming, formed by small producers with low number of beehives. The extracted honey is the most traded, but in this system honey may be contaminated if not obeyed the rules for good beekeeping practices. The packing system is independent of machinery and the final product allows the direct marketing, with greater consumer acceptance. To demonstrate the value of honey from packing beehive, this study evaluated the biological profile. The study was carried out in a Brazilian tropical region. Africanized beehives were monitored, following *Langstroth* model; 12 hives were prepared in the packing system (PS) and in the extracted system (ES). The biological profile of the honeys samples were determined by pollen analysis, physicochemical parameters and antibacterial activities. In the PS, the amount of pollen grains was lower than the ES, showing the real pollen sources. The bioassay of antibacterial activity shows low $UFCg^{-1}$ in both systems, there was also little difference in physicochemical parameters. In Brazil, the packing beehive is used by small beekeepers, who can sell honey directly to consumers and they should sell the honey quickly. To develop its trade is necessary to determine the shelf life.

Key words: honey, beekeeping, pack comb, quality

Introduction

The Brazilian beekeeping is an sideline activity of family farming, formed by small producers with low number of beehives. The extracted honey is the most traded, but in this system, honey may be contaminated if not be obeyed the rules for good beekeeping practices; it can still suffer adulteration and forgering, which affect the credibility of the product in trade.

The packing beehive is an handicraft method (Cataño, 2005), no smoking was used and distubing bees to collect honey, it is independent of machinery and releasing all the processes that the industrial system requires, allowing to retire honey cleanly, without uncaping, spilling or fracturing. The final product, honeycomb attached to the jars by bees, coming up a product ready to sale, allows the direct marketing, with greater consumers acceptance.

To compare the value of honey from packing beehive and honey extracted, this study evaluated the microbiological profile.

Methodology

The study was carried out in a Brazilian tropical region (22º48'S, 43º41'W), with climatic type AW (Köppen), average temperature of 24.5ºC, has high rainfall.

Twelve Africanized beehives were monitored, following *Langstroth* model: six were prepared in the packing system (PS) and six in the tradicional system (ES). The packing beehive

was organized with a nest-ten frames + one container-holder frame + one super. The holder was made up wood (1 cm thickness) and had 30 round perfurations, 5 cm in diameter, for better fit the neck of the jars. Within the jars were placed two pieces of printed wax (almost the same size of jar) (Figure 1). To fill up the super of the PS, hexagonal glass jars were used with a content of 450 mL. Some products to hygiene the jars plus wax were tested to choose the better way to do it: In the lab: alcohol 70%; natural soap; sodium hypochlorite 30 ppm (jars) and alcohol 70% (wax); sodium hypochlorite 30 ppm (jars) and soapy water (wax); in the hive: jars and wax without any treatment. This test was made with 30 jars, with five repetitions per treatment. The mycological analyses had been carried through the methodology of dilution serial in plate and growth was measured, expressed as colony-forming units ($CFUg^{-1}$).

The hives were placed in the beginning of the blossoms and honey was collected when was rippen. Five honey jars from the packed hives was chosen at random for analyses. The honey from tradicional method was extracted, using a eight frame manual honey extractor - about 0.5 kg of honey was sampled per hive. All samples were kept in sealed glass jars at room temperature until be analysed (after three months). Figure 1 shows the experimental apiary and a packing beehive in the field.

Fig. 1 – Experimental apiary and preparing a packing beehive.

The profile of honey samples was determined by:

a) Pollen analysis - we sampled pollen loads from six hives of each method (PS and ES). Subsamples of 10g from each sample were examined at least in duplicate. The samples were diluted with 20 mL of distilled water and centrifuged for 10 min at 2,500 rpm. The sediment was transferred to three different slides, sealed with paraffin and was examined under a light microscope at magnification of x400 and x1000. At least, 500 pollen grains were counted in each subsample (Barth, 1989). Pollen identification utilized literature data (Barth 1989) and the reference pollen slide collection of the Laboratory of Palynology of Universidade Federal do Rio de Janeiro (Brazil). The established pollen classes and terminology follows Zander (1924) and

Louveaux *et al*. (1978), comprising the dominant pollen class (>45% of the pollen sum), the accessory pollen class (15-45% of the pollen sum) and the important pollen class (3-15% of the pollen sum).
b) Physicochemical composition of honey: water content (moisture) was measured by refractive index (Abbe-type refractometer), converted by Chataway table; the pH was assessed in a 10% (w/v) solution of honey in distilled water by mean of pH meter; the total reducing sugars were done in ^{o}Brix and apparent sucrose were determined by volumetry of oxidation- reduction and precipitation; the free acidity was tested by direct titration using NaOH 0.05N by potentiometry; determinations involving spectrophotometry UV/VIS, diastase index and HMF, were made in UV-VIS spectrophotometer, model 482-FEMTO and ashes was carried out by the calcination of samples in muffle oven. All these analyses are according to Adolfo Lutz Institut (1985), LANARA (1981), Codex Alimentarium (2001) and Association of Official Analytical Chemists (AOAC, 1984). Each sample was analysed in triplicate. The physicochemical characteristics of honey samples were compared using Student's T-test and their adequacy to standards established by the Brazilian legislation for honey quality was checked.
c) Antibacterial activities of the honey samples were determined by the method of macrodiluting. All the assays were performed in triplicate. Each sample was inoculated in nutrient agar and incubated at 37 ^{o}C for 24 h and bacterial growth was measured. The results were expressed as colony-forming units (CFUg^{-1}) (Apha, 2001).

Results and Discussion

Considering all samples in the pollen analysis we identified 14 pollen types: *Acacia*, *Cecropia*, *Gochnatia velutina, Mimosa scabrella*, *M. caesalpiniaefolia*, *Mimosa verrucosa*, *Myrcia*, *Trema micantra,* Asteraceae, Cluseaceae, Elusiaceae, Poaceae, Tiliaceae, Ulmaceae.

PS honey presented around 4 to 8 pollen types per sample and ES around 7 to 8 types per sample (Table 1). The nectariferous source was identified in both systems, but most of PS honeys were monofloral, the amount of pollen grains showed better the pollen and nectar sources of the studied region. ES honeys were classified as monofloral, bifloral and until trifloral, some of pollen types occurred prior to the current flower sources. Thus, for making pollen analyses adopting Melissopalinology it is recommended to collect honey from the first honey production of the printed wax.

Table 1 – Pollen types presented in honeys from extracted system and packing beehives State of Rio de Janeiro, Brazil. 2009.

Methods	Packing honeys (PS)	Extracted honeys (ES)
Total number of pollen types	14	11
Number of types per sample	4 - 7	7 - 8
Average pollen sum	298 ± 34	363 ± 30

In the PS method, the best products to clean the wax was washing with alcohol solution 70% and the jars with sodium hypochlorite 30 ppm. The fungi contamination of more than 10,000 UFC g^{-1} was very high when using other products (alcohol, soapy water). The Technical Regulation of Identity and Quality of Honey is not specific in determining the microbiological criteria of food, thus we use the standard required by the International Commission on

Microbiological Specifications for Foods (ICMSF, 1986), which maximum limit is 10,000 $CFUml^{-1}$ for any food.

The bioassay for evaluating antibacterial activities in honey shows low level (1.5 $UFCg^{-1}$) in all samples PS and ES (Table 2); this valeu is under the pattern required by legislation (BRASIL, 2001).

Table 2 – Statistical summary for evaluating bacterian activity of honeys produced by the packing beehive and the tradicional system. Brazil. 2009.

Parameters	Packing honey (PS)	Extracted honey (ES)
Minimum	0.00	0.00
Media	2.00	2.50
Median	1.50	1.50
Maximum	5.00	7.00
CV	108.01%	132.66%

There are no statistical differences in physicochemical composition for the majority factors of both systems (Table 3). The honey samples were in accordance with the Brazilian legislation for honey quality. Only HMF was lower in PS honeys (*p-valeu* <0,05).

After six months some PS honeys showed lower acidity and pH, signaling that this method needs review the hygienic check list, but this list is much smaller when compared to extracting system. It is also necessary to determine the shelf life. Figure 2 shows the appearance of pack honeys (PS).

In Brazil, the packing beehive is used by small beekeepers, who can sell honey directly to consumers and they should sell the honey quickly.

Table 3. Physicochemical parameters of honeys produced by packing beehive and the tradicional system. Brazil. 2009.

Factors	Packing honey	Extracted honey
Nr. Samples	5	5
Moisture % *	21%	21%
pH	04.78	04.97
Free acidity meq kg^{-1}	27.00	25.50
Reducing sugars g $100g^{-1}$	73.50	73.00
Non-Reducing Sugars mg kg^{-1}	02.68	03.15
HMF mg kg^{-1}	20.50	32.93*
Diastase index	05.68	05.91
Ashes g $100g^{-1}$	00.97	00.93

Mean values for each quality factor Analyses 3 months after harvest

Brazilian legislation allows moisture untill 21%

Fig. 2 – Packing Africanized bee hive in the apiary and appearance of honey jars.

Acknowledgements

This study was supported by CNPq/BR. We are grateful to Dr Cataño team, supporting this study with valuable ideas. Special thanks to Sr Getúlio and other beekeepers for their assistance in the field.

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