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ADULTERATION, PACKAGING AND LABELING CONFORMITIES OF HONEY SOLD IN THE FREE MARKETS ON THE BOA VISTA CITY, RORAIMA, BRAZIL

ADULTERAÇÃO, CONFORMIDADES DE ENVASAMENTO E ROTULAGEM DE MÉIS VENDIDOS NAS FEIRAS-LIVRES DA CIDADE DE BOA VISTA, RORAIMA, BRASIL

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Resumo: O mel contém açúcares em alta concentração provenientes do néctar das flores, de nectários extraflorais ou de exsudados de inseto. No entanto, o mel pode apresentar adulterações variadas relacionados à adição de ingredientes de baixo valor comercial. Este trabalho teve como objetivo verificar possíveis adulterações em amostras de mel comercializadas em feiras livres na cidade de Boa Vista, estado de Roraima, por meio da análise polínica e pela precipitação de proteínas na reação de Lund. Também foram avaliados o acondicionamento e a rotulagem. Foram adquiridas 31 amostras comerciais de mel de *Apis mellifera* em seis feiras livres. Das amostras analisadas 20 (64,5%) apresentaram resultado negativo para reação de Lund, ou seja, consideradas adulteradas e 11 (35,5%) mostraram resultado positivo, não adulteradas. Onze amostras de mel não continham pólen. Seis amostras foram consideradas melato de *Acacia mangium,* sete como mel silvestre e duas como um mix de mel silvestre e melato de *A. mangium.* Quanto a embalagem, três amostras estavam acondicionadas em frascos de vidro, as demais em garrafas plásticas, na maioria tipo PET. Somente 11 embalagens possuíam rótulo, mas nenhuma atendeu as exigências da legislação em vigor. Seis amostras rotuladas foram consideradas adulteradas. Um percentual tão alto de adulteração serve de alerta aos órgãos fiscalizadores para combate desse tipo de fraude.

Palavras-chaves: palinologia, reação de Lund, Amazonia Setentrional

Abstract: Honey contains high concentration sugars from flower nectar, extrafloral nectars or insect exuded. However, honey may present varied adulterations related to the addition of low commercial value ingredients. This study aimed to verify possible adulteration in honey samples commercialized at free markets in the Boa Vista city, State of Roraima, through the pollinic content and protein precipitation through Lund's reaction. Packaging and labelling were also evaluated. Thirty-one commercial honey samples of *Apis mellifera* were acquired in six free markets. Of the analyzed samples, 20 (64.5%) gave a negative result for Lund's reaction (considered adulterated) and eleven (35.5%) tested positive (considered unadulterated). Eleven samples did not contained pollen. Six samples were considered *Acacia mangium* honey, seven as wild honey and two as wild honey mixed with *A. mangium* honeydew. In view of packaging, three samples were packed in glass bottles the others in plastic bottles, mostly PET type. Only eleven bottles presented label, but none possess all the requirements of the current legislation. Six labeled samples were considered adulterated. The adulteration percentage

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determined by Lund's reaction was considered very high which point out alert to the supervisory agencies to combat this type of fraud.

Key words: palynology, Lund's reaction, Septentrional Amazon

INTRODUCTION

Honey is the best and oldest sweetener for family and industrial use. The flavor, aroma, color and density vary depending on the plant species from which the bees removed the nectar (WIESE, 1987). In Brazil the Ministry of Agriculture Livestock and Supply (MAPA), through Normative Instruction (IN) 11, of October 20, 2000 establishing the Technical Regulation of Honey Identity and Quality (RTIQM), defines honey as:

> "a food product produced by honey bees from the nectar of flowers or secretions from living parts of plants or excretions of plant-sucking insects that are on living parts of plants, which bees collect, transform, combine with specific substances of their own, store and let ripen in hive combs (BRAZIL, 2000)".

HONEY COMPOSITION AND QUALITY

Honey is a food of easy digestion and assimilation, constituting an energy source that contributes to the balance of biological processes (BATH & SINGH, 1999), also containing pigments, pollen grains and may contain beeswax incorporated into the extraction process. (BRAZIL, 2000)

The honey composition of different blooms varies according to the nectar produced by each plant species (CAMARGO & MACHADO, 1972). Sugars and water are the main chemical constituents of honey, where they represent more than 95%. Proteins, flavonoids, aromatic substances, pigments, vitamins, minerals, organic acids, hormones, enzymes, free amino acids and numerous volatile compounds, constitute the components in smaller amounts. This small percentage of all composition is the main responsible for the organoleptic and functional properties of honey (CRANE, 1987, CORDELLA *et al.*, 2003).

In NI no. 11, of October 20, 2000 from MAPA also determines the requirements of qualities regarding sensory, physical-chemical and contaminant characteristics of honey. The physicochemical analyses indicated are: reduced sugars, apparent sucrose, moisture, hydroxymethylfurfural (HMF), minerals (ash), free acidity, water-insoluble solids and diastatic activity (BRAZIL, 2000).

The flavor, aroma, density, color and viscosity of honey are one of the many factors that, directly related to moisture content, are important for the physicochemical analyses, stability and conservation of the product (CANO *et. al.* 2001; CAVIA *et. al.*, 2002; INSENGAR & PRÄGER, 2003)

The analyses of reduced sugars, non-reductor sugars (apparent sucrose) and moisture content, are related to the degree of maturity of honey (BRAZIL, 2000). Moisture content is one of the main parameters of honey quality analysis, and values above 20% for pure honey are not tolerated, due to the ease of development of certain microorganisms responsible for fermentation (CAVIA *et. al.*, 2002; FARIA, 1993; ISENGARD & SCHULEIB, 2001).

Fermentation, acidity, diastase activity and HMF are directly related to the degree of honey deterioration (BRAZIL 2000). HMF identifies if the product is fresh when in low concentrations, or has been heated, stored in inadequate conditions or adulterated with inverted sugar syrup when it exists in high concentrations (BATH & SINGH, 1999; NOZAL *et. al.*, 2000).

Another way to evaluate and detect the authenticity of honey is through protein analysis. At least 19 polypeptides were detected in honey samples from plants of different origins (SIMÚTH *et al.*, 2004). Honey protein comes from nectar and pollen (vegetable), but also incorporates substance from the bee itself (WHITE *et al.,* 1978). The constituents of animal origin are the secretions of the salivary glands, together with products collected during nectar harvesting or honey maturation (CAMPOS, 1987). Among the amino acids present in honey, proline derived from the salivary secretions of bees presents the highest values, ranging from 0.2% to 2.8%, its concentration is used as a parameter for identifying the "maturity" of honey (COSTA *et al.*, 1999). According to Von Der Oher *et al.* (1991) at least 200 mg of proline/kg of honey are required.

According to Almeida-Muradian & Bera (2008) the Fiehe´s Reactions, Lund´s Reaction, Lugol reaction, although not described in the Brazilian legislation in force for the quality control of honey, are of great use for their simplicity of execution. Viana *et. al.* (2012) used sensory analysis of color, aroma, flavor, consistency for the perception of glucose addition in orange honey, in Araras - SP. The authors verified that the addition of glucose syrup in a percentage greater than 20% was detected by the tasters. Bastos *et al.* (2002) points out that sensory analysis by aroma is directly linked to the presence of volatile compounds in honey.

The requirements related to honey purity are: water insoluble solids, minerals (ash) and pollen content. Honey must necessarily present pollen grains (BRAZIL, 2000). Pollen has attracted man's attention by the richness of its nutritional constituents, so that there is a use of its food properties (SOUZA *et. al.*, 2004). The identification of pollen sources used by bees is done directly; by analyzing the loads contained in the working-class corbículas; or in combs and pots where this material is stored inside the nest. The identification of nectar sources is made by pollen analysis found in honey samples, this science is called melissopalynology (CRANE, 1985; BARTH, 1989,). In addition to chemical and physical analyses, it is necessary to perform the pollinic analysis in order to be able to confirm their compliance with the current legislation. This analysis consists in recognizing the pollinic grains found in the honey samples and reaching the plant species that produced them, as well as the apiculture interest vegetation around the apiary. (BARTH,2005).

The quantity of a specific pollen may be determining its floral origin and is used for normalizes the classification. When the honey come from non-floral source is called “honeydew” and present a little quantity of pollen but high quantity of yest. If in the pollinic analyze the sample presented a diversity of pollen without dominance it is classified as a polyfloral (JUAN-BORRÁS *et al.* 2015).

Melissopalynology is still the most widely used technique for identifying the floral origin of honey, but many attempts are made to use special techniques. There are also equipments such as "electronic tongue" and "electronic nose" as well as sophisticated analytical techniques (PÚSCION-JAKUBIK, 2020).

HONEY ADULTERATION

The availability of commercial honey is limited and its price is relatively high encouraging its adulteration. (ILG, 1988; DAMTO 2021). Generally, adulterations are carried out due to the easy to incorporation substances such as: carbohydrates mainly commercial sugars (disaccharides) such as commercial glucose,

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solution or sucrose syrup, sugarcane juice, and inverted sucrose solution from sugar-cane and maize (GIROU, 2007). The most widely used form of adulteration is obtained from the concentrated sugarcane in fire. More elaborate adulterations include the addition of iodine, to simulate the characteristic color, addition of starch to improve viscosity, (ROSSI, *et al.* 1999), and addition of pollen and flavorings (GIROU, 2007).

The easy incorporation of adulterants, the difficulty in identifying them (need for specialized laboratories), the lack of identification of criminal and the impunity in the Country are factors that strengthen these practices. (ROTATED,2007).

The identification methods of adulterations are the most varied, but in general, the parameters indicated by the legislation in force establishing quality standards are used (BRAZIL, 2002).

The Adolfo Lutz Institute (CANO *et. al.* 2005) recommends Fiehe's reaction to indicate the presence of substances produced during the overheating of honey or the addition of sugar syrups. The Lugol reaction is indicated to investigate the presence of amylum and dextrins in honey. The determination of the protein's presence is also a very sensitive method for the detection of pure honey samples. The most used method to detect honey proteins is Lund's reaction. Lund's reaction is based on the precipitation of natural honey proteins by the tannic acid (ADOLFO LUTZ INSTITUTE, 2005).

Sensory analysis is still an important factor for the identification of frauds in honey. Beekeepers and experienced consumers can identify gross adulterations and even point out the floral origin of a honey sample (VIANA et al, 2012; PUˊSCION-JAKUBIK, 2020; DAMTO 2021).

There are several other methods of detecting honey adulteration. The detection of frauds in honey requires the use of various techniques appropriate for the variety of adulteration (MEHRYARA & ESMAIILIB,2011).

LABELLING

Labels are essential elements of communication between products and consumers. Hence the importance of the information being clear to guide the consumer in the appropriate choice of food. In Brazil, the National Health Surveillance Agency – ANVISA is the institution responsible for regulating food labeling, which establishes the information that a label should contain, aiming to ensuring product quality and consumer health. The information that should be present on the labels are: list of ingredients (if food is unique does not need); shelf life; identification of origin; net content; name or registered name and address of the importer (in the case of imported food) and on the preparation and use of the food when necessary. Food labels should not present words or any graphic representation that may make the false information, or that may mislead the consumer (BRASIL, 2002).

ANVISA through Resolution RDC No. 360 of December 23, 2003, which deals with the Technical Regulation on Nutritional Labeling of Packaged Foods, makes mandatory nutritional labeling, i.e., the declaration of energy value and nutrients and the declaration of nutritional properties (complementary nutritional information) if the food has particular nutritional properties, especially, but not only, in relation to its energy value and content of proteins, fats, carbohydrates and dietary fiber, as well as its content of vitamins and minerals (BRAZIL 2003).

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MAPA published Resolution No. 8 of September 24, which defines the responsibility of the Department of Inspection of Products of Animal Origin (DIPOA), Animal Products Inspection Services (SIPAs) and the Federal Agricultural Police Stations (DFAs), the technical analysis and registration of the labeling of products of animal origin in accordance with the legislation issued by MAPA, the labelling of products of animal origin of the Ministry of Agriculture, the Technical Regulations of Identity and Quality of Products of Animal Origin, RIISPOA, or documents in rule or that may replace them partially or totally, or to complement its provisions. (BRAZIL 2001).

MATERIAL AND METHODS

Honey samples were purchased at the main free markets in the municipality of Boa Vista Roraima. Thirty-one samples of honeys were obtained and identified according to the place sold, box number and/or seller's name and numbered sequentially according to the purchase order. Table 01 shows the commercialized site and the number of samples purchased.

Table 1 – Identification of the commercialized free market and the sample quantity, Boa Vista, Roraima, December 2008.

Free Market	Total samples
São Francisco	07
Produtor	05
Garimpeiro	05
Passarão	05
Romeu Caldas	02
Buriti	05
Indeterminate	02
TOTAL	31

POLLINIC ANALYSIS: PREPARATION AND ASSEMBLY OF SLIDES TO IDENTIFY THE POLLINIC TYPES

From each honey sample, a small fraction was taken that was submitted to Erdtman acetolysis (ERDTMAN, 1960) and the slides were assembled according to the Method of MAURIZIO & LOUVEAUX (1965). From each sample, duplicate slides were assembled.

IDENTIFICATION OF POLLEN GRAINS

The identification of pollen grains was performed by comparison with pollen slides of MIRR´s palinoteca. When types that were not represented in the collection of pollen slides occurred, the identification was made by consulting available pollen catalogues and descriptions (SALGADO-LABOURIAU, 1973; ABSY, 1975; MOORE & WEBB, 1978; ABSY, 1979; BARTH, 1989, 1990, 1996; ROUBIK & PATIÑO, 1991; CARREIRA *et al.*, 1996; BASTOS *et al.*, 2003; MOURA *et al.*, 2004; MATOS *et al.*, 2014; SILVA *et al.*, 2020).

In this work considering that that polyfloral honey in Roraima state came from the native vegetation it will be called “wild honey”.

LUND REACTION

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The technique was performed according to the methodology recommended by the Adolfo Lutz Institute (2005) where it determines that in the presence of adulterated honey there will be formation of precipitate inferior to 0,6 ml. Although the volume of the deposits above 3.0 ml indicates low quality honey. For the samples that presented precipitation the result was considered positive and negative for samples that did not presented precipitation or only traces.

CHECKING LABELLING

In the samples that presented label, the information was analyzed in accordance with the recommendations of ANVISA through Resolutions RDC No. 259 of September 20, 2002 establishes the Technical Regulation on Labeling of Packaged Foods and RDC No. 360 of December 23, 2003, which deals with the Technical Regulation on Nutritional Labeling of Packaged Foods. The parameters were; type of packaging, identification of origin, shelf life, Net weight, Nutritional information and registration with the Federal and state Inspection Service.

RESULTS AND DISCUSSION

Regarding the presence of pollen; 16 samples (51.6%) did not present pollen grains and in nine of these there was the presence of fungi.

The absence of pollen grain may indicate gross falsification or simply that these grains have been removed in an ultrafiltration process but considering the extraction processes existing in Roraima this possibility is quite remote.

Among the most common pollinic types, those of Acacia *(Acacia mangium* Leguminosae) Figure 1-A, was the most common occurring in eighth samples, that of *Mauritia flexuosa* (Arecaceae, buriti) in five samples and inajá *(Attaleia maripa* Arecaceae) in four samples. In addition to these, the pollen of Copaíba (*Copaifera officinalis),* cabeça-de-nego (*Spermacoce* sp*,* Figure 1-B), jatobá (*Hymenea* sp), roxinho *(Peltogine* sp.) and field peanuts (*Cassia* sp.) were frequent pollen grains in the samples.

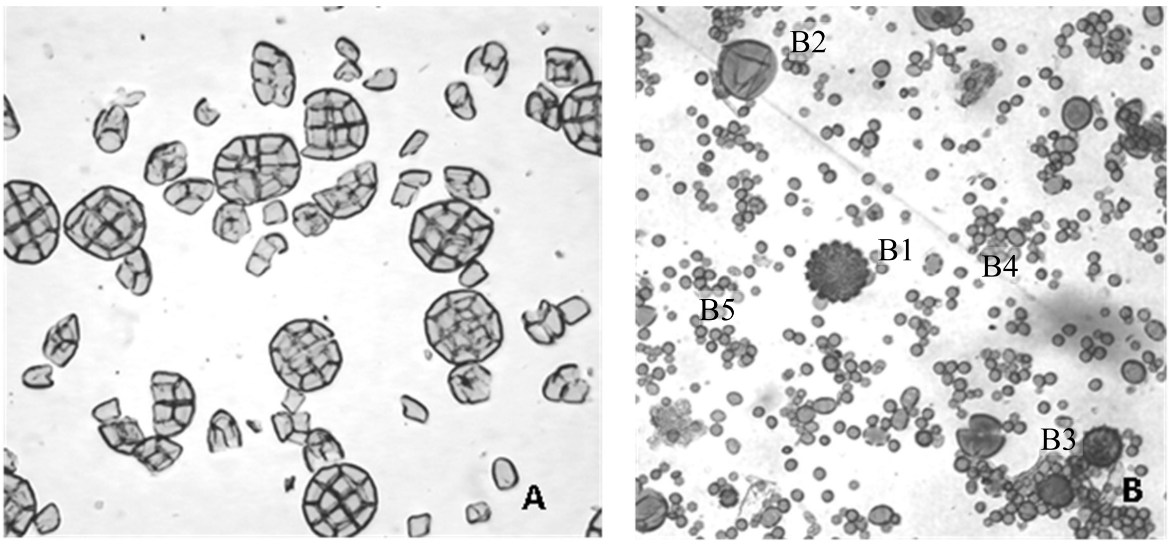

Figure 1. A - Photomicrography of *Acacia mangium* slid pollen (Sample 02); B - Slid with pollen of *Diodia hyssopifolia* (B1), Poaceae (B2), *Peltogyne* sp. (B3*). Hyptis atrorubens* (B4), *Spermacoce* sp. (B5). (Sample 22).

The other pollinic types found are listed in Table 2. This result highlights the great importance of legumes for bees. Amaral (1953) already point out importance of legumes as a food resource for bees. In this work the legume pollen grais were: *Mimosa pudica*, *Mimosa* sp., *Copaifera officinalis, Hymenea* sp., *Peltogine* sp. and *Cassia* sp.

Table 2: Results of the pollinic analysis and protein precipitation (Lund Test) for the free markets of the Boa Vista city, RR. April 2008. (Frequency: + frequent (less than 50%, ++ dominant (greater than 50%) and no cross occurrence recorded.

Sample	Pollinic grains	Pollinic analyze conclusion	Lund's reaction conclusion
1.	No pollen, with yeasts	No honey	NEGATIVE
2.	Only pollen of *Acacia mangium*++	*Acacia mangium* honeydew	POSITIVE
3.	No pollen	No honey	NEGATIVE
4.	No pollen, with yeasts	No honey	NEGATIVE
5.	No pollen	No honey	NEGATIVE
6.	No pollen	No honey	NEGATIVE
7.	No pollen, with yeasts	No honey	NEGATIVE
8.	No pollen, with yeasts	No honey	NEGATIVE
9.	*Hyptis sp., Mimosa pudica+, Acacia mangium* e Poaceae	Wild honey and *Acacia mangium* honeydew	POSITIVE
10.	*Hyptis sp, Acacia mangium* +, Poaceae, *Mimosa sp, Mauritia flexuosa*	*Acacia mangium* honeydew	POSITIVE
11.	*Mauritia flexuosa, Acacia mangium,* Cyperaceae*, Attaleia maripa*	*Acacia mangium* honeydew	POSITIVE
12.	No pollen	No honey	NEGATIVE
13.	*Spermacoce sp., Mimosa sp. +, Diodia hyssopifolia, Cassia sp., Hyptis sp*	Wild honey	NEGATIVE
14.	No pollen, with yeasts	No honey	NEGATIVE
15.	No pollen, with yeasts	No honey	NEGATIVE
16.	*Coutoubea spicata, Attaleia maripa, Spermacoce* sp.*, Mauritia flexuosa,* Bombacaceae*, Astronium sp., Cassia* sp. Asteraceae.	Wild honey*	NEGATIVE
17.	*Copaifera officinalis, Mauritia flexuosa, Acacia mangium*,	Wild honey	POSITIVE
18.	*Attaleia maripa, Protium sp., Cassia* sp., Poaceae, Anacardiaceae, *Vismia* sp..	Wild honey	POSITIVE
19.	No pollen	No honey	NEGATIVE
20.	No pollen, with yeasts	No honey	NEGATIVE
21.	No pollen, with yeasts	No honey	NEGATIVE

22.	*Diodia hyssopifolia, Hyptis sp, Spermacoce sp. ++, Mimosa pudica.,* Poaceae*, Alternanthera sp*.	Wild honey	POSITIVE
23.	No pollen	No honey	NEGATIVE
24.	*Mauritia flexuosa, Acacia mangium + Hymenea sp*., Poaceae	*Acacia mangium* honeydew	POSITIVE
25.	*Acacia mangium* + with yeasts	*Acacia mangium* honeydew*	NEGATIVE
26.	*Peltogyne* sp. ++, *Vismia guianensis*, *Vismia* sp. *Mimosa* sp, Sapindaceae, Bombacaceae	Wild honey*	NEGATIVE
27.	*Mauritia flexuosa*, *Acacia mangium* ++, *Ludwigia* sp.	*Acacia mangium* honeydew	POSITIVE
28.	Poaceae +, *Acacia mangium, Mimosa pudica*	*Acacia mangium* honeydew	POSITIVE
29.	No pollen with yeasts	No honey	NEGATIVE
30.	*Attaleia maripa, Ludwigia sp., Cassia sp. Euterpe* sp.	Wild honey	POSITIVE
31.	No pollen	No honey	NEGATIVE

Note. * Results not coincident with Lund's reaction

The species *Acacia mangium* is an exotic legume, introduced in Roraima in the 1990s (TONINI *et al.* 2010). This species presents extra floral nectars at the base of the phyllodes (transformed leaves, SILVA, 2010). The large production of nectar of this species has driven the beekeeping activity in the state, generating an expressive honey production, with surpluses that are destined for exportation (MADURO *et al.*2020)

SILVA & REBOUÇAS (1996), mention the following plant species visited by *A. mellifera* with probable potential for honey production in Roraima: Legumes - miguel-corrêa (Mimosaceae - *Acacia lorentensis*), malissa/mimosa (*Mimosa pudica*), vassourinha (Malvaceae - *Melochia hirsuta*), vassourinha (*Waltheria americana*), relógio. (*Sida sp*), quaruba (Vochysiaceae - *Vochysia guianensis*), mororó (Caesalpiniaceae - *Bauhinia ungulata*) and roxinho (*Peltogyne sp*). In another work SILVA & REBOUÇAS (1998) listed six plants sought exclusively for pollen collection and six others sought for pollen and nectar collection, the same authors mention the production of bitter honey for the State of Roraima, with dominant pollen types of *Protium* sp. (Burseraceae) and *Vochysia guianensis* (Vochysiaceae). Silva & Absy (2005) later reaffirmed the possibility that bitter honey actually originated from *Vochysia guianensis* flowers.

Silva *et al.* (2021) presented a list of 48 plant species visited *by Apis mellifera* in the savanna areas of the state of Roraima, Brazil. Only palm trees; buritis (*Mauritia flexuosa)*, açaí (*Euterpe* sp) and inajá (*Attaleia maripa*) no were listed by authors in spite of this work.

Table 02 shows that 20 samples (64.5%) did not present protein precipitation for Lund's signaling that are adulterated sample. CAMPOS *et al.* (2001) analyzing the variation of some parameters of honeydew in relation to floral honey, that it was verified by Lund's test that floral honey presented 14% of a result lower than 0.6 mL of flocculation and in honeydew presented results approximated on this value. The average values obtained by AZEREDO *et al.* (1999) in 60 samples after five replicates of each sample, ranged from 1.26mL to 1.90 mL of precipitated by the Lund´s test. Comparing the results obtained in the pollen analysis with the results of Lund's reaction, it was found that four samples, considered as honey due to the presence of pollen grain, gave negative results to Lund's reaction (Table 03).

Table 3: Pollen analysis and Lund's reaction in samples according pollen grains containing. Boa Vista, RR, December 2008

HONEY ACCORDING TO THE POLLINIC IDENTIFICATION	LUND's REACTION	
	NEGATIVE	POSITIVE
Acacia mangium honeydew	1	5
Wild honey with *Acacia mangium* honeydew	0	2
Wild honey	3	4
No pollen (false honey)	16	0
TOTAL	**20**	**11**

In the sample 25, the presence of *Acacia mangium* pollen was detected but with negative result in Lund's reaction. In the case this sample, it is very likely a little honey has been added together with artificial sweeteners. Most likely that pollen and/or a fraction of honey has been added; this is to the fraud more sophisticated adulterated in order to trick deceive consumers into, such as the alerted Girou (2007).

It should be emphasized that there are several techniques of honey adulteration with varying degrees of sophistication, which can deceive even the most experienced consumer been necessary by increasingly requiring the use of various analysis techniques, to ensure a safe diagnosis (DAMTO, 2021). Viana *et. al.* (2012) in sensory analysis considering color, aroma, flavor and consistency for pure orange honeys and with the addition of glucose syrup recorded those only additions above 20% of glucose syrup were perceived by the tasters.

Azeredo *et. al.* (1999) says that the result of Lund's reaction is not conclusive, because gross adulterations made in laboratories with up to 70% refined sugar syrup presented deposits within the range of 0,6 to 3.0 mL of precipitation. This indicates that we cannot confirm a positive result alone in certain samples that have precipitate within the accepted range and there is a need to use other comparative analyses.

Sewbert (2007) analyzed 100 honey samples from Roraima, through the method of the isotopic composition analysis, where 28 samples were acquired at three free markets in the municipality of Boa Vista, of which 57.14% presented adulteration, 39.28% suitable and 3.5% ^{13}C suspicious.

In this work, the samples collected at Passarão Free Market, it was found that 100% were adulterated (Figure 2) due to the absence of pollen and negative Lund's reaction. This percentage of adulteration was also found by Sewbert (2007) for the same free market.

At the Garimpeiro Free Market Sewbert (2007) observed the highest percentage of good samples with 68.75%, a percentage approximated to that of the present study (60%).

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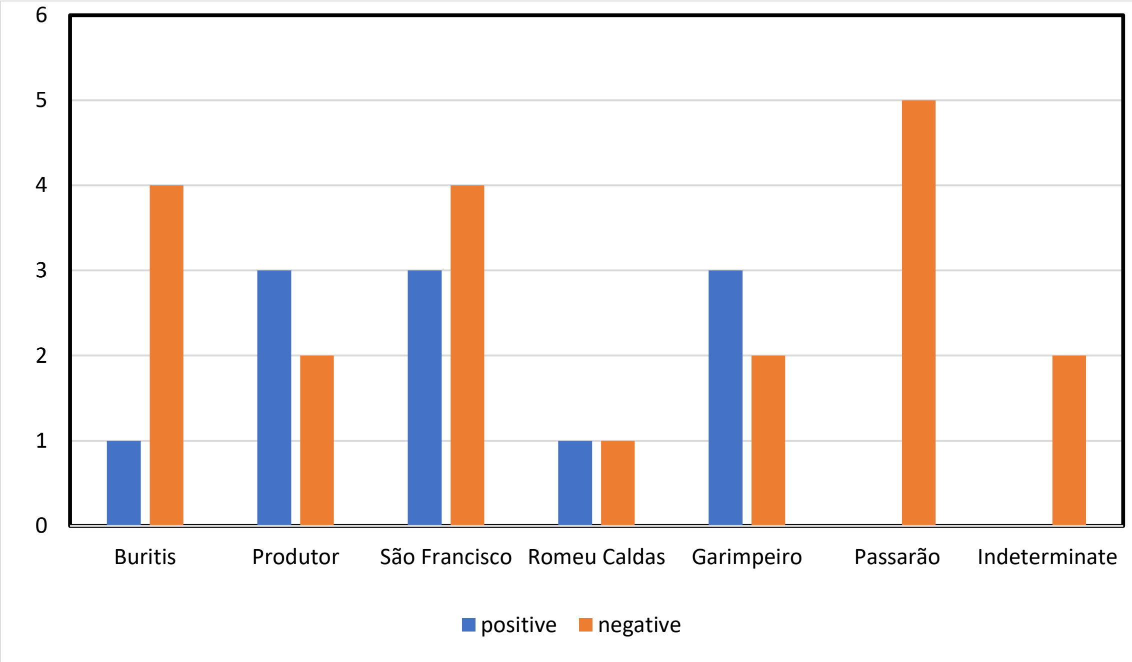

Figure 2: Total results of honey analysis for Lund reaction for each free market. Boa Vista, RR, December 2008.

PACKAGING AND LABELLING

When analyzing the honey packaging, it was observed that 29 samples used plastic bottles, in most PET bottles and three were packed in glass bottles. The use of PET bottles for honey packaging is becoming popular. Azeredo *et. al.* (1999) analyzed the variations in the physical-chemical parameters of honeys stored at room temperature in different packages verified that there was no statistically significant difference, but suggested packaging in plastic in shelter of light.

In this work 68% had the seal broken, indicating the reuse of packaging and/or improper handling of the product. These practices may increase the risk of honey contamination.

Regarding the labeled, 65% of the packages were without the label in these six samples showed satisfactory results in the pollinic analysis and Lund's reaction. Of the samples that presented label, only sample number 25 did not contain the identification of origin, sample number 26 was expired and net weight was observed in nine samples, and only six were with the weight reported on the label. Nutritional information was identified in five samples. Of the packages that had a label, 55% contained no honey with a negative result for Lund's reaction. According to Vilckas et. al. (2001) analyzing the profile of the honey consumer and the honey market in Ribeirão Preto (SP), they found that part of the consumers (34.6%) does not believe that labeled honeys are pure because they are "manufactured" honey. Almeida-Muradiam & Penteado (2007) mention that none establishment can conduct interstate or international trade with products of animal origin, without being registered with DIPOA, are subject to federal inspection. On the other hand, DIPOA may delegate supervisory competence to state or municipal authorities. In the present study, none of the samples were registered at the inspection service and samples number 13, 21 and 26 had other states like origin identification (See Table 4).

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Table 4. Results of the verification of samples with labels for compliance standards.

Sample	Free market	Bottling	Point out origin	Validate	Registry	Net weight	Nutritional Information
8	Passarão	pet bottle without sealing	y	y	n	n	n
9	Produtor	pet bottle with sealing	y	y	n	y	y
10	Produtor	pet bottle with sealing	y	y	n	n	y
11	Produtor	pet bottle with sealing	y	y	n	y	y
13	Buritis	pet bottle with sealing	y	n	n	y	n
16	São Francisco	pet bottle with sealing	y	y	n	y	n
17	São Francisco	pet bottle with sealing	y	y	n	y	y
18	São Francisco	pet bottle with sealing	y	y	n	y	n
21	São Francisco	pet bottle with sealing	y	n	n	y	n
25	indeterminate	glass bottle	n	y	n	y	y
26	indeterminate	pet bottle with sealing	y	y	n	y	y

Obs. compliance: n = no, y = yes

CONCLUSIONS

Such a high percentage of adulteration requires care from consumers who must take sure they are buying the product from suitable suppliers. On the other hand, it is urgent to increase supervision by the competent agencies upon the suppliers in order to prevent this criminal practice.

Although the results of the pollen analyses did not agree in all samples with Lund's reaction, their results corroborated the final diagnosis being conclusive in the absence of pollen (adulterated honey), and to identify the floral origin of the honeys analyzed.

The labelling did not guarantee that the product was free of fraud.

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