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Physico-Chemical and Labeling Control of Imported Honeys in Burkina Faso

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ABSTRACT

Burkina Faso is situated in the centre of Western Africa with a high illiteracy rate, despite efforts of the governments to improve education. This is not without consequences on the choice of foodstuffs bought and consumed by the people and the consequent effect on their health. Honey is one of the foodstuffs consumed by people. However local production falls short of demand, and so most supermarkets in Burkina Faso sell imported honey. Do these imported honeys conform to the international standards regarding labeling of foodstuffs, and specifically do they possess physico-chemical characteristics that conform to international norms of Codex Alimentarus and European honey Commission? The study investigated certain characteristics established by standards of the European Commission and Codex Alimentarius. The labels on packaged honey were analyzed according to the standard of Journal Officiel. Results show that the physic-chemical plan, the hydroxyl-methyl-furfural (HMF) content were high whereas the diastase index was low indicating lack of freshness of imported honeys. For the stability, honey samples conformed to the standard of the European Commission and Codex Alimentarius. Only two honey samples fulfill the Codex Alimentarius and the European commission norms. Storage temperatures degrade honey considerably and it suggested that under tropical conditions the deadline for optimal use (DLUO) of honeys is reduced to one year.

Keywords: Honey Analysis; Food Labeling; Consumption Deadline; Burkina Faso

1. Introduction

Honey is defined as the natural sweet substance, produced by honeybees from the nectar of plants or from secretions of living parts of plants, or excretions of plant-sucking insects on the living parts of plants, which the bees collect, transform by combining with specific substances of their own, deposit, dehydrate, store and leave in honeycombs to ripen and mature [1-3]. So, all honeys intended for human consumption must conform to this definition. Unfortunately, honeys that do not conform to these criteria are found on sale in super markets of Burkina Faso. Some of the physico-chemical and organoleptic characteristics do not conform to those described by Codex Alimentarirus and European Commission. Moreover, their labeling on the packaging has to conform to that of [4]. Indeed, the labeling should not mislead the consumers with regard to the composition of the product and its origin, and persuade them that this foodstuff possesses particular characteristics [5].

In developed countries, many studies have shown several cases of honey adulteration. In Sub Saharan Africa, and particularly in Burkina Faso studies have concentrated on melliferous plant species [6,7], and the impact of temperature on honey storage [8]. However in many developing countries well laid down mechanisms to control the quality of honey is absent. This makes it difficult for producers to meet export standards of the European Commission or Codex Alimentarius [9].

This study aims to draw consumers' attention to international standards as related to the importation and sale of honeys in Burkina Faso. The labeling will be verified

according to the standards outlined in the [4] and the physico-chemical characteristics according to [2] and European Honey Commission [1].

2. Material and Methods

Imported honeys in super markets in Ouagadougou, Burkina Faso were sampled on 05 April 2013. According to the availability, three to five honey pots per sample of any type were bought. The interior temperature of the shelf where honeys were displayed was recorded with Kestrel 4000 version: 4.29 ALL. All the honey samples were analyzed at the laboratories of the Centre d'Etude Technique Apicole de Moselle, France according to the harmonized methods of the European Honey Commission [1]. The following characteristics of the honey samples were analyzed: coolness indicators as Hydroxy-methyl-furfural (HMF) and diastasique activity (amylase); stability indicators as moisture, pH, free acidity, fructose and glucose; botanical origin as electrical conductivity and the colour.

The information on the labeling was verified according to the Directive 2000/13/CE [10]. According to this directive, the information which necessarily have to appear in the case of honey are: the name of sale, the net quantity, the particular conditions of conservation and use, the company name and the address of manufacturer, the deadline for optimal use (DLUO), the geographical origin and the indicative price.

3. Results

Generally, the labeling of the imported honey jars was regular. Legal requirements were presented (**Table 1**). However the name and the address of producers were not mentioned as shown in the table.

Most of the honey samples (72.72%) were mixed flower honeys with their geographical origin being from or outside the European Commission (**Table 1**). Two honey samples (18.18%) were from Spain and one from Australia.

According to the Deadline for Optimal Use stated, one of the honey samples had expired (01/04/2013). Three will expire in 2013, six in 2014 and only one in 2015.

Two honeys (N˚ 9 and 11) had the same name (miel d'oranger), but they didn't have the same composition and the same geographical origin. Four honey samples had the botanical origin as miel d'Acacia, d'oranger, d'oranger and romarin); two were honeydew honeys (miel de montagne, miel de forêt et de sapin); the others were flower honeys.

Table 2 summarized the results of the analysis of the honey samples in terms of their coolness, stability, color and botanical origins. All these characteristics are important to the product quality and therefore the consumers' health.

The Hydroxy-methyl-furfural (HMF) content varied from 29.9 mg/kg for sample N˚ 1 to 122.7 mg/kg for sample N˚ 8. The HMF content of most of the honey samples (81.81%) exceeded the Codex Alimentarius and European commission standard that were less or equal to 40 mg/kg. Only two samples (N˚ 1 and 11) had their HMF value under 40 mg/kg. For the amylase content, the values varied from 4 to 15 Schade unity (N˚ 4 and N˚ 15). Forty-five and half per cent (45.5%) had their values

Table 1. Presentation of honey samples according to the descriptions on the labeling.

Presentation of different honey samples					
N˚	**Denomination**	**Geographical origin**	**Net weight (g)**	**DLUO**	**Price (€)**
1	Miel de forêt et de sapin	Mixture of honeys from EC and non EC	375	01/09/2013	5.27
2	Miel de montagne	Spain	250	01/04/2013	5.56
3	Miel crémeux	Mixture of honeys from EC and non EC	250	01/01/2014	5.27
4	Miel de fleurs	Mixture of honeys from EC and non EC	375	01/07/2014	7.91
5	Miel de fleurs	Mixture of honeys from EC and non EC	450	01/07/2014	5.37
6	Miel d'acacia	Mixture of Acacia honey from EC	375	01/10/2013	8
7	Tartimiel	Mixture of orange tree and Acacia from EC and non EC	250	01/07/2014	5
8	American green	From Australian	500	03/2015	3.43
9	Miel d'oranger	Mixture of orange tree honeys from Spain and Mexico	250	01/10/2014	5.27
10	Miel de romarin	Mixture of rosemary honeys from Spain	375	01/08/2013	7.94
11	Miel d'oranger	Mixture of honeys from EC and non EC	250	30/10/2014	4.88

EC: European Community; DLUO: Deadline for optimal used.

Table 2. Physicochemical characteristics of imported honey samples.

N°	Product freshness		Product stability			Botanical origin	Colour	
	HMF (mg/Kg)	**Amylase** (Schade unity)	**Moisture** (g/100g)	**pH**	**Free acidity** (mEq/kg)	**Electrical conductivity** (µS/cm)	**Pfund scale** (mm)	**USDA colour standards**
1	38.5	15	17.5	4.84	15	993	150	Dark amber
2	44.7	14	17.5	3.58	18.9	540	150	Dark amber
3	50.5	11	18.4	4.06	11.1	393	66	Light amber
4	89.9	4	17.8	4.09	11.9	284	58	Light amber
5	62.8	8	17.8	4.06	9.2	243	58	Light amber
6	46.4	7	17	4.37	6.1	125	22	White
7	75.9	7	16.9	3.96	8.4	224	61	Light amber
8	122.7	4	16.4	4.39	5.1	119	69	Light amber
9	45.6	9	17.9	4.22	12.5	260	77	Light amber
10	100.4	7	17.7	4.01	9.5	172	68	Light amber
11	29.9	10	16.4	4.15	12.8	687	41	Extra light amber

over the Codex Alimentarius and European Commission standard and 54.55% had their values lower than 8 Schade unity.

For the stability, all of honey samples conformed to the standard of the Codex Alimentarius and that of the European Commission. The pH value varied from 3.58 to 4.84. Only one honey sample (N° 1) had pH level being the same as that of the honeydew honeys. In terms of the free acidity, the value varied from 5.1 to 18 meq/kg. All the values were lower than 50 meq/kg.

The conductivity of honey samples showed that most of them (90.90%) were flower honeys with conductivity lower than 0.8 mS/cm. Only one sample (N° 1) had conductivity more 0.8 mS/cm.

According to US Department of Agriculture colour standards [11], the honey samples varied from dark amber (N° 1, and 2) to white (N° 6). Many (63.63%) were of light amber in colour.

4. Discussion

Despite the important efforts done in physico-chemical analyses, the detection and the quantification of honey adulterations continue to be a difficult problem [12]. Even with the adaptation of international standards, the detection and authentication of honeys have become a preoccupation of many. In terms of honey labeling, the results show that honey samples fulfilled the criteria of the European commission and Codex Alimentarius. Only one sample failed to meet the criteria. But according to [5] and [13], the DLUO does not mean that the honey cannot be consumer, but it means that the honey must not fermented. It however meets the legal quality criteria, particularly the index of age as indicated by the HMF and Diastase Index.

The producer cannot be responsible for bad storage conditions of the distributor or in the consumers' houses. This is why it is necessary to indicate the particular conditions for good storage of honey.

For the physico-chemical analyses, the expired honey sample fulfilled a lot of criteria except the HMF value where it was slightly higher than 40 mg/Kg.

The honey freshness is an important criterion for the consumers [14]. Indeed, the diastase index and the HMF content are quality factors and they give the age and the thermal past of the honey [15].

For the HMF content, a lot of honey samples did not meet the standard of the Codex Alimentarius and the European Commission. Indeed, at harvest, the comb honey does not have any HMF value, but time and the temperature accelerates its formation and according to [16], this value is multiplied by 1.10 times in six months and by 2.0 in one year when honeys were stored between 15°C and 20°C. This explains this high HMF value of the sampled honeys because they were storage at 30°C. Nevertheless, two samples despite their DLUO fulfilled this HMF criterion.

The results of the enzymes activities bring good information on the thermal treatment of the honeys studied. Its interpretation allows for the detection not only the freshness state of honey but also the optimal conditions of storage. Finally, when the history of the honey is not known, the analysis allows for the detection of the kind of degradation that it has been subjected [15].

For the diastasique index, a lot of honey samples studied were degraded. That can be explained by the storage

temperature because according to [3,16], the amylase content is sensitive to the temperature and these small values can be a proof of deterioration due to excessive heating.

One honey sample (N˚ 1) is honeydew honey by its denomination and its physicochemical characteristics. Indeed, according to [17], honeydew honey is characterized by its very dark colour (dark amber), its high pH value (4.84) and its electrical conductivity (0.9 mS/cm). The others honey samples were of flower origin.

The honey colour is the physical property perceived immediately by the consumers [18]. Even if the colours were from the plant species foraged by honeybees, the temperature also influence it. The honey samples fulfilled the international norms.

Only two honey samples, one from honeydews honey (N˚ 1) and the second from flowers (N˚ 11) fulfill the Codex Alimentarius and the European commission norms. The sample N˚ 8 with 122.7 mg/Kg of HMF content and 4 Schade unity of diastase index and DLUO in 2015 is the most degraded honey. Probably it has been heated. The sample N˚ 6, 9, and 11 would had less diastase index because they were from Acacia and Citrus or according to [19] the honey of such characteristics are naturally poor in diastase. The others samples N˚ 4, 6, 7, and 10 with high HMF level and low diastasique index have been degraded by the storage temperature near 30 ˚C because according to [8], the tropical temperature of storage increase the HMF and amylase content rapidly and that can reduce considerably the honeys' DLUO.

5. Conclusion

The results show that a lot of honey samples fulfill the labeling criterion. Also, lots of them have been degraded by storage temperature. Only two honey samples fulfill the Codex Alimentarius and European Commission norms. The temperature in tropical area is an important factor that limits the DLUO. Accordingly a storage condition, the DLUO between 6 months and one year is suggested for the honeys sold in tropical regions. That will allow for the preservation of their qualities. The invertase and sugars content and also pollen analysis have not been carried out during this study. These would allow the detection of sugar adulteration by the addition of saccharose syrup. Another important characteristic is the presence of antibiotics. This affects the honey quality and can pose enough danger to public health. Future studies will be concentrated on the above so as to constitute a database for improving the honey quality and to be able to monitor the characteristics of imported honeys in Burkina Faso.

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