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Development of a Drink Type Infusion From Coffee Pulp (*Arabia coffea*) Lempira Variety of Honduras

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Abstract

This work aimed to develop an infusion type beverage from Lempira coffee pulp for human consumption. Samples from the Honduran Coffee Institute IHCAFE were used. According to the results obtained from the sensory analysis, it was determined that 70.75% of the evaluators prefer the beverage made with mature grains, given that a balance in taste and acidity is obtained. As for the mass concentration of the packaged content, 60% of the universe of tasters prefer a concentration of 1.6 g of dried pulp per cup. Regarding the type of grinding of the grain, it was determined that 80% of the tasters prefer coarse grinding (701 to 900 μm), describing it as an extremely pleasant product in its flavor and color, with shades of Jamaica, tamarind and nuts. Checking that with this particle size there is a greater release of flavors and maintains a balance in terms of aromas, however in fine particles (350 to 500 μm), their fragrances stand out, but negatively affects their taste and the high sedimentation rate. Therefore, it was concluded that the quality of the infusion drink from coffee pulp is influenced by the type of grinding used for its preparation.

Keywords: sustentability, quality, type of grinding

1. Introduction

Coffee is the most important export product in Honduras, being the largest exporter in the Central American region; the third in Latin America and the fifth worldwide, making large contributions to the Gross Domestic Product of the country that oscillates around 35%, benefiting about 120 thousand families and generating more than one million direct and indirect jobs (IHCAFÉ, 2017). Hunger will be one of the problems that humanity will face in the future, being that, according to the FAO between the year 2000-2030, the world will have to increase the per capita production of meat by 20%, estimating that in the year 2030, bird production should grow by around 40.4%, bovine 12.70%, fish by 19% and pig by 20%, high percentages at an accelerated rate of growth.

The pulp is the first bioproduct that is obtained in the processing of the coffee fruit, according to FAO data, globally the residues of the coffee industry have been estimated at approximately 22 million tons of coffee pulp and 8.6 million tons of mucilage, these bioproducts are discharged into rivers and cause pollution (Ulloa Rojas et al., 2002).

In the coffee industry, only 9.5% of the weight of the fresh fruit is used in the preparation of the beverage and 90.5% is in the form of waste. The pulp is the most voluminous part of the coffee bean, it represents between 40 and 56% by weight of this, in addition to containing water in 20%, husk in 4.5% and mucilage in 16% (Coronel & Marín, 2010). The pulp presents a great variety of alternatives to be recycled in its entirety, including:

transformation into humus from worm crops and organic fertilizer production, as well as the development of new infusion-type products and cold drinks (Restrepo, 2015).

In the preparation of infusions, the particle size of the coffee pulp is important, since according to its granulometry a perfect extraction is determined, obtaining a greater number of properties than we could obtain from an entire pulp. The objective of this research is to develop an infusion type beverage from coffee pulp of the Lempira variety produced in Honduras for human consumption.

2. Material and Methods

2.1 Local

The coffee pulp was harvested on the farms of Labor Ocotepeque and Caiquín Lempira (Honduras), affiliated with IHCAFE at a height of 1600 meters above sea level and an average temperature of 20±10 °C.

The variety of coffee used was Lempira, collected in mature maturity.

2.2 Preparation of the Infusion Type Drink

It began with the collection of cherry coffee samples, verifying that the cherries were at their optimum ripeness point in the tree. They were deposited in a container with five liters of water for the flotation of the dried grains and to select the type of maturation. Subsequently, at 3 hours after harvesting, the coffee was pulped mechanically. The pulp that was obtained was deposited in sterile plastic bags to protect it from environmental contamination. The pulp was dried in dome-type solar dryers at a temperature of 40 °C and relative humidity of 60%, times and temperatures were controlled, the humidity of the sample was 3.5%. Finally, coffee pulp was ground in an automatic electric Cuisinart coffee bean mill, consisting of three types of grinding: fine (350 to 500 μm), medium (501 to 700 μm) and coarse (701 to 900 μm).

2.3 Physical-Chemical Characterization

The physicochemical characterization was made from a representative sample of 1000 g of sample for each variety, randomly segmenting into 10 experimental units of 100 g of homogenized coffee pulp.

For the determination of humidity, samples were taken in triplicate of 5 g in a porcelain capsule (of known mass), then the sample was placed in the P-SELECTR model DIGITRONIF-TFT oven at three test temperatures of 40 °C, 50 °C and 60 °C and three drying times of 420 min, 360 min and 300 min. With the help of a clamp, the capsule was removed and allowed to stand for 30 min in a Thermo Scientific drying chamber at medium temperature, the weights were subsequently taken, and the moisture content of the samples was determined by mass difference (AOAC, 2009).

To determine ashes, 25 g of triplicate sample in crucibles of known mass were weighed on an analytical scale, subsequently fused in a Thermo Scientific HERATHERM model flask at a temperature of 550±100 °C for 1.5 h until all the organic matter was incinerated and only the inorganic compounds were left, then with the help of a clamp the capsule was removed and allowed to stand for 30 min in a Thermo Scientific drying chamber at medium temperature (AOAC, 2009). The total ash content was calculated by mass difference following the formula proposed by Zumbado (2004).

For the determination of the pH, a digital pH meter WATER PROOF model PC-Tester was used, which was calibrated with buffer solution of pH 4 and pH 7. In the sample preparation 250 ml of distilled water was used at temperature of the medium and 6 g of coffee pulp concentrate, the mixture was homogenized by stirring for 20 min at 30 rpm, in a Vortex Gene 2, Scientific Industries brand. The pH meter was placed in the solution, for 2 min, and the triplicate reading was taken.

Degrees Brix: were determined by the refractometry technique, from a Boeco brand refractometer with a scale of 0 to 320 Brix. A homogenized sample of 6 g of coffee pulp concentrate and 250 ml of distilled water was taken in triplicate, once the solution was obtained, it was filtered and particles in suspension were removed, finally reading.

2.4 Sensory Analysis

The sensory analysis determined the degree of acceptability of the attributes (color, aroma and flavor) for each level of grinding, performing 7-point hedonic tests with specialized expert judges, following the regulations proposed by Espinosa (2014).

2.5 Microbiological Analysis

According to the RTCA standard (2018), for the microbiological analysis, total bacterial count, yeast count, total *colyforms*, *faecal coliforms*, *E. coli*, *Salmonella* spp. These analyzes were carried out in the Sanitara de Salud Region, in Juticalpa, Olancho, Honduras.

3. Results and Discussion

3.1 Physicochemical Analysis

The average values of the moisture content present in the dried coffee pulp of the Lempira variety are shown in Table 1. These results highlight the importance of drying time optimization at different temperatures ranging between 40 °C and 60 °C with humidity percentages less than 10%. Classifying this product as a stable food because of its low moisture content and water activity.

Table 1. Moisture percentage of coffee pulp as a base for infusion

Time (min) (n = 3)	Temperature (°C) (n = 3)	Moisture (%) (n = 3)
420	40	9.5
360	50	7.9
300	60	6.7

Figure 1 shows the results from the quantification of ash that was made to two samples of dehydrated coffee pulp from IHCAFE in the department of Ocotepeque (Sample A) and Lempira (Sample B). Obtaining results of 27.9% and 27.5% respectively, being sample A, who presented the highest mineral content.

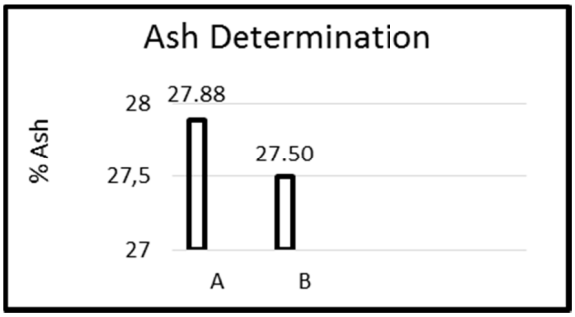

Figure 1. Ashes Quantification

The physicochemical parameters for the coffee samples are collected. The average pH of this drink is 4.25% with a concentration of 1.36 °Brix at a temperature of 27.42 °C for sample A and that the average pH of sample B is 4.3% with a concentration 1.34 °Brix at a temperature of 27.42 °C. Therefore there is no significant difference between samples.

3.2 Sensory Analysis

Table 2 shows the results of sensory analysis carried out by IHCAFE expert judges, that the infusion drink from dehydrated coffee pulp has a higher percentage of acceptance in color, aroma and flavor with a grain size of 6 mm, There are significant differences between the various granulometries ($P < 0.005$).

Table 2. Sensory analysis

Grinding level	**Median**
Fine 2	0.75
Half 4	22.818
Gross 6	75

3.3 Microbiological Analysis

Table 4 shows, according to microbiological analysis, that the parameters of colony forming units of bacteria and fungi are below the RTCA norm, while showing an absence of *E. coli* and *Salmonella* spp.

Table 4. Analysis of aerobic mesophilic microorganisms

Test	Result	Method
Bacteria count	8000 UFC/g	Petrifilm for anaerobic cointing
Fungus count	1500 UFC/g	Petrifilm and cast and Mold Count plate
Total Coliforms	* < 10UFC/g	Petrifilm Coliformes/*E. coli*
Fecal Coliforms	* < 10UFC/g	Petrifilm Coliformes

4. Conclusions

The pulp is a byproduct of coffee bean that is not being used by the food industry and generates environmental pollution. Based on the results of this research, they suggest the use of pulp for the production of infusion drinks.

The quality of this drink is influenced by the particle size, since a coarse ground of 6 mm granulometry offers greater sensory qualities in terms of taste, aroma and color. However, the possibility of inactivating the present tannins should be evaluated, in order to take advantage of the chemical properties of this drink, while a toxicological analysis should be addressed to rule out toxicity.

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