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NUTRIENT CONTENTS IN THE MUCILAGINAL EXTRACT AND IN THE FLOUR FROM THE SKIN OF COFFEE FRUITS

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Abstract: The processing of coffee fruits in order to obtain peeled cherry coffee generates residues such as the husk, which is used in fertilization and animal feed, and the mucilage, which comes out with the wastewater. The objective of this work was to determine the nutrient content in the mucilaginous extract and in the peel flour of coffee fruits of the Oeiras, Catiguá and Catuaí Vermelho varieties. The coffee fruits were washed in potable water and peeled, without using water in the peeler. The peeled cherry coffee was placed in a plastic tray with enough water to cover the beans and, the next day, the coffee was sieved and the mucilaginous extract was separated. The bark was dried in an oven with forced ventilation and then ground. Samples of the mucilaginous extract and the flour from the peel of the fruits were analyzed in the laboratory, according to the usual methods for analyzing effluents and food. The levels of K, Ca, Mg and Na, determined in the mucilaginous extract of the Oeiras, Catiguá and Catuaí Vermelho varieties ranged from 662 to 3307, 154 to 317, 60 to 114 and 12 to 108 $mg.L^{-1}$. The protein contents, carbohydrate, fiber, fat and K in the flour of the Oeiras and Catiguá varieties were 9 and 8, 65 and 68, 19 and 12, 1 and 0.8, and 2700 and 5150 g/100g, respectively. The mucilaginous extract and flour from the coffee fruit peel can be used by the industry to manufacture various products.
Keywords: Post harvest, processing, residue.

INTRODUCTION

The coffee fruit is constituted by the exocarp, mesocarp and endocarp, commonly called husk, pulp and parchment, respectively, and the seed, surrounded by the parchment. The rind of ripe coffee fruits can be separated from the seed by pressing with the fingers; the solid layer of pulp and part of the liquid, called mucilage, is adhered to the peel, while the other part is next to the parchment. In the processing units, the fruits undergo cleaning and washing operations, and, less frequently, peeling and mucilage removal. Removing the husk reduces the volume of material and the time it takes to dry the coffee, reducing the cost of this operation, in addition to making it possible to form batches of pulped coffee from ripe fruits, from which the best beverages are obtained. In the peeling stage, part of the mucilage adheres to the shells and peeled grains and part leaves in the water that passes through the peeler. To facilitate handling during drying, the mucilage adhered to the grains is partially removed by the mechanical process using a demucillator or by the natural process through a degumming tank with water. The bark is used for fertilization and animal feed, while the mucilage is discarded along with the processing water. The coffee husk and pulp contain carbohydrates, fats, proteins and minerals, and can be used in ruminant feed, replacing part of the bulky food needed (BARCELOS & GONÇALVES, 2011). According to Southey (1919), coffee husk flour has been used as an ingredient in the manufacture of various food products. The husk is purchased from coffee growers by Coffee Cherry Co. and transformed into flour rich in antioxidants and fiber and gluten-free. The objective of this work was to determine the levels of K, Ca, Mg and Na in the mucilaginous extract of the grains and of protein, carbohydrate, fat, fiber and minerals in the coffee husk flour.

MATERIAL AND METHODS

Coffee fruits of the Oeiras and Catiguá varieties, with red and yellow bark, respectively, produced at the Boa Safra farm, located in the municipality of Paula Cândido - MG, and the Catuaí Vermelho variety, produced in two neighboring properties, located in the municipality of Araponga - MG. On the day they were harvested, the fruits were washed

three times with treated water, manually removing those that floated; then, the green fruits were picked and separated from the ripe ones, which were peeled in a cherry coffee peeler, without the use of water.

The peeled coffee beans were placed in a plastic tray with enough distilled water to cover them and, the next day, they were sieved and separated from the mixture consisting of water and fruit mucilage, which in this work was called mucilaginous extract. The mucilaginous extract was analyzed at the ''Laboratório da Analag- Consultoria e Serviços", in Viçosa – MG, determining the levels of K, Ca, Mg, Na and N, according to the methodology recommended in Standard Methods for Examination of Water and Wastewater (2005).

The peels were placed to dry, in an oven with forced ventilation, at a temperature of 65 °C, for 5 days, after which they were ground in a Willye-type micro mill, TE 648. The flour obtained was analyzed in the Food Products Analysis Laboratory from the Department of Food Technology at the UFV, in Viçosa – MG, determining the content of carbohydrates, fat, protein, crude fiber and minerals, according to methods of physical and chemical analysis of foods from the Instituto Adolfo Lutz (2008).

RESULTS AND DISCUSSION

The levels of K, Ca, Mg, Na and N determined in the mucilaginous extract of coffee beans of the varieties Oeiras, Catiguá and Catuaí Vermelho are shown in Table 1. It is observed that the extract contains high levels of K, Ca, Mg and Na, with emphasis on potassium in the Catiguá variety, and that the levels vary between varieties and places of cultivation. The levels of K and Ca exceed those recorded in bananas and milk, by Aquino et al (2014) and Monteiro et al (2016), respectively. In addition to the presence of minerals, Camargo et al (2015) found the presence of proteins, carbohydrates, vitamins, fibers, caffeine, chlorogenic acid and phenolic compounds in the extract of coffee husks. An extract with these components can be used by the industry to manufacture various products such as soft drinks, liquors, electrolytic replenishers, energy drinks and others.

Variety	K	Ca	Mg	Na
Oeiras	662	179	60	19
Catiguá	3307	154	86	12
Catuaí vermelho a*	919	317	114	98
Catuaí vermelho b*	841	260	90	108

* Catuaí red produced on neighboring properties, located in the municipality of Araponga, Minas Gerais.

Table 1 – Mineral contents, in mg. L^{-1}, in the mucilaginous extract of Arabica coffee fruits of different varieties.

The protein, carbohydrate, fiber, fat, potassium and sodium contents determined in the fruit peel flour are shown in Table 2. The protein contents determined in the peel flour of the varieties

Variety	Protein	Carbohydrate	Fiber	Fat	Potassium	Sodium
Oeiras	9	65	19	1	2700	5
Catiguá	8	68	12	0,8	5150	9

Table 2 – Nutrient and mineral contents, in g.100g-1, in the husk flour of two Arabica coffee varieties.

Oeiras and Catiguá, with 9 and 8 mg.100g-1, respectively, were close to those obtained by Barcelos & Gonçalves (2011) in the bark of the Catuaí, Rubi and Mundo Novo varieties. The protein and lipid contents were similar and the fiber content is much higher than those determined in corn flour by Giacomelli et al (2012). Coffee husk flour contains more fiber than wheat flour, more antioxidants than pomegranates and more potassium than bananas and can be used in various beverages, baking and confectionery (SOUTHEY, 1919).

3.8 and 3.6 L of extract and 2.1 and 2.0 kg of peel flour were obtained from 30 L of fruits of the Catuaí Vermelho variety grown in two locations in the municipality of Araponga. These results indicate that the processing of 480 L of fruits, which is the estimated volume to obtain a bag of coffee, yields about 59.2 L of extract and 34.4 kg of peel flour, which can be used by the industry. to produce food, beverages, pharmaceuticals and cosmetics. In order for the products derived from the extract and flour to be accepted by the consumer, it is necessary that the processing of the coffee fruits be carried out in hygienic conditions, which currently does not happen. The improvement of conditions and cleanliness in the processing units has been practiced by several coffee growers who produce specialty coffees, especially by those who export coffee, since their customers are demanding in terms of hygiene conditions. Hygiene would make it possible to associate one more differential to the product, and, of course, add value to "sanitized coffee".

CONCLUSION

The mucilaginous extract of the beans and the coffee husk flour contain protein, carbohydrates, fiber and minerals and can be used by the industry to manufacture various products.

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