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## RHEOLOGICAL OF MIXED DRINKS OF PASSION AND RICE FLOUR ADDED PECTIN

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### ABSTRACT

Pectin, probably the most complex natural macromolecule is a heteropolysaccharide containing predominantly galacturonic acid residues. This polymer, the group of dietary fiber, is widely used as a gelling agent and stabilizer in food industry. Currently the addition of pectin and CMC in beverages has been held in the industrial sector aiming at the increase of viscosity and functioning as colloid stabilizer in foods and beverages. The rheological behavior is mechanical performance of the materials when undergoing deformation due to the stress field (TABILO Munizaga-and-BARBOZA CANOVAS, 2005). The importance of rheological study is based not only on the fact that a measure of quality, but for directing the design of industrial processes such as pumping, agitation, transport pipes, evaporation etc.. Given the importance of rheological properties of food the objective of this work was to study the rheological behavior of drinks made with flour and rice, passion fruit, pectin and CMC added at room temperature. The experimental measurements were performed in oscillatory rheometer Thermo Haake Mars in order to understand the viscoelastic properties of folders extruded rice flour and passion and flow curves fitted to models Ostwald de Waele and Herschel-Bulkley. The Herschel-Bulkley model was better adjusted to the rheological data, having drinks presented non-Newtonian behavior with pseudoplastic character.

Keywords: Rheological, mixed drinks, pectin

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### 1. INTRODUCTION

The bark of passion is a waste of passion fruit juice industry that has been tested by hand for the preparation of some products. Brazil, apparently, is one of the most fertile countries Latinos for the cultivation of waste as natural resources, financial opportunities and even food are literally thrown in the trash, with no possibility of return. As a symptom of disorganization and disintegration, the waste is incorporated into Brazilian culture, the production system, the engineering of the country, causing irrecoverable losses in the economy, helping the imbalance of supply and reducing the availability of resources for the population (Borges, 1991). An alternative that has been growing since the early 1970s is the use of waste (mainly shells) of certain fruits as raw material for the production of some foods perfectly capable of being included in food. It is, without a doubt, a plausible proposal, concrete, since these residues represent an extraordinary source materials considered strategic for some Brazilian industries, such as pectin that, until now, has been isolated for purposes Commercial from orange peels, apple and lemon (Oliveira et al, 2002). The use of the residue of passion fruit (peel) has been studied by several researchers (Oliveira, et al., 2002) in recent years, due to its high content of pectin, fiber and carbohydrates. Some examples of products already researched, we mention sweet syrup, jelly, bicoitos, animal feed. The rheological behavior represents the mechanical performance of the materials when undergoing deformation due to the stress field (TABILO-Munizaga and CANOVAS-Barbosa, 2005). The importance of rheological study is based not only on the fact that a measure of quality, but for directing the design of industrial processes such as pumping, stirring, transport pipes, evaporation, etc.. In industrial processing of pulp and other fruit products in fluid or pasty state, the rheological studies assume application key (GRANJEIRO et al.,2007). Given the importance of rheological properties of food the objective of this work was to study the rheological behavior of drinks made with flour and rice, passion fruit, pectin added at room temperature.

## 2.METHODOLOGY

### Formulations

In the formulation of the drinks were used 12 flour extruded rice and passion fruit in the proportions 95:5, 85:15, 90:10, 82:18, according to experimental design and 200ml of filtered water. After the preparation of the beverages was added 1 g of pectin.

### Rheological test

Determined the rheological behavior of drinks in oscillatory rheometer Thermo Haake Mars, reometer advanced modular systems of thermo scientific, in order to understand the viscoelastic properties of folders extruded rice flour and passion, we used the probe Z40 DINVA. The measurements were performed at 25 ° C using a thermostated bath set coupled to the machine. The rheological analyzes were performed with variation of shear rate from 0 to 500 s<sup>-1</sup> (ascending curve) is 500 to 0 s<sup>-1</sup> (downslope), with a time of 3 minutes and 25 reading points for each curve. The readings were performed in triplicate, and used new sample for each measure. To relate the data of shear stress and shear rate models were used Ostwald de Waele and Herschel-Bulkley model.

## 3. RESULTS AND DISCUSSION

Tables 1 and 2 present the parameters obtained by the two models used to fit the experimental data.

**Table 1 - Parameters setting Ostwald de Waele model for mixed drink of rice flour and passion fruit pectin added: k (consistency index) n (flow behavior index) and R2 (coefficient of determination)**

Parameters	95:5	85:15	90:10	82:18
K	0,1326	0,1503	0,2359	0,2339
n	0,7149	0,7259	0,6498	0,6546
R <sup>2</sup>	0,9955	0,9868	0,9961	0,9999

**Table 2 - Parameters setting Herschel-Bulkley model for a mixed drink of rice flour and passion fruit pectin added: k (consistency index) n (flow behavior index) and R2 (coefficient of determination)**

Parameters	95:5	85:15	90:10	82:18
K	0,1439	0,1599	0,2581	0,2692
n	0,6968	0,7121	0,6303	0,6292
T <sub>0</sub>	0,0284	0,0248	0,0480	0,0768
R <sup>2</sup>	1	1	0,9999	0,9999

The coefficient of determination (R<sup>2</sup>) measures the proportion of total variation explained by the regression of the mean, defined as the quadratic sum of Total (MAIA, 2008). Comparing the settings for it is observed that the formulations containing greater amounts of rice flour, the Herschel-Bulkley model provide the best fit (largest coefficient of determination, followed by Ostwald de Waele model).

All formulations exhibited behavior index (n) lower than the drive being characterized as pseudoplastic fluids.

SILVA et al. (2012) analyzed the rheological behavior of pulp cashew, mango and acerola, checking for all samples non-Newtonian behavior with pseudoplastic character.

## 4.CONCLUSION

The mixed drinks of rice flour and passion exhibited non-Newtonian fluids are classified as pseudoplastic.

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