ON LINE
7º Simpósio de Segurança Alimentar
Inovação com sustentabilidade
27 A 29 DE OUTUBRO DE 2020

TEXTURAL CHARACTERISTICS OF BRAZILIAN FOODS - TACACA

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RESUMO – O uso da mandioca na culinária brasileira é uma antiga herança indígena. Tucupi é um caldo amarelado obtido a partir do caldo de mandioca ralado com manipueira - permanece por 12 ou 24 horas para fermentação e decantação parcial do amido, que é posteriormente removido. Após essa etapa, é realizada a adição de condimentos e a ebulição, gerando o tucupi. O amido decantado constitui a goma. Tucupi e goma são os principais ingredientes do tacaca, um prato típico do norte do Brasil, especialmente do Pará. Não há estudos reológicos anteriores sobre o tacaca. A viscosidade e viscoelasticidade de tacacas básicos feitos a partir de tucupi espessado com 5, 7 e 10% de goma foram determinadas nas temperaturas de 25 e 50 ºC. Tacacas com 7 e 10% tiveram os melhores resultados, pois com 5% não formaram uma estrutura de gel verdadeiro. A 25 ºC a estrutura do gel foi rompida.

ABSTRACT – The use of cassava in Brazilian cuisine is an ancient indigenous heritage. *Tucupi* is a yellowish broth obtained from the *manipueira* - grated cassava broth - which is left to stand for 12 or 24 hours for partial fermentation and decantation of the starch, which is subsequently removed. After this stage, addition of condiments and boiling is performed, generating the *tucupi*. Decanted starch constitutes the gum. *Tucupi* and gum are the main ingredients of *tacaca*, a typical dish from northern Brazil, especially from Pará state. There are no previous rheological studies on the *tacaca*. The viscosity and viscoelasticity of basic *tacacas* made from thickened tucupi with 5, 7 and 10% of gum was made at temperatures of 25 and 50 ºC. *Tacacas* with 7 and 10 % had the best results, because with 5% did not form a structure of true gel. At 25 ºC the gel structure was broken.

PALAVRAS-CHAVE: tucupi; goma; viscosidade; viscoeslasticidade; *Manihot esculenta* Crantz

KEYWORDS: tucupi; gum; viscosity; viscoslasticity; *Manihot esculenta* Crantz

1. INTRODUCTION

The Indians, as the first inhabitants of *Terra Brasilis* and therefore knowledgeable about their food raw materials, greatly influenced the eating habits of Brazil. Cassava or manioc (*Manihot esculenta* Crantz), with several varieties, was the most planted and consumed vegetable by them; followed by the potato (genera *Solanum* and *Ipomoea*) and *cará* (genus *Dioscorea*) (Cascudo, 1983). Nowadays are produced and consumed in all Brazilian states and it is part of Brazilian alimentary habit. The cassava is a cyanogenic amylaceous tuberose plant from Tropical America, where is cultivated there are almost 5000 years (Montaldo, 1979). It is one of the main energy sources for Brazilians because it does not need technological devices for cultivation or processing (BRASIL, 2002). In accordance to CONAB (2018), the estimate of Brazilian production of cassava root, for the year 2018, was 19.9 million tons, cultivated in an area of 1.4 million hectares.

Most of the cassava produced in Brazil is industrialized. Tuber processing reduces toxic components to safe levels: grinding, grating and fermentation release the β-glycosides, which hydrolysis the cyanogenic glycosides; the pressing entrains the water-soluble glycosides; cooking and dewatering removes the free cyanide residues (Cereda e Vilpoux, 2003; Amorim et al., 2006). More than 90% of the production of cassava root is transformed into table flour in the state of Pará.

Common to the manufacture of any type of flour is step the pressing of the grated mass, which results in a yellow liquid exudes called *manipueira*, residue rich in toxic hydrocyanic compounds (Cereda e Vilpoux, 2003). The pressed mass go to roasting, and the liquid (*manipueira*) is discharged or used to make *tucupi* (Figure 1A), a traditional yellowish partially fermented broth used as ingredient in various recipes at Amazon region as *tacaca*, duck in *tucupi* and several other dishes in *tucupi* sauce (Alves et al, 2019).

Figure 1- Basic *tucupi* broth (A) and *maniçoba* (B) at sale in Ver-O-Peso market, Belém/Brazil. Basic *Tacaca* preparation (C) and tipical Amazonian plate (D): rice with *tacaca* and maniçoba. Fonte: Autor

To obtain the *tucupi*, “bitter" and yellow (rich in beta carotenes) cassava varieties are preferred. The *manipueira* rests by 12-24 h until starch decantation and natural fermentation; after, the supernatant is taken off and added with garlic and the *chicória-do-Pará* (*Eryngium foetidum L.*, an herbaceous vegetable native from Brazilian northern extreme) and boiled during 90 min (Brasil, 2015); after this time, the *tucupi* is hydrocyanic compounds free and has pH near to 4.1, ready to use in recipe as *tacaca* (SUFRAMA, 2010, Alves, 2019). The *tacaca* (Figure 1D) is made with the *tucupi* broth thickened with the starch decanted from *manipueira* (this wet starch is called *goma* because is used as a gum) and added of the *jambu* (*Acmella oleracea* R. K. Jansen, an

herbaceous plant native to the extreme north of Brazil that causes a tingling sensation in the lips and tongue due to its local anesthetic action) and dry shrimp; incorporates, therefore, different textures (Brasil, 2002). Both *tucupi* and *tacaca* are practically unknown outside the Brazilian northern extreme (Brasil, 2002; Cascudo, 1983).

Using a basic *tucupi* broth (pH 4.1) and *goma* (cassava starch with moisture 15%), both aquired at traditional market *Ver-O-Peso*, in Belém – Brazil, basics *tacaca (*without *jambu* and dry shrimp) were prepared (w/w); *tucupi* (50.0 %), *goma* (5.0, 7.0 and 10.0 %), salt (1.2%) and water (*qsp* to 500g) were used. The starch was pregelatinized in water, the other ingredients were added and mixed; the broth was heated to boiling with constant stirring.

Information in the technical-scientific literature regarding the *tucupi* preparation and analysis are scarce; therefore, the aim of the work was to evaluate the viscous and viscoelastic behavior of different basics tacaca by rheometry and to verify what *goma* concentration makes it possible to obtain *tacaca* with behaviour of true gel.

2. METHODOLOGY

Using a basic *tucupi* broth (pH 4.1) and *goma* (cassava starch with moisture 15% w/w), both aquired at traditional market *Ver-O-Peso*, in Belém – Brazil, basics *tacaca (*without *jambu* and dry shrimp) were prepared (w/w); *tucupi* (50.0% w/w), *goma* (5.0, 7.0 and 10.0 % w/w), salt (1.2%w/w) and water (*qsp* to 500g) were used. The starch was pregelatinized in water, the other ingredients were added and mixed; the broth was heated to boiling with constant stirring

Rheometric analysis of the *tacaca* samples in a rheomether using cone-plate geometry (sensor C35/1º) were performed. Viscosities at 25 and 50ºC of all samples were measured using shear rate from 1 to 200 s^{-1} during 300 s; the viscoelasticities of samples were measured only at 25 ºC, in the frequency from 1 to 10 Hz.

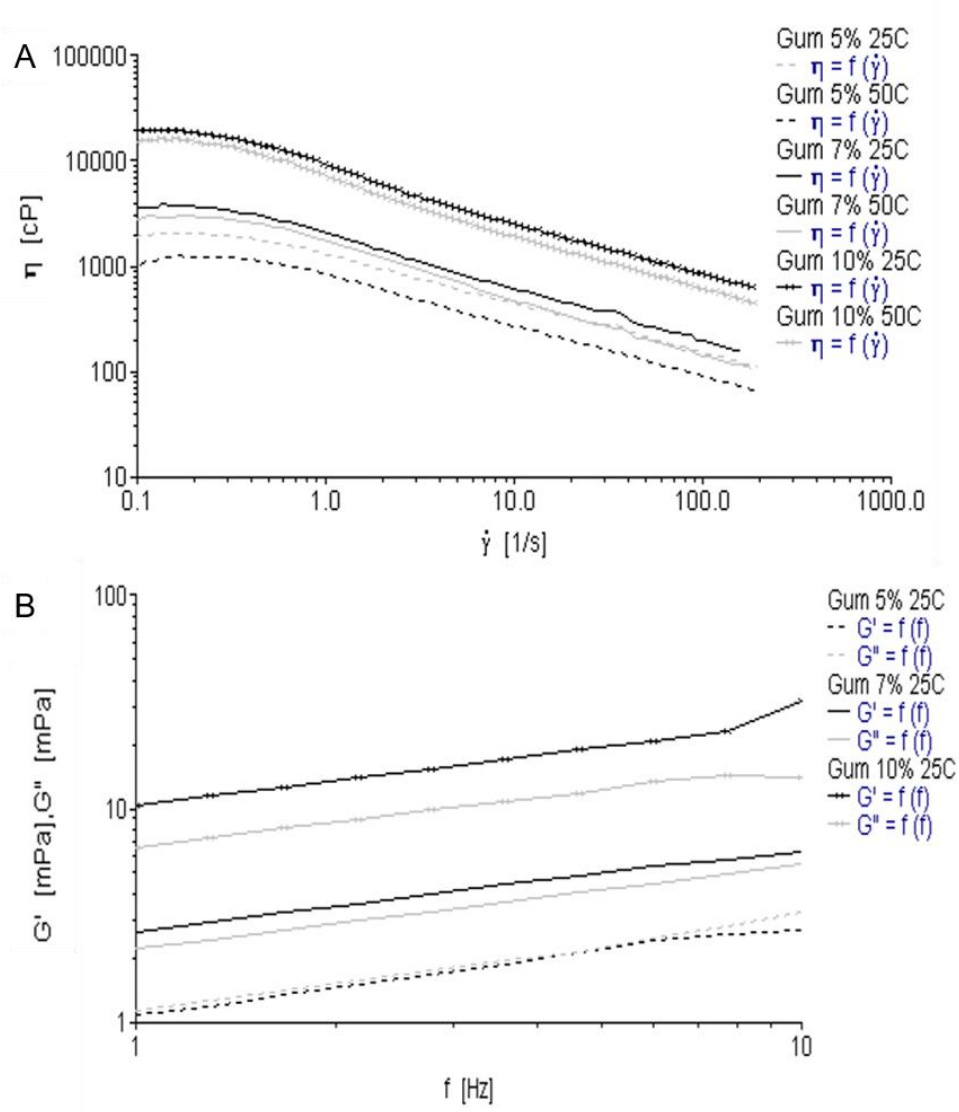
3. RESULTS AND DISCUSSION

All sample had pseudoplastic behaviour. As expected, viscosity was directly related to starch concentration and inversely related to the temperature. The *tacaca* with 7 and 10% of starch, specially the one formulated with10%, were more viscous and formed strong gels. The tucupi with 5% of starch did not have structure of true gel once the viscous component (G´) was lower than the elastic component (G´´).

As the starch is a viscosifier and gelling agent thermo-reversible, at 50ºC the samples dis not presented structure of gel, so they were not analysed about viscoelasticity.

The Figure 2 shows the behaviour regarding the viscosity and viscoelasticity of basic *tacaca* broth prepared.

Figure 2- Viscosities (A) at 25 and 50 ºC and viscoelasticity (B) at 25ºC of basics *tacaca* formulated with different *goma* concentration (moist cassava starch).



4. CONCLUSION

In accordance to formulations of basics *tacacas* developed and analysed, using *goma* with 15% (w/w) of humidity, concentrations from 7% to 10% are sufficient and adequate to obtain a broth with behaviour of a true gel.

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