revista online de extensão e cultura
REALIZAÇÃO

DOI 10.30612/re-ufgd.v7i14.12393

JAMS PRODUCED BY FAMILY AGRIBUSINESS: DIVERSIFICATION STRATEGIES TO IMPROVE PROCESS

GELEIAS PRODUZIDAS POR AGROINDÚSTRIA FAMILIAR: ESTRATÉGIAS DE DIVERSIFICAÇÃO PARA MELHORIA DO PROCESSO

Grace Kelly Mizuno Flozino[1]
Thales Henrique Barreto Ferreira[1]
Otavio Maticoli Ferreira[1]
Hélio Cavalcanti Albuquerque Neto [2]
Eliana Janet Sanjinez Argandoña[1]

Recebido em 21/06/2020 Aceito em 05/08/2020

Abstract: The production of sweets and jams with products native to the region prepared by the family agribusiness values regional fruits by stimulating their consumption. In addition, it is a good alternative to increase sales mainly by European consumers and those looking for products with lower energy value. In this context, the objective of this action was to contribute to the supply of jams with reduced energy value, allowing to increase the contributions of family farming in the socioeconomic scenario of its operations. For this, Dona Izaltina'sjam (GdI) was analyzed for water, moisture, soluble solids, acidity and pH activity. To offer a less sweet jam, the product was made with guavira pulp, sucrose, glucose and citrus pectin. Simultaneously, a sensory evaluation was carried out with trained judges, in order to provide subsidies for the sensory improvement of jam. The results obtained showed that the GdI, presented higher water content, darker color and more fluid texture than the jam produced in the laboratory (GrVE). In the sensory evaluation, the GrVEjam was more accepted in all parameters evaluated in relation to GdI. Thus, it is concluded that the formulation of the product with less sugar content and less sweet taste was accepted, the partial substitution of sucrose for glucose did not change the quality of the jam. Therefore, in addition to serving the European consumer, it is possible to expand the market to consumers who appreciate peculiar flavors and aromas of native fruits and who seek less caloric foods, but do not give up the consumption of traditional foods.

Keywords: Sweets, family production, reduction of energy value; *campomanesia* spp.

Resumo: A produção de doces e geleias com produtos nativos da região elaborados pela agroindústria familiar valoriza os frutos regionais estimulando seu consumo. Ademais, é uma boa alternativa para aumentar as vendas principalmente por consumidores europeus e por aqueles que procuram produtos com menor valor energético. Nesse contexto, o objetivo da presente ação consistiu em contribuir com o fornecimento de geleias com reduzido valor energético, permitindo incrementar as contribuições da agricultura

1 Universidade Federal da Grande Dourados (UFGD), Faculdade de Engenharia (FAEN).
2 Universidade Federal do Piauí (UFPI), Teresina.

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

familiar no cenário socioeconômico de sua atuação. Para isto, a geleia de Dona Izaltina (GdI) foi analisada quanto a atividade de água, umidade, sólidos solúveis, acidez e pH. Para propor uma geleia menos doce, foi elaborado o produto com polpa de guavira, sacarose, glicose e pectina cítrica. Simultaneamente, realizou-se uma avaliação sensorial com julgadores treinados, com o intuito de fornecer subsídios para melhoria sensorial da geleia. Os resultados obtidos mostraram que a geleia da agroindústria (GdI), apresentou maior conteúdo de água, cor mais escura e textura mais fluida que a geleia produzida em laboratório (GrVE). Na avaliação sensorial, a geleia GrVE, teve maior aceitação em todos os parâmetros avaliados em relação à GdI. Dessa forma, conclui-se que a formulação do produto com menor conteúdo de açúcares e gosto menos doce foi aceito, a substituição parcial da sacarose pela glicose não alterou a qualidade da geleia. Portanto, além de atender ao consumidor europeu, é possível ampliar o mercado para consumidores que apreciam sabores e aromas peculiares de frutos nativos e que procuram alimentos menos calóricos, porém não abrem mão do consumo de alimentos tradicionais.

Palavras-chave: doces, produção familiar, redução de valor energético, *campomanesia* sp.

INTRODUCTION

In recent years, transformations in agribusiness have been intense, especially in matters that involve the environment, technological increases and greater added value to products aimed at domestic and foreign markets (GAZOLLA and PELEGRINI, 2011). In family farming, adding value is a necessity.

Family agribusiness begins as an experimental practice based on the historical knowledge of farmers, who are improving their ways of making and producing, adjusting and culminating with the family agribusiness. However, in order to remain in the market, it is necessary to diversify production in order to generate novelties that add greater value, which occurs through the processes of transforming in natura into food products.

Diversification in family production can be an alternative for farmers to increase their incomes and improve the quality of life in the countryside, avoiding dependence on just a single market, such as the sale of fresh food(BARBOSA et al., 2016). The production of sweets and jams with products native to the region and grown by farmers is a good alternative to increase sales, as in addition to the artisanal value and the appreciation of regional fruits can stimulate consumption.

Some farmers to gain market have been applying various types of new sociotechnical configurations, which were understood from the notion of producing novelties. According to GAZOLLA and PELEGRINI(2011), the production of novelties

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

developed by farmers is construction and access to new markets. The creation and development of new products and/or production processes and the presentation of some products and foods, such as preserving cucumbers, adding decorations and jam, adding pieces of fruit, are ways of associating the perception of be a “natural” product. Regarding the development of new products, GAZOLLA and PELEGRINI (2011) also reported the example of the peanut “paçoquinha”, which arose due to requests from elderly people and children, who were unable to consume traditional rapadura because of its hard consistency. On the other hand, they indicated changes in the appearance of the product with a new design, such as fruits and preserves with the design of animals or people, as a marketing strategy, to draw the consumer's attention. Also highlighting ecological or natural products, such as fruit jams, paste sweets, preserves made without chemical additives and from raw materials produced agroecologically.

In this context, the family agribusiness “Dona Izaltina homemade sweets” produces jams and sweets in mass that are marketed in the city of Bonito, MS. The venture was the result of one of the actions of the Non-Governmental Organization (NGO) FundaçãoNeotrópica do Brasil, which stimulated the small rural producer, showing alternatives, based on fruits produced in the home orchard, adding value and complementing family income. Dona Izaltina was one of the people trained by the NGO project and is proud to provide all people who visit Bonito with their homemade jams and jams made with fruits harvested from their own backyard, totally organic and without the addition of preservatives(ALVES, 2019).Currently, Mrs. Izaltina obtains part of her livelihood from the sweets she produces based on native and commercialized fruits that are widely accepted by the consumer market.

Despite the great acceptability of Dona Izaltina'sjams and sweets, foreign visitors, mainly Europeans, are attracted by sweets mainly due to the peculiar aroma and flavor of native fruits but are limited in the consumption and purchase of these products due to the very sweet taste.Therefore, from the productive and economic point of view, the adequacy of the sweetness of the jams can favor to have more profitable products, which is reflected in greater gains for the families involved in the activity. In this context, there was a need to intervene in actions aimed at serving this rural enterprise with the purpose of providing them with technical support to improve their productivity. Through university extension actions, it is possible to meet this demand.

According to Carvalho et al. (2017), the university extension corresponds to the model of academic activity capable of giving a new direction to the Brazilian university

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

and contributing significantly to the change of society. Such model provided for by the National University Extension Plan recommends activities that will:

> "(...) in addition to his traditional understanding of knowledge dissemination (courses, conferences, seminars), service provision (assistance and consultancy) and cultural diffusion (holding artistic and cultural events or products) - he already pointed to a conception of a university in which the relationship with the population came to be seen as the necessary oxygenation for academic life. Within these guidelines, the production of knowledge, via extension, would take place in the exchange of systematic, academic and popular knowledge, with the consequence of the democratization of knowledge, the effective participation of the community in the performance of the university and a production resulting from the confrontation with reality." (Brasil, 2000 – 2001, p.2).

The difficulties still experienced by the family agribusiness in the Brazilian rural environment reaffirm the importance of extension, stimulating the debate around technical assistance policies both in universities, as well as in public, private and NGOs. In this perspective, it is part of the principles of rural extension a series of informal activities, developed by research centers aimed at transforming the productive-economic and social system of rural areas. In these terms, it is clear that the lack of studies on rural extension in traditional communities in the central-western region of the country, especially in the state of Mato Grosso do Sul, may be one of the factors that contributes to the difficulties in social, economic development and productive of these communities with greater expression. One of the factors that may be linked to this is the lack of accessibility of these communities or family enterprises to such knowledge, as well as the absence of public policies that make the extensionist's actions viable.

In view of the current scenario of family agroindustry that live on the basis of family farming, there is a need for intervention of actions aimed at serving these communities with the purpose of providing them with technical support to improve their productivity and quality of life. With this purpose, the Food Engineering course favors interdisciplinary articulations by contemplating, in the curriculum, different disciplines that contribute to the training of engineers with technical and humanistic skills in an integration of skills, scenarios and contexts that add to the current demands of the Curricular Guidelines National Engineering Graduation course(BRASIL, 2019).

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

Thus, the action aimed to contribute to the supply of jams with reduced energy value, adapted to the European palate, aiming to expand the information and contributions of family farming within the socioeconomic context. In parallel, we sought to analyze the conditions of production and processing of the manufacturing process of sweets and jams by family farming, in order to diagnose the main problems faced to carry out the activity on site.

METHODOLOGY

The present study was carried out at the Research Laboratory for Products and Agroindustrial Processes of the Cerrado (LabGeppac/LPACA/UFGD) of the Federal University of Grande Dourados, in the city of Dourados, MS. The extension actions were directed at the family agribusiness "Dona IzaltinaDocesCaseiros", located in Bonito, MS. The family agroindustry is composed of Dona Izaltina, SeuDioniso (family patriarch), children and grandchildren, with each child having their respective families who live in the city of Bonito (MS) and each family base performs its activities independently of the others, performing the marketing of products.

The nature of the actions was of the type applied with action research procedures that contemplate a vulnerable population segment of society (women farmers) while meeting the Sustainable Development Goals (SDGs), regarding the theme "Decent work and economic growth"(UFGD, 2018). The study was carried out by an empirical quantitative descriptive analysis allowing the characterization of the research problem in relation to the technical aspects of canned candy processing. Fieldwork for data collection was carried out from February to July 2019.

To obtain the data, interviews were conducted with the use of a tape recorder together with the individuals of the family, whose purpose was to reliably report the difficulties they faced in their day-to-day activities regarding the obstacles to the development of family farming in the country. field. The family agribusiness supplied the processed sweets for the study of product quality.

MATERIAL

Guavirajam (GdI) was supplied by the family agribusiness "Dona Izaltina homemade sweets", located at the Santa Lucia settlement farm in the city of Bonito, MS. GdI samples were transported in thermal boxes to LabGeppac, to determine the

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

quality of the product from the analysis of water activity, moisture content, soluble solids, acidity, pH, energy value and sensory acceptance.

To produce the product with reduced energy value, guavira fruits were purchased in the city of Ponta Porã / MS, as they are closer to the university, but they were of the same species (*Campomanesia adamantium*) as those grown in the Santa Lucia Settlement in the municipality of Bonito / MS. The fruits were selected for their physical integrity and degree of ripeness (ripe), washed with running drinking water and sanitized for 15 minutes in sodium dichloroisocyanurate solution (*Sumaveg, Diversey Lever*) with a concentration of 0.66% to be sanitized. Then, the fruits were immersed in hot water (85ºC) for 15 minutes to prevent the pulp from darkening (enzymatic inactivation) and soften the fruit, facilitating the extraction of the pulp.

Citric pectin, glucose and commercial sucrose were purchased from the local market in the municipality of Dourados / MS. Glass jars and metal lids were previously sterilized in boiling water, in order to avoid microbiological contamination and depreciation of the final product.

Jam making

Figure 1 shows the flowchart of the stages of jamprocessing with reduced energy value (GrVE). The guavira fruits, after being selected and sanitized, were subjected to heat treatment and immersed in hot water (85°C) for 15 minutes and then manually pulped, separating the pulp from the skin and seeds.

The jammaking process started with weighing the ingredients: 1000 g of guavira pulp (77%), 240 g of sucrose (18%) and 85 g of glucose (5%). After that, these ingredients were placed in an open stainless-steel pan and subjected to cooking under continuous stirring, until the total content of soluble solids, measured in a digital refractometer, reached 60° Brix (BRASIL, 1978). Soon the pH of the mixture was verified (3.2), which meets the ideal pH range for gel formation (3.0 to 3.3). As there was no need to correct the pH, the commercial citrus pectin mixture was then incorporated in the proportion of 0.5% in relation to the amount of pulp added. The pectin was previously diluted in pulp with sucrose (1 part of pectin to 5 parts of sucrose diluted in 100mL of pulp), and the glucose was also previously diluted in 180 ml of pulp (1 part of glucose to 3 parts of pulp). Once these ingredients were added, cooking was carried out until the mixture reached 62º Brix. Then, it was removed from the fire and the jamwas filled in transparent 250 ml pots, previously sterilized in boiling water. The

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

packaged jars of jams were then cooled to room temperature (25ºC) and stored under refrigeration (5ºC), until physical, chemical and sensory analyzes were performed (Figure 1).

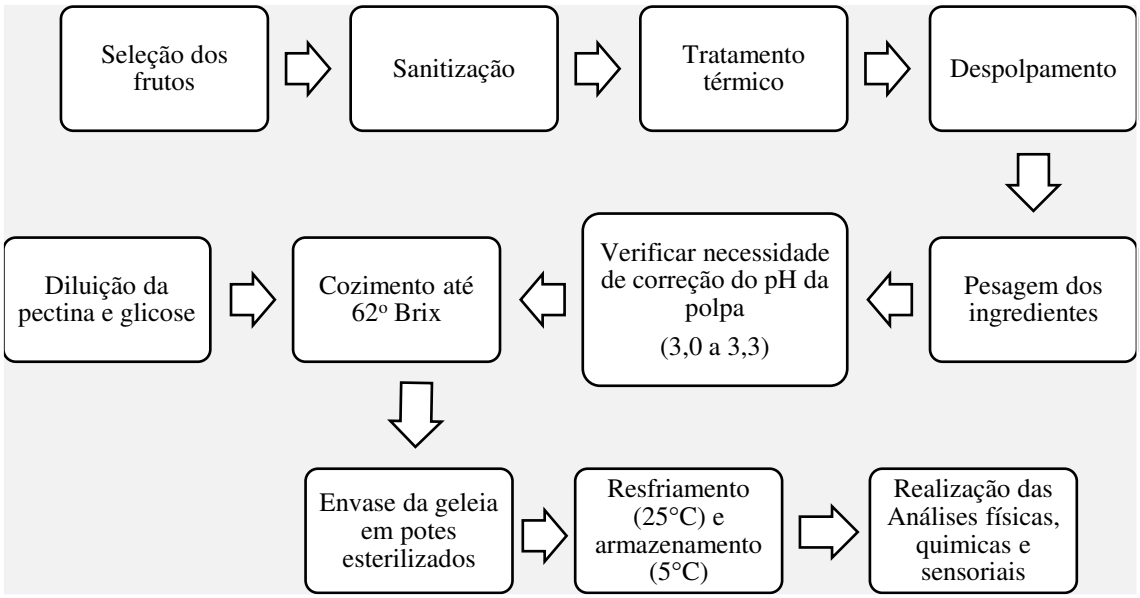

Figure 1. Flowchart of guavirajamprocessing with reduced energy value(GrVE)

Quality assessment

Quality evaluation was performed on both Dona Izaltinaguavirajams homemade sweets (GdI) and guavirajamwith reduced energy value (GRVE) determining the activity of water, moisture content, soluble solids, acidity, pH and the energetic value.

Water activity

Water activity (Aa) was performed by direct reading using a digital hygrometer (*Aqualab, Decagon Devices Inc., EUA)*, previously calibrated with standard solutions of water (Aa = 1,000) and sodium chloride (Aa = 0,775).

Moisture content

The moisture contentwas determined by the loss of water during the drying of the sample, using Equation 1. A 3 g aliquot of jamsample was weighed in a previously tared crucible and placed in an oven with air circulation at 70ºC until constant weight was obtained.

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

$$Moisturecontent\left(\frac{gdewater}{100gdesample}\right) = \frac{M_{am} - M_f}{M_{am}}$$ Equation 1

Where$M_{am}$is the mass of the sample (g) and$M_f$is the final sample after drying and obtaining constant weight.

Soluble solids

The levels of total soluble solids were determined by direct reading of the sample. A bench refractometer (*Abbe, UK*) was used, with temperature control. The results were expressed in °Brix (AOAC, 1995).

Tritratable acidity

The determination of total titratable acidity, expressed in g of citric acid/100g of sample, was carried out by titration with 0.1 N NaOH, titrating in 10 g of homogenized sample with 100 ml of distilled water and adding a few drops of phenolphthalein solution to facilitate viewing the turning point (AOAC, 1995).

$$\frac{gdecitricacid}{100gdesample} = \frac{VNaOH \times NNaOH \times fac \times 100}{M_{am} \times 1000}$$ Equation 2

Where$V$ is the spent volume of NaOH (mL), $N$is the normality of the NaOH solution (0,1), $f_{ac}$is the citric acid factor (64) and$M_{am}$is the mass of the sample (g) used.

pH

To measure the pH, 20 g of the sample were used, which were homogenized together with 100 mL of distilled water, then the measurement was made in direct reading in a digital pot (*LABMETER® model*pHS, 3B).

Energetic value

The energy value of the jams was estimated using the Atwater conversion factors: 4 kcal/g for carbohydrates and proteins and 9 kcal/g for lipids, according to Resolution No. 360 of December 23, 2003 (ANVISA, 2003) and presented in kcal/100g of sample.

Instrumental color analysis

The instrumental color of the jams was determined in a colorimeter (Konica Minolta model CR-400) calibrated in the CIELAB L * color system 10º viewing angle.

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

Analyzing the parameters L * which represents the brightness or luminosity and varies from 0 to 100, 0 being attributed to black and 100 to white; a * which varies from green (-60) to red (+60) and b *, which varies from blue (-60) to yellow (+60). The readings were performed with six repetitions.

Sensory analysis

The sensorial acceptability of the product was carried out in individual environments with ten trained female and male judges with a habit of consuming sweets and jams. The judges received two samples of jam served in disposable cups encoded with random three-digit numbers, standardized and served simultaneously on a white tray, accompanied by a glass of water and the sensory evaluation form (Figure 2).

According to Figure 2, the judges were instructed to taste the samples from left to right and to make use of the water between tasting and the other, to remove the residual flavor. They were asked to evaluate the color, texture, sweetness, aroma and global acceptance through the acceptance test, assigning grades to the attributes on a hedonic scale structured with nine points, which varies from 1 (I really liked it) to 9 (I really liked it).

Statistical analysis

For the statistical treatment of the data, analysis of variance (ANOVA) and the Tukey means test with a safety level of 95% were used.

Name:_____ Age:____ Sex: ( ) Male ( ) Female Date:_____
You are receiving two samples of guavira jam. Please rate the samples and indicate how much you liked or disliked the attributes COLOR, TEXTURE, SWEETNESS, AROMA AND GLOBAL ACCEPTANCE by assigning scores from the scale below.

	SampleNº
9 like extremely	Color
8 like very much	Texture
7 like moderately	Sweetness
6 like slightly	Aroma
5like/dislike	
4 dislike slightly	
3 dislike moderately	
2 dislike very much	Global acceptance
1 dislike extremely	

Comments: Leave your comments to improve the product_____
_____

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

Figure 2. Card used in the sensory analysis of guavirajam.

RESULTS AND DISCUSSION

The action, initially diagnosed by means of on-site observation (in the settlement), the agro-industrial facilities, equipment, utensils, packaging and the stages of jamprocessing. It was observed that the agribusiness meets the hygienic-sanitary standards that include conformities in the production system and in the facilities, although it is located within the family farm. The family agroindustry has a specific health assessment certificate, as determined by Resolution-RDC N ° 49, of October 31, 2013 from the national health surveillance agency (BRASIL, 2013).

With regard to the processing of sweets, the observations collected from the testimony of the owner of the family agroindustry, it was found to be effective in the preparation of mass sweets, however for jams, depending on the type of fruit, the jamcould have less or greater firmness. The firmness of the gel is influenced by the presence of pectin in the fruit and not all fruits have enough pectin to favor the formation of the gel, which is an important parameter in the jam.

Thus, the aim was to elaborate the standardization of guavirajamfrom the addition of pectin and to propose a sensorially less sweet formulation, to meet the sensory requirements of the European consumer. Photo 1 shows the cooking process of guavirajam.



Photo1. Cooking process of guavirajam

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

The GrVEjampresented a firmer gel, due to the addition of pectin and to the control of the sugar concentration during cooking and to the pH verification using a refractometer and pH meter. The quality characteristics of jams from the family agroindustry (GdI) and those produced in the laboratory (GrVE), consisting of water, moisture content, soluble solids, acidity and pH activity are shown in Table 1.

When checking Table 1, it must first be clarified which water activity determines the lowest water limit available for microbial growth. By measuring water activity, it is possible to predict which microorganisms will be potential sources of deterioration. Most bacteria responsible for food deterioration grow in water activity greater than 0.91, while deteriorating fungi are able to grow at Aw values of 0.8. Despite this, some bacteria are able to adapt, so the deterioration of mass sweets and jams occurs mainly by coliforms and staphylococci (bacteria) and molds and yeasts (fungi) (BRASIL et al, 2016). Therefore, it can be said that in the water activity of GdI and GrVEjams (0.884 and 0.860, respectively) such microorganisms (Coliforms, staphylococci, molds and yeasts) can proliferate.

However, as the production of jamis carried out under heating, contamination can be avoided by following safety measures, such as maintaining the hygiene of the place, sanitizing the fruits and using sterile packaging. According to Brasil et. al (2016), in most cases, microorganisms only contaminate the product if they come into contact with the food when exposed to the inappropriate preparation site and without adopting hygienic techniques.

Table 1. Physical and chemical properties of guavira pulp jamproduced by family agribusiness and prepared in the laboratory.

Properties	**Guavirajam**	
	Agribusiness	**Prepared**
Wateractivity (adm)	0,884 ± 0,001	0,860 ± 0,002
Moisturecontent (g/100g)	47,98 ± 0,59	30,80 ± 1,98
Solublesolids (%)	49,0 ± 0,5	66,23 ± 0,25
Titratable acidity ($g_{citric\ acid}$ /100g)	0,64 ± 0,01	0,58±0,03

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

pH (adm)	4,12 ± 0,025	3,07 ± 0,03
Energeticvalue (kcal/100g)	122,00	84,05

Water activity (Aw) is a qualitative measure and moisture contentis a quantitative measure, that is, Aa refers to the water available in the food in free form, and the moisture contentindicates the amount of water present in the product is available or linked constituents of food such as carbohydrates, proteins, fibers and others.

The moisture content of the GdIjam(47.98g of water / 100g of jam) was higher than that of the GrVEjam(30.80g of water / 100g of jam), which means greater water retention in the product. This result corroborates with the water activity which was also higher (0.884) than that of the GrVEjam(0.860). Knowledge of water activity and moisture content are critical factors in determining the useful life of the food. Concomitantly with the moisture contentof the jams, the percentage of soluble solids was lower (49.0%) in the jam of the agribusiness that had the highest water content (47.98g / 100g).

Soluble solids are solid substances that dissolve in water, such as sodium chloride (table salt), sugars and some acids such as citric and ascorbic acid. In bulk sweets and jams, soluble solids are generally attributed to the sugars present in the product, in this perspective, the GrVEjam suggests being sweeter since it has 66.23% soluble solids, however, the perception of sweet taste reported by judges, in the sensorial analysis, was smaller than the jam produced by the family agroindustry (GdI). This sensory perception can be attributed to the addition of glucose. Glucose contributes to the increase in soluble solids, but has less sweetness. Therefore, it is possible to obtain a less sweet product, but with soluble solids suitable for the formation of the gel.

According to Bragante (2009), the gelling process, using pectin, occurs with soluble solids content above 55% and pH from 2.0 to 3.5. The acidic pH causes the protonation of the carboxylic groups, decreases the electrostatic repulsion between the chains and increases the formation of hydrogen bonds. The addition of a soluble solid (such as sucrose) reduces water activity, which decreases the availability of free water.

Thus, gel formation was more effective in jamformulated in the laboratory, due to the control of pH and soluble solids content, since the pH and the optimum soluble solids content for the formation of jamare 3.0 to 3, 2 and 65%, respectively.

Given these findings, to meet the demand of the European public it is suggested to partially replace sugar with glucose and incorporate citrus pectin to standardize the

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

texture of the jam. To maintain the quality standard, it is suggested to carry out the control of pH and soluble solids, during the preparation of the jam. After the jamhad cooled, the final Brix had 65º Brix, even though the cooking stopped at 62º Brix, since during the filling stage there was release of water vapor causing the concentration of soluble jamsolids.

In addition to these factors, according to Normative Resolution No. 15/78 (BRASIL, 2001), the essential factors of quality are the color, flavor and aroma that must be characteristic of the fruit used. Consistency is another important factor, and the jam should be semi-solid, relatively viscous, with characteristics of soft gel and absence of defects. As verified by the analyzes carried out, to maintain the standardization of the product it will be necessary to invest in some portable devices that will assist in the verification of some quality parameters, such as the pH meter and the refractometer, whose investment may be less than five hundred reais (R$500,00), this investment may be recovered by the increase in sales.

When buying the product, the customer expects to taste the same flavor every time. Thus, if the result of the analysis is as expected, the product will be standardized, better adapting to the customer's expectations. Photo 2 shows the agro-industry jams (a) and the one formulated and prepared in the laboratory (b), as well as the jam samples distributed in trays for sensory analysis (c).

The color of the product was analyzed by physical measurement using a colorimeter, and by sensory analysis. The values obtained in the jams showed that the GdIjam was darker (L * = 18.98 ± 2.83) than the GrVEjam (L * = 25.35 ± 0.21), as can be seen in Photo 2a and 2b. This difference can be attributed to the addition of glucose, which gives a brighter appearance, in addition to reducing the sweetness content. The lighter color can also be attributed to the previous inactivation of enzymes during the immersion of the fruit in hot water prior to the pulping stage. In the process of making the jam, the order in which the ingredients were incorporated can also influence the color, since sugar caramelization reactions can occur, due to the heat and cooking time, especially if all the sugar was incorporated at the beginning of the process.

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil



(a) (b) (c)

Photo2. Family agribusiness jam- GdI(a), Laboratory made jam - GrVE(b), jam samples for sensory evaluation (c).

The acceptability of the products was verified by sensory analysis, providing both samples to the judge in a tray (Photo 2c). Therefore, Figure 3 shows the results found.

Through Figure 3, the majority of judges, potential consumers of jam, assigned an average score of 6 (I didn't like it) for most of the attributes analyzed in the GdIjam, highlighting the texture as the attribute to be improved (lowest score 5, 9). For jam formulated with the addition of glucose, the grades vary between 7 (I liked it moderately) and 8 (I liked it a lot), drawing attention to the color of the product (8.6), which corroborates with the color analysis, where the GrVEjam showed greater brightness and clarity.

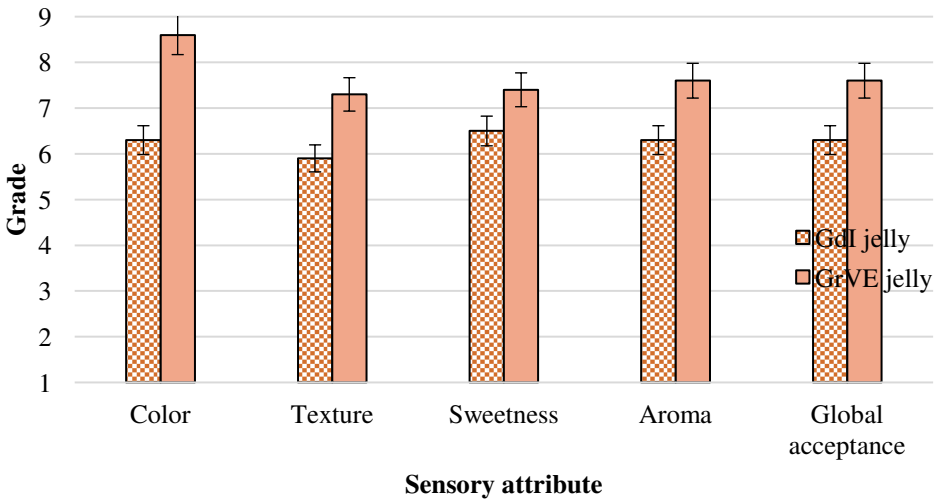

Figure3. Acceptability-preference notes for the attributes color, texture, sweetness, aroma and global acceptance of guavirajam produced in the family agroindustry (GdI) and elaborated in the laboratory (GrVE).

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

The acceptability results may have been influenced by the preference between the two samples, since they were served at the same time. On the other hand, these results indicate that, although the Brazilian consumer has a preference for sweeter taste, the results showed that there was no statistically significant difference ($p > 0.05$) which represents that the product formulated with glucose was accepted.

Therefore, in addition to serving the European consumer, it is possible to expand the market to consumers who appreciate peculiar flavors and aromas of native fruits and who seek less caloric foods, but do not give up the consumption of traditional foods.

FINAL CONSIDERATIONS

The results showed that it is possible to decrease the sweet taste, without compromising the quality of the jam and maintaining the peculiar flavor of guavira. The adjustments do not make the production of the family agroindustry more expensive, however, technical control is necessary to maintain a standard product. The transfer of technological knowledge, in this case, can result in products with better insertion in the market, reflecting in the increase of sales and profit. In addition, products with peculiar tastes and flavors may favor the permanence of plant species from the regional biodiversity.

The dialogue of academic knowledge with demands of the Specific Sustainable Development Goals (SDGs) in the action carried out for an agroindustrial unit, allowed the development of skills of both students and teachers, in the social mission of the university institution, concluding that the extension, in the curricula, it is configured as an opportunity for training, enabling practices and reconciling knowledge and theories appropriate to local contexts, bringing us closer to the real needs of society.

ACKNOWLEDGMENT

The authors are grateful to the project The Latin American University at the heart of the challenges of sustainable social and technical innovations in territorial food systems - INOVIA for the financial support to carry out the action and to PROEX/UFGD for the scholarship granted.

REFERENCES

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

ALVES, R.P. **Dona Izaltina Doces Caseiros** - Made in Bonito. Santa Lúcia Settlement - Chácara Boa Vista. Bonito / MS. 2019. Flyer.

AOAC. Association OfOficial Analytical Chemistral. Official methods of analysis of the association of official analytical chemistry. 16th ed, AOAC, Arlington, 1995.

BARBOSA, P. J. F.; CASAROTTO, E. L.; MACHADO, R. R.; ALMEIDA, V. L.; VITORINO FILHO; V. A. The importance of agricultural diversification as a complement to family income in the Manhuaçu region – MG. **Magazine CCEI – URCAMP**, v. 20, n. 35, p. 1-11, 2016.

BRAGANTE, A.G. Gelling process in food. E-disciplines, USP, São Paulo / SP. Available in: <https://edisciplinas.usp.br/pluginfile.php/3275062/mod_resource/content/1/Bragante2009%20Processo%20de%20Gelifica%C3%A7%C3%A3o%20em%20Alimentos.pdf>. Access in: 04 de jun 2020.

BRASIL, C. A.; VALIATTI, T. B.; FONTES, R. M. S.; GÓIS, R. V. Microbiological evaluation of homemade jams sold on the banks of BR 364 in the state of Rondônia C&D. **Eletronic Magazine ofFainor**, Vitória da Conquista, v.9, n.2, p.194-202, 2016.

BRASIL. CNE / CES Resolution no. 2, April 24, 2019. National Curricular Guidelines for the Undergraduate Engineering course - ABMES, Brasília, DF, April 2019. Available at:https://abmes.org.br/arquivos/legislacoes/Resolucao-CNE-CES-002-2019-04-24.pdf. Access in: 10 de dez. 2019.

BRASIL. CTA Normative Resolution No. 15/78. Compendium of Food Law, ABIA 2001.

BRASIL. Resolution-Rdc No. 49, Of October 31, 2013. Productive Inclusion With Health Security. Resolution Rdc 49/2013, Available at:http://bvsms.saude.gov.br/bvs/saudelegis/anvisa/2013/rdc0049_31_10_2013.html.Access in: 12 de jul. 2019.

2020 | Volume 7 | Nº 14
ISSN: 2358-3401

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil

CARVALHO, M. E. A. Rio and the School: an experience of university extension and environmental education. **Chemistry and Society**. v. 39, n. 2, p.112-119, 2017.

GAZOLLA, M.; PELEGRINI, G. Family experiences of agroindustrialization: a strategy for the production of novelties and added value. **EssayFEE,** Porto Alegre, v. 32, n. 2, p. 361-388, 2011

UFGD. Pró-Reitoria de Extensão. Edital PROEX/PIBEX n. 39 de 10 de jul de 2018. Extension actions with burden from the Federal University of Grande Dourados Foundation. Available in: http://portal.ufgd.edu.br/pro-reitoria/proex/documentos-baixar.Access in: jul de 2019.

Esta obra está licenciada com uma Licença Creative Commons Atribuição-NãoComercial-CompartilhaIgual 3.0 Brasil