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Sensory analysis of jellies made with pineapple (Ananas comosus) and aloe (Aloe barbadensis Miller) suitable for people with noncommunicable diseases.

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ABSTRACT
Fruits are used as indicators for healthy nourishment due they are an excellent source of energy, vitamins, minerals, and fiber as well as protection factors of the human body against oxidative damage due your antioxidant activity Studies showed that consumption of pineapple (Ananas comosus) and aloe (Aloe barbadensis Miller) are associated with a remarkable reduction of oxidative stress and may help in preventing chronic pathologies. The aim of the present investigation was to elaborate a jelly with pineapple and aloe with a non-caloric sweetener with good acceptance by consumers. Four different formulations of jelly alone and added with sugar, stevia and sucralose were elaborated and sensory was evaluated. The jelly elaborated with pineapple, aloe and sucralose had the highest acceptance ($p = 0.05$) by 50 untrained judges due mainly at your sweet flavor. The most important parameters in the choice of consumers were: consistency, palate consistency, pineapple flavor, sweet taste, pleasant taste and general taste.
Keywords – pineapple; aloe; jelly; sensory; quality

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I. INTRODUCTION

Fruits are parts of flowering plant derived from the fertilization of one or more ovaries, and are used as indicators for healthy nourishment [1] due are an excellent source of energy, vitamins, minerals, and fiber [2] as well as protection factors of the human body against oxidative damage due your antioxidant activity [1]. Pineapple (Ananas comosus L.) belongs to Bromeliaceae family which encompasses about 50 genera and 2000 species [1] and is a subtropical fruit native to Thailand, Philippines, China, India [3] and some countries of South America how Brazil and Paraguay [4], [5]. The worldwide total pineapple production is between 16 – 19 million tons [1]. The pineapple is considered the third most important tropical fruit produced in the world, after the banana and citric fruits, and Brazil is its third largest producer [6].

Pineapple (Ananas comosus L) contains considerable amount of water, carbohydrates, crude fiber, and different minerals how calcium and potassium [7]. Pineapple also contains polyphenolic compounds and vitamin C, which possesses antioxidant activity [1], suggesting a possible protective role in humans against cell damage [3]. Vitamin C also is required for the collagen synthesis in the body [1], [8], which is an essential protein to keep teeth, gums, bones, cartilage and skin healthy [8]. It helps in the absorption of iron that is ingested from plant foods. An adequate consumption of vitamin C is very important for the proper functioning of the immune system [3], [8].

Aloe barbadensis Miller commonly referred to as Aloe vera, is one of more than 400 species of Aloe belonging to family Liliaceae that originated in South Africa [9], [10] [11] and is cultivated in the dry regions of North America, Europe and Asia [12].Recently, only a few species of Aloe have been considered for commercial importance, of which Aloe vera is considered the most potent and, thereby, the most popular plant in the research field [11]. The leaves of Aloe vera consists mainly of water, and the residual dry mass of 2.6% is composed of approximately 73.4% carbohydrate fibers, 16.9% ashes, 6.9% proteins, and 2.9% lipids [13]. Additionally, it contains polyphenols [10], lignin, saponins, anthraquinones, glycoproteins, and enzymes [13]. Many secondary metabolites have anti-inflammatory functions, lipid lowering, antimicrobial [14] and antioxidant activities [10]. Aloe can be utilized as a valuable ingredient for food application due to these biological activities and functional properties [9],

[15]. The objective of the present work was to evaluate the sensory characteristics of four jellies of pineapple (Ananas comosus L) and Aloe (Aloe vera) with different sweeteners and its comparison.

II. MATERIAL AND METHODS

2.1 Manufacture of jellies made with pineapple and aloe

Pineapple (Ananas comosus) were purchased from a store and aloe (Aloe barbadensis Miller) was obtained from a nursery in the municipality of Piedras Negras, Coahuila, Mexico in September of 2019. Four jellies of pineapple with aloe were made. 500 g of pineapple were weighed, which were peeled and cut into pieces. They were boiled for 3 m in 1,125 L of purified water, and allowed to cool. Subsequently the leaves of the aloe plant were cut and allowed to drain for 15 m to remove the aloin and 35 g of gel were extracted. The pineapple pieces were placed in the blender together with the aloe gel, and were liquefied for 20 s at maximum speed and then strain the juice, this step was repeated again to remove most of the fiber. 34.72 g of grenetina were hydrated in 100 ml of purified water for 10 m. The sweetener was added: sugar, stevia or sucralose. Once the grenetina was hydrated it was added to the juice and we mixed until it dissolved completely. Finally, they were distributed in the molds and refrigerated until the gelatin solidified until obtain the appropriate consistency.

2.2 Nutritional analysis of jellies made with pineapple and aloe

A nutritional analysis of the samples was carried out in which total sugars, total fat, total protein, dietary fiber and humidity were determined using the AOAC 2005 [16] methodology. In addition, the percentages of some vitamins and minerals were determined through established nutritional tables of Mexican System of Food [17]

2.3 Analysis of the jellies

Sensory analysis of four jellies of Pineapple (Ananas comosus) with aloe (Aloe barbadensis Miller) was performed by un-trained panel composed of 50 panelists. The distribution in age was in range between 17-30 years old, and the distribution in female and male was 60 and 40% respectively. The evaluation was conducted in the Bromatology Laboratory of the School of Health Sciences, of the Autonomous University of Coahuila, Mexico. The conditions of the sensory room were 25 ° C of temperature and white light illumination. A hedonic scale was used from 1 to 7. Being 1 dislike very much and 7 like very much and 3 was the rejection point. The attributes of appearance, color pleasant, consistency, palate consistency, hardness, pleasant smell, pineapple flavor, sweet taste, pleasant taste and general taste were evaluated.

2.4 Experimental design

For the analysis of the nutritional analysis of jellies with pineapple and aloe, a multiple comparison test of Tukey HSD (p=0.5) was used. Sensory analysis data were analyzed using a Kruskhal-Wallis test. Duncan test was applied to compare sums of ranks and principal component analysis (p=0.05). Data analysis was carried out using Statgraphics Centurion XV software version 16.1.15

III. RESULTS AND DISCUSSION

3.1 Nutritional analysis of jellies made with pineapple and aloe

Four jellies of pineapple (Ananas comosus) with Aloe (Aloe barbadensis Miller) and sweetened with sugar, sucralosa and stevia (Stevia rebaudiana) were nutritionally evaluated. It was determined that for each 65 g of jelly of pineapple with aloe sweetened with sugar the product had energy value of 25.98 Cal, equivalent to 108.70 kJ, this energy was obtained of: 0.10 g of total fat, 5.08 g of carbohydrates and 0.28 g of protein and for each 65 g of jelly of pineapple with aloe with sucralose or without sweetener, the product has energy of 15.67 Cal, equivalent to 65.56 kJ, this energy was obtained of 0.10 g of total fat, 2.46 g of carbohydrates and 0.28 g of protein. Similar nutritional values are show by the product sweetened with stevia (Table 1). Resulting a product with low number of calories and sugars so it is also a product suitable for people with chronic diseases. It can be consumed as part of the breakfast or as a snack for those people who want without risk of increase your levels of sugar in blood.

Table 1. Nutritional facts of jellies of made with pineapple (Ananas comosus) and aloe (Aloe barbadensis Miller)

Nutritional facts	Pineapple aloe sugar	Pineapple aloe stevia	Pineapple aloe sucralose	Pineapple aloe natural
Energy	25.98 Cal /180.70 KJ	15.98 Cal /66.86 KJ	15.67 Cal /65.56 KJ	15.67 Cal /65.56 KJ
Protein (g)	0.28	0.28	0.28	0.28
Total carbohydrates (g)	6.34	3.79	5.52	3.72
Sugars (g)	5.08	2.53	2.46	2.46
Fiber (g)	0.96	0.96	0.96	0.96
Total Fat (g)	0.10	0.10	0.10	0.10
Vitamin A (µg RE)	0.48	0.48	0.48	0.48
Folic acid (mg)	2.58	2.58	2.58	2.58
Ascorbic acid (mg)	3.87	3.87	3.87	3.87
Iron (mg)	0.37	0.37	0.37	0.37
Potassium (mg)	28.21	28.21	28.21	28.21
Sodium (mg)	0.61	0.61	0.61	0.61
Calcium (g)	0.07	0.07	0.07	0.07
Magnesium (g)	0.05	0.05	0.05	0.05
Stevia (mg)		0.32		
Sucralose (mg)		1.16	1.80	

Table 2. Analysis of means by the Tukey test HSD p = 0.05 of sensory characteristics of four jellies of made with pineapple (Ananas comosus) and aloe (Aloe barbadensis Miller)

Sample	**Tukey analysis HSD 0.05**				
	Appearance	**Color pleasant**	**Consistency**	**Hardness**	**Pleasant smell**
Pineapple aloe natural	5.74^{ab}	5.50^{ab}	4.82^{b}	4.96^{b}	4.70^{c}
Pineapple aloe stevia	5.34^{b}	5.46^{ab}	5.24^{b}	5.00^{b}	4.72^{bc}
Pineapple aloe sugar	5.38^{b}	5.18^{b}	5.38^{ab}	5.42^{ab}	5.58^{a}
Pineapple aloe scralose	5.98^{a}	5.90^{a}	5.94^{a}	5.74^{a}	5.44^{ab}
Sample	**Tukey analysis HSD 0.05**				
	Palate consistency	**Pineapple flavor**	**Sweet taste**	**Pleasant taste**	**General taste**
Pineapple aloe natural	3.78^{c}	2.90^{d}	2.46^{d}	2.48^{d}	2.98^{d}
Pineapple aloe stevia	4.92^{b}	3.72^{c}	3.26^{c}	3.64^{c}	3.74^{c}
Pineapple aloe sugar	5.10^{b}	4.66^{b}	4.42^{b}	4.74^{b}	4.82^{b}
Pineapple aloe scralose	6.04^{a}	6.12^{a}	6.02^{a}	6.12^{a}	6.00^{a}

3.2 Sensory analysis of the jellies

In the sensory analysis it was found that pineapple jelly with aloe made using sucralose as a sweetener was the had highest acceptance (p = 0.05) by the untrained judges (Tables 2). This due to sucralose is a sweetener 500 to 700 times sweeter than sugar [17], [18] and several studies have shown that the preference for sweet taste is universal and is more evident in the people younger [19]. All judges in the sensory evaluation were young adults, and although the taste for sweet flavors begins to diminish during adolescence, this is still the preferred flavor for this age group and could have influenced the outcome of the choice of the elaborated gelatin with sucralose [20], [21], [22], [23. In the case of stevia, although this is 300 times sweeter than sugar, but it leaves a remnant taste that is not so attractive to judges.

The consistency of the palate was an important parameter in the selection of the judges because the consistency and texture are sensory properties of foods that have an important role in consumer appeal, purchasing decisions and final consumption. And is one of the most dominant attributes of consumer preference for food [24].

Table 3. Values of sensory analysis of four jellies of made with pineapple (Ananas comosus) and aloe (Aloe barbadensis Miller)

Number	Eigenvalue	Proportion	Proportion accumulated
1	5.2465	0.525	0.525
2	1.709	0.171	0.696
3	0.9601	0.096	0.792
4	0.6776	0.068	0.859
5	0.4497	0.045	0.904
6	0.3722	0.037	0.942
7	0.2267	0.023	0.964
8	0.1808	0.018	0.982
9	0.1114	0.011	0.993
10	0.0661	0.007	1.000

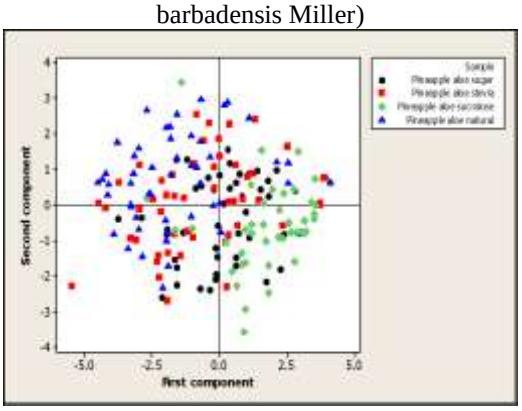
Principal component analysis (PC) for pineapple jelly (Ananas comosus) samples with aloe (Aloe vera) sweetened with sugar, sucralose and stevia (Stevia rebaudiana) shows that 79% of the variation is explained by the main components PC1, PC2 and PC3 (Table 3); The was PC1 influenced by the attributes of consistency, consistency on the palate, pineapple flavor, sweet taste, pleasant taste and general taste. The PC2 for the attributes of appearance, pleasant color and consistency and the PC3 for hardness (Table 4).

By plotting (Figure 1) the results of the first main component against the second, it is possible to clearly identify that the sample of jelly made with pineapple and aloe sweetened with sucralose was the one that presented the most pleasure to the judges, mainly influenced by the sweet taste. This is consistent with the means test of the general taste parameter.

Table 4. First three principal components of the sensory analysis of four jellies of made with pineapple (Ananas comosus) and aloe (Aloe barbadensis Miller)

Variable	PC1	PC2	PC3
Appearance	0.204	0.478	0.432
Color pleasant	0.217	0.427	0.507
Consistency	0.306	0.320	-0.426
Hardness	0.262	0.319	-0.589
Pleasant smell	0.236	0.267	-0.075
Palate consistency	0.342	-0.031	-0.008
Pineapple flavor	0.364	-0.297	0.049
Sweet taste	0.383	-0.278	0.091
Pleasant taste	0.386	-0.286	0.099
General taste	0.385	-0.257	0.041

Figure 1. Comparison of the first major component versus the second major component in sensory analysis of samples of four jellies of made with pineapple (Ananas comosus) and aloe (Aloe barbadensis Miller)



IV. CONCLUSION

The jelly of jelly made with pineapple and aloe sweetened with sucralose were the preferred by the judges (p = 0.05). The most important parameters in the choice of consumers were: consistency, palate consistency, pineapple flavor, sweet taste, pleasant taste and general taste. This was due to sucralose is a sweetener 500 to 700 times sweeter than sugar and most of judges in sensorial evaluation were young adults and some papers has described sweet taste preference among a young adult and this could be influenced the results of the test.

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