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*Scientific articles*

# Deshidratación osmótica del mamey (Pouteria sapota) así como la evaluación de sus propiedades nutrimentales y sensoriales

## *Osmotic dehydration of the mamey (Pouteria sapota) as well as the evaluation of its nutritional and sensory properties*

## *Desidratação osmótica do mamey (Pouteria sapota) bem como avaliação de suas propriedades nutricionais e sensoriais*

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## Resumen

El Mamey, es un fruto originario de México y del norte de América del Sur, este fruto tiene una cantidad adecuada de fibra, polifenoles y carotenos, por lo que estas características hacen que este alimento sea recomendado en caso de diarrea, anemia y desnutrición.

Al final se obtuvo una fruta deshidratada con apariencias distintas, de acuerdo al tiempo de secado utilizado, siendo las muestras sometidas a 60Brix 60ºC las de mayor aceptación visual, por mantener un color uniforme y no presentar un colapso en su estructura, por otra parte, en cuanto a los resultados del análisis químico proximal se obtuvo un descenso de agua de 75% en todas las muestras, comparándolas con las muestras de mamey en su forma natural, lo que indica mayor vida de anaquel. Se observó, que se concentró más la fibra, siendo más evidente en las muestras sometidas a 40ºBrix y 40ºC, alcanzando un 30%, en comparación a las otras muestras, lo que lo hace un alimento aún más funcional.

En cuanto a las propiedades sensoriales se pudo establecer que la DO, influyó de forma determinante en el agrado del sabor y aceptación del producto, mientras que la temperatura de secado con aire a 40ºC incide de forma desfavorable sobre la consistencia y aspecto final del producto.

**Palabras clave:** Deshidratación Osmótica, Grados Brix, Energéticamente denso.

## Abstract

The Mamey is a fruit native to Mexico and northern South America. This fruit has an adequate amount of fiber, polyphenols and carotenes, so these characteristics make this food recommended in cases of diarrhea, anemia and malnutrition.

In the end, a dehydrated fruit with different appearances was obtained, according to the drying time used, with the samples subjected to 60Brix 60ºC being the ones with the greatest visual acceptance, for maintaining a uniform color and not presenting a collapse in its structure, on the other hand, Regarding the results of the proximal chemical analysis, a 75% decrease in water was obtained in all the samples, comparing them with the mamey samples in their natural form, which indicates a longer shelf life. It was observed that the fiber was more concentrated, being more evident in the samples subjected to 40ºBrix and 40ºC, reaching 30%, compared to the other samples, which makes it a more functional food.

Regarding the sensory properties, it was established that the DO had a decisive influence on the pleasantness of the flavor and acceptance of the product, while the air drying temperature at 40ºC had an unfavorable impact on the consistency and final appearance of the product.

**Keywords:** Osmotic Dehydration, Brix Degrees, Energy Dense.

## Resumo

Mamey é uma fruta nativa do México e norte da América do Sul. Esta fruta possui quantidade adequada de fibras, polifenóis e carotenos, portanto essas características tornam este alimento recomendado em casos de diarreia, anemia e desnutrição.

Ao final obteve-se uma fruta desidratada com aparências diferentes de acordo com o tempo de secagem utilizado sendo as amostras submetidas a 60Brix 60ºC as que tiveram maior aceitação visual por manterem uma cor uniforme e não apresentarem colapso em sua estrutura por outro lado, em relação aos resultados da análise química proximal, obteve-se uma diminuição de 75% de água em todas as amostras, comparando-as com as amostras de mamey na sua forma natural, o que indica um maior prazo de validade. Observou-se que a fibra ficou mais concentrada, ficando mais evidente nas amostras submetidas a 40ºBrix e 40ºC, chegando a 30%, em comparação às demais amostras, o que o torna um alimento ainda mais funcional.

Em relação às propriedades sensoriais, constatou-se que o DO teve influência decisiva na agradabilidade do sabor e aceitação do produto, enquanto a temperatura de secagem ao ar a 40ºC teve impacto desfavorável na consistência e aparência final do produto.

**Palavras-chave:** Desidratação Osmótica, Graus Brix, Densidade Energética.

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# Introduction

In gastronomic terms, fruit is an edible food product obtained from plants or trees and generally has a sweet taste; while, for botany, it is the organ from the flower or part of it that contains the seeds and helps to disperse them, which has intense flavors and aromas, and they are also foods that provide a large amount of sugars, water, vitamins, minerals, fiber and other bioactive compounds (Rural, 2015).

Post-harvest handling is one of the leading causes of annual food loss or waste worldwide. After harvest, it is essential to take measures to preserve food, particularly fruits and vegetables, since the main cause of their deterioration is the free water present in them, which has a significant impact on their shelf life, allowing the proliferation of microbes and enzymes and accelerating their deterioration. Wilting, dark spots and wrinkling of the skin affect the quality of these horticultural products, reducing their firmness, causing consumer rejection and reducing their commercial value (Flores-Mendoza et al., 2022).

Phytochemicals (from the Greek word *phyto* , meaning plant) are natural, biologically active chemical components found in plant-derived foods that act as a defense system for plants, protecting them from infections and microbial invasions and giving them color, aroma and flavor (Gasaly, 2020).

Dietary phytochemicals are a class of non-nutrients that can help health directly, mainly in the digestive tract, or indirectly through their prebiotic properties on the intestinal mucosa and the production of bioactive bacterial metabolites that have effects both locally and systemically. The beneficial effects of consuming fruits and vegetables rich in phytochemicals are explained by these metabolites (Gasaly, 2020); they are also recommended for some other problems related to poor nutrition, such as anemia, which is a group of hematological disorders that occur with a reduction in the number of erythrocytes, in the amount of hemoglobin or in the percentage of erythrocytes (hematocrit ); malnutrition that can be primary (due to insufficient food consumption) or secondary (due to impaired

utilization), chronic degenerative diseases and exercise that expends a greater amount of calories compared to those consumed (RP@Naturtable, 2022).

Fruits and vegetables are an important part of a healthy diet, and an adequate daily intake of fruits and vegetables can help prevent major diseases such as cardiovascular diseases and certain types of cancer. Overall, if fruit and vegetable consumption increases sufficiently, it is estimated that 1.7 million lives could be saved worldwide each year. Current estimates of fruit and vegetable consumption vary widely around the world, from 100 g per day in less developed countries to approximately 450 g per day in Western Europe (OPS/OMS, 2011).

The consumer page mentions mamey in its analysis as a fruit that has an acceptable amount of energy (69 Kcal./100 gr.), compared to oranges (50 Kcal./100 g) and apples (58 Kcal./Kg.), due to its high carbohydrate (HC) content, of which most is sugar. It is a good source of vitamin C, potassium, iron and magnesium and is deficient in pro-retinol and B vitamins (Consumidor, 2021).

Fruits are rich in polyphenols (tannins) which makes them a good intestinal astringent, so they are recommended in cases of diarrhea and gastroenteritis, and due to their acceptable amount of energy and content of B vitamins, they are recommended for anemic and malnourished people. On the other hand, they contain an acceptable amount of carotenoids that generate retinoids (provitamin A), which will benefit people with problems in their visual functions, bone growth and tissues (CIAD, 2021).

Because fruits are rich in moisture, their shelf life is shorter, which is why in relatively recent times the use of combined methods for food preservation has gained great interest because it is a suitable conservation method for modifying fruits and vegetables without significantly changing their nutritional and organoleptic properties.

Emerging technologies offer products in their most natural state, improve shelf life, and above all, offer safe products. Therefore, processing technologies such as high pressure, irradiation, electrical pulses, power ultrasound, ozone and oscillating magnetic fields are currently the most innovative. The recent goal of these technologies is not only to obtain high quality food with fresh characteristics, but also to provide food with improved (Dionelys, 2015)characteristics .

Osmotic dehydration is an uncommon preservation method, but it has some favorable characteristics, such as not requiring much money for its implementation, as well as maintaining the organoleptic characteristics of food such as its firmness, color, flavor and

nutrients. This preservation technology is used to partially dehydrate fruits or as a pretreatment to improve the final product of processes such as hot air drying, vacuum drying, freezing, among others (Flores-Mendoza et al., 2022).

## Material and methods

A quantitative research was developed with a descriptive, transversal design. The work universe was made up of horticultural products, specifically Mamey (*Pouteria Sapota)*, in optimal state of ripeness, from Michoacán and which was acquired at the Mercado Alcalde in Guadalajara. The method of collecting the information was through a logbook, in which the data from the proximal chemical analysis and sensory evaluation were concentrated.

The inclusion criteria established were: 1.- use a fruit and vegetable product in good condition, 2.- That the product has an optimal state of ripeness, 3.- Be from the state of Michoacán. The exclusion criterion was not meeting the appropriate organoleptic conditions for the study.

Regarding the techniques and instruments for data collection, firstly, it was applied to Mamey (pouteria sapota) a first treatment, called Osmotic Dehydration, which has two phases; the first is to immerse the mamey (pouteria sapota) in an osmotic saccharose solution and subject it to different concentrations, the ones used in this study being 40º Brix and 60º Brix at a temperature of 40º C. In order to prevent the osmotic solutions from imparting any type of flavour to the samples, this process only lasted 3 hours; then the second phase was applied, which consists of drying; for this study only one type of drying dehydration was used, which was with air. With this method two temperature levels were used: 40º and 60º C.

Once the combined methods were completed, the samples were selected based on their visual appearance. Those that maintained their original size, color and appropriate texture were subjected to proximal chemical analysis according to the Association of Organic Chemistry methods. of Official Agricultural Chemist (AOAC); being the following: Humidity. - (AOAC, method 934.01 and NMX-083-1986), Ash determination. (AOAC, method 942.05 and NMX-F-066-S-1978), Ethereal extract. (AOAC, 2006, method 954.02 and NMX-F-089-S-1978), Proteins. (AOAC, 960.52), crude fiber. (AOAC, method 962.09), Nitrogen-free elements, NIFEXT (nitrogen-free extract), Acidity (NMX-FF-011- 1982).

Subsequently, a sensory test was carried out, in which the Pleasure Level Test was used, according to (Severiano-Pérez, 2021.), with the use of a structured Hedonic Scale of 9

points, which describe from an extreme of pleasure to an extreme of displeasure. This study was carried out with 31 consumers or affective judges, to make it strictly significant, who evaluated the texture, color, smell and taste. Finally, for the analysis of the data, the computer program ORIGIN 7.5 was used; in which the analysis is *proximal chemical.* The means of the chemical composition of mamey were calculated and represented by a bar graph, in which the error bars were added that represent the standard deviation of the analysis.

*Sensory evaluation.* For the graphical presentation of these results, a histogram was used, which represents a frequency distribution. To draw a histogram, the horizontal axis is used to represent the measured scale, and the boundaries of the class intervals are drawn, the vertical axis represents the frequency scale (or relative frequency). This type of graph provides a visual interpretation of the shape of the distribution of the measurements, as well as information about the dispersion of the data, (Hines, 1993); The data were then interpreted in light of the authors reviewed.

The procedure was carried out through the following steps: 1) request for permission to the Academic Institution; With Legal Name; Centro Educativo Jalisco AC and whose request was presented to the head of the food science laboratory; in which it was specified what was desired to address in this study and once approved by the head of the food science laboratory (CEJ) 2) The laboratory facilities were used to carry out the different treatments to the mamey fruit ( pouteria sapota ) 3) Application of sensory evaluation, 4) Analysis of data through the development of a spreadsheet in the ORIGIN 7.5 program.

This research is carried out on fruits, therefore, it does not harm the physical or mental integrity of people. In the sensory evaluation, the opinion of 31 consumers about the taste, texture, color and smell was considered. For this, each person was asked if they wanted to participate in the evaluation of the products and was informed of the purpose of their participation. It should be noted that for the sensory evaluation, the sample was dehydrated again, taking care of hygienic conditions. In the same way, the participants were asked if they were allergic to Mamey.

# Results

## Visual description of osmotically dehydrated mamey – air dried

Mamey is an excellent fruit with great nutritional characteristics such as being quite energetic due to its high content of carbohydrates, being a good source of vitamin C,

potassium, iron and magnesium (Consumidor, 2021); and from which some samples were taken that were subjected to a combined conservation treatment (Osmotic Dehydration and Drying).

**Table 1.** Exposure times in osmotic dehydration and air drying exposure of mamey (*Pouteria sapota).*

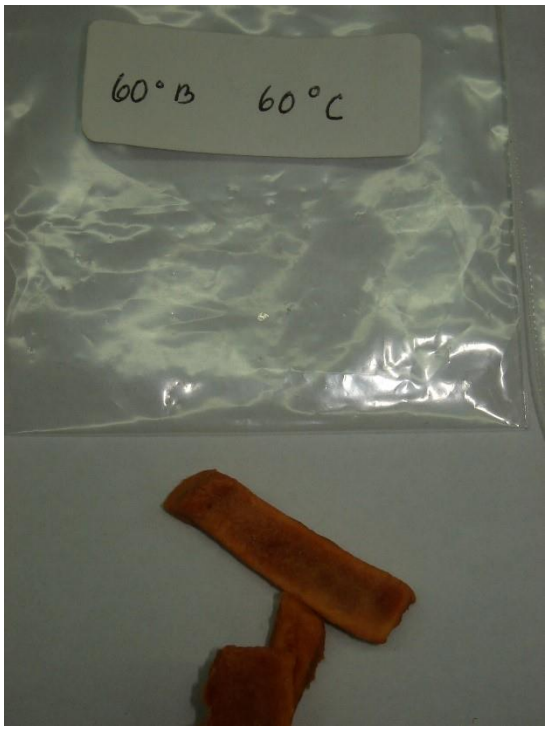
| SAMPLE | EXPOSURE TIME IN OSMOTIC DEHYDRATION | AIR DRYING EXPOSURE TIME |
|---|---|---|
| 60 BRIX60ºC | 3 Hours | 12 Hours |
| 40 BRIX60ºC | 3 Hours | 12 Hours |
| 60 BRIX40ºC | 3 Hours | 24 Hours |
| 40 BRIX40ºC | 3 Hours | 24 Hours |

Source: Own elaboration

Table 1 reports the final drying time for all combined method treatments of mamey. It can be observed that for a higher air drying temperature (60° C), the dehydration time is shorter (12 hours), while for a lower temperature (40° C), the drying time is longer (24 hours). This point is important, since it directly affects the energy costs required to carry out air drying.

In Figure 1 you can see the final appearance of some mamey samples subjected to a combined method of conservation, in this case with the characteristics of an osmotic dehydration at 60º Brix and an air drying at 60º C. In the previously mentioned samples it can be observed that an orange color similar to that present in natural mamey is maintained, because the rectangular samples are immersed in ascorbic acid for 5 min., in order to avoid a loss of vitamin C and an enzymatic darkening, in addition to the fact that the sample did not show signs of collapse of its structure, which shows that the drying time did not influence the visual appearance of the mamey structure (*Pouteria Sapota).*

**Figure 1.** Samples of Mamey osmotically dehydrated at 60º Brix and air dried at60 ºC




Source: Own elaboration

Figure 2 shows the final appearance of the osmotically dehydrated and air-dried mamey samples, in this case with the characteristics of 40º Brix and 60º C. In these samples it can be observed that the orange color present was not modified and in the same way it is almost similar to that present in the natural mamey, which could be preserved due to the use of ascorbic acid for 5 min. and whose purpose of avoiding enzymatic darkening, it can be said that it was achieved, in addition to the fact that this sample also does not show signs of collapse in its structure, which shows that the drying time did not affect the visual appearance of the mamey structure ( *Pouteria Sapota* ).

**Figure 2.** Samples of Mamey osmotically dehydrated at 40º Brix and air dried at60 ºC


Source: Own elaboration

In Figure 3, you can see the samples of osmotically dehydrated mamey dried with air at 60º Brix 40º C. In these samples, you can see that the color of the mamey was not similar to that of the natural mamey. In addition, you can see that these samples do show signs of collapse of their structure, which shows that the drying time influenced the visual appearance of the mamey structure (*Pouteria Sapota)*. and in preserving the color of the samples because when exposed to a longer period of drying in air, vitamin C volatilizes and there is a decrease in color.

**Figure 3.** Samples of Mamey osmotically dehydrated at 60º Brix and air dried at40 ºC


Source: Own elaboration

In the case of the osmotically dehydrated mamey samples dried with air at 40º Brix 40º C. (figure 4) it can be observed that they presented a decrease in terms of the change in color, possibly due to the fact that they were exposed to a longer period of time of drying in air which could cause the vitamin C to volatilize and therefore cause an enzymatic darkening, in addition it can be seen that these samples presented greater signs of collapse of their structure which shows that the drying time influenced both the final appearance of color that the fruit presents as well as the visual appearance of the structure of the mamey ( *Pouteria Sapota* ).

**Figure 4.** Samples of Mamey osmotically dehydrated at 40º Brix and air dried at40 ºC


Source: Own elaboration

In Figure 5, the samples of osmotically dehydrated mamey and air dried at different temperatures and different ºBrix can be observed . In these samples, the changes previously

described can be observed both at a structural level and in color changes. Therefore, it can be clearly identified that those taken to 40 ºC (which are those located at the ends of the figure) regardless of the Brix degrees are those that had losses in their color, thus obtaining a darker appearance compared to those taken to 60º C and it can also be noted that these same samples presented a collapse at a structural level and all these events can be attributed to the fact that these mamey samples were exposed to a longer period of air drying.

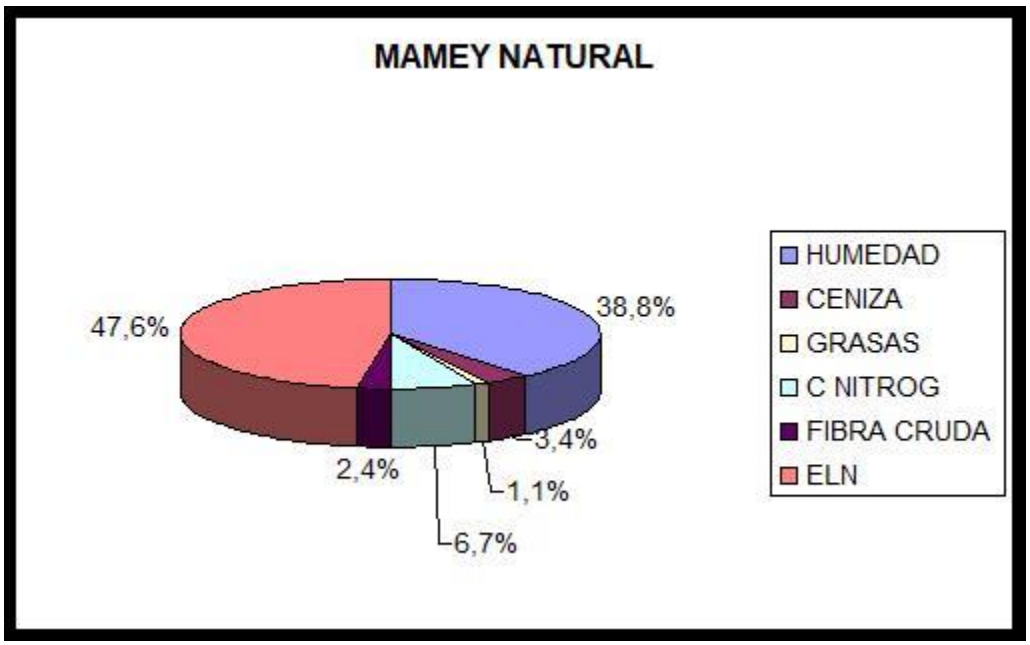
**Figure 5**. Mamey samples osmotically dehydrated at 40 and 60 º Brix and air dried at 60 and40 ºC


Source: Own elaboration

## Analysis of the chemical composition of Mamey (Pouteria Sapota)

In the pie chart in figure 6 you can see the chemical composition of natural mamey (MN). It can be seen that mamey in its natural form is rich in free nitrogen elements (ELN) since it is clearly identified that it has a higher percentage compared to the other parameters, said components are those that are directly linked to the sugar content, so this also explains the sweet taste that this fruit has in its fresh state. In addition, it can be seen that it is very rich in water, it has an acceptable amount of nitrogen compounds (C Nitrog), where the enzymes that give color to this fruit are found, it also has a small but acceptable amount of minerals and fiber and finally it has something of great importance: it is a fruit with very low fat content.

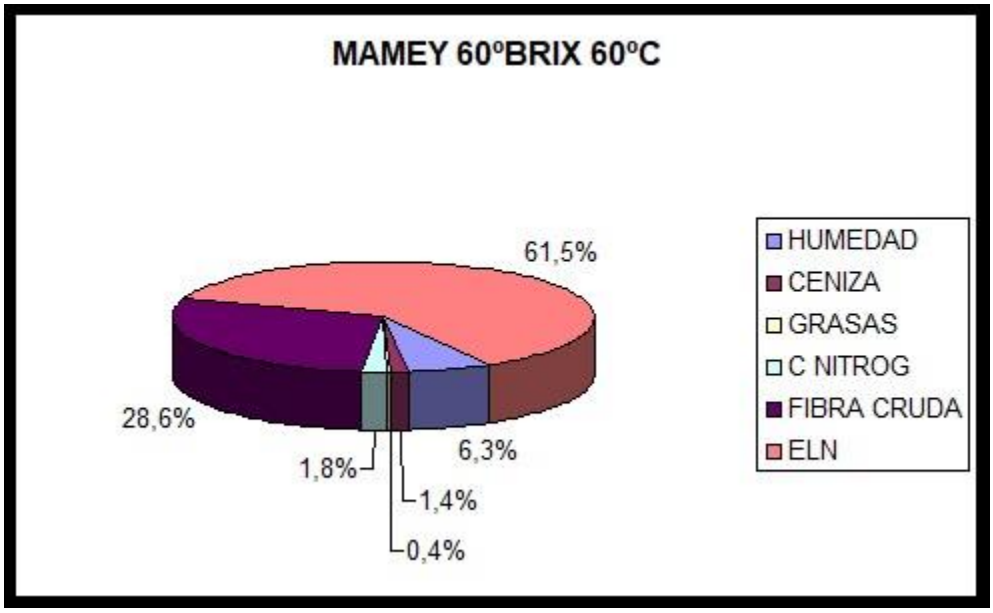
**Figure 6** . Chemical composition of Mamey ( *Pouteria Sapota )* in its Natural form (ELN = Free Elements of Nitrogen, C Nitrog . = Nitrogen Compounds)




Source: Own elaboration

The pie chart in Figure 7 shows the chemical composition of the Mamey samples subjected to a combined preservation method, in this case with an osmotic dehydration of 60ºBrix and a drying temperature of 60ºC. In this graph it can be seen that due to the drying process to which the sample was subjected, the amount of water decreased significantly, while the osmotic dehydration significantly influenced the increase in the amount of free nitrogen elements (ELN), as previously mentioned these elements are directly related to the amount of sugar present in the sample, so when using an osmotic saccharose solution, its content will also increase. On the other hand, it can be seen that the nitrogen compounds (C Nitrog) and the amount of minerals decreased, possibly due to the preservation methods used, which caused a loss of color (enzymes), but most importantly, it can be identified that the amount of fat decreased.

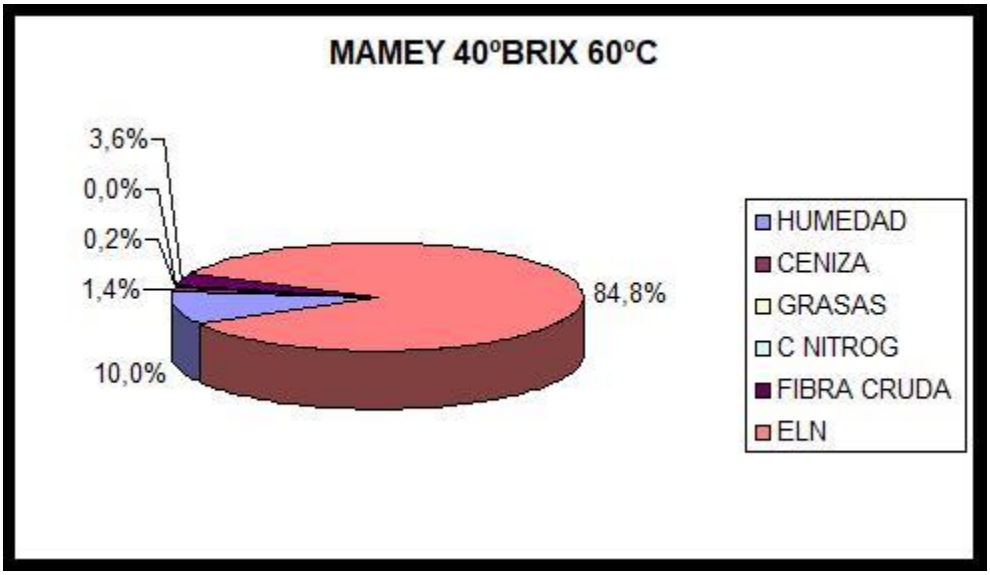
**Figure 7**. Chemical composition of Mamey (*Pouteria Sapota)* osmotically dehydrated At 60ºBrix and air dried at 60 º C (ELN = Free Elements of Nitrogen, C Nitrog. = Nitrogen Compounds)




Source: Own elaboration

The pie chart in Figure 8 shows the chemical composition of the mamey samples subjected to a combined conservation method, in this case with an osmotic dehydration of 40ºBrix and a drying temperature of 60ºC. In this graph it can be seen that due to the drying process to which the sample was subjected, like the previous one, the amount of water decreased significantly, while the osmotic dehydration further influenced the increase in free nitrogen elements (ELN), also due to the immersion of the sample in a hypertonic sucrose solution. On the other hand, it can be observed that the nitrogen compounds (C Nitrog) and the amount of minerals decreased even more, possibly due to the conservation methods used, which caused a total loss of C Nitrog and a volatilization or loss of some minerals, but the most important thing that can be identified is the amount of fat is still insignificant.

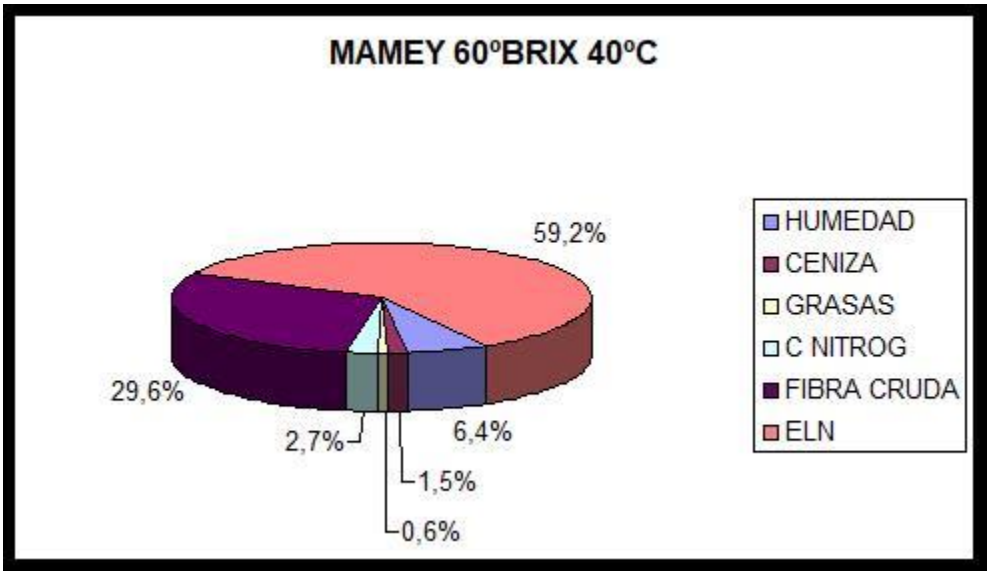
**Figure 8**. Chemical composition of Mamey (*Pouteria Sapota)* osmotically dehydrated at 40ºBrix and air dried at 60 º C (ELN = Free Elements of Nitrogen, C Nitrog. = Nitrogenous Compounds)




Source: Own elaboration

In the pie chart in figure 9 you can see the chemical composition of the samples of osmotically dehydrated mamey at 60º Brix and a drying temperature of 40ºC. In this graph you can see that due to the longer drying process, the amount of fiber was significantly concentrated, compared to the previous samples, and like the previous one, the water content decreased significantly, while it can be seen that the osmotic dehydration process was decisive in the increase of the free nitrogen elements (ELN), due to the immersion of the fruit in the sucrose solution, on the other hand it can be seen that the nitrogen compounds (C Nitrog ) and the mineral content continue to decrease, possibly due to the conservation methods used, and the prolonged drying time, but what is remarkable is that it continues to be a food with a low amount of fat.

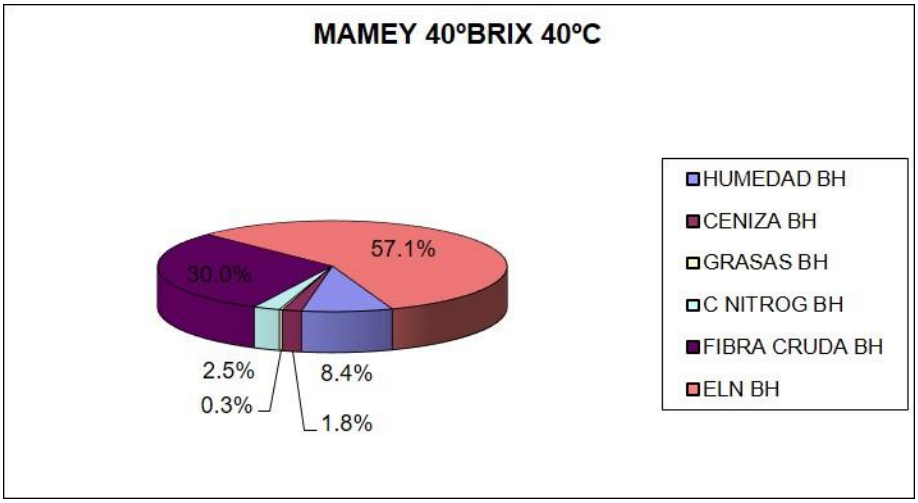
**Figure 9.** Chemical composition of mamey (*Pouteria Sapota)* osmotically dehydrated At 60ºBrix and air dried at 40 º C (ELN = Free Elements of Nitrogen, C Nitrog . = Nitrogen Compounds)




Source: Own elaboration

In the graph of figure 10 you can see the chemical composition of the samples of osmotically dehydrated mamey at 40ºBrix and a drying temperature of 40ºC; In this graph you can see that these samples were the ones that gave the best results in terms of functional properties due to the drying process that was longer and which significantly concentrated the amount of fiber, it is also evident that the amount of water decreased significantly, while it can be seen that the osmotic dehydration process was decisive in the increase of the free nitrogen elements (ELN), due to the immersion of the food in the sugar solution, but even so it did not increase significantly compared to the previous samples, on the other hand it can be seen that the nitrogen compounds (C Nitrog ) and the mineral content continue to decrease, possibly due to the conservation methods used, and the prolonged drying time, but what is remarkable is that it continues to be a food with a low amount of fat.

**Figure 10.** Chemical composition of Mamey (*Pouteria Sapota)* Osmotically dehydrated at 40ºBrix and air dried at 40 º C (ELN = Free Nitrogen Elements, C Nitrog. = Nitrogenous Compounds).

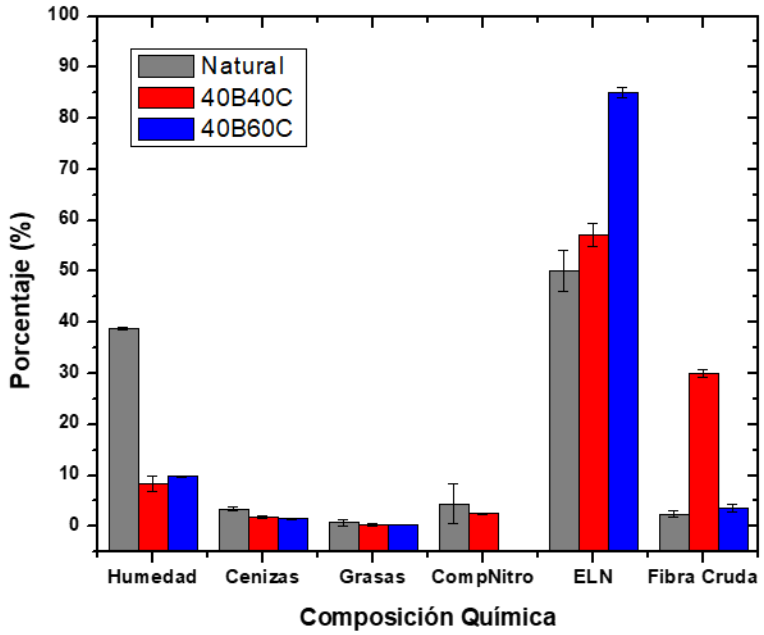



Source: Own elaboration

Figure 11 shows a comparison of the chemical composition of mamey (*Pouteria Sapota)* in its natural form, with the samples osmotically dehydrated at 40º Brix, but air dried at 40º C and 60º C. In this graph it can be observed in a general way that the humidity content decreased approximately 75% for both cases. This is important to highlight because there is a reduction in weight which would facilitate the marketing and transportation of this type of food.

On the other hand, it is surprising to see that in its natural form subjected to a combined preservation method it is still a food with low fat content; however, the physical appearance was diminished due to the decrease in nitrogen compounds (C. Nitro), possibly due to the time of exposure to air drying, in addition, just as expected, there was a significant increase in the gain of solutes which increased the free nitrogen elements (ELN), which indicates that osmotic dehydration (DO) was carried out properly, as for the amount of crude fiber it can be seen that the sample subjected to 40 ºBrix 40ºChad more than double the increase compared to the natural mamey sample, making this sample the best in terms of the amount of fiber it contains, which makes it a functional element; while for the amount of ash there was a decrease, probably due to the time of dehydration with air.

**Figure 11.** Comparison chart of the chemical composition of Mamey (*Pouteria Sapota)* Naturally *and* osmotically dehydrated at 40ºBrix (ELN = Free nitrogen elements, CompNitro = Nitrogen compounds).




Source: Own elaboration

Figure 12 shows a comparison of the chemical composition of mamey (*Pouteria Sapota)* in its natural form, with the samples osmotically dehydrated at 60º Brix, but air dried at 40º C and 60º C.

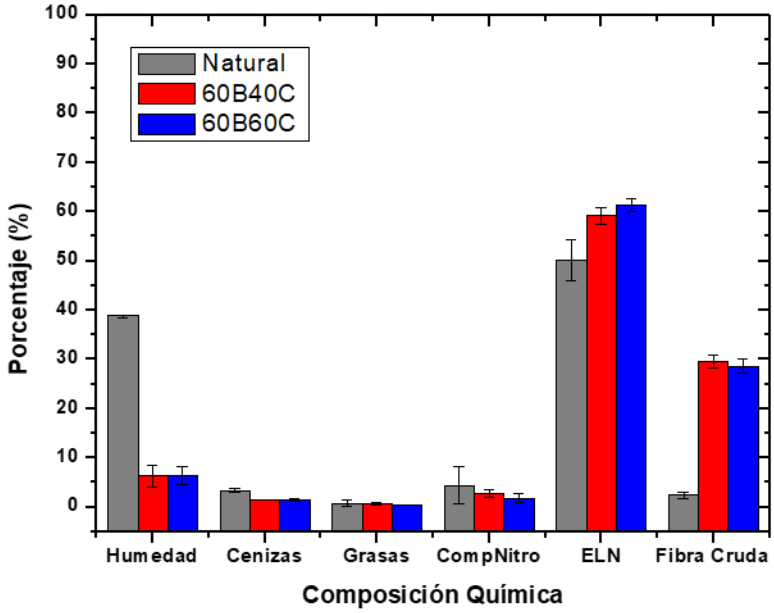
It can be observed that the moisture content was reduced by approximately 80%, the decrease in weight is significant because it would facilitate the marketing and transportation processes.

On the other hand, it is confirmed that mamey, both in its natural form and when subjected to a combined preservation method, continues to be a food with low fat content; however, the physical appearance of the samples was indeed diminished, but to a lesser extent than the samples subjected to 40 ºBrix due to the shorter exposure time to air drying.

is also observed that there was a smaller decrease in nitrogen compounds ( CompNitro ), in addition, just as expected, there was a significant increase in the gain of solutes, which increased the ELN, which indicates that the DO was carried out appropriately; as for the amount of crude fiber, it can be seen that the sample subjected to 60 ºBrix had a significant

growth compared to the natural mamey sample, but both were similar in the increase regardless of the drying time.

**Figure 12.** Graph of the chemical composition of mamey (*Pouteria Sapota)* natural and osmotically dehydrated at 60ºBrix (ELN = Free elements of nitrogen, CompNitro = Nitrogen compounds).



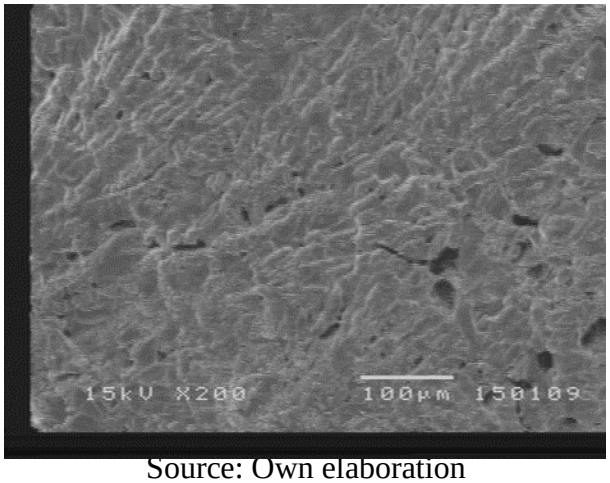

Source: Own elaboration

**Observation of the microstructure of osmotically dehydrated mamey–air dried, using scanning electron microscopy (SEM)**

The physical changes at the microstructural level that the mamey samples *( Pouteria) may have undergone Sapota )* mentioned above, were subjected to a combined conservation process (osmotic dehydration and air drying) and were analyzed by Scanning Electron Microscopy ( SEM ) . With these analyses, the above mentioned can be confirmed with respect to the final appearance of the products.

In Figure 13 you can see a photomicrograph of a mamey sample subjected to 60º Brix 60º C in which it can be seen that the effect of the temperature to which it was subjected did not affect the structure of the mamey, since it can be seen in the figure that the structure presented by the surface of this fruit is uniform.

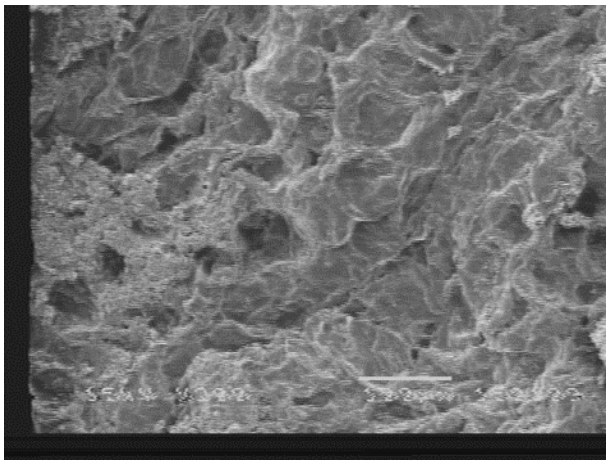
**Figure 13.** Sample of osmotically dehydrated Mamey and air dried at 60º Brix,60ºC




Source: Own elaboration

Figure 14 shows the microstructure of the mamey (*Pouteria Sapota*) osmotically dehydrated at 60º Brix and air dried at 40º C, where it can be seen that, compared to the previous sample, this one has its structural surface affected, due to the fact that the drying time to which it was subjected was greater; it can even be seen that it does not have uniformity on its surface, which indicates that this sample suffered a collapse at a structural level.

**Figure 14.** Sample of osmotically dehydrated Mamey and air dried at 60º Brix,40ºC

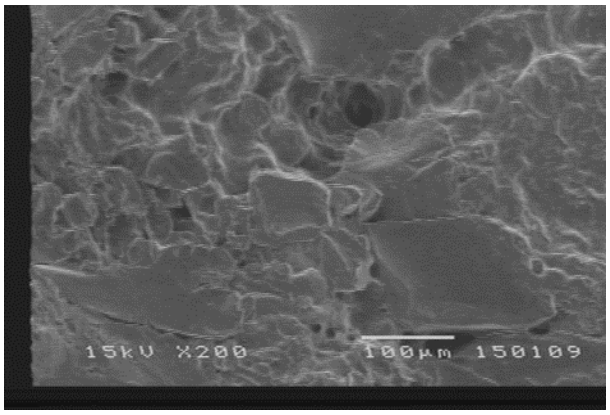


Source: Own elaboration

Figure 15 shows the microstructure of the mamey ( *Pouteria Sapota )* osmotically dehydrated at 40º Brix and air dried at 60º C, in this figure it can be observed that compared to the previous sample, this one does not present its structural surface affected, because the drying time to which it was subjected was shorter and similar to that shown in figure 39,

where the uniformity of its surface was not affected either, which indicates that this sample, like the one shown in figure 39, did not suffer from a significant collapse at a structural level.

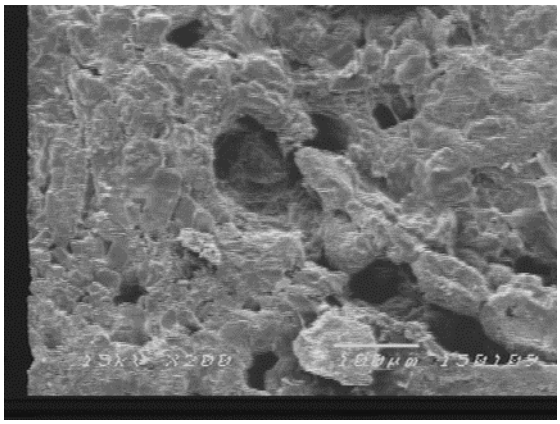
**Figure 15.** Sample of osmotically dehydrated Mamey and air dried at 40º Brix,60ºC




Source: Own elaboration

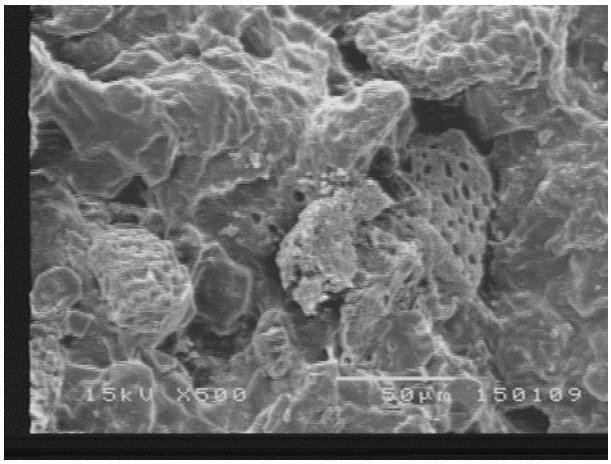
Figures 16 and 17 show two photomicrographs of the mamey ( *Pouteria Sapota )*, both have the same characteristic; that is, were osmotically dehydrated at 40º Brix and air dried at 40º C, in the figures it can be observed that in comparison with the previous samples, these present a structural surface mostly affected, due to the drying time to which these samples were subjected, where in the same way as in figure 40 these samples were visibly affected in the uniformity of their surface, which indicates that this sample, like the one shown in figure 40, suffered a significant structural collapse and which can be corroborated through the images shown.

**Figure 16.** Sample of osmotically dehydrated Mamey and air dried at 40º Brix,40ºC



Source: Own elaboration

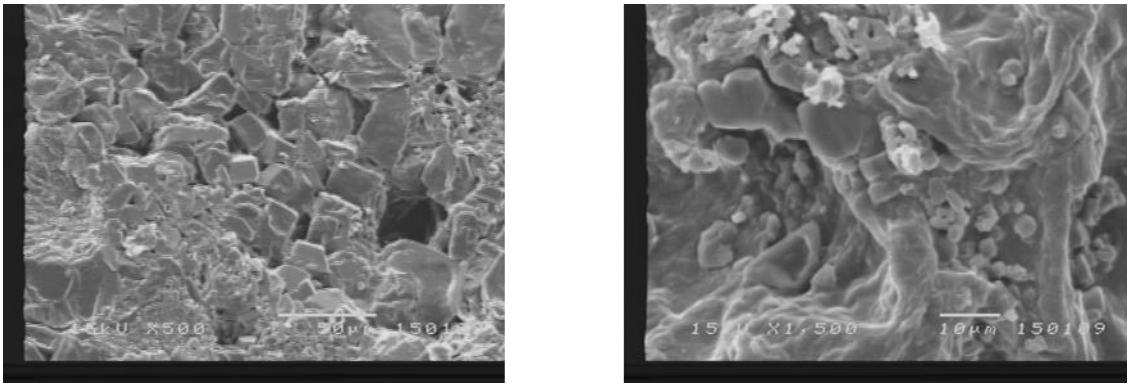
**Figure 17.** Sample of osmotically dehydrated Mamey and air dried at 40º Brix,40ºC




Source: Own elaboration

Figure 18 shows the microstructure of mamey ( *Pouteria Sapota* ) osmotically dehydrated the one on the right side at 40º Brix and the one on the left side at 60º Brix, but both air dried at 40º C. In these figures it can be seen that for a heating temperature lower than 60ºC, the structure of this product collapses completely, because when this fruit is subjected to a temperature of 40º C the exposure time of the samples to air drying will be longer and therefore there will be these consequences, in addition in these same figures the sugar crystals obtained through osmotic dehydration (DO) are clearly seen, which occupied the pores that the samples present where this structural collapse occurred, thus corroborating that the DO worked very well since water was released (existence of pores at the structural level) and solutes were incorporated into the sample (sugar crystals).

**Figure 18.** Sample of osmotically dehydrated Mamey and air dried, the one on the right at 40º Brix, 40ºC and the one on the left at 60º Brix40ºC




Source: Own elaboration

Figure 19 shows the microstructure of the mamey ( *Pouteria Sapota* ) osmotically dehydrated at 60 and 40º Brix and air dried at 60 and 40º C. In this figure it can be perfectly seen that in the mamey samples that were subjected to 40º C, a greater accumulation of sugar crystals is observed compared to the other figures, due to the fact that there was a longer exposure time of the sample to air drying, which allowed a greater quantity of water to evaporate and the sugar crystals could be visualized in said pores, while in the samples that were subjected to a temperature of 60ºCnot, the sugar crystals can be visualized in the same way; however, it can be noticed that the structure of these was little affected.

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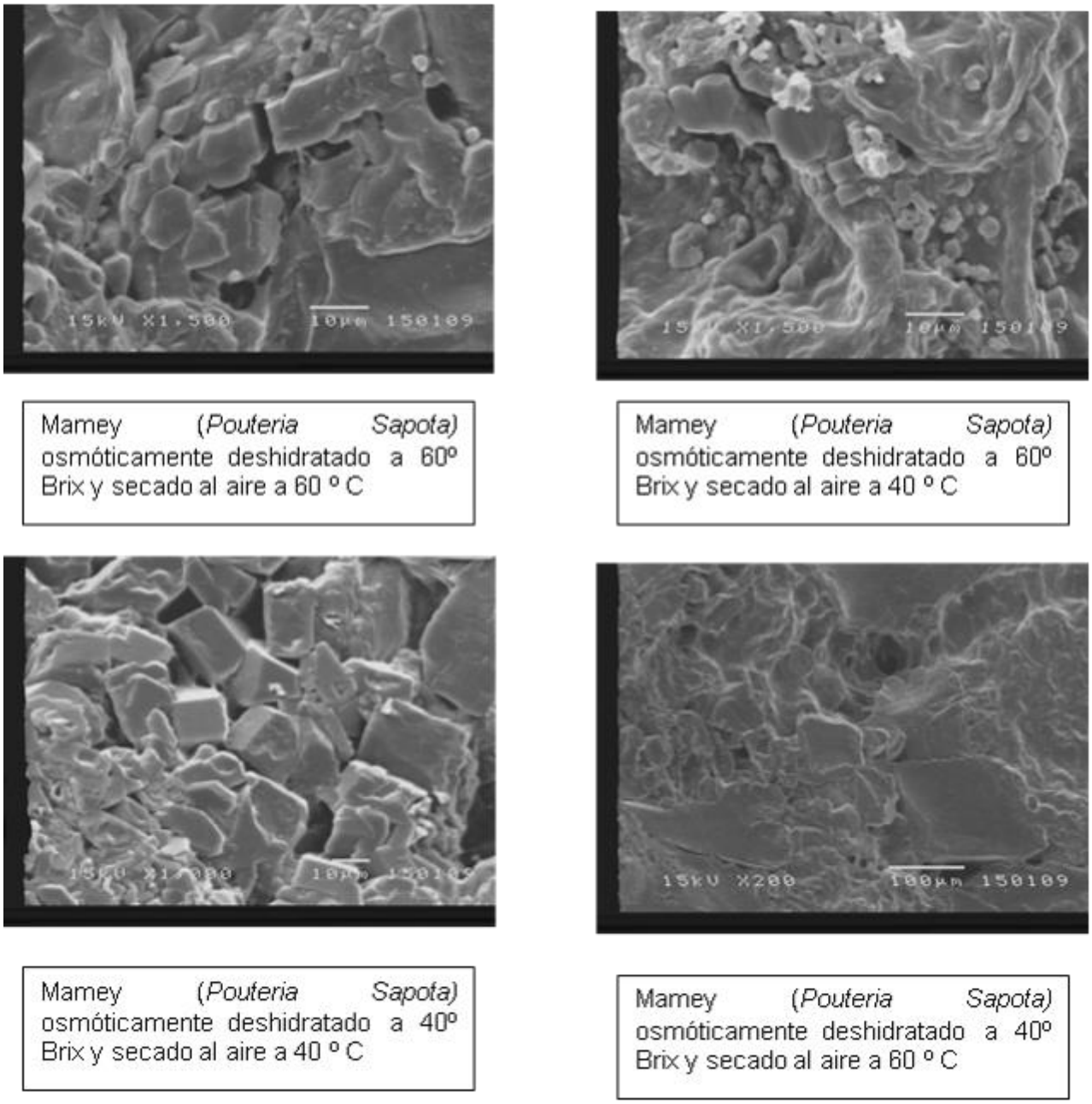
**Figure 19.** Mamey samples osmotically dehydrated at 60 and 40º Brix and air dried at 60º and40ºC




Source: Own elaboration

**Pleasantness level test for osmotically dehydrated mamey – air dried**

The aim of this test was to determine the level of pleasure or displeasure that the samples of mamey fruit dehydrated by combined methods produced in the consumer.

This study was conducted as described in the Materials and Methods section, and thus, as mentioned there, the characteristics of each sample (response variables) that were rated by the affective judge or consumer were the following:

- Smell
- Aspect
- Flavor
- Consistency

Of the total population that participated in this test, 86.2% were women, while 13.8% were men. In addition, the age range of these people ranged from 19 a57 years.

It is important to highlight that, in order to carry out the aforementioned statistical analyses, the 9-point structured hedonic scale used to carry out the Pleasure Level Test is represented numerically as shown in Table 2.

**Table 2.** Numerical representation of the Structured Hedonic Scale.

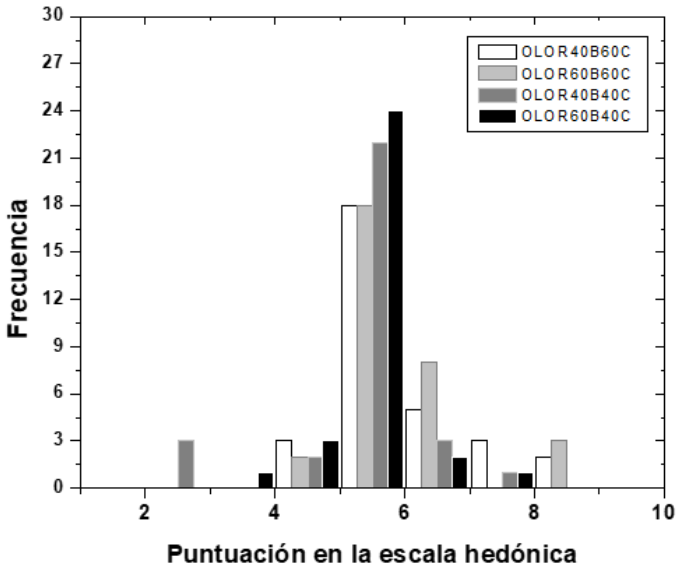
| STRUCTURED HEDONIC SCALE | EQUIVALENT TO... |
|---|---|
| I like it very much | 9 points |
| I like it a lot | 8 points |
| Likes moderately | 7 points |
| It tastes a little bit | 6 points |
| I am indifferent | 5 points |
| It upsets me a little | 4 points |
| Moderately disliked | 3 points |
| It upsets a lot | 2 points |
| It upsets me a lot | 1 points |

Source: Own elaboration

**Pleasantness Level Test for the Smell of Osmotically Dehydrated Mamey – Air Dried**

In Figure 20, you can see the pleasantness level evaluations for the smell of osmotically dehydrated mamey at 60 Brix and 40º Brix and air dried at 60ºC40ºC.

**Figure 20.** Graphs for the data of level of pleasantness for the smell of mamey dehydrated by combined methods **(**Osmotically dehydrated at 60 Brix and 40º Brix and air dried 60ºCat 40ºC)



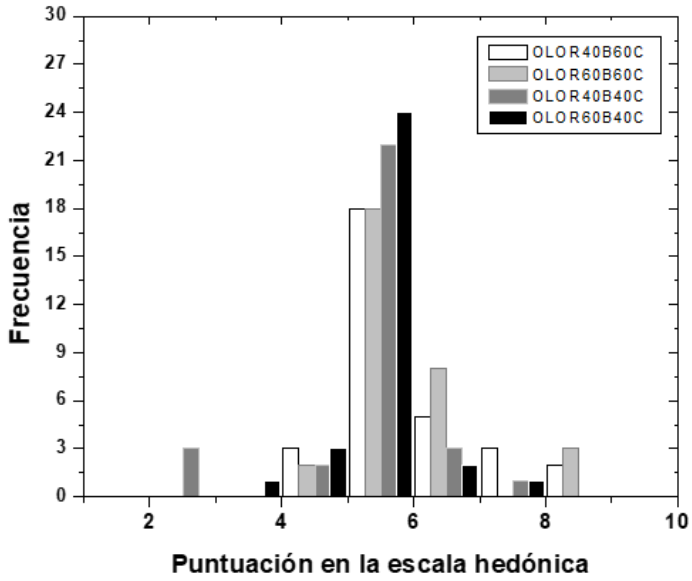

Source: Own elaboration

Figure 20 shows the related graph, with the level of pleasantness of the smell of dehydrated mamey by combined methods and in which it can be observed that for 9.67% of the total number of people the sample subjected to 40 Brix 40 Cgreatly disliked its smell, while for 77.41% of the total number of people, the samples subjected to 60 Brix 40 Cwere indifferent to the smell; on the other hand, for 9.67% of people, the samples subjected to 60 Brix 60 C, they really liked their smell and similarly for 4.83% of people the samples subjected to 40 Brix 60 ºCthey really liked them, in this way we can realize that people presented a higher degree of acceptance for those samples that were subjected to 60ºCregardless of the Brix degrees, while it is clearly observed that the samples subjected to temperatures of 40 ºCwere not totally liked by people, which indicates that the higher the drying temperature, the lower the loss of smell of the samples.

**Pleasantness Level Test for the appearance of osmotically dehydrated mamey – air dried.**

In Figure 21, the evaluations of the level of pleasure for the appearance of osmotically dehydrated mamey at 60 Brix and 40º Brix and air dried at 60ºCand can be observed 40ºC.

**Figure 21. Graphs for the data of level of liking for the appearance** of dehydrated mamey by combined methods (60 Brix and 40º Brix and air drying at 60ºC)40ºC



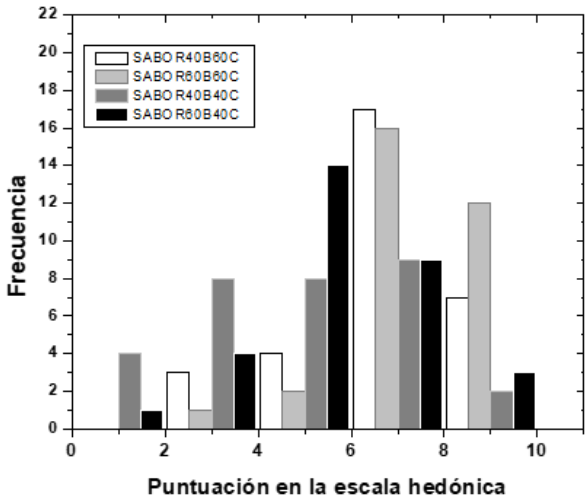

Source: Own elaboration

Figure 21 shows the related graph, with the level of liking for the appearance of dehydrated mamey by combined methods and in which it can be observed that for 4.83% of the total number of people, the sample subjected to 40 Brix 40 Cgreatly disliked the appearance of these samples, while for 58.06% of the total number of people, the samples subjected to 60 Brix 40 Cwere indifferent to the appearance they presented, on the other hand, for 4.83% of people, the samples subjected to 60 Brix 60 Cliked the appearance very much and for 4.83% of people, the samples subjected to 40 Brix 40 ºCand 60 Brix 40 ºCliked the appearance very much, in this way we can realize that people presented a greater degree of acceptance for those samples that were subjected to 40ºCregardless of the ºBrix , while it is clearly observed that those subjected to temperatures of 60 ºCwere not unpleasant for people, however, they were not totally accepted either, which which indicates that the lower the drying temperature, the greater the degree of acceptance of the appearance of the samples.

**Taste Pleasure Level Test for osmotically dehydrated mamey – air dried.**

Figure 22 shows a table where the evaluations of the level of pleasantness for the flavor of osmotically dehydrated mamey at 60 Brix and 40º Brix and air dried at 60ºCand can be observed 40ºC.

**Figure 22.** Graphs for the data of level of liking for the flavor of dehydrated mamey by combined methods (60 Brix and 40º Brix and air drying at 60ºCand 40ºC)




Source: Own elaboration

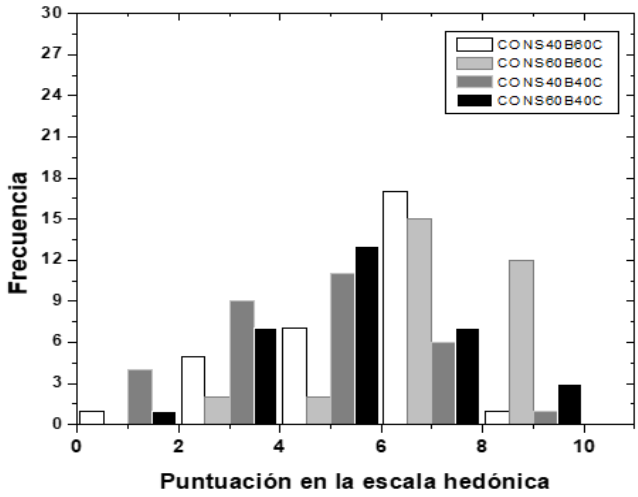
Figure 22 shows the related graph, with the level of liking for the flavor of mamey dehydrated by combined methods and in which it can be observed that 12.9% of the people think that the sample subjected to 40 Brix 40 C, displeased them greatly in terms of flavor, possibly because there was a longer exposure time to air drying, which could have caused a loss of flavor in the sample, while for 56.45% of the total number of people, the samples subjected to 40 Brix 60 Cthey liked a little in terms of the flavor they presented, in the same way 51.61% had the same opinion with respect to the samples subjected to 60 Brix 60 C; On the other hand, for 11.29% of people, the samples subjected to 60 Brix 40 C, they liked it very much, in this way we can realize that people presented a greater degree of acceptance for the samples subjected to 60 Brix 40 ºC, than in comparison with the samples subjected to 40 Brix 40ºC, we can realize that both were subjected to the same drying temperature time, but we can observe that it had a decisive influence on the flavor for the acceptance of the people, the Brix degrees used to carry out the osmotic dehydration.

**Pleasantness Level Test for the consistency of osmotically dehydrated mamey – air dried**

For this study, consistency was considered as the property of the food that the consumer perceives when taking the first bite. That is, whether it is soft or very hard, and the judge related this adjective to whether it is desirable in the type of product being evaluated.

In Figure 23, you can see the evaluations of the level of pleasantness for the consistency of the osmotically dehydrated mamey at 60 Brix and 40º Brix and air dried at 60ºCand 40ºC.

**Figure 23. Graphs for the data of level of liking** for the consistency of mamey dehydrated by combined methods (60 Brix and 40º Brix and air drying at 60ºC)40ºC




Source: Own elaboration

Figure 23 shows the related graph, with the level of liking for the consistency of mamey dehydrated by combined methods and in which it can be observed that for 4.83% of the total number of people the sample subjected to 40 Brix 60 C, they disliked it a lot in terms of consistency, while for 53.22% of the total number of people. The samples subjected to 40 Brix 60 Cthey liked it moderately in terms of consistency, as well as 48.38% of the people thought the same with respect to the samples subjected to 60 Brix 60ºC; on the other hand, for 9.67% of the people, the samples subjected to 60 Brix 40 ºC, were the ones they liked a lot in terms of consistency, and through this we can conclude that in this hedonic parameter it was also influenced not only by air drying, but also by the ºBrix , since the samples subjected to 40 ºBrix 40 ºCThey were not entirely to people's liking in terms of consistency.

## Discussion

In the samples of osmotically dehydrated mamey and air dried at different temperatures and sugar concentrations, several structural changes could be observed, such as color changes, the most noticeable being in the samples subjected to 40ºC and 180 g of sugar/180 ml of water; in addition, these same samples presented a structural collapse, due to the fact that they were exposed to a longer period of air drying.

In the proximal analyses, it was generally observed that the moisture content decreased by approximately 75% for both cases compared to the natural mamey samples. This is important to highlight because there is a weight reduction which would facilitate the marketing and transportation of this type of food; in addition, it can be observed that despite having been subjected to a food preservation method, it is still a fruit with a low fat content. On the other hand, just as expected, there was a significant increase in the solute gain which increased the free nitrogen elements (FNE) by up to 60% compared to the natural mamey samples, which indicates that osmotic dehydration (OD) was carried out properly. Regarding the amount of crude fiber, it can be observed that the sample subjected to 40 ºBrix 40ºC had more than double the increase compared to the natural mamey sample, which makes this the best in terms of the amount of fiber it contains, which makes it a functional element.

Regarding sensory properties, it can be established that osmotic dehydration favorably influenced the flavor and acceptance of the food, on the other hand, it is evident that the drying temperature negatively influenced the appearance, texture and color of the products and this could be observed in the samples subjected to 40ºC.

In short, the results presented in this work are very similar to those shown by El Consumidor (2021), in which the qualities and characteristics of the fruits stand out, in terms of organoleptic and sensory properties; thus, we arrive at the limitations and advances that we have obtained with our study, asserting that the product treated with DO is a good option to be marketed and will help with certain pathologies due to the absence or deficit of energy or fiber.

# Conclusions

Through the combined dehydration process used, an energetically dense food was obtained, due to the osmotically dehydration method used. On the other hand, it presents an intermediate humidity in any of its samples, which makes it a food with acceptable sensory characteristics.

It can be established that this type of food is easy to market, because it is easy to transport, in addition it can be corroborated that the chemical composition had notable differences, due to the drying time used, becoming more noticeable in the samples subjected to 40ºBrix 40ºCthat significantly increased the amount of fiber, compared to the 2.4% presented by the samples of natural mamey, this made them the best at this level, by increasing their amount of fiber and maintaining an acceptable increase in the free elements of nitrogen (ELN), directly related to the immersion of the fruit in the sucrose solution.

The drying parameter is very important, since it can be determined which temperature is suitable, which will translate into an increase or decrease in costs, since if the samples subjected to 40ºBrix 40ºCwere the best at the level of chemical composition, they were not at the structural level (due to the structural collapse that it presented), nor at the sensorial level (due to the low acceptance that was presented by the samples subjected to 40ºC); while the samples subjected to 60ºCsi were acceptable in these last two parameters.

This type of food, due to the functional characteristics it has acquired, such as increasing its amount of fiber and being able to be considered an energetically dense food due to the conservation method used, is recommended for people with malnutrition problems, anemia, older adults, athletes and people with diseases that require a high caloric expenditure, while it is not recommended for people with Diabetes mellitus and Obesity, due to the high concentrations of sugars it contains.

Now, regarding the sensory properties of these products, it can be established that osmotic dehydration favorably influenced the flavor and acceptance of the food, with those subjected to 60 ºBrix being the most accepted, while the drying temperature negatively influenced the appearance, texture and color of the products and this could be observed in the samples subjected to 40ºCthat were exposed to a longer drying time which caused a structural collapse and a loss of color in the samples, which greatly influenced their appearance compared to the samples subjected to 60ºC.

## Future Lines of Work

1. Osmotic dehydration with hyperosmolar saline agents.
2. Use of sugar substitutes in osmotic dehydration.
3. Osmotic dehydration in seasonal vegetables

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# ANNEXES

## ANNEX 1

Sensory Analysis

Date:_____Series_____Sex_____Age _____

INSTRUCTIONS: Please observe and taste the sample and indicate with an X your level of pleasantness, according to the scale presented:

SAMPLE

**Table 3.- Pleasure scale**

| | Smell | Aspect | Flavor | Consistency |
|---|---|---|---|---|
| I like it very much | | | | |
| I like it a lot | | | | |
| Likes moderately | | | | |
| It tastes a little bit | | | | |
| I am indifferent | | | | |
| It upsets me a little | | | | |
| Moderately disliked | | | | |
| It upsets a lot | | | | |
| It upsets me a lot | | | | |

Source: Own

## ANNEX 2

**Table 4.- Results of the tests of the level of liking of Mamey *(Pouteria Sapota)* osmotically treated at 60ºBrix and oven dried at40ºC**

| No. | SAMPLE | M60/40B | SEX | AGE | SMELL | ASPECT | FLAVOR | CONSISTENCY |
|---|---|---|---|---|---|---|---|---|
| 1 | 401 | M60/40B | 1 | 23 | 5 | 6 | 6 | 4 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | 401 | M60/40B | 1 | 21 | 4 | 5 | 7 | 8 |
| 3 | 401 | M60/40B | 1 | 22 | 5 | 6 | 8 | 6 |
| 4 | 401 | M60/40B | 1 | 36 | 8 | 8 | 9 | 7 |
| 5 | 401 | M60/40B | 2 | 20 | 8 | 6 | 8 | 5 |
| 6 | 401 | M60/40B | 1 | 57 | 5 | 6 | 8 | 7 |
| 7 | 401 | M60/40B | 1 | 21 | 4 | 4 | 6 | 6 |
| 8 | 401 | M60/40B | 1 | 20 | 7 | 7 | 6 | 6 |
| 9 | 401 | M60/40B | 1 | 23 | 6 | 7 | 8 | 6 |
| 10 | 401 | M60/40B | 1 | 20 | 7 | 6 | 8 | 6 |
| 11 | 401 | M60/40B | 1 | 21 | 7 | 6 | 7 | 7 |
| 1 | 401 | M60/40B | 1 | 20 | 5 | 6 | 6 | 7 |
| 12 | 401 | M60/40B | 1 | 20 | 5 | 5 | 7 | 7 |
| 13 | 401 | M60/40B | 1 | 20 | 5 | 4 | 7 | 6 |
| 14 | 401 | M60/40B | 1 | 20 | 5 | 4 | 2 | 1 |
| 15 | 401 | M60/40B | 1 | 22 | 6 | 2 | 2 | 2 |
| 16 | 401 | M60/40B | 1 | 23 | 5 | 4 | 4 | 3 |
| 17 | 401 | M60/40B | 2 | 23 | 5 | 4 | 6 | 4 |
| 18 | 401 | M60/40B | 1 | 21 | 5 | 5 | 6 | 6 |
| 19 | 401 | M60/40B | 2 | 21 | 5 | 6 | 8 | 3 |
| 20 | 401 | M60/40B | 1 | 20 | 5 | 6 | 3 | 4 |
| 21 | 401 | M60/40B | 1 | 20 | 5 | 6 | 7 | 7 |
| 22 | 401 | M60/40B | 1 | 20 | 6 | 5 | 4 | 4 |
| 23 | 401 | M60/40B | 1 | 21 | 5 | 5 | 7 | 6 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 24 | 401 | M60/40B | 1 | 20 | 5 | 6 | 7 | 6 |
| 25 | 401 | M60/40B | 1 | 20 | 4 | 4 | 6 | 4 |
| 26 | 401 | M60/40B | 1 | 20 | 6 | 4 | 7 | 3 |
| 27 | 401 | M60/40B | 2 | 20 | 5 | 5 | 6 | 6 |
| 28 | 401 | M60/40B | 2 | 21 | 5 | 5 | 6 | 6 |
| 29 | 401 | M60/40B | 2 | 21 | 5 | 6 | 8 | 3 |
| 30 | 401 | M60/40B | 1 | 20 | 5 | 6 | 3 | 4 |
| 31 | 401 | M60/40B | 1 | 20 | 5 | 6 | 7 | 7 |

Source: Own

**Note:** 1 is Female and 2 is Male

**ANNEX 3**

**Table 5.- Results of the tests of the level of liking of Mamey *(Pouteria Sapota)* osmotically treated at 60ºBrix and oven dried at60ºC**

| No. | SAMPLE | M60/60B | SEX | AGE | SMELL | ASPECT | FLAVOR | CONSISTENCY |
|---|---|---|---|---|---|---|---|---|
| 1 | 202 | M60/60B | 1 | 23 | 5 | 4 | 7 | 6 |
| 2 | 202 | M60/60B | 1 | 21 | 4 | 5 | 7 | 8 |
| 3 | 202 | M60/60B | 1 | 22 | 5 | 6 | 8 | 6 |
| 4 | 202 | M60/60B | 1 | 36 | 5 | 8 | 9 | 7 |
| 5 | 202 | M60/60B | 2 | 20 | 6 | 6 | 8 | 8 |
| 6 | 202 | M60/60B | 1 | 57 | 5 | 6 | 6 | 4 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 7 | 202 | M60/60B | 1 | 21 | 4 | 4 | 2 | 6 |
| 8 | 202 | M60/60B | 1 | 20 | 8 | 8 | 8 | 7 |
| 9 | 202 | M60/60B | 1 | 23 | 6 | 8 | 8 | 8 |
| 10 | 202 | M60/60B | 1 | 20 | 6 | 5 | 7 | 7 |
| 11 | 202 | M60/60B | 1 | 21 | 8 | 7 | 8 | 8 |
| 1 | 202 | M60/60B | 1 | 20 | 5 | 8 | 8 | 8 |
| 12 | 202 | M60/60B | 1 | 20 | 5 | 5 | 8 | 8 |
| 13 | 202 | M60/60B | 1 | 20 | 6 | 8 | 7 | 8 |
| 14 | 202 | M60/60B | 1 | 20 | 5 | 7 | 6 | 6 |
| 15 | 202 | M60/60B | 1 | 22 | 5 | 2 | 5 | 2 |
| 16 | 202 | M60/60B | 1 | 23 | 5 | 4 | 5 | 3 |
| 17 | 202 | M60/60B | 2 | 23 | 5 | 8 | 8 | 7 |
| 18 | 202 | M60/60B | 1 | 21 | 6 | 6 | 7 | 7 |
| 19 | 202 | M60/60B | 2 | 21 | 5 | 5 | 8 | 6 |
| 20 | 202 | M60/60B | 1 | 20 | 5 | 7 | 7 | 6 |
| 21 | 202 | M60/60B | 1 | 20 | 5 | 6 | 7 | 8 |
| 22 | 202 | M60/60B | 1 | 20 | 6 | 5 | 6 | 6 |
| 23 | 202 | M60/60B | 1 | 21 | 5 | 5 | 6 | 6 |
| 24 | 202 | M60/60B | 1 | 20 | 6 | 7 | 7 | 8 |
| 25 | 202 | M60/60B | 1 | 20 | 8 | 7 | 8 | 8 |
| 26 | 202 | M60/60B | 1 | 20 | 5 | 7 | 8 | 5 |
| 27 | 202 | M60/60B | 2 | 23 | 5 | 8 | 8 | 7 |
| 28 | 202 | M60/60B | 1 | 21 | 6 | 6 | 7 | 7 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 29 | 202 | M60/60B | 2 | 21 | 5 | 5 | 8 | 6 |
| 30 | 202 | M60/60B | 1 | 20 | 5 | 7 | 7 | 6 |
| 31 | 202 | M60/60B | 1 | 20 | 5 | 6 | 7 | 8 |

Source: Own

**Note:** 1 is Female and 2 is Male

**ANNEX 4**

**Table 6.- Results of the tests of the level of liking of Mamey *(Pouteria Sapota)* osmotically treated at 40 Brix and oven dried at40ºC**

| No. | SAMPLE | M50/40B | SEX | AGE | SMELL | ASPECT | FLAVOR | CONSISTENCY |
|---|---|---|---|---|---|---|---|---|
| 1 | 282 | M40/40B | 1 | 23 | 5 | 4 | 4 | 4 |
| 2 | 282 | M40/40B | 1 | 21 | 4 | 6 | 4 | 4 |
| 3 | 282 | M40/40B | 1 | 22 | 5 | 6 | 8 | 4 |
| 4 | 282 | M40/40B | 1 | 36 | 7 | 7 | 6 | 4 |
| 5 | 282 | M40/40B | 2 | 20 | 4 | 6 | 4 | 5 |
| 6 | 282 | M40/40B | 1 | 57 | 5 | 8 | 6 | 4 |
| 7 | 282 | M40/40B | 1 | 21 | 6 | 7 | 6 | 6 |
| 8 | 282 | M40/40B | 1 | 20 | 5 | 4 | 6 | 4 |
| 9 | 282 | M40/40B | 1 | 23 | 5 | 2 | 2 | 2 |
| 10 | 282 | M40/40B | 1 | 20 | 5 | 4 | 4 | 2 |
| 11 | 282 | M40/40B | 1 | 21 | 5 | 4 | 7 | 7 |
| 1 | 282 | M40/40B | 1 | 20 | 5 | 6 | 8 | 8 |
| 12 | 282 | M40/40B | 1 | 20 | 5 | 3 | 2 | 2 |
| 13 | 282 | M40/40B | 1 | 20 | 5 | 6 | 2 | 3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 14 | 282 | M40/40B | 1 | 20 | 6 | 4 | 1 | 2 |
| 15 | 282 | M40/40B | 1 | 22 | 5 | 3 | 1 | 1 |
| 16 | 282 | M40/40B | 1 | 23 | 5 | 4 | 6 | 4 |
| 17 | 282 | M40/40B | 2 | 23 | 2 | 2 | 1 | 1 |
| 18 | 282 | M40/40B | 1 | 21 | 5 | 4 | 6 | 6 |
| 19 | 282 | M40/40B | 2 | 21 | 5 | 2 | 1 | 1 |
| 20 | 282 | M40/40B | 1 | 20 | 5 | 4 | 3 | 3 |
| 21 | 282 | M40/40B | 1 | 20 | 5 | 6 | 2 | 6 |
| 22 | 282 | M40/40B | 1 | 20 | 5 | 5 | 6 | 6 |
| 23 | 282 | M40/40B | 1 | 21 | 6 | 5 | 7 | 6 |
| 24 | 282 | M40/40B | 1 | 20 | 5 | 2 | 4 | 3 |
| 25 | 282 | M40/40B | 1 | 20 | 2 | 2 | 2 | 5 |
| 26 | 282 | M40/40B | 1 | 20 | 5 | 1 | 2 | 1 |
| 27 | 282 | M40/40B | 2 | 23 | 2 | 2 | 1 | 1 |
| 28 | 282 | M40/40B | 1 | 21 | 5 | 4 | 6 | 6 |
| 29 | 282 | M40/40B | 2 | 21 | 5 | 2 | 1 | 1 |
| 30 | 282 | M40/40B | 1 | 20 | 5 | 4 | 3 | 3 |
| 31 | 282 | M40/40B | 1 | 20 | 5 | 6 | 2 | 6 |

Source: Own

**Note:** 1 is Female and 2 is Male

**ANNEX 5**

**Table 7.- Results of the tests of the level of liking of Mamey *(Pouteria Sapota)* osmotically treated at 40 Brix and oven dried at60ºC**

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| No. | SAMPLE | M50/60B | SEX | AGE | SMELL | ASPECT | FLAVOR | CONSISTENCY |
|---|---|---|---|---|---|---|---|---|
| 1 | 353 | M40/60B | 1 | 23 | 5 | 4 | 6 | 5 |
| 2 | 353 | M40/60B | 1 | 21 | 5 | 7 | 8 | 9 |
| 3 | 353 | M40/60B | 1 | 22 | 6 | 6 | 8 | 9 |
| 4 | 353 | M40/60B | 1 | 36 | 7 | 6 | 6 | 4 |
| 5 | 353 | M40/60B | 2 | 20 | 3 | 4 | 2 | 4 |
| 6 | 353 | M40/60B | 1 | 57 | 5 | 8 | 8 | 8 |
| 7 | 353 | M40/60B | 1 | 21 | 5 | 7 | 6 | 4 |
| 8 | 353 | M40/60B | 1 | 20 | 5 | 6 | 5 | 4 |
| 9 | 353 | M40/60B | 1 | 23 | 5 | 5 | 4 | 4 |
| 10 | 353 | M40/60B | 1 | 20 | 6 | 6 | 7 | 6 |
| 11 | 353 | M40/60B | 1 | 21 | 5 | 4 | 6 | 4 |
| 1 | 353 | M40/60B | 1 | 20 | 5 | 4 | 4 | 4 |
| 12 | 353 | M40/60B | 1 | 20 | 5 | 3 | 2 | 2 |
| 13 | 353 | M40/60B | 1 | 20 | 5 | 2 | 2 | 2 |
| 14 | 353 | M40/60B | 1 | 20 | 5 | 4 | 6 | 6 |
| 15 | 353 | M40/60B | 1 | 22 | 5 | 2 | 5 | 6 |
| 16 | 353 | M40/60B | 1 | 23 | 5 | 4 | 7 | 6 |
| 17 | 353 | M40/60B | 2 | 23 | 5 | 3 | 2 | 3 |
| 18 | 353 | M40/60B | 1 | 21 | 5 | 4 | 6 | 4 |
| 19 | 353 | M40/60B | 2 | 21 | 5 | 2 | 1 | 1 |
| 20 | 353 | M40/60B | 1 | 20 | 5 | 4 | 5 | 4 |
| 21 | 353 | M40/60B | 1 | 20 | 4 | 4 | 5 | 2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 22 | 353 | M40/60B | 1 | 20 | 5 | 5 | 4 | 6 |
| 23 | 353 | M40/60B | 1 | 21 | 5 | 5 | 6 | 7 |
| 24 | 353 | M40/60B | 1 | 20 | 5 | 2 | 4 | 2 |
| 25 | 353 | M40/60B | 1 | 20 | 4 | 4 | 4 | 2 |
| 26 | 353 | M40/60B | 1 | 20 | 5 | 4 | 5 | 5 |
| 27 | 353 | M40/60B | 2 | 23 | 5 | 3 | 2 | 3 |
| 28 | 353 | M40/60B | 1 | 21 | 5 | 4 | 6 | 4 |
| 29 | 353 | M40/60B | 2 | 21 | 5 | 2 | 1 | 1 |
| 30 | 353 | M40/60B | 1 | 20 | 5 | 4 | 5 | 4 |
| 31 | 353 | M40/60B | 1 | 20 | 4 | 4 | 5 | 2 |

Source: Own

Note: 1 is Female and 2 is Male