

# Potencial del plátano macho verde para la elaboración de botanas saludables

*Potential green plantain to prepare healthy snacks*

**María de Jesús García Gómez**  
Universidad del Papaloapan  
[bf07\\_06@hotmail.com](mailto:bf07_06@hotmail.com)

**Laura Patricia Ramírez Coutiño**  
Universidad del Papaloapan  
[lpramirez@unpa.edu.mx](mailto:lpramirez@unpa.edu.mx)

## Resumen

El objetivo de este trabajo fue desarrollar una botana extruida horneada elaborada con una mezcla de harina de plátano macho y harina de maíz para obtener un producto nutritivo, con propiedades funcionales y sensoriales que permitan su aceptabilidad por parte del consumidor. Los resultados mostraron que los niveles de aceptación en cuanto a textura, sabor y color están en función del tratamiento químico que se utilizó para preparar la harina de plátano, así como la concentración de harina de plátano macho en la formulación del producto extruido horneado. Estas acciones conjuntas permitieron la obtención de un snack con características organolépticas aceptables con bajo contenido en grasas debido a que fue un producto horneado que podría ser una alternativa de botana nutritiva, además de que aumentaría el valor agregado de un cultivo regional, lo que podría en un futuro repercutir en una actividad económica de gran importancia en la Cuenca del Papaloapan.

**Palabras clave:** *plátano macho verde, harina, botana, extruido.*

## Abstract

The aim of this work was to develop an extruded baked snack made with a blend of plantain flour and cornmeal for a nutritional product, functional and sensory properties that allow its

acceptability by consumers. The results showed that the levels of acceptance in texture, taste and color are based on chemical treatment that was used to prepare banana flour and concentration plantain flour baking the extruded product formulation. Are joint actions allowed obtaining a snack with acceptable organoleptic characteristics with low fat content because it was a baked product that could be an alternative nutritious snack, plus it would increase the added value of a regional culture, which could in future impact on economic activity of great importance in the Papaloapan Basin.

**Key words:** male green banana flour, snacks, extruded

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## Introduction

In Mexico's annual sales in 1997 reached snacks worth 40 billion pesos, the Mexican Association for the Study of Consumer Protection "AMEDEC"; This figure is supported by the clear preference of the Mexican public for these savory, most evident in the 416 pesos annual "per capita" consumption spent on them. According to the Barcel industry in Mexico, among the most consumed snacks are chips with 35.5% and fried with egg omelet with 21.3%, being the extruded products (pellets) in third with 15.4%, followed by the direct expanded extruded with 9.3%.

Although snacks are highly popular due to its high content of salt and fat, manufacturers have struggled for a long time with the image of "junk food", although the term is somewhat unfair, since it is used to identify those products that are high in simple carbohydrates or refined, high fat and high amounts of sodium sugars. This image has changed with the introduction of new fat substitutes and some technologies such as extrusion and baking. In addition, snack food can be redesigned to be nutritious, containing micronutrients, phytochemicals and antioxidant vitamins ingredients that make them attractive to consumers, regulatory requirements gathering. You can also make some mixtures of grains with fruits, vegetables and extracts and concentrates for making products that have a high nutritional value.

The aim of this work was to develop an extruded baked snack made with a blend of plantain flour and cornmeal for a nutritional product, functional and sensory properties that allow their acceptability by consumers.

**MATERIALS AND METHODS**

**Fishmeal.** For obtaining green plantain flour the following chemical treatments were performed:

1. metabisulfite 0.01% + 0.5% ascorbic acid (T1)
2. metabisulfite 0.01% citric acid + 0.5% (T2)
3. Control (H2O) (C)

10 green plantains peeled, cut into slices about 0.3 cm thick and were immersed in the first solution for 5 minutes; then they were removed and allowed to dry at room temperature slices with the help of a fan. The same for the second treatment and control was repeated. After 72 hours of drying of the slices of each of the treatments, grinding thereof is performed in an industrial blender, mark "WARING LABORATORY", at maximum speed. Subsequently, flour sifted to a particle size of 05 cm. The flour obtained from each treatment were weighed and stored in sealed bags until use.

**Mixtures of green plantain flour and cornmeal.** Mixtures Plantain flour (HP) with cornstarch (HM) (MOH "nixtamal mass") is made to a weight of 100g of mixture as indicated in Table 1.

<b>Metabisulfito 0.01% + ácido ascórbico 0. 5%</b>	40 – 60 50 – 50 60 – 40
<b>Metabisulfito 0.01% + ácido cítrico 0.5%</b>	40 – 60 50 – 50 60 – 40
<b>Agua</b>	40 – 60 50 – 50

**Table 1 concentration ratio green plantain flour (HP), obtained with different chemical treatments, and cornmeal (HM) in different mixtures**

**Moisture determination mixtures.** To each mixture was determined with a thermobalance moisture (SHIMADZU Moc-120H), these determinations were performed in triplicate.

**Determination of color.** A colorimeter (Hunter Lab Color-Flex) was used for measuring color. Operation of this device is based on comparing the parameters of the sample to be evaluated with a standard that represents the "ideal" according to the specifications of any product. Table 2 shows the parameters considered are specified.

Parámetro	Interpretación	Escala
L*	Designa brillantez o luminosidad	100= blanco 0= negro
a*	Indica que tan rojo o verde es el alimento	Positivo= rojo Negativo= verde
b*	Indica que tan amarillo o azul es el alimento	Positivo= amarillo Negativo= azul

**Table 2 Interpretation and scale parameters of color.**

To determine the color of the flour after drying, it is necessary to compare the parameters obtained with a standard. In this case it was cornmeal "MoH".

**Development of extruded.** For the preparation of extruded dough mixing 90 g and 800 ml of water was prepared about. Subsequently, the dough was placed in a manual extruder to give a preform, then cut into pieces of 7 cm. After obtaining the preform proceeded to bake churritos (HAMILTON BEACH) at 170 ° C for 40 minutes. The same procedure for HP + HM mixtures shown in Table 1 is repeated.

Preliminary analysis of product acceptance. Was performed with a panel of 20 people in the Tuxtepec campus of Papalopan.

## RESULTS

Each treatment was observed that plantain slices obtained a different color. The control C were darker; the treatment had a yellowish appearance T1, T2 and the treatment were the clearest. This means that in T2 (metabisulphite 0.01% + 0.5% citric acid) was the best in inhibiting the enzyme polyphenol oxidase.

Performance-wise, it can be seen that treatment with which T2 was obtained higher yields (Table 3).

TRATAMIENTO	PESO DE	PESO DE	RENDIMIENTO
	PLÁTANO	HARINA	
<b>Metabisulfito 0.01% + ácido ascórbico 0.5%</b>	1500 g	420.53 g	28.03%
<b>Metabisulfito 0.01% + ácido cítrico 0.5%</b>	1490 g	434.10 g	29.13%
<b>Agua</b>	1485 g	318.00 g	21.41%

**Table 3 Performance plantain flour.**

It is important to note that this apparent color, can define the application of green plantain flour.

To use the green plantain flour in the preparation of extruded snacks, it was mixed with corn flour in different proportions, this in order to obtain the rheological properties necessary to make an extruded. The color of the corn flour was used as standard, as it is commonly used as a raw material in the manufacture of commercial snacks, and compared with mixtures of HP + HM.

52.53	13.31	32.16
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**Table 4 Parameters of Color cornmeal**

<b>M1</b>	T1	63.99	9.10	30.84
<b>M2</b>	T2	58.15	11.05	31.89
<b>M3</b>	Control	65.67	7.37	28.54

**Table 5 Color Parameters 40/60 mixture with their respective treatments.**

<b>M4</b>	T1	64.43	8.21	29.46
<b>M5</b>	T2	62.02	8.61	29.86
<b>M6</b>	Control	65.66	5.99	25.05

**Table 6 Color Parameters 50/50 mixture with their respective treatments.**

<b>M7</b>	T1	68.50	7.14	30.69
<b>M8</b>	T2	65.48	7.94	30.52
<b>M9</b>	Control	61.03	8.70	29.69

**Table 7 Color Parameters 60/40 mixture with their respective treatments.**

From the above tables, it was determined that the mixture containing HP obtained with treatment T2 with 40/60 HM in a relationship which is closer to the color parameters of the pattern, and therefore could be used as raw material for the preparation of a snack.

In a preliminary analysis of product acceptance, people who tasted the "churritos" agreed that the best texture was obtained with the sample identified as M2 (40/60, T2) (Figure 1), while the best flavor was perceived with the samples identified as M1 and M3 (both 40/60, T1 and C, respectively) (Figure 2), the color was more acceptable to the snacks made with the samples identified as M3 (40/60, C) and M9 (60/40, C) (Figure 3). These results demonstrated that the 40/60 mixture of HP + HM, could be used for the production

of extruded baked snacks, and I had the highest acceptance rates in texture, flavor and color.

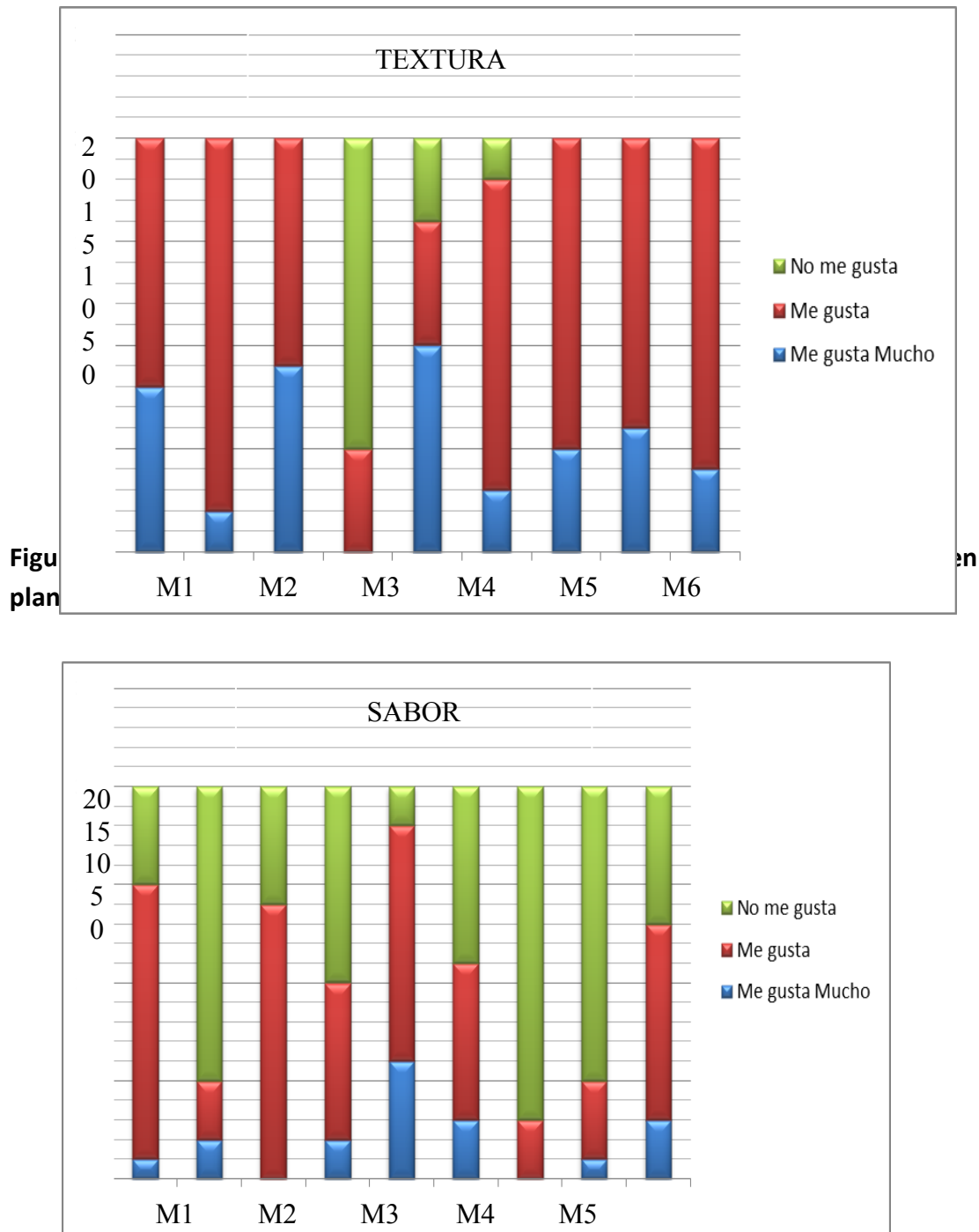
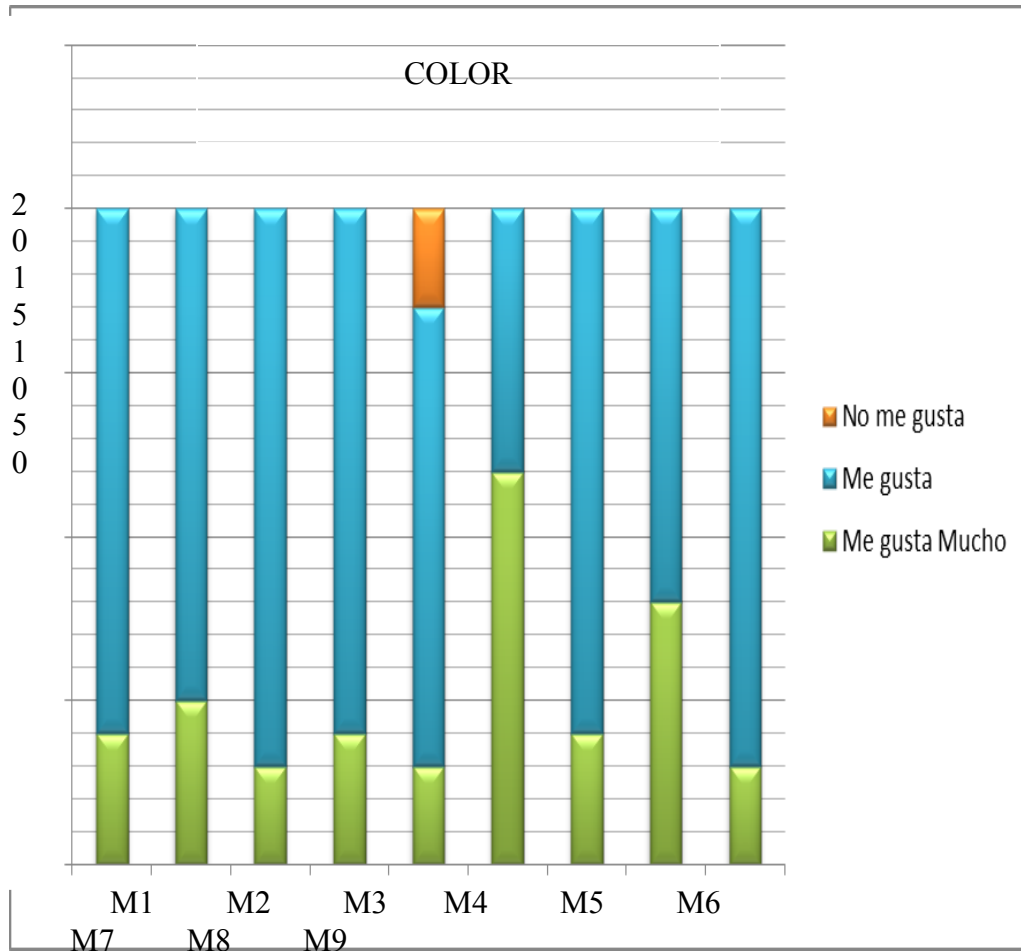


Figure 2 Acceptability of the flavor of a baked snack made from extruded blends green plantain flour and cornmeal.



**Figure 3 Acceptability color of an extruded snack mixes made with baked green plantain flour and cornmeal.**

**Conclusion**

The results showed that the levels of acceptance in texture, taste and color are a function of the ratio HP + HM, while the color was a function of the chemical treatment applied to banana slices during processing of the HP. You are joint actions allowed obtaining a snack with acceptable organoleptic characteristics with low fat, because it was a baked product, which could be an alternative nutritious snack, plus it would increase the added value of a regional culture, which could, in the future, impact on economic activity of great importance in the Papaloapan Basin.

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