



Polyphenols into an “orito” banana fermented drink (*Musa acuminata*)

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<p>Graphical Abstract</p>	<p>Abstract.</p> <p>The aim of the present work was to evaluate the content of total phenols in a fermented orito banana (<i>Musa acuminata</i> AA) pulp drink. A central compound experimental design with nine treatments was carried out in the elaboration of an orito banana pulp fermented beverage. Total antioxidant activity was evaluated by means of Folin Ciocalteu, obtaining a higher content of polyphenols in T₀ (4.888 mg/L) and T₃ (4.616 mg/L) treatments, after eight days of fermentation. In conclusion, in the fermented beverage, T₀ treatment at 70°C and & 0.6% citric acid concentration, as well as T₃ treatment at 60°C & 0.9% citric acid concentration, preserved the organoleptic characteristics from orito banana, no enzymatic browning was visualized in the subsequent operations.</p> <p>Keywords: <i>Musa acuminata</i> AA, enzymatic browning, fermented beverage, total phenols.</p>
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Introduction (optional), no page limit

Orito banana or baby banana (*Musa acuminata* AA) fruit, is an edible product. In Ecuador, the cultivation of this specie is very important for thousands of Ecuadorian families. Due to national and international demand, it is exported to the European Union and the United States. The climatic conditions and the soil



characteristics to orito banana cultivars are adequate for the good development of this musaceae, where the plantations are managed predominantly in an organic and traditional way (INIAP, 2004).

In fact, the orito banana has been managed to become a product that meets the requirements for export. The production of orito in the Ecuadorian Amazon has achieved a wide adaptation, becoming a fruit of great consumption by the inhabitants of the zone, its commercialization is not very profitable for the producers, since the price in the market of the product is relatively low (Caicedo et al. 2019).

Studies carried out with banana peel and pulp reported that these by-products contain several antioxidant compounds, such as gallic acid, alkaloids, flavonoids, tannins, phenolic compounds, and dopamine (Blasco-López and Gómez-Montaña 2014). In the nature, alkaloids and tannins inhibit nutrient absorption, and for their efficient use, drying, cooking and fermentation with lactic bacteria (LAB) are recommended. Fermentation of agricultural by-products with LAB is one of the important processes for obtaining phenolic compounds with an antioxidant effect (Lin *et al.* 2018). The objective of this study was to determine Polyphenols in orito banana fermented drink (*Musa acuminata*).

Materials and Methods (optional), no page limit

The development of this research work take place in the laboratory of fruits and vegetables, in Amazonian State University main campus, located at Puyo-Tena road, km 2 ½, Pastaza Ecuador. The raw material will be obtained from the Mariscal Sucre market in the city of Puyo.

Determination of total polyphenols by Folin-Ciocalteu method.

For the implementation of the Folin-Ciocalteu test (Singleton and Rossi, 1965), it was necessary to previously construct a calibration curve by successive dilutions from a concentrated solution (stock solution) of 1000 mg.L⁻¹ gallic acid (reference standard). From this solution, 10 ml of each diluted solutions were prepared from increasing concentrations of gallic acid between 5 and 25 mg.L⁻¹.

For the preparation of the samples, 40 µL of extract and 500 µL of Folin-Ciocalteu reagent were placed in a 10 ml volumetric flask, shaken and left to stand protected from light for 8 minutes. Then 500 µL of the 10% sodium carbonate solution was added and brought to a volume of 10 ml with distilled water. The solution was homogenized by manually shaking the volumetric flask and was kept in the dark at room temperature for 2 hours. Absorbances of samples of extracts and 765 nm standards were measured against the reagent blank. As reference, a sample of Chilean red cabernet sauvignon wine was analyzed.

Results and discussion

Table 1 details the central compound design and the values obtained with respect to the content of total phenols in mg of gallic acid per ml in orito fermented beverage at eight days of fermentation. The results were presented with minimum values of 2.711 and maximum values of 4.888 followed by 4.616 corresponding to the treatments with higher quantity of total phenols.



Table 1. Absorbance values versus gallic acid concentration of the treatments under study.

Treatments	Temperature (°C)	Acid citric concentration (%)	Absorbance	Concentration (mg/L)
To	70	0.6	0.356	4.888
T1	60	0.6	0.250	3.444
T2	60	0.9	0.196	2.711
T3	70	0.3	0.336	4.616
T4	70	0.9	0.285	3.921
T5	60	0.3	0.230	3.172
T6	50	0.9	0.295	4.057
T7	50	0.3	0.295	4.057
T8	50	0.6	0.243	3.349

At temperatures below 60°C a slight increase in FT content is observed, while at temperatures above 60°C the FT content increases significantly, on the other hand, at citric acid concentrations in the range of 0.3 to 0.6% the FT increases and above 0.6% the polyphenolic activity decreases as shown in figure 1.

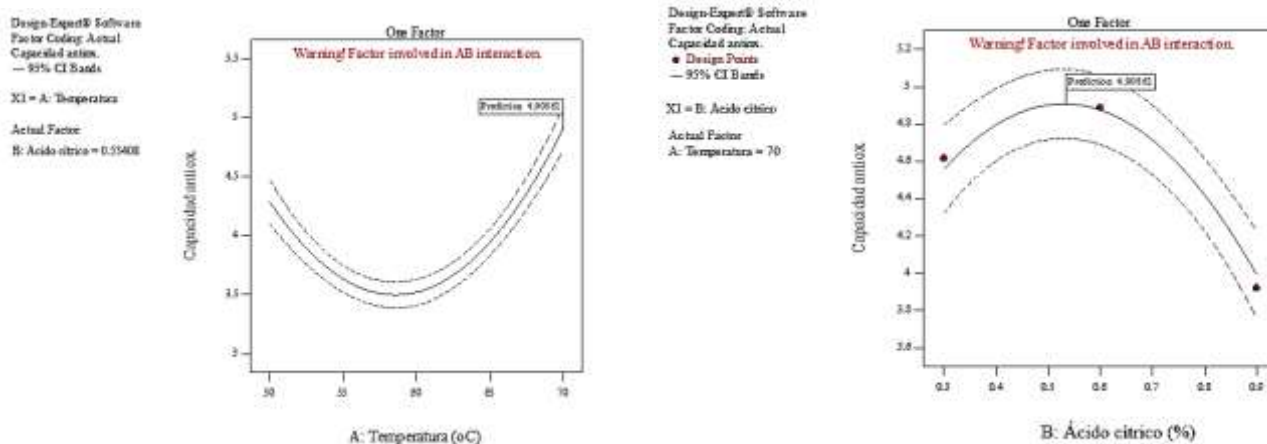


Figure 1: Temperatures, citric acid concentrations and total phenolic content.

Caicedo et al. (2020) found total contents of phenols on day 30 (323,361.91 μMol GAE/100 g DM) and antioxidant activity on day eight (29,595.62 μMol TROLOX/100 g DM) in *Musa acuminata* silage. It showed a light brown color and solid consistency. It is concluded that, through orito banana rachis fermentation, improvements were achieved for contents of crude protein, total phenols and antioxidant activity, which makes possible to obtain a functional food that can be used for animal feed.



Conclusions

In the elaboration of the fermented beverage, at a temperature of 70°C and a concentration of 0.6% of citric acid, as well as in the treatment at 60 °C with a concentration of 0.9% of citric acid, preserved the organoleptic characteristics of the orito banana, no enzymatic browning was visualized in the subsequent operations with a high content of total phenols.

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