Article **Journal of Environmental Sciences and Natural Resources**
June 2020 Vol.6 No.17 7-9

Sensory evaluation of a flour tortilla enriched with microcapsules of beet (*Beta vulgaris* L.)

Evaluación sensorial de una tortilla de harina enriquecida con microcápsulas de betabel (*Beta vulgaris* L.)

MARTINI-MORALES, Sasi Elibeth[1]† & REYES-MUNGUÍA, Abigail*

Universidad Autónoma de San Luis Potosí, Facultad de Estudios Profesionales Zona Huasteca-(UAMZH-UASLP). Romualdo del Campo 501, Rafael Curiel, Cd. Valles, S.L.P. CP. 79060

ID 1st Author: *Sasi Elibeth, Martini-Morales* / **ORC ID**: 0000-0002-0975-960, **CVU CONACYT ID**: 53406

ID 1st Coauthor: *Abigail, Reyes-Munguía* / **ORC ID**: 0000-0002-2151-7979, **CVU CONACYT ID**: 165265

DOI: 10.35429/JESN.2020.17.6.7.9 Received April 26, 2020; Accepted June 30, 2020

Abstract

Beets (*Beta vulgaris* L.) have antioxidant compounds, with a characteristic color which is due to the presence of betalains. Microencapsulation is a technique used to protect aromas, flavors, colors and nutritional and antioxidant components. The objective of this work was to microencapsulate beet juice (*Beta vulgaris* L.) by spray drying using gum arabic as wall material, to later elaborate a flour tortilla incorporating the microencapsulated antioxidants from beet juice and evaluate it sensory. The microencapsulation process was carried out using a Mini Spray Dryer. The sensory evaluation used was descriptive and was carried out on 50 panelists (men and women) with an age range of 18 to 23 years. The flour tortilla was accepted by the panelists.

Antioxidants, Microencapsulation, Biopolymers

Resumen

El betabel (*Beta vulgaris L.*) tiene compuestos antioxidantes, con un color característico el cual se debe a la presencia de betalaínas. La microencapsulación es una técnica usada para proteger aromas, sabores, colores y componentes nutricionales y antioxidantes. El objetivo de este trabajo fue microencapsular jugo de betabel (*Beta vulgaris L.*) mediante el secado por aspersión utilizando como material de pared goma arábiga, para posteriormente elaborar una tortilla de harina incorporando los antioxidantes del jugo de betabel microencapsulados y evaluarla sensorialmente. El proceso de microencapsulación se realizó mediante un secador por aspersión Mini Spray Dryer. La evaluación sensorial utilizada fue descriptiva y se realizó a 50 panelistas (hombres y mujeres) con un rango de edad de 18 a 23 años. La tortilla de harina tuvo aceptación dentro de los panelistas.

Antioxidantes, Microencapsulación, Biopolímeros

Citation: MARTINI-MORALES, Sasi Elibeth & REYES-MUNGUÍA, Abigail. Sensory evaluation of a flour tortilla enriched with microcapsules of beet (*Beta vulgaris* L.). Journal of Environmental Sciences and Natural Resources. 2020, 6-17: 7-9

* Correspondence to Author (email: abigail.reyes@uaslp.mx)
† Researcher contributing first author.

Introduction

Beet is part of the frequent consumption in many homes and is considered a source of carbohydrates, proteins, in addition to possessing in its composition high levels of vitamins, minerals and micronutrients. It is a good source of iron, phosphorus and other minerals. The content of these may differ depending on the method of preparation. The iron content is relatively high compared to other vegetables (Nottingham, 2004). The Agrifood and Fisheries Information Service (SIAP) and the Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA), in 2019 reported that the states of Puebla, Jalisco, Baja California, Mexico and Sonora, this during the agricultural year and the mode and temporal irrigation.

In San Luis Potosí, production was reported at 327.98 tons. Beets have a high fiber content. The phytochemical composition of the beet (Beta vulgaris L.) is formed mainly by betalaines, feluric acid, phenolic amides and flavonoids. For the best use of the active compounds of the beet (Beta vulgaris L.) the food industry has implemented technological processes of innovation; such as the microencapsulation.

The applications of this technique have frequently increased in the encapsulation of aromas, flavor, color and nutritional components, with the purpose of protecting the base material from degradation (reduction or reactivity) with its external environment (heat, humidity, air and light), maintaining its stability and viability for the development of products that provide a health benefit, that present a fresh flavor and that also have a long shelf life. For the proper preservation of nutraceutical compounds, natural and low-cost biopolymers have been used, such as maltodextrin and gum arabic (Pavón-García et al., 2011).

Methodology

The beet was obtained in the market of cd supplies. Valleys. The juice was obtained in a commercial juice extractor Hamilton Beach® brand. The beet juice was stored in amber bottles and placed in refrigeration until the microcapsules were made.

Obtaining microcapsules by spray drying

The previously prepared solutions (JB + GA at 30%; JB + MD ME-10 at 30%) were fed into a Mini Spray Dryer, model Büchi B-290, at a speed of 40 mL/min, with an atomization pressure of 5 bars, an inlet air temperature of 180 ± 5°C and an outlet air temperature of 85 ± 5°C. The microcapsules were stored in amber bags at room temperature.

Procedure for the elaboration of the flour tortilla

The vegetable shortening (125g) was whipped for a period of 5 minutes, then the wheat flour (500g) was gradually added. Then salt and baking powder were added, partially disintegrating the existing lumps. Finally, 150 g of microcapsules previously dissolved in the 250 mL of milk were added, and the beating was continued until a homogeneous mass was achieved (8 minutes).

The dough was removed from the mixer and placed on the table (previously dusted with flour) to be manually kneaded with the help of a roller. For the elaboration of the tortillas, portions of the dough of 15 g each were taken, they were rolled up pressing slightly on the table and placed in the tortilla machine pressing them until they were uniformly thick, then they were placed on the stove until they were cooked.

Sensory evaluation

The sensory evaluation used was descriptive, in which a qualitative description of the individual attributes that make up the sample was obtained, in addition to establishing the degree to which these attributes are perceived. The evaluation was carried out to 50 panelists (men and women) with an age range of 18 to 23 years, taking a representative sample of the Universidad Autónoma de San Luis Potosí Campus Huasteca.

Statistical analysis

Quantitative data were expressed as mean ± standard deviation (s), an analysis of variance (ANOVA) was performed and statistical significance was determined with a value of 0.05.

ISSN 2444-4936

All the determinations were made in triplicate, the calculations and the graphs of the obtained data were processed using the program Statistica 8 and Graph Pad Prism 6 Demo.

Results

The microcapsules of the beet juice using as wall material gum arabic, presented an average percentage of inhibition of free radicals of 69.79 ± 3.17%. The results obtained in the sensory evaluation made to the flour tortilla added with microcapsules of beet juice with gum arabic, are shown in the radial graph (Figure 1), the attributes were evaluated according to their intensity expressed in a scale from 0 to 10. The sensory evaluation was done the same day the flour tortilla was made, according to the panelists' appreciation, it presented generally acceptable characteristics.

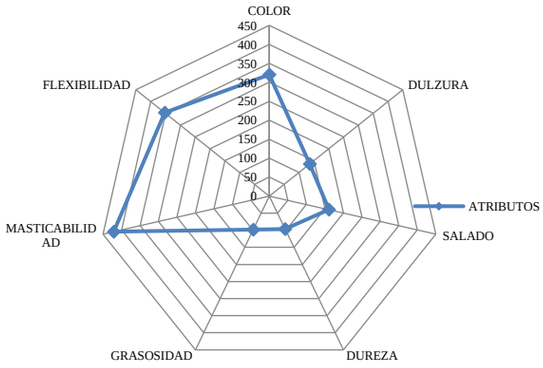

Figure 1 Chart for the attribute scale of the flour tortilla added with microcapsules of beet juice with gum arabic

However, the highest score was achieved in the attributes such as color, flexibility and chewiness, contrary to what was obtained in the evaluation of the greasiness and hardness, appearing according to the scale in less intensity. With regard to flavor, this was interpreted as normal, because the tortilla did not have the characteristics of being salty and/or sweet (table 1).

These results are similar to those reported by Vazquez (2013) in which a sensory evaluation of color, flavor, texture and chewiness of a flour tortilla was carried out, identifying that the most important attributes for the sensory acceptability of consumers were flexibility, ease of chewing and flavor.

Conclusions

The sensory evaluation made to the flour tortilla added with microcapsules of Beta vulgaris L., showed that it presented acceptable sensory characteristics, being of good approval by the consumers.

Attributes	Total Score	Arithmetic mean
Color	320	6.4
Sweetness	136	2.7
Salty	161	3.2
Hardness	96	1.9
Greasiness	98	1.9
Chewability	421	8.4
Flexibility	353	7.06

Table 1 Attribute scale of the flour tortilla added with microcapsules of beet juice with gum arabic

References

Araneda, C., y Valenzuela, F. (2009). Microencapsulación de extractantes: una metodología alternativa de extracción de metales. *Revista Ciencia Ahora*, 22(11), 9-19.

Nottingham S. (2004). Beetroot. 2a. ed. Ed. Quarterman, EUA. 148 p.

Pavón-García, L.M.A., Pérez-Alonso, C., Orozco-Villafuerte, J., Pimentel González, D.J., Rodríguez-Huezo, M.E., Vernon-Carter, E.J. (2011). Storage stability of natural colourant from *Justicia spicigera* microencapsulated in protective colloids blends by spray-drying. *International Journal of Food Science and Technology*. 46, 1428-1437.

Servicio de Información Agroalimentaria y Pesquera (SIAP), Secretaria de Agricultura, Ganadería, Desarrollo rural, Pesca y Alimentación (SAGARPA), México. (2019). Recuperado de https://nube.siap.gob.mx/cierreagricola/Consultada el 10 de noviembre 2020.

Vázquez López, L. d. C. (2013). Evaluación de mezclas de harina de malanga y maíz para elaborar tortillas. Colegio de Postgraduados. Institución de Enseñanza e Investigación en Ciencias Agrícolas. Recuperado 09 de noviembre 2020. http://www.lareferencia.info/vufind/Record/MX_2a744d9dc8ac42bd5b29932517b5eb59

ISSN 2444-4936