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Short Communication

Sensory profile and chemical composition of *Opuntia joconostle* from Hidalgo, Mexico

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The objective of this study was to compare the sensory profile and the chemical composition of four samples of *Opuntia joconostle* cultivated in Sahagun and Cuautepec, Hidalgo (Mexico). A group of ten trained panelists built the flavor profile of the samples according to ISO 13299:2003. The chemical composition was determined according to AOAC. The differences observed between sensory profiles and chemical composition of the four *O. joconostle* studied were significant even though all fruits belonged to the same specie and variety. The maturity stage, the chemical composition of soil and the geographic region could have influence on the results.

Key words: *Opuntia joconostle*, flavor profile, sensory analysis, chemical composition.

INTRODUCTION

Cacti have traditionally been an important part of Mexican culture. The Cactaceae family is a botanical group of the new world and Mexico is the country with the largest center of diversity of this family (Ortega-Nieblas et al., 2001). This natural resource has been and is being used for multiple purposes since pre-Columbian times. Some of the current uses include: Food for humans as vegetable and fruit, forage for animals, source for alcoholic beverages, sweetener, live fences, industrial products such as cosmetics and dye, and as a medical source against diabetes and other diseases (Saenz et al., 1998; Badii and Flores, 2001; Basurto et al., 2006).

In Mexico, the genus *Opuntia* is represented mainly by the following species: *Opuntia ficus-indica, Opuntia albicarpa, Opuntia robusta, Opuntia streptacanta* and *Opuntia joconostle.* The prickly pear from the last specie is known as "Xoconostle" and is characterized by a smaller size, a weak pink color and an acid flavor. This fruit is widely used for the preparation of jam, marmalades, beverages, sauces and has traditionally been used for alternative treatments of diabetes mellitus.

In despite of the potential of prickly pears in the food, cosmetic and pharmaceutical industries (Ruiz-Feria et al., 1998; Moreno-Alvarez et al., 2003; Garcia-Pantaleon et al., 2009) there are few information about their composition and medicinal properties. The physicochemical and sensory properties (odor, aroma, taste and texture) of some fruits of *O. joconostle* have been determined. The objective of this study was to compare the sensory profile and the chemical composition of four samples of *O. joconostle* cultivated in Sahagun and Cuautepec, Hidalgo (Mexico).

MATERIALS AND METHODS

Sample collection and preparation

Eighty fruits of four samples of *O. joconostle* were collected from Cuautepec (samples 1, 2 and 3) and Sahagun (sample 4), Hidalgo (Mexico). Fruit samples were taken from ten different plants pursuant to the criteria set forth by Viloria-Matos and Moreno-Álvarez (2001) for fruits of the same species. The samples were transported in thermally insulated containers at a temperature of 7±1ºC. Fruits were washed and thorns were removed. Later, the pulp was separated manually and kept in plastic containers under

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Table 1. Chemical composition of *O. joconostle* fruits analyzed.

Parameter (g/ 100 g)	Sample 1	Sample 2	Sample 3	Sample 4
Protein	0.71	1.16	1.56	1.11
Carbohydrates	7.98	6.33	5.81	6.95
Crude fat	<0.10	<0.10	<0.10	<0.10
Moisture	87.30	87.69	87.70	89.05
Ash	0.49	0.54	0.65	0.54
Crude fiber	3.52	4.28	4.28	2.35
Energetic content (kcal)	34.76	29.96	29.48	32.24
pH	3.00	3.20	3.00	2.80

Samples 1, 2 and 3 were collected in Cuautepec, Hidalgo, Mexico. Sample 4 was collected in Sahagun, Hidalgo, Mexico.

refrigeration before analyses.

Chemical composition

Moisture content, protein, ethereal extract, ash and crude fiber were analyzed according to AOAC (1990) methods.

The pH of the "Xoconostle" pulp samples was determined by taking 10 g of homogenized pulp sample in 50 ml clean beaker, using a digital pH meter (Jenway 3510-UK) at 25ºC.

Sensory evaluation

The sensory evaluation was performed in the "Centro de Investigación y Asistencia en Tecnología y Diseño del Estado de Jalisco" - Research and Assistance in Technology and Design of the State of Jalisco (CIATEJ), Mexico. For the determination of the flavor profile of four samples of "Xoconostles" ten judges were selected and trained according to the standards of the ISO 3972:1991, ISO 8586:1993, ISO 5496:1992 and the ISO 6564:1985. The sensory profile was developed by using descriptive quantitative and qualitative analysis (QDA). A list of descriptive terms was generated for each sample. A sensory score sheet with a 150 mm non-structured scale was used to rate the perceived intensity of each descriptive term. The intensity of each descriptor was the average of the intensity attributed by the 10 panelists and two repetitions. Only the descriptive terms that presented a variation coefficient less than 10% were selected.

RESULTS AND DISCUSSION

Chemical composition

The chemical composition parameters of four samples of *O. jononostle* analized are listed in Table 1. Later analysis revealed low amounts of protein (0.71 to 1.56%), crude fat (<10%), crude fiber (2.35 to 4.28%), ash (0.49 to 0.65%) and carbohydrates (5.81 to 7.98%). These results were consistent with the low energetic content observed (29.48 to 34.76 kcal/100 g). Moisture content was the higher parameter found in all samples analyzed (>80%). All the fruits presented low and homogeneous pH values (2.8 to 3.2).

Excepting pH, chemical composition values found were in agreement with those reported for some prickly pears varieties (O*. ficus-indica*, *O. robusta, O. albicarpa*). pH was lower to those reported for most prickly pear fruits (4.27 to 5.75) (Sawaya et al., 1983; Chavez-Santoscoy et al., 2009).

Sensory profiles

At the beginning of the experiment, a list of 42 descriptor terms for appearance, odor, aroma, taste, texture, and trigeminal sensations was proposed. However, the descriptors that represented similar characteristics or those that were not detected by all the judges were eliminated. A final vocabulary list of six odor, five aroma, one taste and two texture descriptors was selected and used to build the QDA of each sample. "Xoconostles" collected in Sahagun showed a larger number of descriptors compared with those from Cuautepec (Figure 1). The odor terms found for Sahagun samples were green fruit, peach, green oxidized fruit, melon, cucumber and wet straw, aroma descriptor for these samples included citric, wet straw, green fruit, dry grass and dirty cloth. Regarding Cuautepec samples, they showed a similar flavor profile among them but markedly different from "Xoconostles" from Sahagun. Their common odor descriptors were green fruit, peach and cucumber while melon was detected only in samples 1 and 3. Sample 3 showed green oxidized fruit odor descriptor perceived in sample 4. Green fruit was the only aroma descriptor detected in samples 1, 2 and 3. Bittersweet taste, firmness and fiberousity were detected in all prickly pear fruits studied.

Conclusion

Despites the analyzed samples belonged to the same genus and specie (*O. joconostle*), there were notorious differences in their flavor profile attributed mainly to the

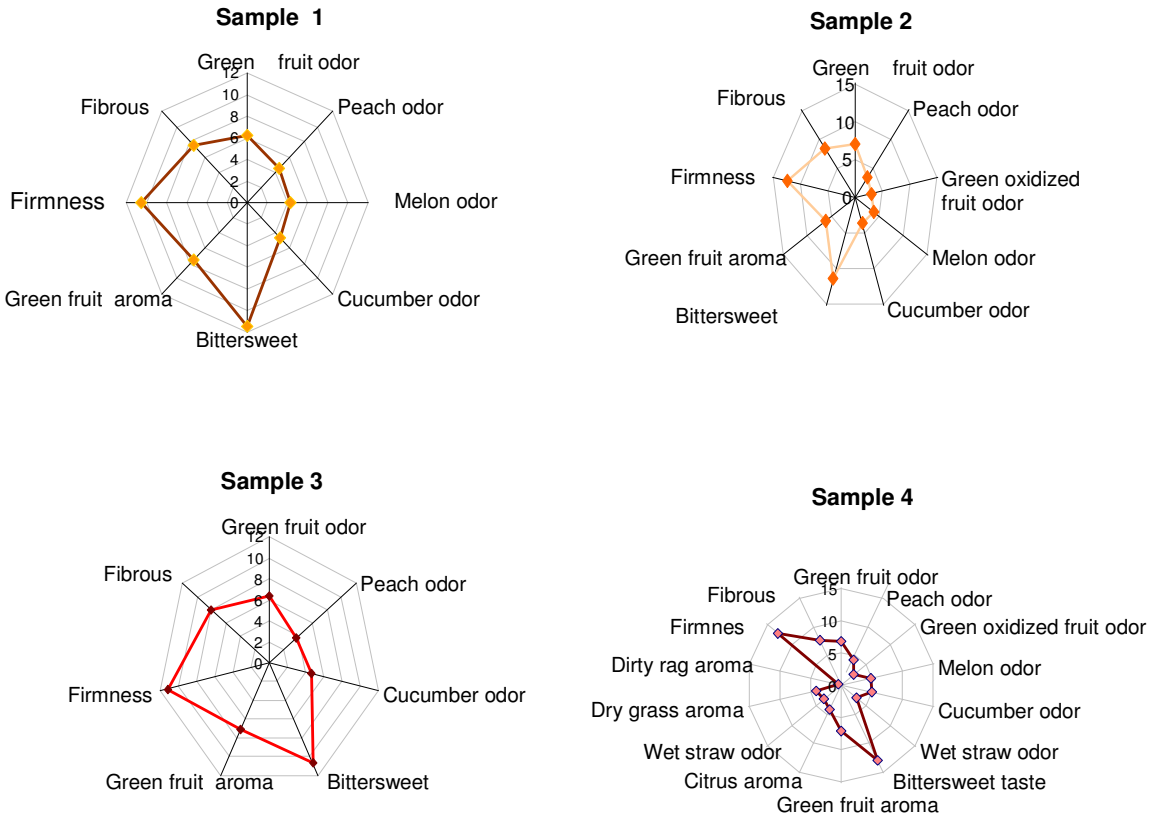

Figure 1. Sensory flavor profiles of samples 1, 2, 3 and 4 collected in Cuautepec and Sahagun, Hidalgo, Mexico.

geographical conditions of the regions where they were collected. However their chemical composition was similar. Further research is needed in order to find the factors affecting the sensory properties that determine the flavor profile of each fruit.

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