

## Physicochemical characterization of 5 varieties of pecan walnut (*Carya illinoensis k*) from north of México.

L. E. Chacón-Garza\*, L. A. Aguilar-Zapata\*, G. Díaz-Palafox\*, S. Hernández-Corral\*, A. Rodríguez-Vidal\*\* and H. D. Flores-Chávez\*\*\*

\* (Escuela de Ciencias de la Salud. Universidad Autónoma de Coahuila, Piedras Negras, México.

\*\* (Facultad de Ciencias Químicas. Universidad Autónoma de Coahuila, Saltillo, México.

\*\*\* (Escuela de Ciencias de la Salud. Universidad Autónoma de Durango, Saltillo, México

### ABSTRACT

Pecan walnut is a tree that represents a very important source of income in Mexico and the United States. Its fruit, the pecan nut is a highly nutritious food with nutraceutical properties. Pecan nut consumption has been associated with better cardiovascular performance due to its high content of mono and polyunsaturated fatty acids, which are notable for lowering cholesterol (LDL) levels and triglycerides in the blood. For this reason, 5 varieties of pecan nut (*Carya Illinoensis K var Pawnee*, *Carya Illinoensis K*, *Carya Illinoensis K var Wichita*, *Carya Illinoensis K var Cheyenne*, *Carya Illinoensis K var Sioux* and *Carya Illinoensis K var Western*) from northern Coahuila were analyzed, to evaluate its nutritional properties, especially its oil content. The Pawnee variety presented the best size and the highest oil yield, so it could be a good alternative for the production of this in the industry.

**Keywords** – characterization; walnut; pecan; quality

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### I. INTRODUCTION

Actually, high interest exists in consuming foods that contribute to maintaining the health, as well as preventing degenerative diseases [1]. Among this type of food are the pecan nuts, which are nutritious, tasty, convenient, and easy snack that contribute to a healthy lifestyle this are obtained from the pecan tree.

The pecan or pecan walnut tree (*Carya illinoensis* Koch) was first reported in 1533 by the Spanish López de Oviedo and was called by the Spanish colonizers simply as walnut or pecan due to a very similar term heard from the natives, derived from the Algoquin "Pakan" which in general terms means "fruits so hard that they require a stone to break them." Its origin lies in the southeastern United States of America, as well as in northern of Mexico [2], [3].

Pecan nut consumption has been associated with better cardiovascular performance due to its high content of mono and polyunsaturated fatty acids, which are notable for lowering cholesterol (LDL) levels and triglycerides in the blood [4], [5], [6], [7]. In addition, because it is a food rich in fiber, its contribution to the digestive system is equally positive, as it helps prevent constipation [6]. There are also many benefits provided by the highest content of antioxidants [8], [9], vitamins and

minerals present in the nut [6].

The nut can be consumed fresh or used in the kitchen, especially in pastries, but also in dishes with a lot of flavor: it is used in fillings, nut breads ("nut pancake" in Mexico), ice cream and salted vegetable dishes. One of the best-known desserts with pecan as the main ingredient is the "pecan pie" of the United States [1], [2].

### II. MATERIAL AND METHODS

Samples of 5 varieties of pecan nut (*Carya Illinoensis K var Pawnee*, *Carya Illinoensis K*, *Carya Illinoensis K var Wichita*, *Carya Illinoensis K var Cheyenne*, *Carya Illinoensis K var Sioux*, and *Carya Illinoensis K var Western*) were obtained from a farm of Zaragoza Coahuila, Mexico. The length and weight were determined to evaluate its category according to Official Mexican Standard NMX-FF-084-SCFI-2009 [10] and a proximal analysis of walnut almonds was performed according to the methodology official of the Association of Official Analytical Chemists [11], through the following analyzes: humidity (925.09); proteins (920.87); total lipids (920.85); Total fiber (991.43) and minerals (923.03), to evaluate the differences between the different varieties. A completely randomized design with the same number of repetitions was used, a Tukey HSD test with a sensitivity of  $p = 0.5$  was performed, the results were analyzed in the

Statgraphics Centurion Version XV statistical package

### III. RESULTS AND DISCUSSION

According to the classification of the Official Mexican Standard NMX-FF-084-SCFI-2009 [10], the Pawnee variety entered into the category of giant nut because at least 122 nuts are needed to complete a Kg despite not Be the longest nut. The Wichita variety with 130 nuts per kilo entered into the extra-large category and the Sioux variety with 189 nuts per kilogram in the small category (Table 1).

**Table 1.** Length and weight of five pecan nut varieties (*Carya illinoensis K*)

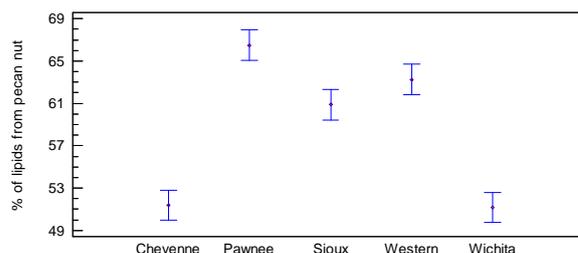
Variety	length (cm)	weight (g)
Wichita	4.140 <sup>a</sup>	7.668 <sup>b</sup>
Western	3.868 <sup>b</sup>	7.180 <sup>b<sup>c</sup></sup>
Pawnee	3.824 <sup>b</sup>	8.383 <sup>a</sup>
Sioux	3.460 <sup>c</sup>	5.288 <sup>d</sup>
Cheyenne	3.324 <sup>d</sup>	6.842 <sup>c</sup>

Based on various studies, it is important to note that pecans are a food of plant origin, which has a high fat content and proteins, in addition to own a low percentage of carbohydrates, which depends of the variety and year of production [12]. In the present research work all nuts were within the

nutritional ranges established within by the literature, humidity 2-4%, ashes 1%, carbohydrates 4% and proteins 15% (Table 2) [12], [13], [14].

The major component of the pecan nut are the total fats. The fat content of pecan nuts varied between approximately 55 and 65% (Figure 1). Significant differences were found between the different samples (p = 0.05). Walnut varieties with lower oil content were Wichita and Cheyenne with 51.15% and 51.37%, and varieties with higher oil content were Western and Pawnee with 63.26% and 66.51% however these variations are normal according to similar studies [15], [16], [17].

These data confirm the high energetic value that presents the pecan nut compared to other dried fruits. Therefore, the five types of nuts (*Carya Illinoensis K var Pawnee*, *Carya Illinoensis K*, *Carya Illinoensis K var Wichita*, *Carya Illinoensis K var Cheyenne*, *Carya Illinoensis K var Sioux* and *Carya Illinoensis K var Western*) constitutes a nutritious food that contribute significantly to the health of the consumers [12].



**Figure 1.** Percentage of oil from five varieties of pecan nut (*Carya Illinoensis K*).

**Table 2.** Nutritional facts of five varieties of pecan walnut

Pecan Walnut	Cheyenne	Pawnee	Sioux	Wichita	Western
Humidity (%)	3.85 <sup>a</sup>	2.57 <sup>d</sup>	3.22 <sup>c</sup>	3.45 <sup>c</sup>	3.71 <sup>b</sup>
Ash (%)	1.90 <sup>a</sup>	1.30 <sup>a</sup>	1.90 <sup>a</sup>	2.11 <sup>a</sup>	1.29 <sup>a</sup>
Total sugar (%)	8.99 <sup>a</sup>	8.98 <sup>a</sup>	7.02 <sup>a</sup>	10.17 <sup>a</sup>	9.98 <sup>a</sup>
Total fiber (%)	2.10 <sup>a</sup>	1.95 <sup>a</sup>	1.80 <sup>a</sup>	2.19 <sup>a</sup>	2.09 <sup>a</sup>
Protein (%)	9.50 <sup>a</sup>	10.01 <sup>a</sup>	8.00 <sup>a</sup>	10.01 <sup>a</sup>	11.01 <sup>a</sup>

### IV. CONCLUSION

According to the Official Mexican Standard, three of the five varieties of pecan nuts collected was entered the category of extra-large, one in the small and the *Pawnee* variety entered in the giant category. All nuts were within the nutritional ranges established within the literature. The oil content varied significantly (p = 0.05) among the different nut varieties. The *Western* and *Pawnee* varieties had the highest oil content.

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### REFERENCES

- [1] M. St-Onge. Dietary fats, teas, dairy, and nuts: potential functional foods for weight control? *Am J Clin Nutr*, 81, 2005, 7–15.

- [2] C. I. Orona, D. M. Sangerman-Jarquín, M. H. Fortism, C. V. Vázquez, M. A. Gallegos. Producción y comercialización de nuez pecanera (*Carya illinoensis* Koch) en el norte de Coahuila, México *Revista Mexicana de Ciencias Agrícolas*. 4(3), 2013, 461-476.
- [3] M. G. Cervantes, I. Orona, C. Vázquez, M. Fortis, J. J. Espinoza A. Análisis comparativo de huertos de nuez pecanera (*Carya illinoensis* Koch) en la Comarca Lagunera. *Revista Mexicana de Ciencias Agrícolas*. 9(1), 2018, 25-35.
- [4] C. De Lira-García, M. Bacardí-Gascón, A. Jiménez-Cruz. Efecto del consumo de nueces, semillas y aceites sobre marcadores bioquímicos y el peso corporal; revisión sistemática. *Nutr. Hosp.* 27 (4), 2012, 964-970.
- [5] M. Nuss, R. Mar, F. J. Sánchez-Muniz. Frutos secos y riesgo cardío y cerebrovascular. Una perspectiva Española. *Archivos Latinoamericanos de Nutrición*. 54(2), 2004, 1-10.
- [6] M. A. Flores-Córdova, Sanchez C. E. Fitoquímicos y nutrientes en almendra y cáscara de nuez pecanera”. *RIIT*. 3(18), 2016, 1-10.
- [7] Chisholm, K. Mc Auley, J. Mann, S. Williams, and M. Skeaff, Cholesterol lowering effects of nuts compared with a Canola oil enriched cereal of similar fat composition. *Nutrition, Metabolism and Cardiovascular Diseases*, 15(4), 2005, 284–292.
- [8] R. Blomhoff, M. H. Carlsen, L. F. Andersen, and D. R. Jacobs, Health benefits of nuts: potential role of antioxidants, *British Journal of Nutrition*, 96(2), 2006, S52–S60.
- [9] E. Ryan, K. Galvin, T. P. O'Connor, A. R. Maguire and N. M. O'Brien, Fatty acid profile, tocopherol, squalene and phytosterol content of brazil, pecan, pine, pistachio and cashew nuts, *International Journal of Food Sciences and Nutrition*, 57(3-4), 2006, 219-228.
- [10] Norma Mexicana NMX-FF-084-SCFI-2009. Productos alimenticios no industrializados para consumo humano – fruto fresco – nuez pecanera *Carya illinoensis* (Wangenh) K. Koch –especificaciones y métodos de prueba
- [11] Official Methods of Analysis of AOAC Internacional (AOAC). 2005. USA. 18 edition.
- [12] M.A. Flores-Córdova, P. Berzoza-Vasquez, E. Sánchez-Chávez, J. I. Sáenz Solís, S. Guerrero-Morales and J. Hernández-Carrillo. Composición fisicoquímica y capacidad antioxidante del fruto del pecanero en condiciones de año de elevada producción (“on”) y de año de baja producción (“off”). *ITEA* 112 (3), 2016, 255-270
- [13] Organización Panamericana de la Salud. Tabla de composición de alimentos de Centroamérica. Guatemala; 2ª Menchu MT (ed.) 2007
- [14] A. B. Pérez. Sistema Mexicano de Alimentos Equivalentes. (México, DF. Ogali, 2014)
- [15] Malhotra, S. 2008. World edible nuts economy. 538 pp. Concept, New Delhi.
- [16] Malik, N., J. Pérez, L. Lombardini, R. Cornacchia, L. Cisneros and J. Bradford. 2009. Phenolic compounds and fatty acid composition of organic and conventional grown pecan kernels. *J. Sci. Food Agric.* 89: 2207-2213.
- [17] G. D. Fernandes, B. Raquel, M. C. Gómez-Coca, W. Pérez-Camino, and D. Barrera-Arellano. Chemical Characterization of Major and Minor Compounds of Nut Oils: Almond, Hazelnut, and Pecan Nut. *Journal of Chemistry*. 2017, 1-11