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PROXIMAL ANALYSIS OF THE RESIDUAL CAKE OBTAINED WITH EXTRACTION BY PRESSING SEEDS OF PEREHUETANO

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ABSTRACT

The *Parinari pachyphylla Rusby* is a tree native to South America, popularly called "Perehuétano", there is currently a growing interest dedicated to finding new ways of obtaining edible oils such as those of plant seeds that represent an important source of oils with high nutritional, industrial and pharmaceutical importance. In this paper the proximal analysis of the residual cake of seeds of the Perehuétano was carried out, the extraction was carried out by the mechanical method of pressing, obtaining the following results: humidity 3.28%, ashes 3.10%, crude protein 37.87%, crude fiber 12.54%, crude fat 42.30% and carbohydrates 4.30%. In conclusion it is indicated that the nutrients of the cake of the raw seeds can be compared favorably with the nutrients of the seed of common use, such as soybeans, cottonseed, rapeseed, cantaloupe, jatropha curca, among others.

Keywords: composition, parinari pachyphylla rusby, quality, residual cakes.

INTRODUCTION

The growing demand for vegetable oils in the formulation of food, industrial, pharmaceutical and cosmetic products has motivated in our country and other countries of the world the need to import oleaginous raw materials to meet the demands of the market [1]. In this sense, the countries that present a biodiversity of genetic resources initiate research programs towards the use of native sources such as the case of our research where the *Parinari pachyphylla Rusby* in a plant that can be found in a few parts of the world, its seed contains a high percentage of oil and of great nutritional value [2].

The collections of perehuétano known in Colombia were made between 1944 and 1991 and come from places now drastically transformed for intensive agriculture, as is the case of the Atlantic Coast and the Antioquia Urabá [3]. It is assumed that in these regions, except perhaps those corresponding to the Tayrona National Park (PNN), the populations are severely decimated and reduced to a few isolated individuals in paddocks or in small forests. It is possible that the largest and best preserved populations are found in Norte de Santander and Vichada [4]. However, it is estimated that the population has suffered a reduction greater than 50% in the last 100 years, a situation that tends to continue in the future [5].

The cake resulting from the pressing of the perehuétano is a by-product obtained from the seed once the oil is extracted, which has little commercial value due mainly to the absence of scientific information [6]. It is expected that the analysis of the cake will yield high nutritional content to be used in animal feed or in the composition of fertilizer for crops. Therefore, it is interesting to carry out the proximal analysis of the residual seed cake of *Parinari pachyphylla Rusby*.

METHODOLOGY

The initial procedure

The raw material that was used in this work was the seed of *Parinari Pachiphilla Rusby*, was collected in the municipality of Montería-Córdoba (Colombian Caribbean). For the pretreatment of the matter the following steps were carried out: first the seed was separated from the mesocarp, then the peeling was done, which consists of taking a knife and splitting the seeds in two and then extracting the nut, the seeds were exposed to the Sun for 3 hours. To extract the cake by mechanical means (pressing) [7], first crush the sample, heat it and place it in the press cartridge which is handled through a bottle-type hydraulic jack. After the extraction of the oil by pressing, the residual cake is obtained, which was taken as a raw material to carry out the different analyzes of the proximal type.

Proximal analysis

The proximal analysis of each of the samples was carried out according to the methods recommended by the AOAC [8]: Moisture, by drying the samples at 105 ° C for 3 h in an oven; proteins (N x 6.25) by the Kjeldahl method; fats by Soxhlet method; ash by incineration in muffle; fiber by treatment with acid and base; carbohydrates per difference (100 - percentage of each of the above).

RESULTS

A percentage of humidity of 3.2854% is presented, as can be seen in Table-1, this is because the cake obtained by pressing preserves the amount of water and volatile compounds mostly present in the seed, this parameter is very important for the preservation of the residual cake, since the higher humidity creates an environment more favorable for the growth of bacteria

and fungi that deteriorate and lower the quality of the seed [9]. According to this it can be said that the residual cake obtained by pressing has a good quality.

Table-1. Moisture of residual cake.

Sample	W sample wet (g)	W sample dry (g)	Humidity (%)
1	20.033	1.940	31.448
2	20.014	19.347	33.326
3	20.095	19.416	33.789
X	20.047	19.387	32.854
S	0.0034	0.0029	0.10

In Table-2, the results obtained from the ash content of the residual cake are observed, where an ash content with an average value of 3.10% was obtained, this is because in the sample there was little organic matter content [10]. This parameter is useful to know what application can be given regarding the feeding of animals, this will depend on the minerals and salts present in the sample.

Table-2. Ash content in the residual cake.

Sample	W sample wet (g)	W sample dry (g)	W sample calcined (g)	Ash percentage (%)
1	50.030	48.452	0.1501	3.10
2	50.025	48.357	0.1498	3.10
3	50.027	48.336	0.1487	3.10
X	50.027	48.381	0.1495	3.10
S	0.00020	0.0050	0.00060	0

Next, a description of the protein content in the residual cake of Parinari pachyphylla Rusby seed will be made. As shown in Table-3, average values of 37.87% are presented. These values do not meet the standard of the CODEX General Standard for Vegetable Protein Products (PPV) - CODEX STAN 174 - 198967 [11], which establishes that the crude protein content should not be less than 40% based on the dry weight. The crude protein content obtained is within the range reported by Usman *et al*. (2009) [12], which is between 30 - 37%, these results give reliability to the method used for this type of analysis.

Table-3. Protein content of the residual cake.

Sample	W sample wet (g)	Volume HCl (mL)	NT (%)	PC (%)
1	20.005	43.5	6.09	38.07
2	20.012	43.0	6.02	37.64
3	20.007	43.3	6.06	37.90
X	20.008	43.2	6.05	37.87
S	0.00029	0.20	0.02	0.17

In Table-4, the results obtained from the fiber content of the *Parinari pachyphylla Rusby* seed are observed, the values for the percentage of fiber, 12.54%, which is a relatively high value, are stipulated. The presence of a high content of crude fiber in food is important because it has been reported that it decreases the digestibility of dry matter in animals [13]. Therefore, the high crude fiber content is a good indicator of the nutritional value.

Table-4. Fiber content of the residual cake.

Sample	W sample wet (g)	W_1–W_2 (g)	Fiber (%)
1	20.051	0.2576	12.46
2	20.033	0.2544	12.69
3	20.044	0.2594	12.47
X	20.042	0.2571	12.54
S	0.00074	0.0020	0.1078

The carbohydrate content obtained from the residual cake of *Parinari pachyphylla Rusby* seed by pressing was 4.30 as shown in Table 5; these carbohydrates are mostly starch which could be affected by the storage time and the environmental conditions of the medium, being able to cause the structure of the starch to be broken down affecting the glycosidic bonds that unite the monosaccharides that form the structure of this polysaccharide [14].

Table-5. Carbohydrate content of the residual cake.

Sample	Carbohydrates (%)
1	4.01
2	4.71
3	4.19
X	4.30
S	0.29

Next, the results obtained from the raw fat content of the residual seed cake of *Parinari pachyphylla Rusby* are shown in Table 6. Raw fats are very heterogeneous organic compounds, but they have in common the property of being soluble in some substances called organic solvents, such as ethyl ether, petroleum ether, among othersv [15]. Foods of natural origin for animals usually contain low levels of fat, but in balanced foods the use of oils, fats and baits in common practice as they provide a nutritional benefit [16]. The content of crude fat obtained was 42.30% which indicates that the seed has a good amount of fat, making it good for animal feed.

Table-6. Raw fat content of the residual cake.

Sample	W sample wet (g)	W fat extracted (g)	Raw fat (%)
1	20.015	0.85	42.46
2	20.010	0.84	41.97
3	20.012	0.85	42.47
X	20.012	0.84	42.30
S	0.00020	0.0047	0.23

CONCLUSIONS

In the results of the proximal analysis of the cake of the Perehuétano seed it is concluded that: the percentage of moisture and volatile matter by the pressing method is low because the seed conserves little amount of water and volatile material since it does not It was treated with substances that can eliminate these compounds at the time of extraction. In the percentage of ash obtained by the pressing method indicated a high amount of minerals, which provides a high nutritional value that can be used as a food source for the development and growth of animals. The percentage of crude protein obtained is below the standards established by CODEX. The percentage of crude fiber in the cake is favorable when it is used as a raw fiber supplement in animal nutrition.

REFERENCES

[1] Quispe J., Ayala M., Ingunza G., Landeo E. and Pascual G. 2009. Caracterización de aceites, tortas y harinas de frutos de ungurahui (Jessenia polycarpa) y aguaje (Mauritia flexuosa L.) de la amazonía peruana. Revista de la Sociedad Química del Perú. 75(2): 243-253.

[2] Thomas E., Jalonen R., Loo J., Boshier D., Gallo L., Cavers S., Bordács S., Smith P. and Bozzano M. 2014. Genetic considerations in ecosystem restoration using native tree species. Forest Ecology and Management. 333, 66-75.

[3] Cerón M., Gutiérrez D., Bolivar D., Bedoya G. and Palacio L. 2015. Toma de decisiones basada en gestión de procesos: impacto en sistemas intensivos de producción de leche. Livestock Research for Rural Development. 27(12).

[4] Lafont J., Páez M. and Lans E. 2011. Composición fisicoquímica de la semilla y del aceite de la semilla del Canime (Copaifera officinalis L). Información tecnológica. 22(3): 19-26.

[5] Lafont J., Durango L. and Aramendiz H. 2014. Estudio químico del aceite obtenido a partir de siete variedades de soya (Glycinemax l.). Información tecnológica. 25(2): 79-86.

[6] Uquiche E., Romero V., Ortíz J. and del Valle J. M. 2012. Extraction of oil and minor lipids from cold-press rapeseed cake with supercritical CO2. Brazilian Journal of Chemical Engineering. 29(3): 585-598.

[7] Lafont J., Calle E. and Durango L. 2013. Composición Química del Aceite de Almendras producidas por el Árbol Olleto (Lecythis minor DC). Informacion tecnológica. 24(1): 59-68.

[8] AOAC Official Methods of Analysis, 18 Edition (2005), métodos 925.40, 981.10, 942.05, 978.10.

[9] Šimić B., Vratarić M., Sudarić A., Krizmanić M. and Andrić L. 2005. Effect of storage longevity under different storage conditions on seed vigor and oil content in maize, soybean and sunflower. Agriculture. 1(2): 12-17.

[10] Wang Z., Yang G., Zheng J., Cao L., Yu H., Zhu Y., Tagami K. and Uchida S. 2015. Effect of ashing temperature on accurate determination of plutonium in soil samples. Anal Chem. 87(11): 5511-5.

[11] Comisión del Codex Alimentarius, Alinorm. Programa Conjunto FAO / OMS sobre normas alimentarias. Directrices para la aplicación del Sistema de Análisis de Peligros y de los Puntos Críticos de Control (HACCP). Anexo al CAC/RCP 1-1969, Rev. 3 (1997), Roma, Italia; 1995.

[12] Usman H., Abdulrahman F., Kaita H. and Khan I. 2009. Antibacterial assays of the solvents partitioned portions of methanol stem bark extract of Bauhinia rufescens Lam [Leguminosae-Caesalpinioideae]. Pacif. J. Sci. Tech. 10(2): 857-867.

[13] Jha R. and Berrocoso J. 2015. Review: Dietary fiber utilization and its effects on physiological functions and gut health of swine. Animal. 9(9): 1441-1452.

[14] Adeyeye E. 2011. Fatty acid composition of zonocerus variegatus, macrotermes bellicosus and anacardium occidentale kernel. Int J Pharma Bio Sci. 2, 135-144.

[15] Rios R., Ferreira M., Fernandes P., Viana C. and da Silva S. 2014. Application of fats in some food products. Food Science and Technology. 34(1): 3-15.

[16] Lafont J.J., Páez M.S. and Portacio A.A. 2011. Extracción y Caracterización Fisicoquímica del Aceite de la Semilla (Almendra) del Marañón (Anacardium occidentale L). Información Tecnológica. 22(1): 51-58.