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Physicochemical study of *Moringa oleifera* Lam Seeds

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Abstract The potential use of Non-Conventional Food Plants in Brazil is still unknown and requires further studies, and may become an important tool in establishing sustainable production systems. The objective was to compare the physicochemical composition of moringa seeds from two states in the Northeast of Brazil. The seeds used in the research came from two states, namely: Bahia and Paraiba. In the Laboratory of Processing and Storage of Agricultural Products of the Federal University of Campina Grande, physicochemical analyses of moisture, water activity, titratable acidity, pH, ashes, proteins, carbohydrates and lipids were performed. The seeds of the two states have low water content and activity, low acidity. The pH was classified as low acid; the amount of ash was higher than in the literature cited, both seeds contain high protein content.

Keywords Physicochemical composition, Food, Northeast Brazil, Nutrition, Plant

1. Introduction

In recent decades, the process of urbanization has progressively weakened the relationship of human beings with the land and the cultivation of their food; there are significant changes in food patterns and loss of cultural characteristics and identity with the reduction in consumption of local and regional food. Food can be characterized as a cultural identity, because through it there is recognition of societies, together with habits around food. Among the food of plant origin are the Non-Conventional Food Plants (PANCs), which are represented by native, exotic, spontaneous, wild or domesticated edible species that are not part of the production chain and the current usual dietetics of a portion of the population, also including unusual parts of plants with food potential [1].

The *Moringa oleifera* is an example of Unconventional Food Plant; it originates from India and belongs to the Moringaceae family. In the last decades, its seeds have been the object of studies in different areas, such as the environmental area as an efficient natural coagulant in water treatment, application in cosmetics and pharmaceuticals [2-3]. And recent studies are being developed with the aim of applying the moringa in food products [4].

The moringa has important nutritional properties. Its content in proteins, vitamins and minerals is significant and is considered one of the best perennial vegetables. Besides having several therapeutic properties, it is also cultivated due to its high nutritional value of leaves, green fruits, flowers and seeds, as they present high quality and quantity of calcium, iron, proteins, fibers, minerals and essential amino acids. It can be widely used by the chemical and food industry [5].

This potential of PANCs in Brazil is still unknown and requires further studies, and may become an important tool in establishing production systems on a sustainable basis, since these resources are still consumed by the rural population and are adapted to the soil and climate conditions of many regions [6].

Knowledge of the physico-chemical characteristics of moringa seeds allows their application in various food products, and verification of their behaviour in relation to cultivation in different states is certainly an important aspect. Therefore, the objective was to compare the physicochemical composition of moringa seeds from two states in the Northeast of Brazil.

2. Material and Methods

Place of Research

The seeds used in the research were collected in two states: Bahia and Paraiba. In the Laboratory of Processing and Storage of Agricultural Products, of the Federal University of Campina Grande the seeds were selected and peeled manually.

Physicochemical Composition of the Seeds

Physicochemical analyses of moisture (%) were carried out by the method of drying the samples in an oven at 105 °C; water activity by direct reading in 'Aqua-Lab', model 4TE; titratable acidity (%) by titulometry; pH by direct reading of the homogenised samples in digital pH meter; ash (%) by incineration of samples in muffle furnace; proteins (%) by the micro-kjeldahlmethod; carbohydrates (%) by taking from 100 the sum of water, lipids, proteins and ash contents, both according to the methodology proposed by Brazil [7] and lipids (%) by the modified Bligh and Dyer method [8].

Statistical Analysis

The experimental design was entirely randomized, with two treatments (two locations) and three repetitions. The results were submitted to analysis of variance and the means were compared using Tukey 5% probability test, using the statistical software Assistat 7.7 [9].

3. Results and Discussion

The seeds presented (Figure1) low water content as recommended by the legislation, which describes the maximum acceptance limit of 15% of moisture [10]. The water activity of the seeds can be classified as intermediate; there was no significant difference between the two locations. Silva et al. [11]verified 5.24% of water content for moringa seed flour and 0.62 for water activity, results close to those verified in this research.

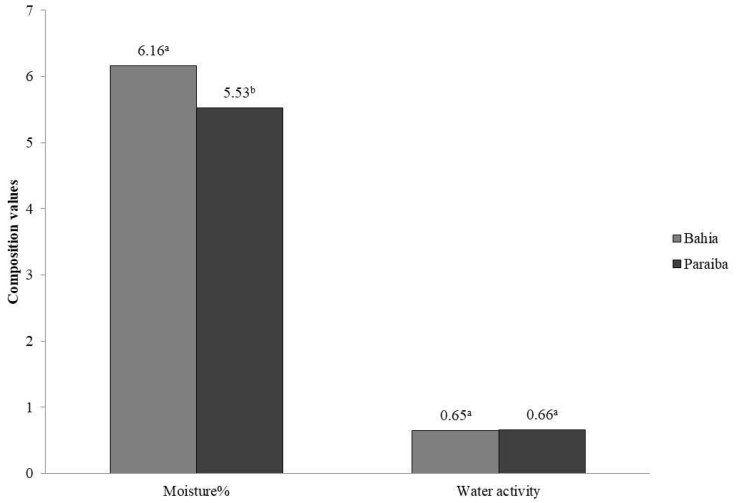

Figure 1: Graphical representation of humidity and water activity of Moringa oleifera seeds from two states of Northeast Brazil

Seeds from both locations showed low acidity (Figure 2), meeting the requirements of Brazilian legislation, which determines a minimum of 0.8% acidity in citric acid [9]. Passos *et al* [12], found a pH value of 7.47%, being much higher than that obtained in this study. The pH is one of the intrinsic factors of the product that is related to the development of microorganism, enzymatic activities, and retention of taste, odor and general conservation of the product.

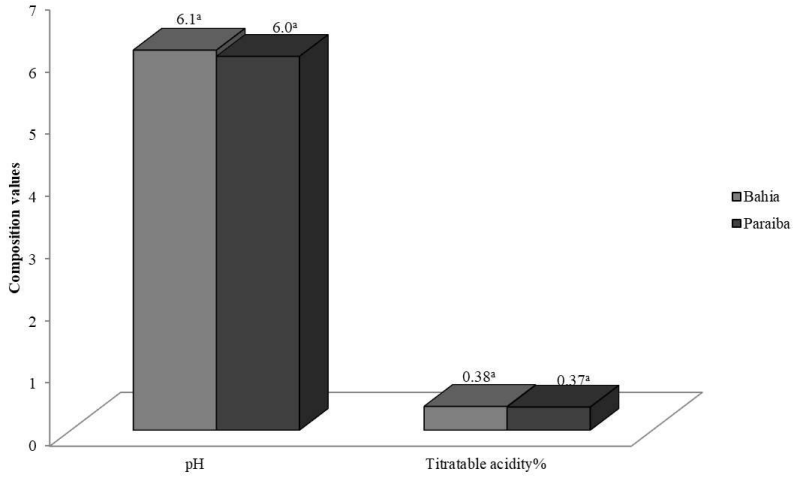

Figure 2: Graphical representation of pH and titratable acidity in Moringa oleifera seeds from two states of Northeast Brazil

According to Souza *et al* [13], food can be classified as: low acid (pH >4.5), acids (4.0 to 4.5) and very acid (< 4.0). Faced with this classification, the seeds were not very acidic. However, for the ash parameter, Passos *et al* [12], found a much lower amount than in that studies (0.95%).

There was no statistical difference for protein between the localities (Figure 3); both seeds had high protein content. Macambira *et al* [14] found 18.31% protein in the chemical composition of moringa leaf meal. All parts of the moringa are rich in nutrients and compounds favorable to the proper functioning of the body.

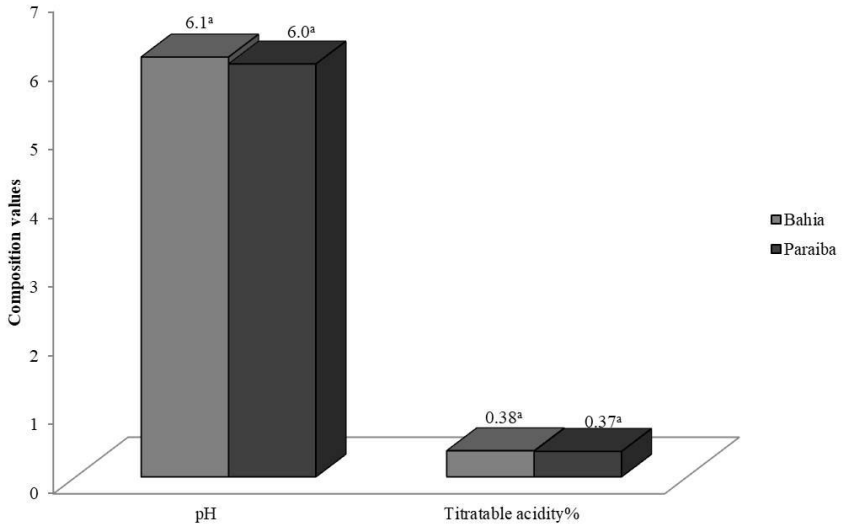

Figure 3: Graphical representation of the amount of ash and proteins from Moringa oleifera seeds from two states of Northeast Brazil

Silva *et al* [15] analyzing the physicochemical composition of the in nature powder obtained from moringa seeds found 31.92% of proteins, 31.46% for lipids and 28.59% for carbohydrates. In this study, for the parameters lipids

and carbohydrates the seeds presented statistical difference, being the Paraiba seeds the ones that resulted in higher lipid contents and lower amount of carbohydrates (Figure 4).

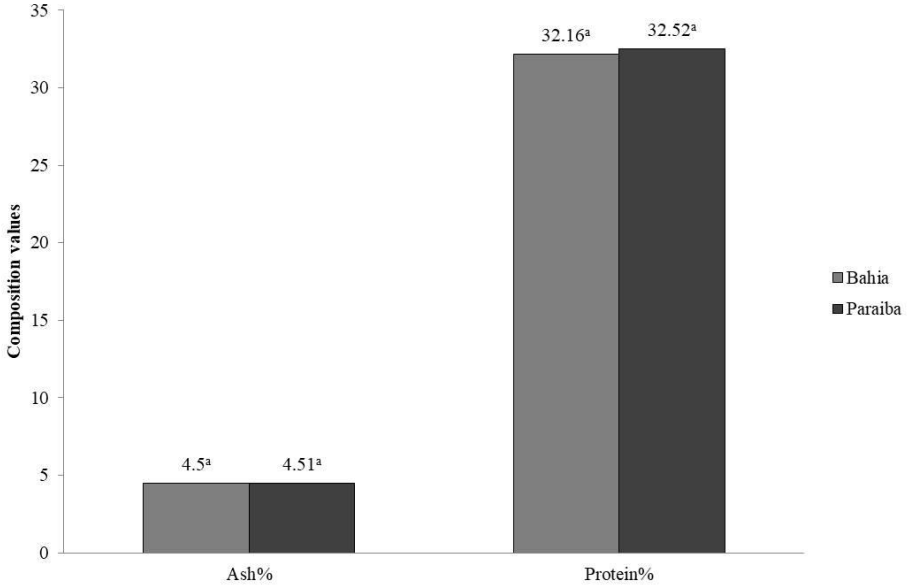

Figure 4: Graphical representation of the amount of carbohydrates and lipids present in Moringa oleifera seeds from two states of Northeast Brazil

According to Silva *et al* [11], the amount of nutrients in food is affected by environmental conditions in the period of its development in the field and by harvesting, drying, processing and storage conditions.

4. Conclusion

Seeds in both states have low moisture and water activity, low acidity, both parameters being within what is established by current legislation. The pH was classified as low acidity; the amount of ash was higher than in the literature cited, both seeds contain high protein content. The seeds from Paraiba resulted in higher lipid contents and lower amount of carbohydrates.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Reference

[1]. Kinupp VF & Lorenzi H, 2014. Unconventional Food Plants (PANC) in Brazil: identification guide, nutritional aspects and illustrated recipes. 1st ed. Plantarum Institute of Flora Studies.

[2]. Kwaambwa, HM & Rennie, AR., 2012.Interactions of surfactants with a water treatment protein from *Moringa oleifera* seeds in solution studied by zeta-potential and light scattering measurements. *Biopolymers*, 97(4): 209-18.

[3]. Baptista, ATA., Coldebella, PF., Cardines, PHF., Gomes, R. G., Vieira, MF., Bergamasco, R& Vieira, AMM., 2015. Coagulation-flocculation process with ultrafiltred saline extract of *Moringa oleifera* for the treatment of surface water. *Chemical Engineering Journal*, 276:166-73.

[4]. Cardines, PHF, Baptista, ATA, Gomes, RG., Bergamasco, R., & Vieira, AMS, 2018. *Moringa oleifera* seed extracts as promising natural thickening agents for food industry: Study of the thickening action in yogurt production. *Food Science and Technology*, 97: 39-44.

[5]. Gallão, MI., Damasceno, LF., & Brito, ES., 2006. Chemical and structural evaluation of moringa seed. *Agronomic Science Journal*, 37(1):106-9.

[6]. Barreira, TF., Paula Filho, GX., Rodrigues, VCC., Andrade, FMC., Santos, RHS., Priore, SE & Sant'ana, HMP., 2015.Diversity and Equitability of Unconventional Food Plants in Rural Viçosa, Minas Gerais, Brazil. *Brazilian Journal of Medicinal Plants*, 17(4): 964-74.

[7]. Bligh, EG & Dyer, WJ., 1959. A rapid method of total lipid extraction and purification. *Journal Biochemistry Physiology*, 37(8): 911-17.

[8]. Brazil, 2008. Adolfo Lutz Institute.Chemical and physical methods for food analysis. 4. ed. Analytical standards of the Adolfo Lutz Institute. São Paulo. v. 1, p.1020.

[9]. Silva, FAS & Azevedo, CAV, 2016.The Assistat Software Version 7.7 and its use in the analysis of experimental data. *African Journal Agricultural Research*, 11 (39): 3733-40.

[10]. Brazil, 2005. Ministry of Health. National Health Surveillance Agency - ANVISA. Resolution RDC nº 273, of September 22, 2005. Technical Regulation of Mixtures for the Preparation of Food and Food Ready for Consumption. 4pp.

[11]. Silva, SN, Almeida, FAC., Gomes, JP., Barroso, AJR., Silva, PB., Melo, BA., Silva, LPFR., Santos, NC., Matos, JDP., Moraes, MS., & Moraes, JS., 2019. Production and physical and physicochemical characterization powder in natura and freeze-dried of moringa seeds. *Journal of Agricultural Science*, 11 (9): 11-20

[12]. Passos, RM., Santos, DMC., Santos, BS., Souza, DCL., Santos, JAB.,& Silva, GF., 2012. Post-harvest quality of moringa (*Moringa oleifera* Lam) used in its natural and dry form. *GEINTEC Journal*, 3:113-20.

[13]. Souza, JML., Alvares, VS., Leite, FMN., Reis, FS., & Felisberto, FAV., 2008. Physical and chemical characterization of flour from cassava varieties used in the Jurua Valley, Acre. *Acta Amazonica*, 38(4): 761-766.

[14]. Macambira, GM., Rabello, CBV., Navarro, MIV., Ludke, MCMM., Silva, JCR., Lopes, EC., Nascimento, GR., Lopes, CC., Bandeira, JM.,& Silva, DA., 2018. Nutritional characterization of *Moringa oleifera* (MOL) leaves for broilers. *Brazilian Archive of Veterinary Medicine and Zootechny*, 70(2): 570-78.

[15]. Silva, AL., Silva, JF., Almeida, FAC., Gomes, JP., Alves, NMC., & Araújo, DR., 2012. Physiological quality and control of corn seeds treated with *Piper nigrum*. *Brazilian Magazine of Agroindustrial Products*, 14: 131-42.