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Proximate Composition of Ora-pro-nóbis (*Pereskia aculeata* Miller)Leaves Grown Under Water Control

short communication

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Abstract

The Ora-pro-nóbis (OPN) - *Pereskia aculeata* Miller -is considered an unconventional vegetable because it is not regularly produced and sold in common stores such as supermarkets and street markets. However, its consumption is encouraged by the Brazilian government because it is considered a plant that is easy to grow, fast-growing, and rich in nutrients of human food interest [1]. This study presents the results of the centesimal composition of Ora-pro-nóbis leaves, grown under intermittent water restriction, with soil matric potentials of -10 kPa, -30 kPa, -50 kPa, and -70 kPa. The leaves showed nutritional characteristics with potential for food enrichment in the range of water potentials studied.

Keywords: *Pereskia Aculeata* Miller; Proteins; Unconventional Food; Water Deficit

Development

The centesimal composition of OPN leaves as a function of soil potential levels was carried out on leaves whose growth was controlled for 140 days in a protected environment. The analyses followed the standard recommended by the Adolfo Lutz Institute [2] for moisture, ash, protein, crude fiber, and lipids, and the carbohydrate content was determined by the difference between 100% and the other contents (Table 1) [1].

The controlled water supply significantly influenced ($p<0.01$) the protein, lipid, crude fiber, and carbohydrate content, with linear regression adjustments for proteins, lipids, and carbohydrates, and quadratic for crude fiber (Figure 1). All these variations allow us to state that OPN leaves respond to the water supply in the soil or substrate. If nutritional and environmental variables are controlled, it is possible to maximize certain chemical constituents in the plant.

The ash content in the OPN leaves was not affected by the difference in matric potential ($p>0.05$, Table 1). However, this result is noteworthy because there is a high fixed mineral residue in the leaves (21.0%), which indicates that the leaves may be an important source of minerals for the human body. Almeida Filho and Cambraia[3] reported ash contents within this same range, 21.7 and 20.1%, for samples obtained from different sources. There are other references with reports of similar ash contents, 20.11% [4] and also below those found in this work, such as 16.1% [5], 18.07% [6] and 14.24% [7].

Comparing the ash content found in this research with the content in iceberg lettuce (*Lactuca sativa* L.) (9.1%), butter cabbage (*Brassica oleracea* var. *acephala*) (11.2%), spinach (*Tetragonia expansa*) (14.3%), white cabbage (*Brassica oleracea* var *capitata*) (5.6%), broccoli (*B. oleracea* var *italica*) (7.2%), watercress (*Nasturtium officinale*) (10.7%) and taioba (*Xanthosoma saggitifolium*) (9.9%)[2], OPN leaves have a higher ash content than the vegetables listed. These results indicate that OPN leaves are a more abundant source of minerals than other vegetables, whether they are consumed traditionally or not.

As a result of the reduction in matric potential from -10 kPa to -70 kPa, there was a significant linear increase in the protein content in the leaves of the plant, estimated at $0.0955\ g\ 100\ g^{-1}\ kPa^{-1}$($p<0.01$; Table 1, Figure 1). Concerning the highest content obtained, at a potential of -70 kPa, it can be seen that up to -10 kPa there was a 32.3% drop in the protein content in the leaves. Considering the differentiated water control and the other conditions in the greenhouse were uniform for all treatments, it can be said that the protein content in OPN leaves is related to water availability in the soil. Therefore, this is one of the factors that can explain the different percentages of protein reported by researchers in samples from different regions, without cultivation under specific conditions (Chart 1), although this statement does not exclude the probable joint influence of other factors (soil, environmental and genetic) on the protein contents presented by the different samples analyzed.

[1]Complete growing conditions and management can be found at: https://repositorio.unesp.br/items/dec06943-8a0b-44fb-ba6d-8e01c91a32f6

[2]TBCA/USP [6], data converted to dry basis taking the sum of proteins, ashes, lipids, carbohydrates, and fibers as 100% dry extract.

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Table 1: Mean values ± standard deviation, regression equations (ŷ) and coefficients of determination (R^2) for the ash, protein, lipid, crude fiber, and carbohydrate contents of Ora-pro-nóbis leaves, as a function of the soil's matric potential, on a dry basis at 105 °C, at 140 days after transplanting.

Matric potential (kPa)	Ash^{NS}	Protein**	Lipid**	Crude fiber**	Carbohydrate**
		% (g/100g)			
-10	22.72±0.99	11.96±0.74	7.12±0.49	11.96±1.55	46.24±2.11
-30	21.62±2.03	14.28±0.79	7.51±0.77	11.98±1.79	52.13±3.01
-50	20.03±1.89	15.42±0.47	6.47±0.77	10.39±1.24	54.16±2.53
-70	19.53±2.83	19.97±0.74	5.82±0.90	6.65±1.32	55.86±3.40

Variable (g/100g)	Regression Equations	R^2
Ash	$\hat{y} = 21.0^{NS}$	-
Protein	$\hat{y} = 11.028 - 0.0955x(^{**})$	0.9816
Lipid	$\hat{y} = 7.7171 + 0.0247x(^{**})$	0.7376
Crude fiber	$\hat{y} = 11.1581 - 0.1004x - 0.0023x^2(^{**})$	0.9992
Carbohydrate	$\hat{y} = 45.9147 - 0.1546x(^{**})$	0.9051

[c]Average values - obtained by the difference between 100 and the sum of ash, protein, lipids, and fiber, in each repetition. NS, **, * Statistically significant at 1% and 5% probability, respectively, by the F test; R = Regression.

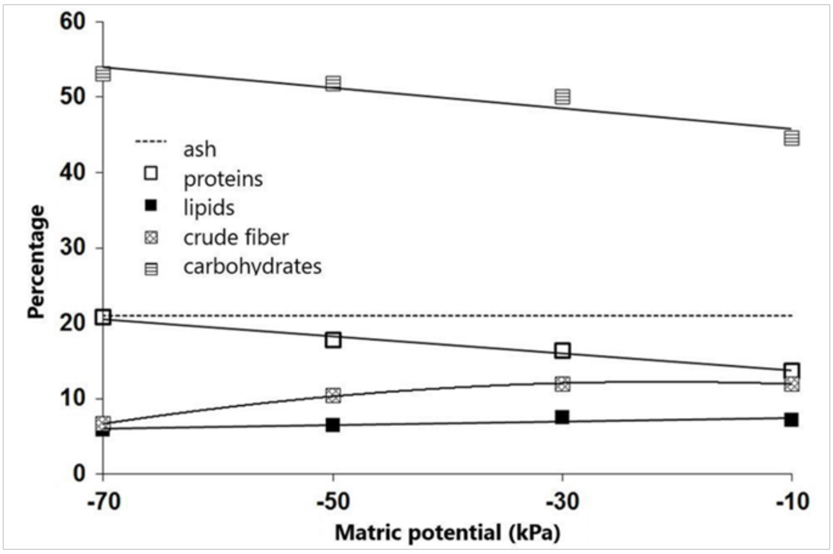

Figure 1: Variation in ash, protein, lipid, crude fiber, and carbohydrate content in Ora-pro-nóbis leaves as a function of soil matric potential, on a dry basis at 105 °C, at 140 days after transplanting.

Chart 1: Protein content from analysis of samples collected in different locations or regions, on a dry basis.

Protein (%)	Sample location	Reference
17.4	Guiricema, MG	Almeida Filho and Cambraia(3)
25.5	Viçosa, MG	
25.14	Sete Lagoas e Lagoa Santa, MG	Dayrell and Vieira [8]
[a]28.59	Jardim Botânico, UFRJ, RJ	Albuquerque *et al.* (7)
[b]19.67	Horto, UFLA, MG	Girão *et al.* (9)
22.93 ± 3.02	Diamantina, MG	Rocha *et al.* (6)
28.4 ± 0.4	Mairiporã, SP	Takeiti *et al.* (5)
9.64	Ibiá, MG	Silva *et al.* (4)
[c]15.2- 30.1	Uberlândia, MG	Magalhães *et al.* (10)
[d]13.7-20.6	Uberlândia, MG	Data obtained in this work

[a]Values obtained from pre-drying at 60 °C.
[b]Obtained from a sample pre-dried at 30 °C for 72 hours.
[c]Interval of protein percentage obtained from five different samples, in apical and basal leaves.

The proteins in the leaves are possibly one of the constituents of greatest interest in OPN and the reason why it is also called "poor meat", as it is popular knowledge that it is "rich" in proteins. According to the National Health Surveillance Agency, RDC 269 [11]an adult should have a daily intake of 50 g (daily intake) of protein, and a protein-rich food provides 20% of the DI in a 100 g portion of food (solid), according to Anvisa Ordinance number 27[11]. Considering dried OPN leaves, in the range of matric potential studied, a 100 g portion of leaves would provide between 13.7 and 20.6 g of protein, which corresponds to more than 20% (10 g) of an adult's daily protein requirement and could therefore be classified as protein-rich food.

The protein content found in OPN leaves in this study is between the maximum and minimum reported in the literature. For consumption as a food with a higher protein content, the supply of water should be minimized, since at lower matric potentials the protein content was higher than at higher levels (Figure 1).

The protein content in OPN leaves obtained in this study (Table 1) are comparable to those determined for vegetables such as american lettuce (*Lactuca sativa* L.) (15.8%), white cabbage (*B. oleracea* var *capitata*) (12.2%), chard (*Beta orientalis* L.) (18.2%), lettuce (*Cichoryum intybus* L.) (19.0%) and taioba (*Xanthosoma saggitifolium*) (19.0%) and are lower than the levels in butter cabbage (*B. oleracea* var acephala) (23.5%), broccoli (*B. oleracea* var *italica*) (31.2%), watercress (*Nasturtium officinale*) (32.8%), spinach (*Tetragonia expansa*) (24.7%) and stinging nettle (*Phenax uliginosus* Wedd.) (24.2%). The results obtained and the comparison with the protein content of other vegetables, conventional or not, show that there is potential for OPN to be consumed as a source of this nutrient, as well as other leafy vegetables since they also have similar and/or higher levels than those obtained in this study for OPN leaves; as already shown by the reports by Kinupp and Barros [12] for plants consumed unconventionally. However, OPN differs from conventional vegetables due to its greater ease of cultivation, high leaf yield, and low incidence of pests and diseases [14].

The lipid fraction in OPN leaves is the smallest contributor to its centesimal composition (Table 1) and varied linearly in the range between 6.0 and 7.5 g 100 g^{-1}, in the malic potential range studied (Figure 1). The decrease in water potential from -10 to -70 kPa decreased lipid content, at a rate of 0.0247 g 100 g^{-1} kPa^{-1}, causing a difference of around 20% between the lipid content at -10 kPa and -70 kPa.

Although the results for lipid content are higher than those found by Taketi *et al.* [6](4.1 ± 0.41%), Rocha *et al.* [6](3.64 ± 0.41%), Girão *et al.* [9](4.41%) and Wang *et al.* [14] (2.35%), they are lower than those found by Almeida Filho and Cambria [3](11.7%) for an OPN plant collected in Guiricema, MG, and are close to those found by Albuquerque *et al.* [7](6.30%), Dayrell and Vieira[8] (5.83%) and Almeida Filho and Cambria[3]for plant samples in Viçosa, MG (6.8%). Magalhães *et al.* [10] reported lipid contents varying between 1.6 and 5.6% for OPN leaves from five different matrices in Uberlândia, MG, indicating that there is also high variability in the data reported in the literature for lipid content.

The crude fiber content in the OPN leaves (Table 1) was influenced by the matric potentials in the soil ($p<0.01$, Table 1, Figure 1). The regression with a quadratic fit revealed that the maximum crude fiber content occurred at a potential of -21.8 kPa, with a content of 12.3 g 100 g^{-1} to the dry mass of the leaf. Between the potential of -10 kPa and -21.8 kPa, the percentage increase in fiber content in the leaves was only 2.7%. Between -21.8 and -70 kPa the fiber content decreased, reaching a minimum of 6.9 g 100 g^{-1}, equivalent to a 43.5% reduction with the maximum content.

By comparing the fiber content obtained as a function of the different matric potentials with the crude fiber content obtained by Dayrell and Vieria[7](7.12%), Wang *et al.*[14] (15.12%) and Magalhães *et al.* [10] (between 11.4 and 15.5%), it can be seen that the results obtained under the range of matric potentials in the soil are within the range reported in the literature, even considering the different forms and growing conditions of the plants analyzed.

The crude fiber content values obtained from the dried OPN leaves in this study indicate that they can be considered a food rich in fiber according toAnvisa Ordinance number 27 [11], as they have more than 6 g of fiber per 100 g, the minimum recommended by the standard.

The carbohydrate content (Table 1) increased linearly ($p<0.01$; Table 1, Figure 1) with the reduction in the matric potential in the soil, at a rate of 0.1546 g 100 g^{-1} kPa^{-1}. In this study, there was a 19.5% increase in carbohydrates in the leaves between the highest and lowest water potential due to the reduction in water potential.

Conclusion

The nutritional characteristics of Ora-pro-nóbis leaves suggest its potential to be incorporated into the human diet across the entire range of matric potentials studied.

References

1. Brasil (2010) Manual de hortaliças não-convencionais. Ministério da Agricultura, Pecuária e Abastecimento. Belo Horizonte, MG, 92 p.
2. Instituto Adolfo Lutz (2008) Procedimentos e determinações gerais. In: LUTZ, I. A. Métodos Físico-químicos para análise de alimentos. 4ªedição/1ªedição digital. ed. São Paulo: Instituto Adolfo Lutz 1(4):1020.
3. Almeida Filho J, Cambraia J (1974) Estudo do valor nutritivo do "Ora-Pro-Nobis". Revista Ceres, Viçosa MG. 21(114) :10-5
4. Silva DB, Agostini-Costa T, Vieira RF, Alves RD Das N, *et al.* (2010) Proteína bruta e teor de minerais em duas espécies de ora-pro-nóbis (*Pereskia aculeata* Mill. e *P. grandifolia* Haw). *In:* Congresso Brasileiro de Gastronomia, 3.; Simpósio Regional De Ciência e Tecnologia, 1., 2010, Brasília, DF. Anais... Brasília:UNB:CET; SBCTA. 1-4.
5. Takeit CY, Antonio GC, Motta EMP, Colares Queiroz FP, Park KJ (2009) Nutritive evaluation of a non-convencional leafy vegetable (*Pereskia aculeata* Miller). International Journal of Food Science and Technology, Campinas 1(60):148-160.
6. Rocha DR Da C, Pereira Júnior GA, Vieira G, Pantoja L,Santos AS, *et al.* (2008) Macarrão adicionado de ora-pro-nóbis (*Pereskia aculeata* Miller) desidratado. Alimentos e Nutrição,19:459-465.
7. Dayrell MS, Vieira EC (1977) Leaf protein concentrate of the cactaceae *Pereskia* aculeata Mill. I. Nutrition Reports International 15(5) :529-537.
8. Albuquerque MGPT, Saaba Srur AUO, Freiman LO (1991) Composição centesimal e escore de amino-ácidos em três espécies de "ora-pro-nóbis" (Pereskia aculeata Mill., *P. bleu De Candolle*, *P. pereskia* (L) Karsten). Boletim SBCTA, Campinas 25(1):7-12.
9. Girão LVC, Silva Filho JC, Pinto JEBP, Bertolucci SKV (2003) Avaliação da composição bromatológica de ora-pro-nóbis. In: Congresso De Olericultura, 43º, Recife, PE. Anais... Recife: ABH, p. 1-4
10. Magalhães R de O, Santos GM, Queiroz CRA Dos A, Andrade RR de, Oliveira F de M, *et al.* (2011) Avaliação físico-química de folhas de ora-pro-nóbis obtidas de plantas catalogadas no município de Uberlândia, MG. In: Seminário de Iniciação Científica, I, Uberlândia, MG. Anais... Uberlândia: IFTM, 4.
11. Anvisa. RDC 269, 22 de setembro de (2005). Regulamento técnico sobre a ingestão diária (IDR) de proteína, vitaminas e minerais. Brasília, DF.
12. Anvisa (1998) Portarianº 27 - Informação Nutricional complementar. Agência Nacional de Vigilância Sanitária. Brasília, DF. 1998.
13. Kinupp, VF, Barros IBID (2008) Teores de proteínas e minerais de espécies nativas, potenciais hortaliças e frutas. Ciência e Tecnologia de Alimentos, Campinas, SP, 857, p. 846.
14. Santos GM, Magalhães R de O, Queiroz CRA, Andrade RR, Oliveira F de M, *et al.* (2011) Catalogação de ora-pro-nóbis em cultivo no

município de Uberlândia, MG. In: Seminárioде Iniciação Científica, I, Uberlândia, MG. Anais... Uberlândia: IFTM. p. 4.

15. Wang SH, Ascheri, JLR, Albuquerque MGPT, Borges GG (1996) Caracteristicas tecnologicas y sensoriales de fideos fortificados con diferentes niveles de harina de hojas de ora-pro-nobis (*Pereskia aculeata* Miller). Alimentaria, Marid, ES, v. 276:91-96.