Vegetable salt: an ignored resource

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Introduction

Tree ash and vegetable salt are widely used as a native salt source for human consumption in the Amazonian basin. Among the indians of the Colombian Amazon, vegetable salt is also used in rituals and in the preparation of "ambil", the tobacco paste which is traditionally used applied to the gums.

The Huitoto indians from the Colombian Amazon prepare vegetable salt in the following way: they collect the bark, flowers, buds, or other plant material from the various species from which salt is obtained; they burn this material until it reduces to ashes; they put the ashes in a piece of bark of Heliconia sp. leaf, with fern leaves or moss at the bottom; slowly, they filter water through the ashes, to extract the salts it contains; and finally they boil down the resulting water in order to dry the salts.

Using the traditional method, we extracted the vegetable salt from 30 plant species from the Colombian Amazonian rainforest (table 1), and analyzed the concentration of several metals, anions and cations.

Materials and methods

Sulphate levels were determined by precipitation as barium sulphate, which was then dissolved in a measured excess of standard EDTA (ethylenediamine tetra-acetic acid) solution in the presence of aqueous ammonia. The excess of EDTA was then titrated with standard magnesium chloride solution using Eriochrome Black T as indicator.

Chloride levels were determined by the Mohr titration method. Bicarbonates are reported as carbonates and determined by titration.

Potassium, sodium, calcium and magnesium in the salt samples were measured by atomic absorption (Perkin-Elmer).

Results and discussion

The concentrations of carbonate, chloride, sulphate, sodium and potassium ions present in the vegetable salts are summarized in Table II. Concentrations are expressed as a percentage of the total salt obtained from air-dried samples. Potassium, carbonate, chloride and sulfate are the main ions present, ranging between 28.2 and 44.6% for potassium, 0.9 and 27.4% for carbonate, 1.1 and 26.1% for chloride, and between 7.9 and 49.6 % for sulphate. All the studied vegetable salts are characterized by a low concentration of sodium and a high concentration of potassium ions.

Maximiliana maripa and *Thurnia sphaerocarpa* presented a particulary high content of potassium and chloride ions, as Gustavia longifolia, Astrocaryum sciophilum, and Astrocaryum chamhira showed a content of sulphate higher than 44%.

Previous studies about plant derived ashes consumed in Papua New Guinea report the presence of a significative content in calcium and magnesium ions, accounting for a calcium content as high as 34,9% in the ashes from *Melaleuca leucadendron* L., and a magnesium content as high as 15,7% in those from *Acacia mangium* Willd. (Ohtsuka *et al.*, 1987; Freund *et al.*, 1965). Interestingly, in all of the salts of our study, the concentration of calcium and magnesium was found to be less than 0,63% and 0.31%, respectively. This correlates with the fact that low solubility salts (e.g. calcium sulphate) can be retained in the extraction process, and their concentration can be finely controlled by tasting the filtrate.

On the other hand, the ashes from *Maytenus vitis-idaea* Griseb., traditionally used by the Ayoreo, an Amerindian group of the

Paraguayan Chaco, present a sodium content as high as 2,27% (Schmeda-Hirschmann, 1994). The author suggests that taste preferences may account for the consumed plant ashes. In contrast, in our study, none of the plant derived salts presented a sodium content higher than 0.39%.

A high potassium-sodium ratio would make such salts dangerous if consumed in large quantities but with the information available it is difficult to assess the health hazard. No relation between the consumption of these salts, combined with the tobacco paste "ambil", and high blood pressure has been assessed, nor the reasons why they continue to be employed in the preparation of "ambil", despite the availability of commercial sodium chloride. Considering the way in which these salts are consumed, it is unlikely to envisage toxic effects. Nevertheless, further study would be worthwhile, particulary at the prospect of an eventual industrial preparation of some of these salts for the food and dietary market.

References

FREUND A.P.H., HENTY E.E., LYNCH M.A. (1965) Salt making in inland New Guinea, *Trans. Papua New Guinea Sci. Soc.*, 6:16-19.

LEMMONIER P. 1984. La production de sel végétal chez les Anga (Papouasie Nouvelle-Guinée), *J. Agric. Trad. Bot. Ap.*, 21:1-2.

HTSUKA R., SUZUKI T., MORITA M. (1987) Sodium-rich Tree Ash as a Native Salt Source in Lowland Papua, *Economic Botany*, 41: 55-59.

SCHMEDA-HIRSCHMANN G. (1994) Tree ash as an Ayoreo Salt Source in the Paraguayan Chaco, *Economic Botany*, 48: 159-162.

Table I. Scientific and vernacular names in Huitoto language of the plants used in the extraction of vegetal salt

Species	Family	Vernacular name
Asplundia sarmentosa Galeano & R. Bernal	Cyclanthaceae	Turao
Astrocaryum chamhira Burret	Arecaceae	Ñekina
Astrocaryum gynacanthum Mart.	Arecaceae	Ruiriyi
Astrocaryum jauari Mart.	Arecaceae	Korina
Astrocaryum sciophilum (Miq.) Pulle	Arecaceae	Júúikuruyi
Attalea racemosa Spruce	Arecaceae	Uiyoyi
Bactris fissifrons Mart.	Arecaceae	Zitori
Bactris humilis (Wallace) Burret	Arecaceae	Iñori
Chaunochiton lorantoides Benth.	Olacaceae	Víírigi
Chrysophyllum sanguinolentum (Pierre) Baehni	Sapotaceae	Bafákona
Cyclanthus bipartitus Poit.	Cyclanthaceae	Jogairi
Ecclinusa bullata T.D. Penn.	Sapotaceae	Iáikona jifikona
Ecclinusa ulei (Krause) Gilly ex Cronquist	Sapotaceae	Dairo
Geonoma macrostachys Mart.	Arecaceae	Zíínuikori
Geonoma maxima (Poit.) Kunth	Arecaceae	Fikaingo ereri
Gustavia hexapetala (Aubl.) Sm.	Lecythidaceae	Jameda
Gustavia longifolia Poepp. & Endl. ex Berg.	Lecythidaceae	Jameda (ua)
Hyeronima alchorneoides Allemao	Euphorbiaceae	Ekoroai
Lecythis pisonis Cambs.	Lecythidaceae	Iairo jero
Lepidocaryum tenue Mart.	Arecaceae	Ereri
Manilkara bidentata (A. DC.) A. Chevalier	Sapotaceae	Meníñokiai
Mauritia flexuosa L. f.	Arecaceae	Kinena
Mauritiella armata (Mart.) Burret	Arecaceae	Zííyaña, yumuna
Maximiliana maripa (Aubl.) Drude	Arecaceae	Jarina
Oenocarpus bataua Mart.	Arecaceae	Komaña
Oenocarpus mapora Karst.	Arecaceae	Gurikai
Parkia pendula (Willd.) Benth. Ex Walp.	Mimosaceae	Rangogi, jifibegi
Phenakospermum guyannense (Rich.) Endl.	Strelitziaceae	Iyoberi, Uiyoberi
Tapura guianensis Aubl.	Dichapetalaceae	Zeema iaiña
Thurnia sphaerocephala (Rudge) Hook. f.	Thurniaceae	Zaikori

Table II. Vegetable salt composition of the selected species (%)

Vegetable source	Carbonate %	Chloride %	Sulphate %	Sodium %	Potassium %
Asplundia sarmentosa	22.9	9.6	16.0	0.11	41.6
Astrocaryum chamhira	4.8	2.2	44.1	0.14	33.8
Astrocaryum gynacanthum	7.3	13.5	34.8	0.03	38.5
Astrocaryum jauari	8.3	10.5	22.0	0.03	36.1
Astrocaryum sciophillum	2.5	11.8	44.0	0.03	35.9
Attalea maripa	6.5	21.1	7.9	0.07	41.0
Attalea racemosa	5.4	20.3	19.9	0.04	31.7
Bactris fissifrons	8.9	2.2	39.5	0.04	42.6
Bactris humilis	4.8	10.6	23.2	0.39	37.7
Chaunochiton lorantoides	15.1	1.1	25.3	0.19	28.2
Chrysophyllum sanguinolentum	16.9	3.6	15.9	0.06	41.3
Cyclanthus bipartitus	18.7	6.5	19.4	0.05	29.4
Ecclinusa bullata	18.0	2.8	19.6	0.01	36.1
Ecclinusa ulei	17.2	3.2	32.6	0.03	34.2
Geonoma macrostachys	2.3	13.2	42.2	0.05	41.3
Geonoma maxima	8.2	4.5	34.7	0.10	33.5
Gustavia hexapetala	18.6	11.8	21.8	0.01	38.8
Gustavia longifolia	2.5	7.3	49.6	0.05	34.5
Hyeronima alchorneoides	29.4	2.3	12.8	0.02	37.8
Lecythis pisonis	7.2	17.4	21.3	0.01	39.2
Lepidocaryum tenue	10.5	8.5	21.8	0.06	32.7
Manilkara bidentata	8.8	6.7	34.6	0.03	35.0
Mauritia flexuosa	19.8	10.1	12.3	0.05	36.7
Mauritiella armata	21.3	6.3	17.2	0.02	30.4
Oenocarpus bataua	10.9	9.7	30.5	0.01	35.2
Oenocarpus mapora	23.5	4.8	13.9	0.05	33.1
Parkia pendula	24.0	5.6	11.6	0.10	38.5
Phenakospermum guyannense	27.4	3.3	8.0	0.02	33.4
Tapura guianensis	15.6	3.2	23.7	0.06	38.6
Thurnia sphaerocephala	0.9	26.1	14.9	0.04	44.6