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Nutritional Value and Minerals of *Treculia perrieri* (Tsitindry) Meal after Cooking Seeds

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Abstract Currently in Madagascar the nutritional deficiencies are numerous and frequent. The present work was carried out with the aim of evaluating some chemical and nutritional properties of Treculia perrieri (Tsitindry) flour after cooking the seed harvested in the Sambirano area were studied. The total water, ash, lipid, protein and carbohydrate contents of the "Tsitindry" flour were 9.42 g, 2.14 g, 9.57 g, 14.7 g, 64.17 g and an energy value of 401.61 kcal / 100 g. The measured mineral contents were expressed in mg / 100 g of seed flour as follows: Ca 146.73; K 444.69; Mg 143.11; Na 49.32; Fe 7.75. The mineral content and nutritional value are very high in the flour of Treculia pereirri. Furthermore, the content of antinutritional factors was low as pyrogallic phenolic compounds 0.002mg / g and catechics with a rate of 0.004mg / g and 0.009mg / g for polysaccharides. Other anti-nutrients such as tannins, saponins and polyphenols are absent.

Keywords *Treculia perrieri* (Tsitindry), Physico-chemical analysis, Nutritional, Antinutritional

1. Introduction

Treculia perrieri are humid wood below 300m, alluvium; it blooms in July and October. The ripe fruits are between months of January - February. The Tsitindry is widely spread in the region DIANA, more precisely the district Ambanja (Sambirano). It is also in the west of Madagascar, Menabe, Morondava, Befandriagna. *Treculia perrieri* (Tsitindry) is an endemic plant of Madagascar. It is classified in:

Class: Equisetopsida
Subclass: Magnoliidae
Superorder: Rosanae
Order: Rosales
Family: Moraceae
Genus: *Treculia*
Species: *Treculia perrieri*
Variety: *Treculia perrieri var. perrieri*
Vernacular names: Katoka, Tobory, Tsipa, Titindry [1, 2, 3, 4]

Treculia perrieri is a tree reaching 30m with trunk deeply furrowed with winged projecting buttresses, with smooth and grayish bark. Young pubescent branches. Leaves persisting to petiole puberulate at the beginning, 8 to 12 mm. Leafy corolla, angular or obtuse and unbalanced at the base rounded or acute at the apex, wider in the lower half than the upper half, 11 to 18 cm long on 4 to 7 cm; About 15 secondary ribs on each side; Finely cross-linked fine nerves. Dioecious flowers rarely monoecious, male receptacles usually on young twigs, females on older twigs [1-4].

Males, obovate receptacles with narrow base, reaching 4cm by 3. Flowers interwoven with bracts coated in escutcheon, welded on 2/3 of their length, exceeded by the flowers at the anthesis. Perianth hyaline shortly campanulate with 3-4 small ciliate teeth and 4 exerted stamens. Female receptacles of similar shape but larger (6 out of 5). Female flowers in several rows, interspersed with peeling bracts, the stigmas protrude alone. Two stigmatic branches of 5 to 7mm slightly papillose, obtuse, surmounting a style hairy of 3mm approximately. Sessile, irregularly shaped carcass, more than 30 cm and 5 kg, fleshy, with about 6-7 rows of ovoid achenes about 1 cm in surface. Thin, woody pericarp, brown on dry seed pendent without albumen; thin coat. Cotyledons unequal completely folded the bilobed notched tops folding at the level of the radicle, the wider enveloping the other in tongue [1-4].

2. Methods and Materials

2.1. Preparation of *Treculia perrieri* Flour

The seeds are extracted from ripe fruit. And afterwards, the seeds are separated from the pods and boiled for a few moments so that the pod that surrounds them bursts. Drain and dry the pods before shelling them for ease. After the cotyledons are dried in the sun then the cotyledons are ground to obtain the flour of *Treculia perrieri*.

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2.2. Mineral Analysis

The flour is placed in a muffle furnace at 550°C to obtain a white ash which contains the minerals.

The mineral contents Ca, Mg, K, Na are determined by atomic absorption spectrophotometry. After humidification, 5 to 25 ml of concentrated hydrochloric acid is added. The suspension is then boiled, and then filtered. The phosphorus content is determined by colorimetry or by spectrophotometry at 560 nm [6, 9, 13, 26].

The lipids: the sample is treated with hexane. Five grams of sample are introduced into extraction cartridges for six hours. The extract is placed in a drying oven at 75°C. for one hour until a constant mass is obtained [26, 32, 35, 43].

2.3. Analysis of Nutritional Value

- **The lipids**: the sample is treated with hexane. Five grams of sample are introduced into extraction cartridges for six hours. The extract is placed in a drying oven at 75°C. for one hour until a constant mass is obtained [26, 32, 35, 43].

The crude ash: the sample of 5 g taken is placed in a muffle furnace set at 550°C. The white ash is weighed after cooling.

- **The proteins:**

Two protein extraction techniques are used.

a) The flour obtained is suspended in a sodium phosphate buffer (0.05 mole.l^{-1} at pH 8.0) at a rate of 4 g in 9 ml. The debris is removed by centrifugation at 20,000 g. The proteins of the supernatant and of the centrifugation pellet are precipitated in the presence of TCA at 50 g.l^{-1}. They are dissolved in decinormal soda and dosed according to the method of LOWRY [6, 11, 26].

b) The flour is suspended in sodium phosphate buffer (1 mole.l^{-1} at pH 0.8) at a rate of 1 g in 9 ml and milled under constant pressure (420 kg/cm^2). The cell debris is removed and the suspension centrifuged at high speed under the conditions described in the art. The soluble proteins obtained according to the two techniques are separated into two groups by chromatography and the supernatants extracted after high-speed centrifugation.

Are dialyzed for 16 h against sodium phosphate buffer (0.01 mole.l^{-1} at pH 8.0) containing urea at a final concentration of 8 mole.l^{-1}. The dialysates are then chromatographed in a column of diethylaminoethylcellulose equilibrated with the same buffer. In this method the cationic protein retained by the resin and in other cases the anionic proteins remain adsorbed. The cationic and anionic proteins separated by chromatography are hydrolysed at 140°C. for 24 h in the presence of 6N HCl. Their respective amino acid composition is determined after analysis of the hydrolysates [6, 11, 26].

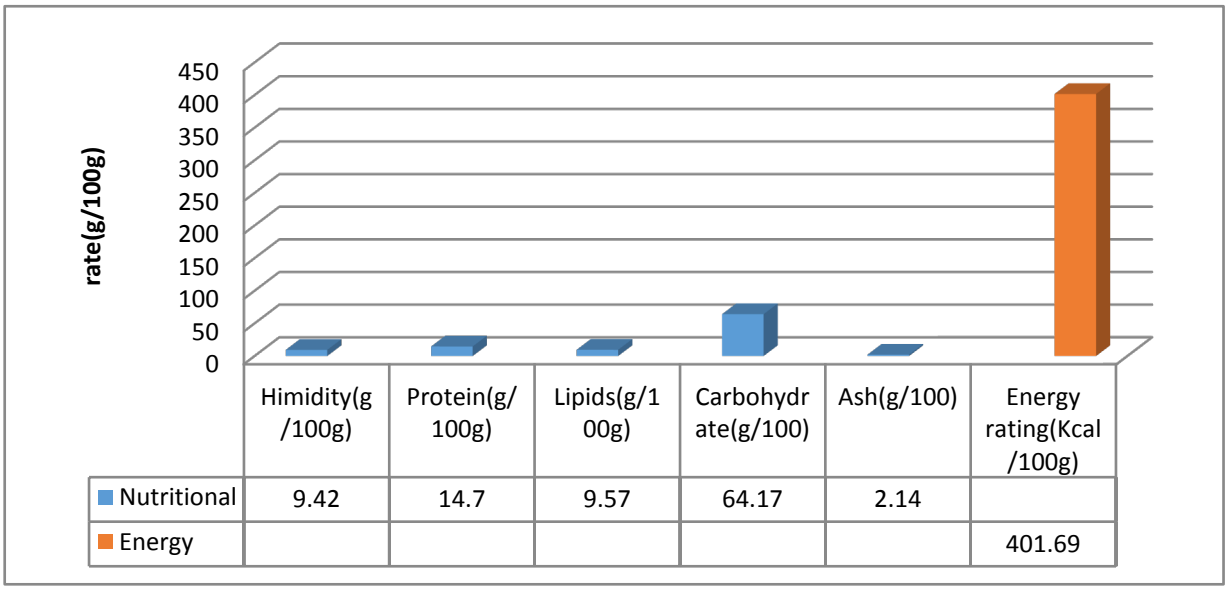
- **Carbohydrates** are assayed by spectrophotometry at 490 nm. The Fischer and Stein method is applied and uses DNS at 540 nm to evaluate soluble sugars [14, 18, 24, 26].

2.4. Determination of Antinutritional Factors of *Treculia perrieri* "Tsitindry" Flour

The determination of the total phenolic compound content was based on the reaction with the Folin Ciocalteu reagent. The blue coloration obtained has a maximum absorption at 725 nm. The tannins were determined according to the spectrophotometric method using acidified vanillin and tannic acid as standard (λmax = 500 nm). The determination of the saponin content was made using the afrosimetric method based on the formation of stable foams by Koziol saponins [20, 25, 26, 28, 33].

3. Results and Discussions

3.1. Nutritional Value of *Treculia perrieri* «Tsitindry»



	Himidity(g/100g)	Protein(g/100g)	Lipids(g/100g)	Carbohydrate(g/100)	Ash(g/100)	Energy rating(Kcal/100g)
Nutritional	9.42	14.7	9.57	64.17	2.14	
Energy						401.69

Table 1. Nutritional Value Analysis

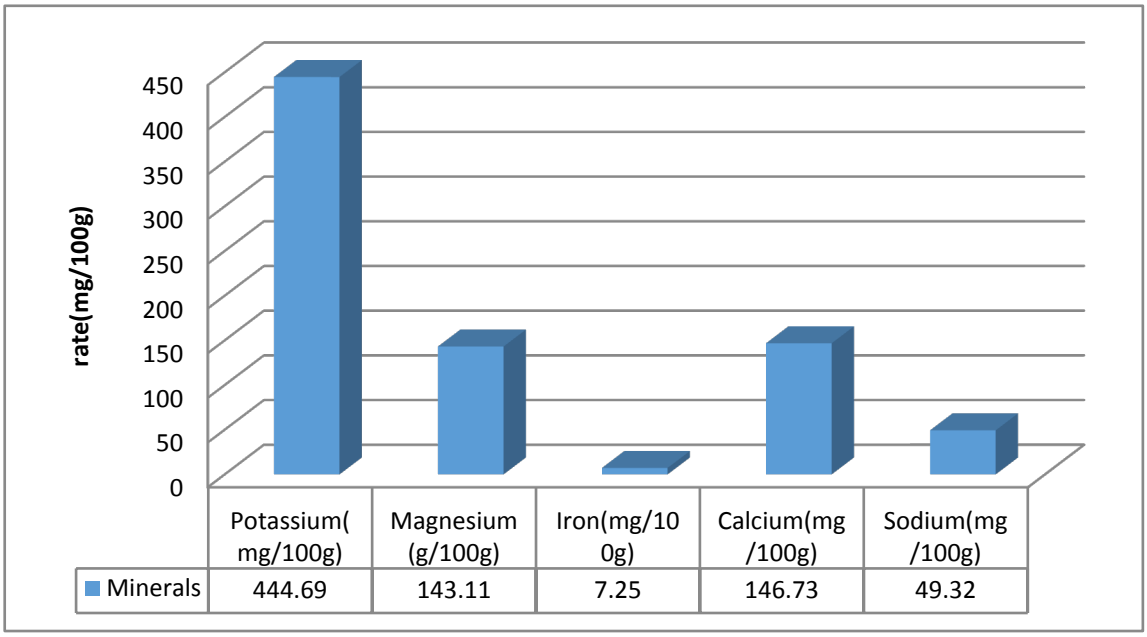
Humidity (g/100g)	9.42
Protein (g/100g)	14.7
Lipids (g/100g)	9.57
Carbohydrate (g/100g)	64.17
Ash (g/100g)	2.14
Energy rating (Kcal/100g)	401.61

Treculia perrieri is rich in carbohydrate with a rate of 64.17g per 100g followed by protein with a rate of 14.17g / 100g. In our study the presence of lipids with rate 9.57g / 100g is very noticeable. Therefore, the analysis of "Tsitindry" showed that the seed contains energetic elements with 401.61Kcal per 100g of *Treculia perrieri* flour.

3.2. Minerals in *Treculia perrieri* "Tsindry"

Table 2. Analysis of minerals

Potassium (mg/100g)	444.69
Magnesium (mg/100g)	143.11
Iron (mg/100g)	7.25
Calcium (mg/100g)	146.73
Sodium (mg/100g)	49.32



The seed "Tsitindry" is one of the seeds richest in natural minerals in Madagascar. The analysis shows that it is very rich in Potassium with a rate of 444.69mg / 100g and 146.73mg / 100g of Calcium. The seed of "Tsitindry" is complete; it is rich in minerals essential in human life like Magnesium, Iron, Sodium with rate of 143,11mg / 100g, 7,25mg / 100g and 49,32mg / 100g.

3.3. Antinutritional Value in *Treculia perrieri* "Tsitindry"

a) Screenings of saponins

Table 3. Saponins Test

	T=0mn	T=30mn	Observation for positive test	Result	Conclusion
Foam height	0,2cm	0cm	3cm height after 30mn	-	Absence of saponins

b) Screenings of tannins and polyphenolic compounds

Table 4. Test of tannins and polyphenols

Test	observation	Observation for positive test	Result	Conclusion
Gelatine 1%	Change in color in golden yellow	Precipitation	-	Absences of polyphenols
Salt Gelatin	No change in white color	Precipitation	-	Absences of tannins
$FeCl_3$	Changing color	Change in color-Black or Blue-back green (Catechic type) Bluish black coloring (pyrogallic and catechic type)	+ +	Presence of other types of phenolic compounds, other than pyrogallic and catechic

c) Polysaccharide Screenings

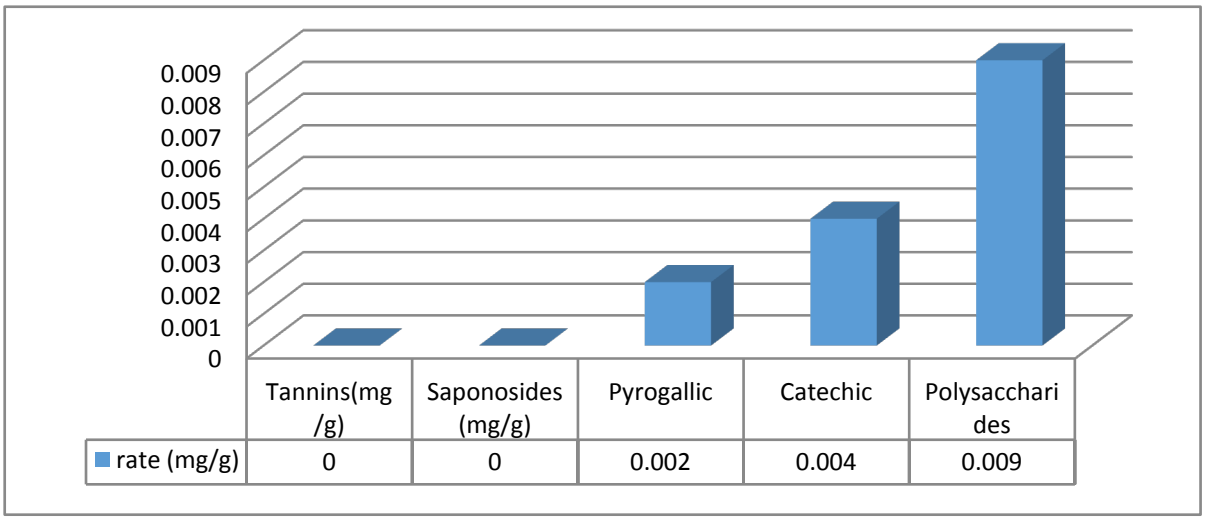
Table 5. Test of polysaccharides

Test	Observation	Observation for positive test	Result	Conclusion
Polysaccharides	White precipitation	Precipitation	+ +	Presence of polysaccharides

d) Recapitulation

Table 6. Summary of antinutritional factors

Antinutritional factors	Results
Tannins (mg/g)	0
Saponosides (mg/g)	0
Pyrogallic (mg/g)	0.002
Catechic (mg/g)	0.004
Polysaccharides (mg/g)	0.009



The extensive study showed that the absence of Tannins, Saponins in the seed of Tsitindry is very noticeable. However, the presence of phenolic compound as pyrogallic 0.002mg / g and catechics with a rate of 0.004mg / g is mentioned according to the analysis. The polysaccharides are present in the seed of Tsitindry with a rate of 0.009mg / g.

4. Conclusions

The seed of *Treculia perrieri* says "Tsitindry" is one of the seeds richest in nutrients like protein, lipids, carbohydrates and minerals essential to human life like potassium, magnesium, calcium sodium, iron. The Tsitindry is an endemic plant and one of God's gifts for the Earth called Madagascar but the populations and the Government do not use as a solution to the famine in Madagascar.

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