

Magnesium rich extract of cashew tree (*Anacardium occidentale*) nut and its principal compound, anacardic acid, stimulate glucose uptake in C2C12 muscle cells.

Leonard Tedong^{1,3}, P. Madiraju², L.C. Martineau², D. Vallerand², J.T. Arnason², D. P. D. Dzeufiet³, L. Lavoie², P. Kamtchouing³, P.D. Haddad², A. Rosanoff⁴

¹: Department of Physiology, High Institute of Health, University "des Montagnes", Bangante, Cameroon.

²: Department of Pharmacology, Faculty of Medicine, University of Montreal, Montreal, Canada. ,

³: Department of Animal Biology and Physiology, Faculty of Science, University of Yaounde 1, Yaounde, Cameroon

⁴. Center for Magnesium Education & Research Pahoa, HAWAII, USA

*e-mail : ltedong@yahoo.fr

INTRODUCTION

Diabetes mellitus (DM) has continued to increase worldwide, reaching a figure of about 370 million in 2011, with 4.6 million/year¹. The standard therapy for this epidemic disease includes diet, exercise, use of oral hypoglycemic drugs, and/or subcutaneous insulin injections. Several studies have demonstrated that different pharmacological agents can successfully lower blood glucose. However, the large number of limitations and unwanted side effects that still exist limit their use. Cashew plant extracts widely used to improve the glucidic and lipidic profiles of patients with diabetes. In our previous studies, we found that hydro-ethanolic extract of cashew seed (CSE), stimulated glucose transport in C2C12 myotubes³. Cashew nut are high in nutrient such as Mg that may improve glucose homeostasis. Hypomagnesaemia is a common feature in patients with diabetes and it might lead to a decrease in insulin mediated glucose uptake and depress release of chemical energy (ATP is form by Mg-ATP oxidative phosphorylation). In the other size cashew nut is amount the 9 top magnesium rich foods. These scientific information's on magnesium and diabetes enable us to investigate magnesium content in cashew nut from Cameroon.

PRINCIPAL OBJECTIVE

Investigating magnesium content in cashew nut from Cameroon .



Cashew Mineral composition

Magnesium (Mg) – Physiological functions

- Helps to build and maintain normal bones and teeth.
- It helps to maintain normal functioning of skeletal, smooth and cardiac muscle.
- Sometimes referred to as 'nature's physiological Ca²⁺ channel blocker. Like other calcium antagonists it acts as vasodilator and inhibits coagulation.
- Reduces neuron excitability. It inhibits Ach release at the neuromuscular junction, and reduces the effect of the excitatory CNS neurotransmitter NMDA.
- Contributes to normal energy metabolism. Modulator of intracellular ion concentrations and is involved in the active transport of other ions across cell membranes.
- Helps maintain normal healthy brain function, and in particular, psychological functions.
- Is involved in protein synthesis and carbohydrate metabolism.

METHODOLOGY

Plant samples collection: 9 cashew plantations. Garoua town-Cameroon 07/08/2014
Analysis: Avomeen analytical Services 03/ 09/ 2014

Cashew sample (1 gram)
Add 6 mL HNO₃; 2.5 ml conc. HCl

Microwave
*Heated for 1 hour
*Add 3 ml 30% H₂O₂
*Samples completion :

Digestion
in the hot block at 95°C
and Heated for 30 min
50 ml final vol. with deionized water

Inductively Couple Plasma (ICP)-Mass Spectrometry (MS)/EPA SW846 6020

RESULTATS

Fig 1. Effect of AOHE plants parts on Glucose uptake in C2C12 myotubes

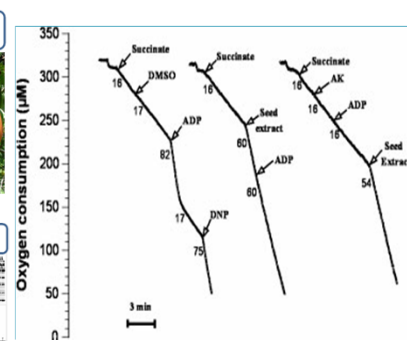
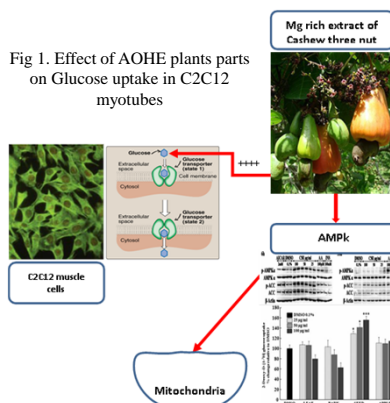


Fig 2. Effect of CSE on isolated rat liver mitochondria

	Fa1	Fa 2	Fa 3	Fa 4	Fa 5	Fa 6	Fa 7	Fa 8	Fa 9
Moisture (%)	6.17	7.69	N/A	6.01	N/A	6.30	N/A	N/A	N/A
Magnesium (mg/100g) dry wt	250±0.26	250±0.05	280±0.17	240±0.36	270±0.34	290±0.20	250±0.35	290±0.3	300±0.20

Table 1. Magnesium composition of cashew nut. Nine farms (n=3)

The cashew nut (CN) magnesium (Mg) content studied is shown in table 1. From the data of the farms studied, the CN mean content in Mg was 271 mg/100 g dry weight. We did not notice any significant difference between the farms in term of Mg content; remarkably, the Mg content of cashew nut 271mg/100g compared favorably with that of USDA nutrient database (292mg/100g) or Brazilian Mg CN content (277 mg/100 g) . We found that the Garoua cashew nut of Cameroon have high Mg content compared to that of Ivory cost (261 mg/100 g). The highest magnesium value (300 mg/100g) was observed in the samples collected around the Benoue River. These differences could be the result of the plant nutrition, climate and/or soil. We harvested the soil samples in other to study the correlation between the Mg content in cashews and the soil analysis in the future study. In the other hand, the moisture content in cashew nut is presented in Table 1. No significant variation was noted in the percentage of moisture of the nuts among the farms investigated; the low mean value of moisture reported in this study (6.54%) fell within the limits recommended by WHO/FAO on GAP and GMP. Low moisture content can inhibit the growth of microorganisms and cause minimal changes in texture. Moreover, the moisture % data will help us to do the nutritional estimates for the human consumption.

CONCLUSION

The result of this study showed that cashew nut from Garoua-Cameroon is nutritionally riches in term of mineral such as Mg. The high Mg content in the cashew nut showed its potential to supply Mg depletion for children and adults. This study supports the dietary recommendation to increase consumption of major food sources of magnesium, such as whole grains, nuts, and green leafy vegetables.

REFERENCE

- Ginter E, Simko V. Type 2 diabetes mellitus, pandemic in 21st century. 2014. *Adv Exp Med Biol.* 2012;771:42–50.
- Rosanoff Andrea, Connie M Weaver, and Robert K Rude. Suboptimal magnesium status in the United States: are the health consequences underestimated? *Nutrition Review.* Vol. 70(3):153–164.
- Tedong Leonard, Padma Madiraju, Louis C. Martineau1, Diane Vallerand1, John T. Arnason, Dzeufiet D. P. Desire, Louis Lavoie, Pierre Kamtchouing, and Pierre S. Haddad. Hydro-ethanolic extract of cashew tree (*Anacardium occidentale*) nut and its principal compound, anacardic acid, stimulate glucose uptake in C2C12 muscle cells. *Mol. Nutr. Food Res.* 2010, 54, 1753–1762.
- Cristiane Hermes Sales , Adriana Rodrigues dos Santos, Dennys Esper Corrêa Cintra , Célia Colli Magnesium-deficient high-fat diet: Effects on adiposity, lipid profile and insulin sensitivity in growing rats *Clinical Nutrition* 33 (2014) 879–888.