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INFLUENCE OF THE SUGAR EXTRACTION METHOD OF COCONUT WATER ON THE CALCIUM, IRON, ZINC AND PHOSPHORUS CONTENTS

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ABSTRACT

Sugars from immature coconut water were analyzed. All types sugars of coconut water showed high content Ca, Fe, Zn and P. The Ca and P content were highest in brown sugar than syrup and white sugar. Iron and zinc contents were respectively identical in the white and brown sugars and syrup, but highest than content in cane sugar. There are more iron in sugars from West African Tall water (5.5 mg/100 g) compared to sugar of $PB113^{+}$ water (1.2 to 1.8 mg/100 g) and EGD water (0.9 mg/100 g). The influence of heat on minerals is therefore dependent on the type of mineral. After heat used, Ca content increased but P levels remains static. Also, Fe and Zn contents remains static after heat used. One can conclude that coconut water sugar can significantly improve condition of hemoglobin deficient male anemic patients.

KEYWORDS: Coconut water sugar, minerals, technological impact.

INTRODUCTION

Macroelements and microelements play an indispensable role in the metabolism of the human body. There are several dietary sources of fortifying minerals for certain foods that lack

them. The sugars of the coconut water, unlike ordinary sugars, contain several nutrients minerals. This publication allows to evaluate the mineral composition in Ca, P, Fe and Zn of coconut water sugars from varieties WAT, EGD and PB113^{+} at the immature stage.

1-MATERIAL AND METHODS

1-1-Plant material

Sugars made by Lathro *et al.* (2018) from immature coconut water of three ecotypes namely West African Tall (WAT), Equatorial Green Dwarf (EGD) and Port-Bouët 113 improved (PB113^{+}) were used as plant material in this study. It is about white sugar got by lyophilization of coconut water, brown sugar and syrup obtained by heat treatment. The sugars were made in less than 24 hours after coconuts harvest. Brown cane sugar bought at the shop used as control.

1-2-Methods

The contents of 4 minerals, Ca, P, Fe and Zn, were determined by Atomic absorption spectroscopy after solubilization of 1 gram of sugar ash acidic medium. The ashes were treated with 10 mL of hydrochloric acid and then 100 mL of water were added. The apparatus used is an AAS 1100 Atomic Absorption Spectrometer (Perkin-Elmer, USA) powered by an air-acetylene flame.

2-RESULTS AND DISCUSSION

2-1-Ca, P, Fe and Zn contents in coconut water sugars

In all three categories of coconut water sugars (white, brown and syrup), calcium are significantly higher than those of phosphorus. Considering varieties, this is the hybrid PB113^{+} which provides more calcium followed by the dwarf EGD and finally WAT (Figure 1). The same findings are made at the level of trace elements where iron levels in sugars are higher important than zinc (Figure 1).

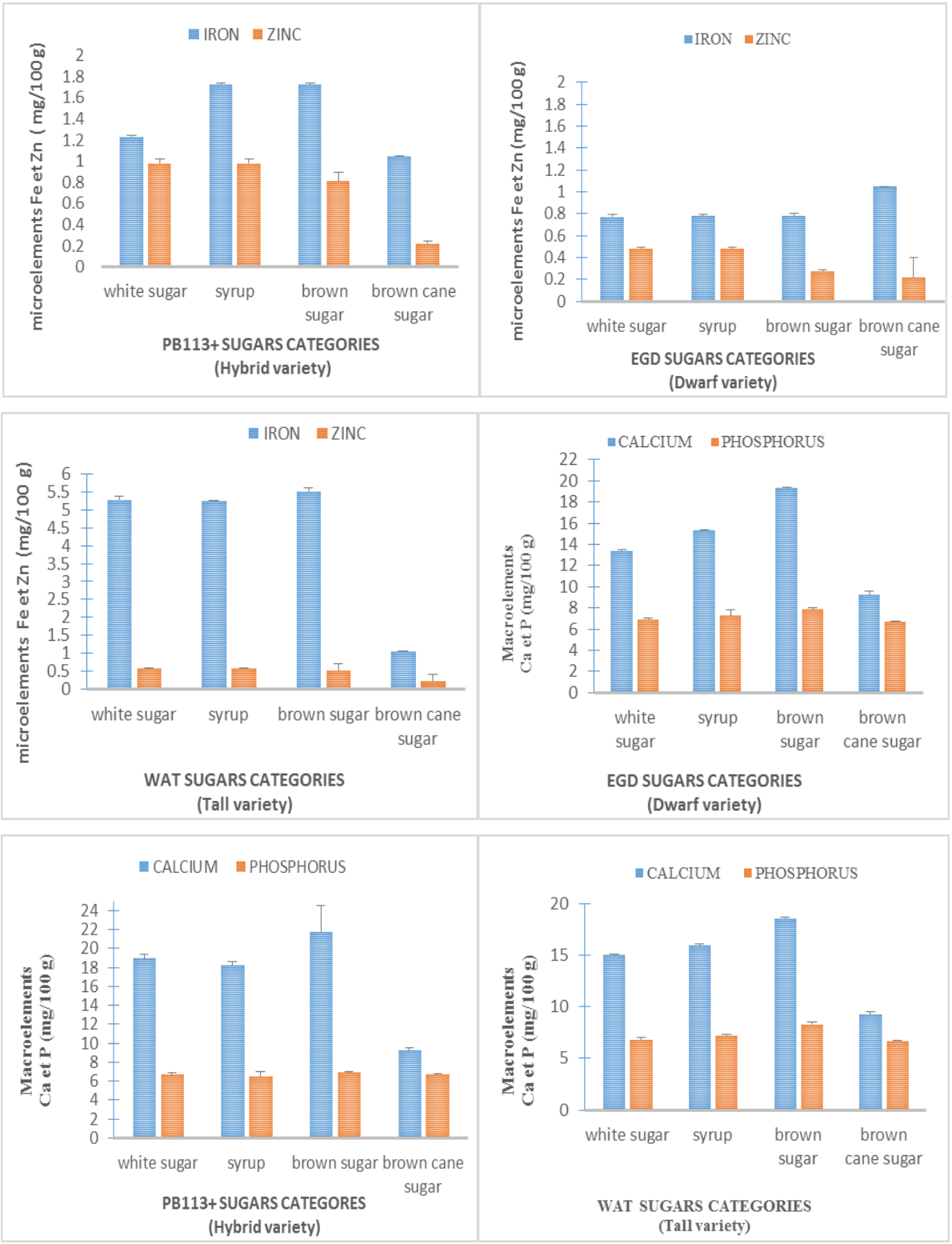

Figure 1: Calcium, phophorus, iron and zinc contents of coconut water sugars.

2-2-Impact of extraction type on minerals

There are two types of extraction: Heat and cold. The type of extraction is function of type of sugar: the brown sugar and the syrup were extracted by thermal dehydration so by heat

use. On the other hand, the white sugar was obtained by cold dehydration such as lyophilization under vacuum.

2-2-1-Effect on macroelements Calcium and Phosphorus

Heat extraction increases calcium levels from brown sugar while phosphorus remains static whichever the variety. The influence of heat on minerals is therefore dependent on the type of mineral (Figure 3).

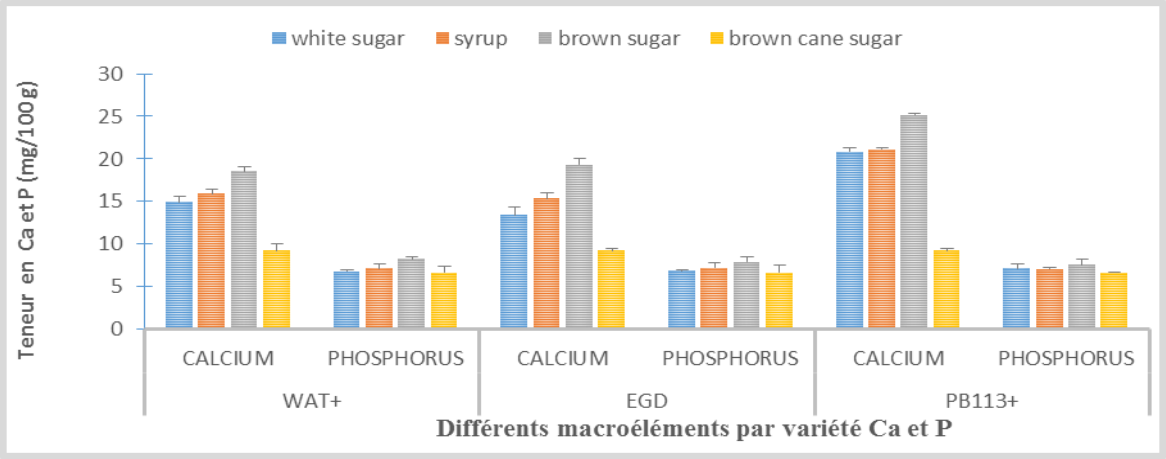

Figure 2.a: Evolution of Ca and P levels in sugars according to the extraction method

2-2-2-On the trace elements Iron and Zinc

The iron content in sugars remains stable for all varieties regardless of the type extraction. It is the same for the element zinc. Apart from the sugars of EGD, there are more than iron in the sugars of the coconut water than in the brown cane sugar. Also, zinc contents are they more important in sugars than coconut water compared to cane brown sugar (Figure 4).

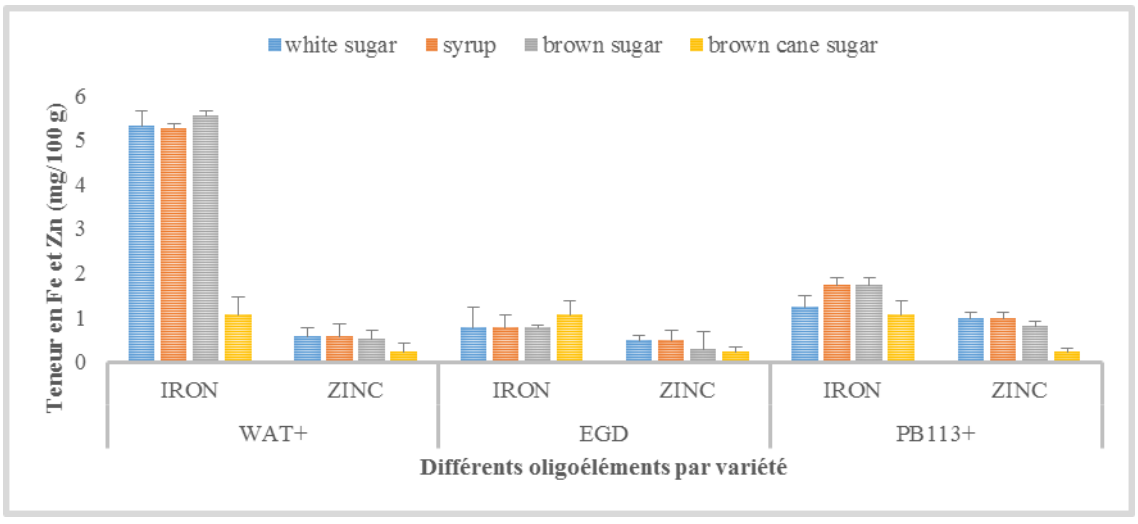

Figure 2.b: Evolution of the Fe and Zn content in sugars according to the extraction.

The hybrid variety ($PB113^{+}$) has more calcium and phosphorus than the tall (WAT) and the dwarf (EGD) which possess them similar. This difference could explained by the varietal difference, the mineral constitution of the parcels and the non-static mineral distribution of coconut palms (Debmalya and Mazundar, 2008).

In all coconut palm varieties studied, there are more calcium and phosphorus for brown sugar than in the white sugar and the syrup that are almost similar. Thermal dehydration leads to an increase of minerals in food (Hawe *et al.*, 2006; Antoine *et al.*, 2009).

The highest iron content at the level of WAT sugars compared to those of EGD and $PB113^{+}$ is related to the availability of trace elements in the soil or are implanted coconut palms and the varietal effect. The tree WAT would be more able to capture the mineral iron to store it in the fruit in the water of the walnut. The type of treatment used to produce the sugar does not have impact on the iron content. On the other hand, for all varieties, zinc content decreased in the brown sugars while it remains static in the white sugar and syrup of coconut water.

CONCLUSION

During the production of coconut water sugar, the use of heat provoke calcium content increase but a stabilization of phosphorus, iron and zinc content. However, coconut water sugar of EGD does an exception.

The increase or decrease of macroelements and microelements of coconut water sugars is related to the extraction method, to the type of sugar and to a less degree to the variety.

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