Effect of different cooking treatments on sugars and sweetness of sweetpotato root

By

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Introduction

- Sweetpotato breeding efforts in Ghana target the development of low-sugar, staple-types preferred by consumers.

- Sweetpotatoes are cooked by different methods; baking, microwaving, steaming etc., which inevitably affect the quality ***attributes*** of the cooked products ;
  - Sugars
    - Sweetness
    - Flavour,
    - Others (sensory, etc.)

Introduction

- Concentrations are controlled by factor of the cooking method and roots such as;
  - Temperature
  - Time
  - Initial sugar content and
  - Initial amylase activity, of the root

Problem statement

- Scientific data on the variability of these factors on sugars and sweetness, which determine its utilisation potential, are limited

Specific Objectives

To determine the effect of three cooking methods and β-amylase activity on sugars and sweetness of sweetpotato varieties in Ghana.

Methodology

Design:

- Factorial: 11 sweetpotato variety and three cooking treatment (baking, microwaving and steaming)
- Roots were harvested after four months of planting

Methods

- Sugar profile was determined by HPLC
- Sweetness (sucrose equivalent): kays *et al*., (2005)

equation: 1.2 fructose + 1 sucrose + 0.64 + 0.43 maltose glucose. (Kays *et al*., 2008)

Methodology

- **Cooking methods;**
  - Baking (205^{o}C for 30min)
  - Microwaving (HTST for 5min)
  - Steaming (100^{o}Cfor 10min)

Total amylase activity

- DNSA method (Owusu-Mensah *et al*., 2010)

Results and Discussion

Table 1. Source of variations and percentage variance of sugars in cooked sweetpotato roots

Source of Variation	**Variance (%)**			
	Maltose	Sucrose	Glucose	Fructose
Genotype	7.26*	16.93*	38.82*	45.68*
Cooking treatment (CT)	90.12*	79.04*	52.60*	43.12*
GxCT	2.60*	4.03*	8.65*	11.47*

*significant at p=0.05

Results and Discussion

Table 2. Means and ranges of individual sugars in raw and cooked sweetpotato roots.

Individual Sugars (% DM)	Raw	Cooking Treatment		
		Baking	Microwaving	Steaming
Sucrose	10.58 (9-23)[a]	11.01 (6 - 20) [a]	10.72 (7-16) [a]	4.30 (0-8) [b]
Glucose	2.69 (1-4)[a]	1.10 (0 - 3) [b]	1.63 (0.4-5) [b]	1.55 (0-5) [b]
Fructose	1.58 (0-3)[a]	0.84 (0 - 2) [a]	0.92 (0-2) [a]	0.95 (0-4) [a]
Maltose	0.63 (0-1) [a]	20.13 (5 -36) [b]	5.07 (2-15) [c]	14.35 (2-27) [d]

Mean values with the same superscripts in a row are not significant; p=0.05

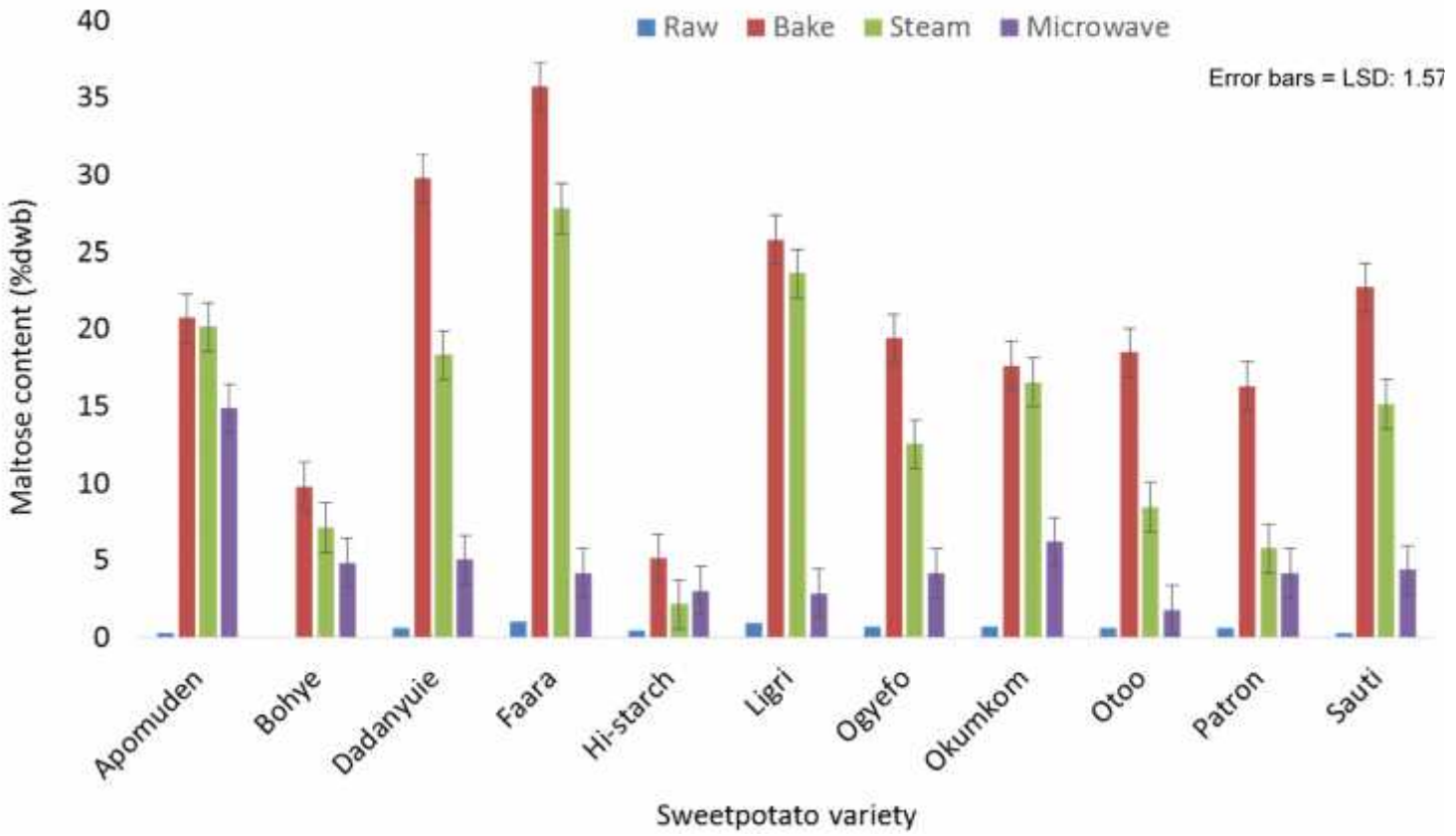

Fig 1. Maltose content (%dwb) of raw, baked, steamed and microwaved sweetpotato roots

Table 3. Means and groupings of amylase activity in sweetpotato roots

Sweetpotato varieties	Amylase activity (U/g)	Groupings
Ligri	927.14 (40.56)	Very high
Dadanyuie	882.05 (26.82)	”
Sauti	809.24 (30.45)	”
Ogyefo	804.10 (30.67)	”
Okumkom	779.25 (37.76)	”
Faara	687.32 (50.34)	High
Otoo	650.67 (20.45)	”
Patron	489.81 (25.45)	Moderate
Apomuden	454.10 (21.45)	”
Bohye	414.26 (24.45)	”
Hi-starch	387.06 (13.24)	”

Grouping was based on ranges of amylase activity found: Very High (≥ 750), High (749-550), moderate (549- 350), low (≤ 349). Values in brackets are standard deviations

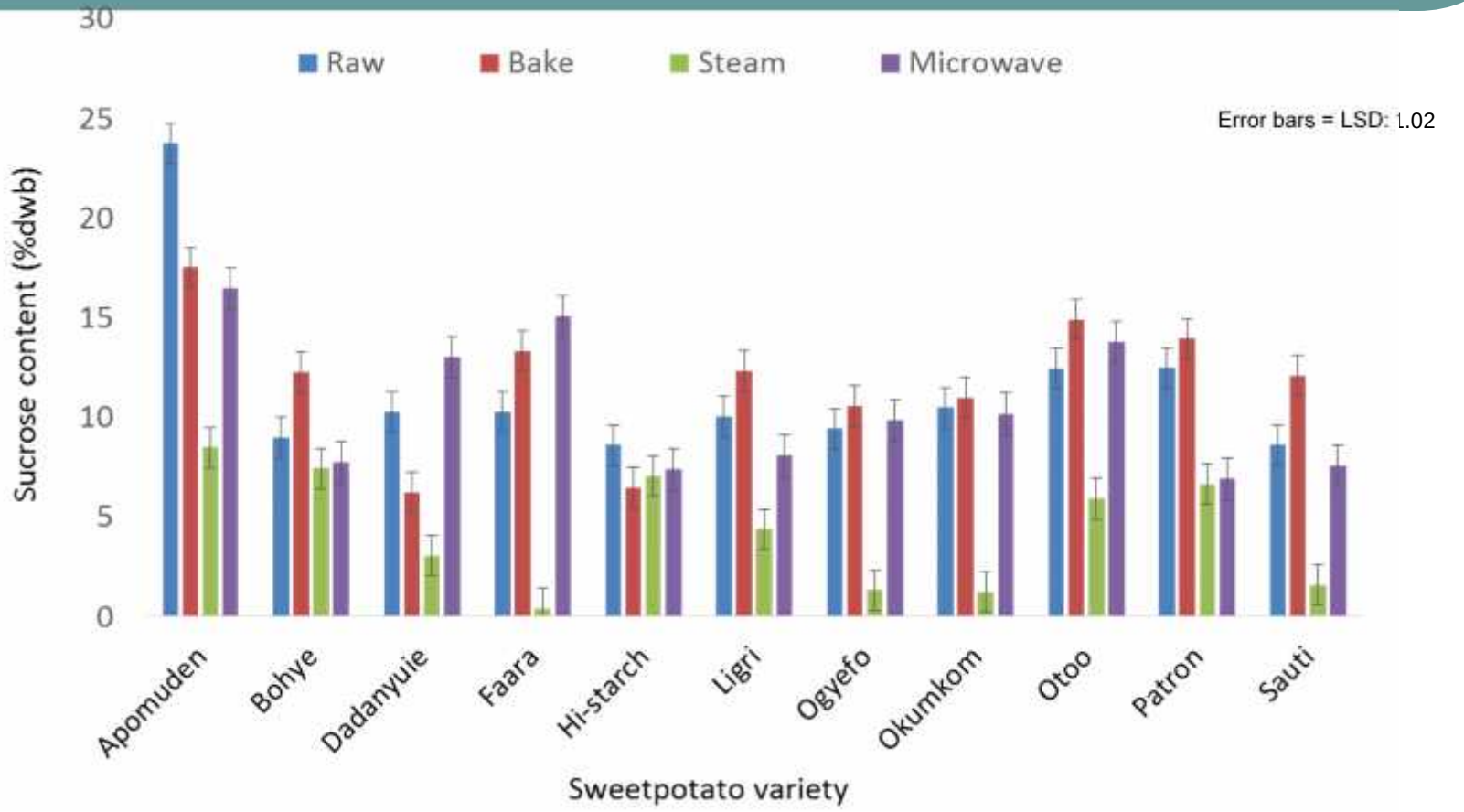

Fig 2. Sucrose content (%dwb) of raw, baked, steamed and microwaved sweetpotato roots

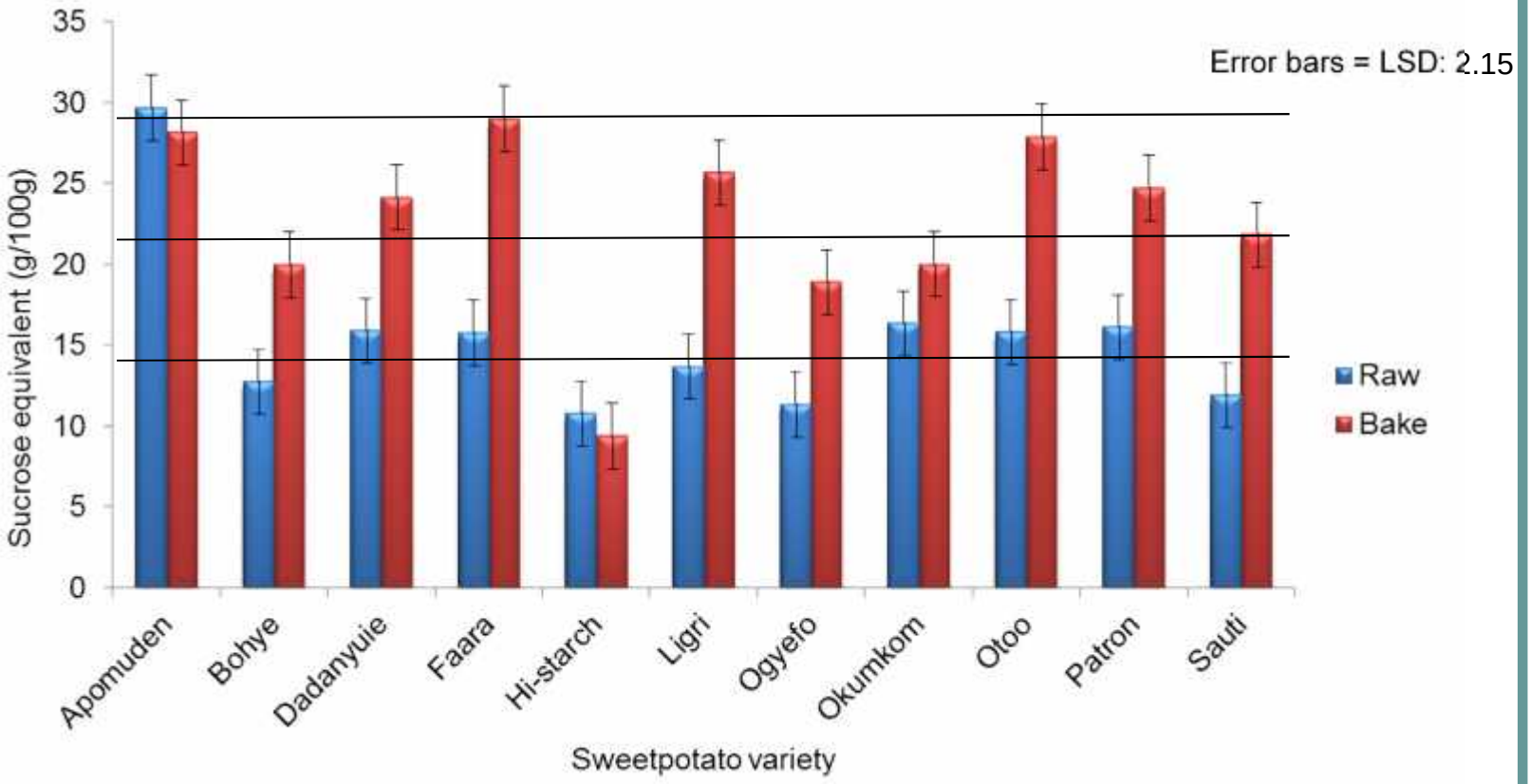

Fig 3. Sweetness levels (%) of raw and baked sweetpotato roots

Conclusion

- Established that sugar contents and sweetness levels in sweetpotato roots are significantly dependent on cooking treatment, and amylase activity of the roots
- Baking treatment produced the highest effect; profound on maltose content and sweetness levels
- Effect of microwave treatment was minimal, leading less sweet products.
- Sucrose is the predominant sugar in uncooked roots whilst Maltose content increases dramatically after cooking

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