Selecting the right product for the right target group

Sweetpotato the raw material – what do we know

Agnes Namutebi
Department of Food Technology and Nutrition, Makerere University

8th Sweetpotato Support Platform Meeting for East and Central Africa:
Sweetpotato Post-harvest Management and Agro-processing

Chez Lando, Kigali, Rwanda. 29-30 January 2014

Introduction

- Approximate and nutritional composition of sweetpotato
- Endogenous amylases and browning enzymes
- Physico-chemical changes in sweetpotato
  - ✓ desired and undesired browning
  - ✓ Desired textural changes – mashiness/ mealiness

Introduction (cont.)

- Sweet potato carbohydrate (sugars & starch) changes due to various post harvest processes & conditions
- Range of products – starch as the main ingredient for confectionary, beverages (fermented & non-fermented), cooked/

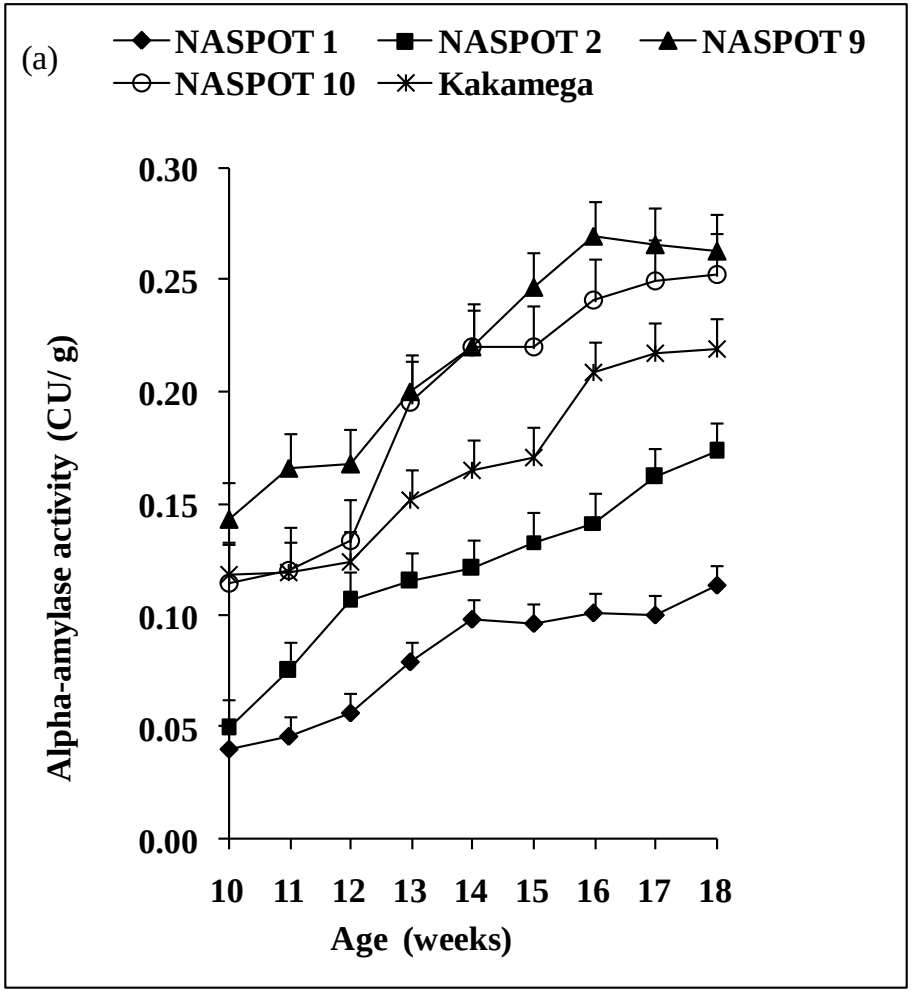
Table 1a. Selected physio-chemical characteristics of sweet potato (Source: Nabubuya et al., 2012)

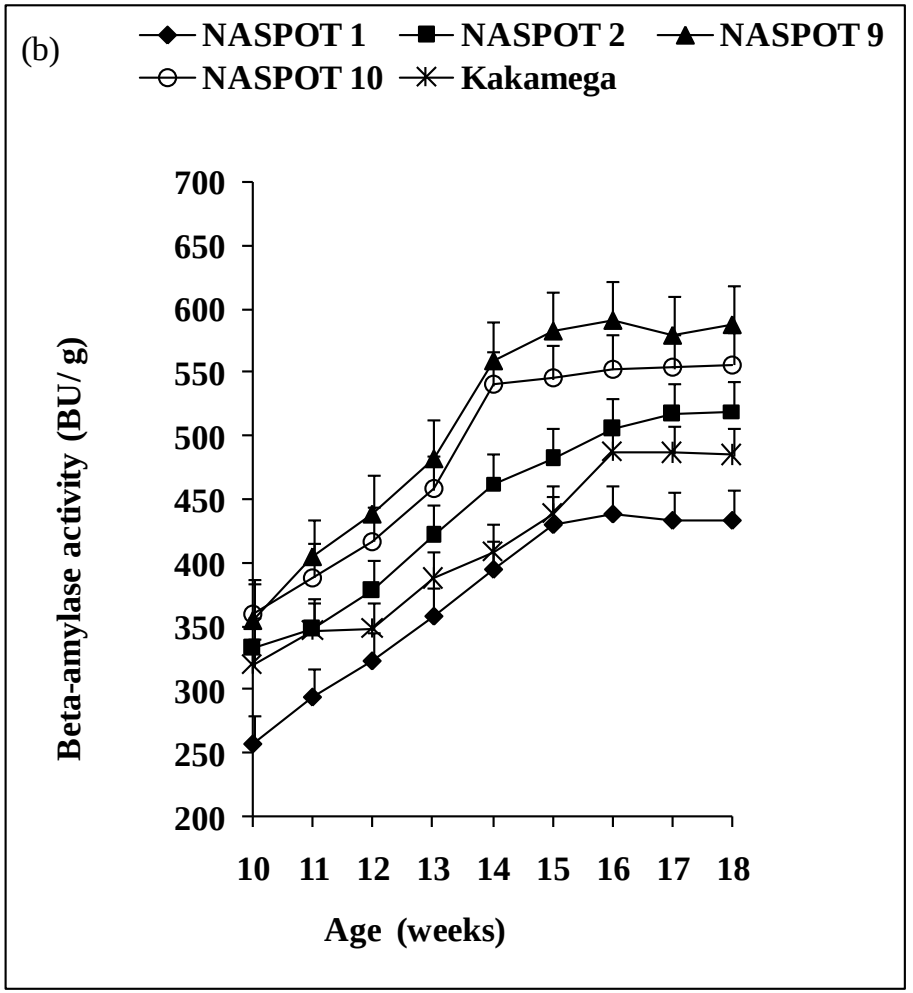
Variety	Flesh colour	Dry matter (%)	Starch content (%)	Peak viscosity (cP)	Total sugar content (%)	Reducing sugar content (%)
Esapat	yellow	39.2	73.9	1,043	8.25	1.1
NASPOT 1	cream	36.2	73.6	**2,504**	9.31	0.9
Ejumula	deep orange	35.9	68.4	1,648	11.89	1.54
Kakamega (SPK004)	pale orange	34.6	71.7	**2,327**	10.29	**2.3**
Soroti	yellow	34.5	72.9	904	10.96	1.42
New Kawogo	white	34.3	69.9	917	16.1	1.68
NASPOT 2	white	32.9	71.8	1,917	8.51	1.21
NASPOT 10 (SPK004/6/6)	orange	32.5	70.3	868	13.59	**3.49**
NASPOT 9 (SPK004/6)	orange	30.7	69.1	826	10.6	1.27
Dimbuka	pale yellow	30.2	72.8	**3,039**	6.52	0.73

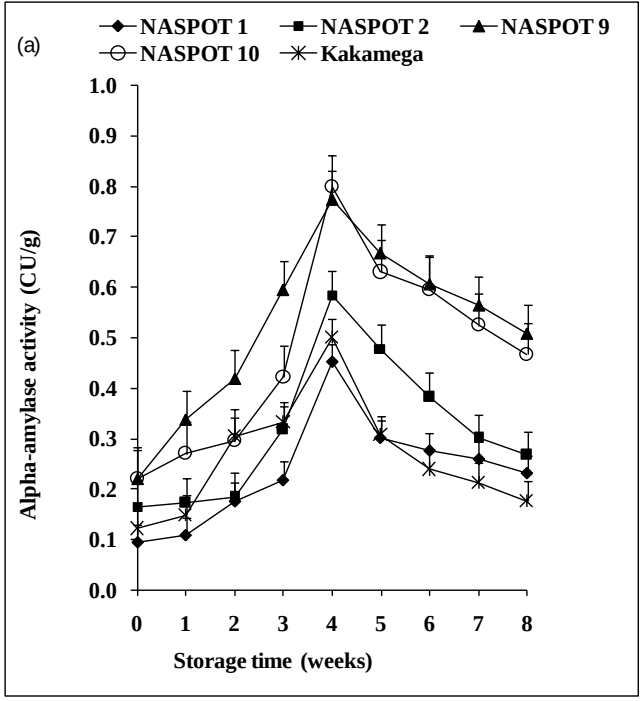
Table 1b. Selected physio-chemical characteristics of sweet potato (Source: Nabubuya et al., 2012)

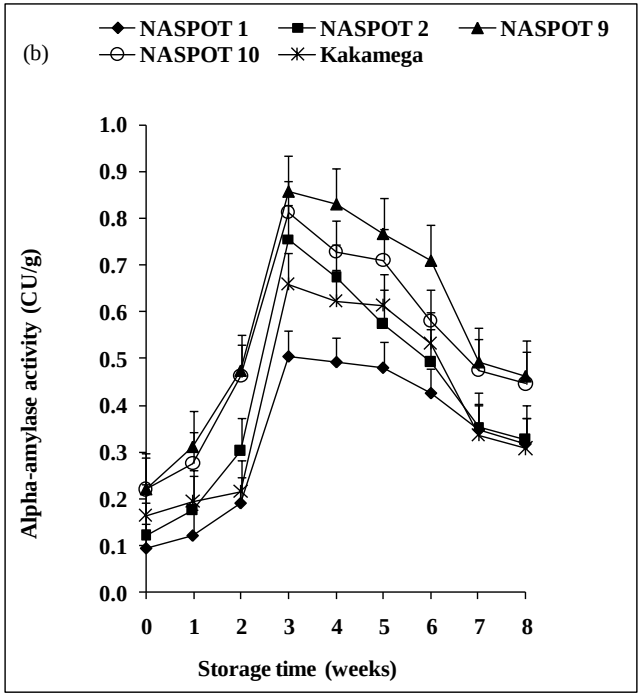
Variety	Flesh colour	Dry matter (%)	Starch content (%)	Total amylase content (mg/ ml/ min)
Esapat	yellow	39.2	73.9	**0.256**
NASPOT 1	cream	36.2	73.6	0.328
Ejumula	deep orange	35.9	68.4	**0.57**
Kakamega (SPK004)	pale orange	34.6	71.7	**0.414**
Soroti	yellow	34.5	72.9	0.261
New Kawogo	white	34.3	69.9	0.392
NASPOT 2	white	32.9	71.8	0.416
NASPOT 10 (SPK004/ 6/ 6)	orange	32.5	70.3	**0.516**
NASPOT 9 (SPK004/ 6)	orange	30.7	69.1	**0.569**
Dimbuka	pale yellow	30.2	72.8	**0.28**

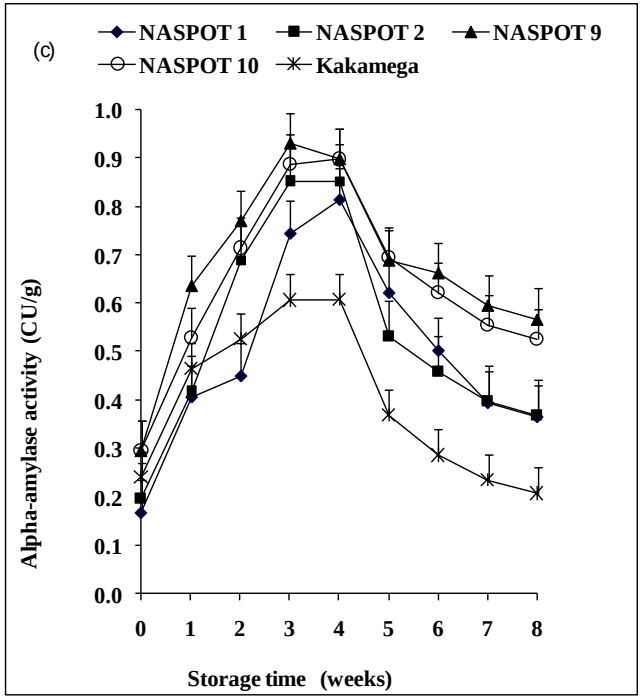
Fig 1. Changes in amylase activity of sweetpotato varieties during development: (a) α-amylase activity, Ceralpha Units per gram (CU/g); (b) β-amylase activity, Betamyl Units per gram (BU/g) (Source: Nabubuya *et al*., 2012)











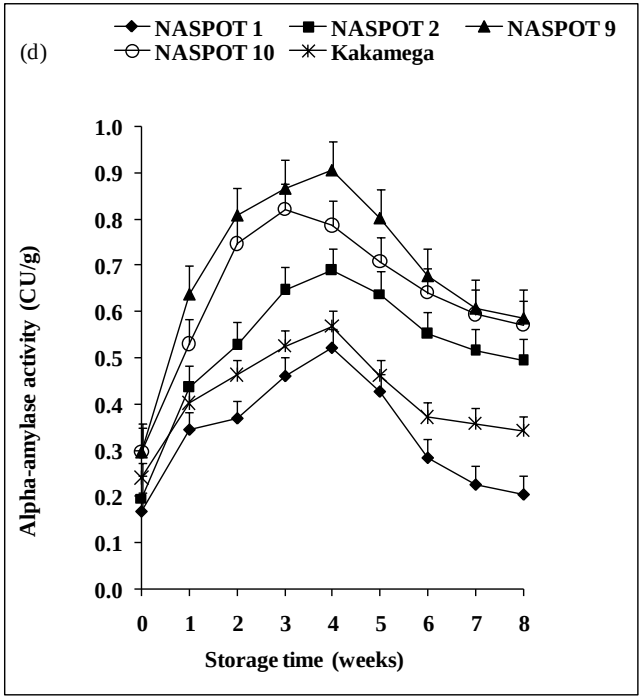


Fig 2: Changes in amylase activity of sweetpotato varieties subjected to various storage conditions:

(a) Freshly harvested roots stored under room conditions (23°C - 26°C & 70% - 80% relative humidity);

(b) Freshly harvested roots stored in a pit (19°C - 21°C & 90% - 95% relative humidity);

(c) Cured roots stored under room conditions (23°C - 26°C & 70% - 80% relative humidity);

(d) Cured roots stored in a pit (19°C - 21°C & 90% - 95% relative humidity)

(Source: Nabubuya et al., 2012)

Table 2. Pro-vitamin A carotenoid content retention (%) of various processed orange-fleshed sweetpotato products (Source: Tadria *et al*., 2010)

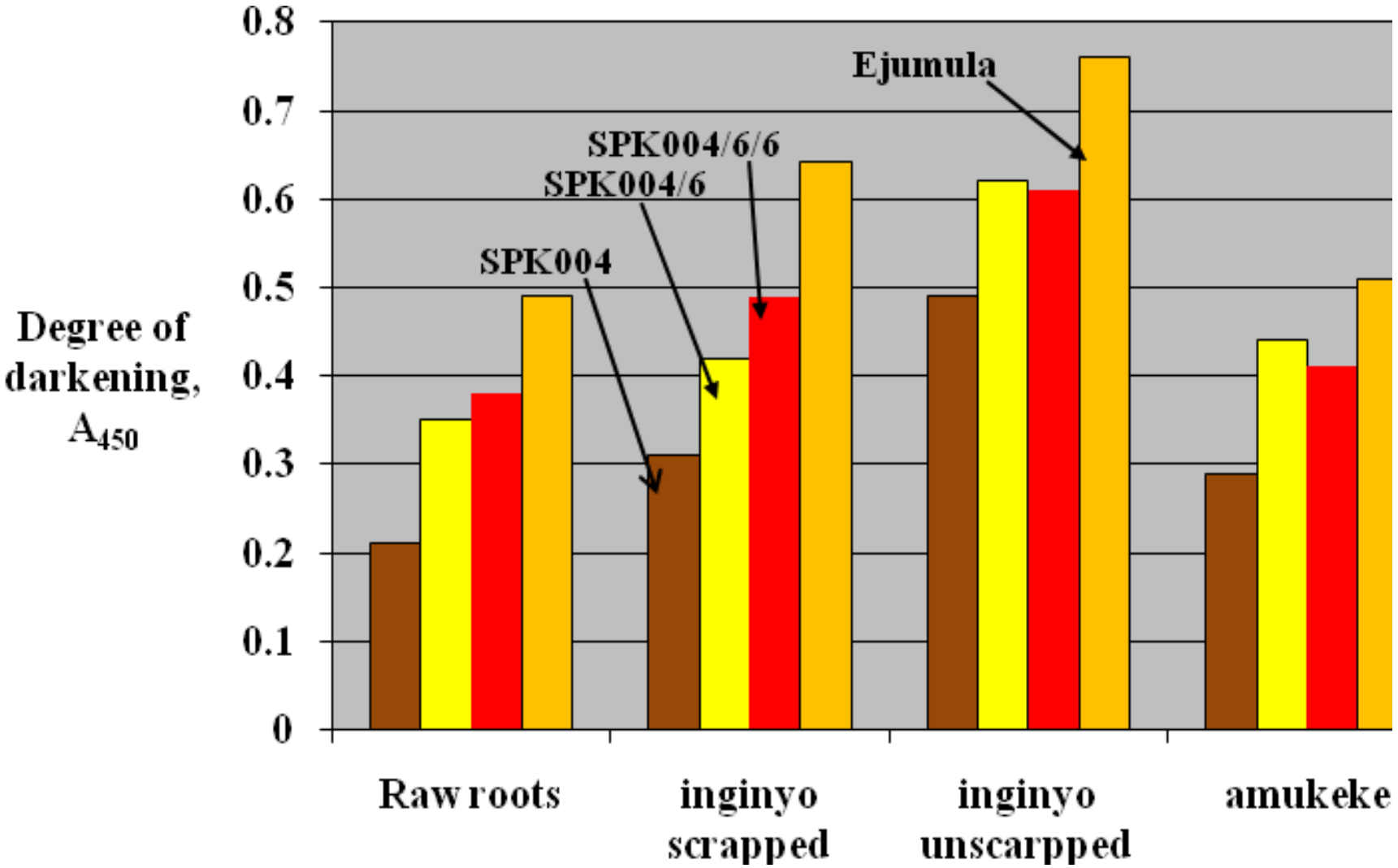
Sweetpotato variety	Steamed	Boiled	[1a]Inginyo scrapped	[2a]Inginyo un-scrapped	[3a]Amukeke
NASPOT 10 (SPK004/6/6)	87.7±0.9	86.9±1.3	38.8±1.6	24.6 ± 0.3	10.3±0.1
NASPOT 9 (SPK004/6)	88.1±1.9	86.9±1.3	36.2±2.4	29.8 ± 1.5	5.3±0.1
Kakamega (SPK004)	73.0±1.0	75.4±1.8	67.4±3.9	47.1 ± 1.6	8.1±1.0
Ejumula	79.5±2.0	75.4± 1.8	42.1±4.5	31.7 ± 6.6	5.3±0.1

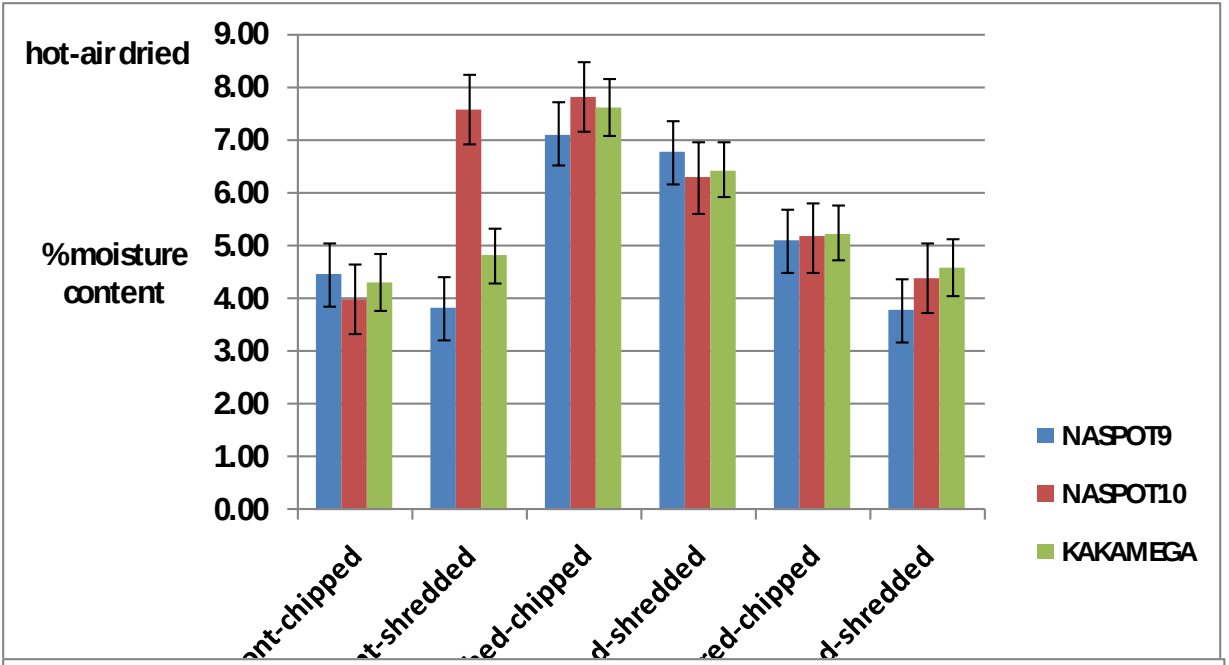
a: open-air sun dried products; 1 – Inginyo is dried product from crashing small-sized OFSP roots;

2 – Modified method for production inginyo by scrapping root skin prior to crashing and subsequent drying;

3 – Dried sliced product from drying large sized OFSP root

Fig 3. Extent of darkening of dried orange fleshed sweetpotato products (Source: Tadria et al., 2006)





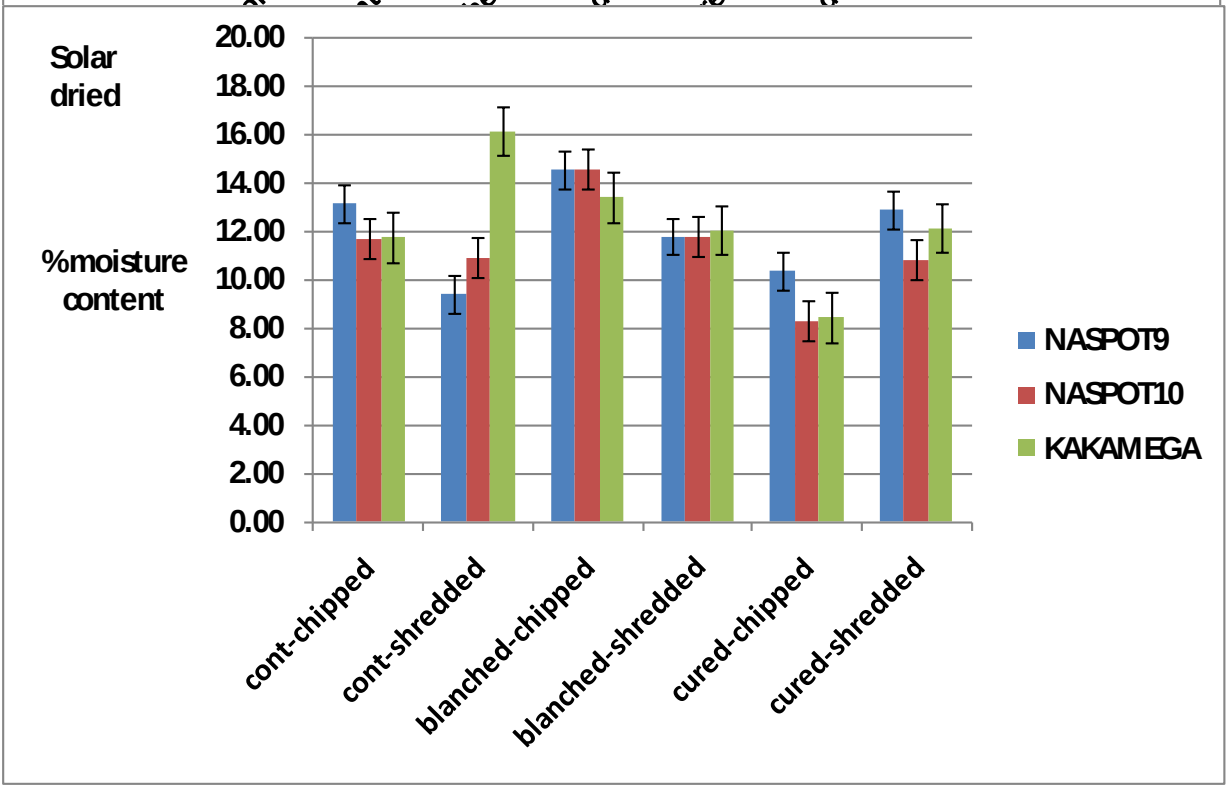
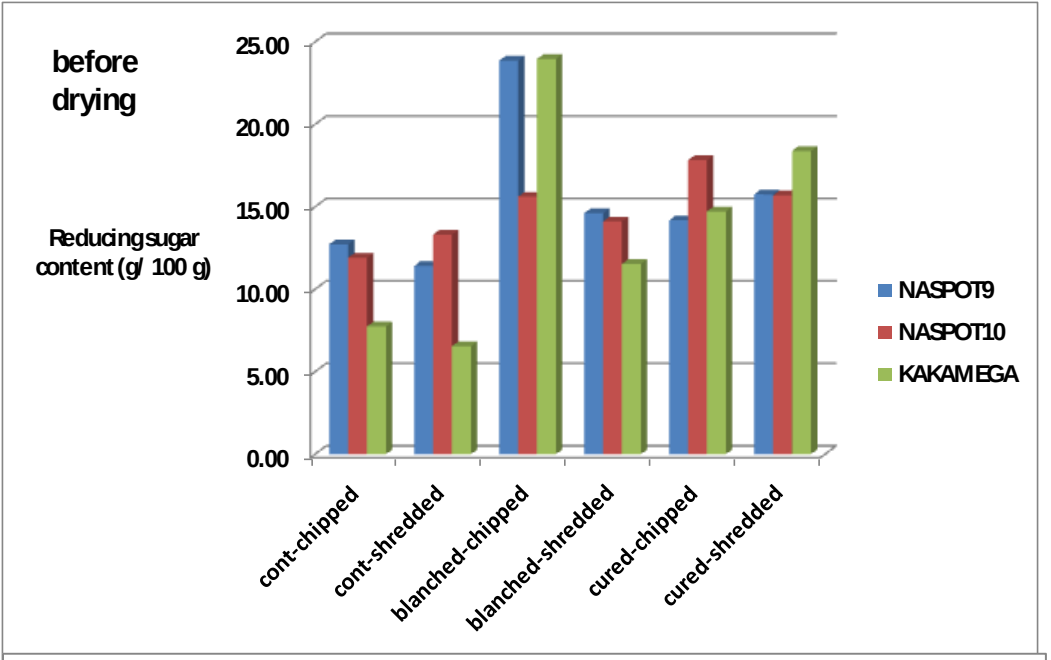


Fig 4. Moisture content of various SP dried products

a) control – roots washed, peeled, chipped/ shredded & hot-air dried at 60°C for 18 h

b) blanched – roots washed, peeled, dipped in hot water (76-80C for 10 mins), drained & cooled, followed by chipping/ shredding & hot-air drying at 60°C for 18 h

c) Cured – roots cured for 3 days at ambient conditions. Roots washed, peeled, chipped/ shredded & tunnel solar dried at 33± 6°C for 36- 48 h



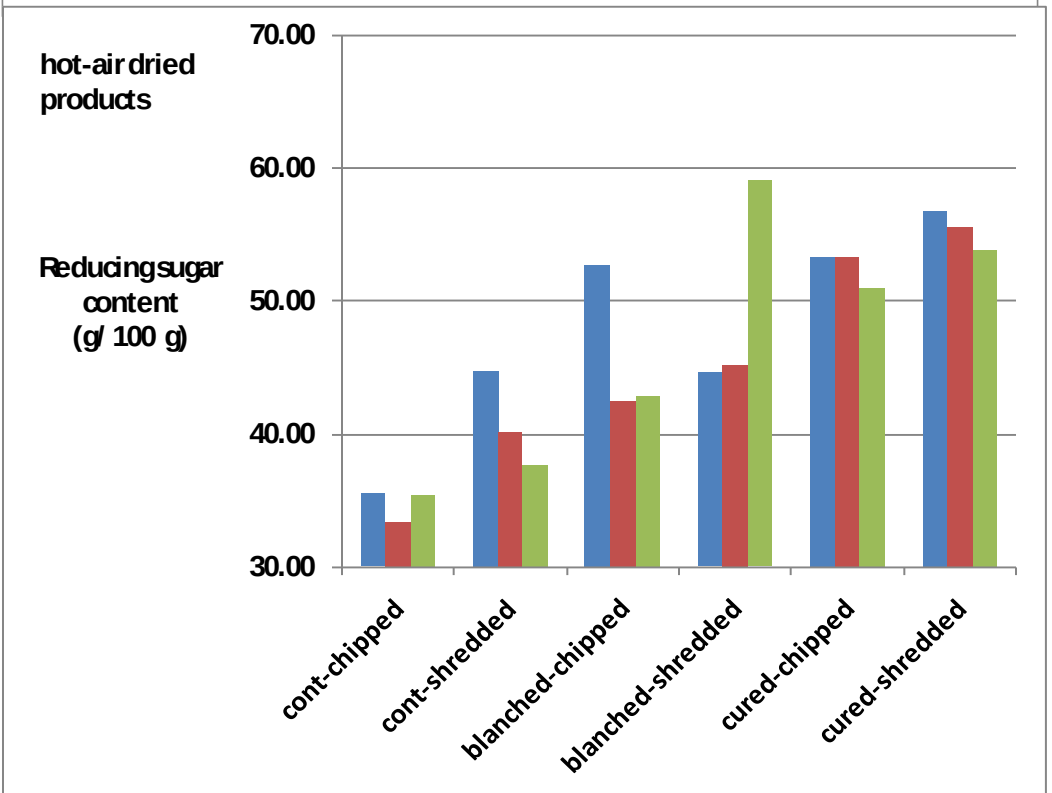


Fig 4. Reducing sugar content of various SP dried products

a) control – roots washed, peeled, chipped/ shredded & hot-air dried at 60°C for 18 h

b) blanched – roots washed, peeled, dipped in hot water (76-80C for 10 mins), drained & cooled, followed by chipping/ shredding & hot-air drying at 60°C for 18 h

c) Cured – roots cured for 3 days at ambient conditions. Roots washed, peeled, chipped/ shredded & tunnel solar dried at 33± 6°C for 36- 48 h

Table 4: Effect of various flour processing methods on the Colorimetric values of sweet potato variety

FLOUR METHOD	COLOUR DESCRIPTION (AVERAGE VALUES)	
	NASPOT10	NASPOT9
Control	+ 0.4 UNITS YELLOW/ ORANGE	+ 0.7 UNITS YELLOW/ ORANGE
Cured	+ 0.7 UNITS YELLOW/ ORANGE	+ 1 UNITS YELLOW/ ORANGE
Blanched	+ 0.9UNITS YELLOW/ ORANGE	+ 1.1 UNITS YELLOW/ ORANGE

Table 5: Effect of flour method type and level of OFSP flour substitution on final loaf volume (m^3) of bread

Flour method type	Variety	10%	20%	30%
Control	NASPOT10	**2.34±0.03^a**	1.94±0.08^a	1.54±0.11^a
	NASPOT9	**2.37±0.01^a**	1.90±0.06^a	1.59.0.10^a
Cured	NASPOT10	**2.09±0.14^a**	1.84±0.09^a	1.45±0.39^a
	NASPOT9	**2.18±0.0^a**	1.84±0.10^a	1.56±0.03^a
Blanched	NASPOT10	**1.91±0.03^a**	1.75±0.70^a	1.28±0.01^a
	NASPOT9	**1.94±0.08^a**	1.71±0.12^a	1.28±0.01^a

Mean scores in columns with the same superscript are not significantly different at (p≥0.05)

Conclusions

- Processing and post harvest handling options and appropriate technologies
- Starch, moisture and reducing sugar contents
- Subsequent products to be consumed and marketed