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Consumption Trends of White Cassava and Consumer Perceptions of Yellow Cassava in Ghana

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Abstract Vitamin A deficiency has been one of the major nutritional problems for many countries where cassava is eaten as a major source of energy. In an attempt to help reduce the incidence of vitamin A deficiency, bio-fortified cassava which contains more pro-vitamin A carotenoids than the white cassava, has been introduced to such areas. This study therefore endeavored to find out how often Ghanaians ate cassava and its products, as well as what Ghanaian consumers knew about bio-fortified cassava and their willingness to consume it. A survey was done between the month of January and March using 287 participants in the Greater Accra Region of Ghana which gathered information on their demographics, and their frequencies of the consumption of cassava and its products. Data on the knowledge of the participants on yellow flesh cassava, and their willingness to accept it were also gathered. Logistic regression was used to determine the relationship between some demographic characteristics and knowledge and 'willingness-to-accept' biofortified cassava. The cassava product which was mostly consumed by the participants was *gari*. Sixty-three percent of the participants had no knowledge of bio-fortified cassava. About half of them were willing to accept the biofortified cassava, and more than half of the participants perceived that yellow cassava could be used for some white cassava products. Providing nutritional information and sensitizing consumers on the benefits of biofortified cassava can enhance its consumption in Ghana.

Keywords: *bio-fortified cassava, willingness-to-accept, knowledge, gari*

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1. Introduction

Cassava is a very important starchy root tuber which contributes to the staple of millions worldwide, many of whom are in sub-Saharan Africa (SSA). It is originally native to Latin America but was introduced to Africa by the Portuguese in the sixteen century as a potentially useful crop [1]. Globally the production and consumption of cassava has increased over the past few years with sub-Saharan Africa recording the highest growth of 48.3 million tonnes in 1980 to 95.3 million tonnes in 2011 [7,9]. [16] reported that about 121 million tonnes of cassava was produced by Africa. This growth in the production and consumption of cassava in SSA is mainly championed by Nigeria which is the largest producer of cassava and Ghana the second highest [9].

In spite of the phenomenal increase in the consumption of cassava in sub-Saharan Africa, there are some concerns of its nutritional benefits especially for children. [10] and [17] in separate studies involving children aged between two and five years reported that in areas where cassava was a staple, children who consumed cassava as a major carbohydrate source were deficient in some important micronutrients like iron, zinc, and vitamin A.

In an attempt to increase the micronutrient density of cassava, breeding programs worldwide have been initiated, with the development of yellow flesh cassava or pro-vitamin A cassava (pVAC) in the forefront, which has higher total carotenoid contents and can be used to improve the vitamin A situation in cassava growing areas where there is a high prevalence of vitamin A deficiency (VAD) [2,6,14].

Cassava is processed and consumed in a number of different forms in sub-Saharan Africa. These methods of processing can be classified mainly as fermentation, drying and milling into flour, boiling, extracting starch from it or using the leaves for stew. Examples of products that come out of these processing techniques include: *amala*/*ugali*/*nchima*/*nsima*/*ubugali*/*funge* (Nigeria, Democratic Republic of Congo, Cameroon and Gabon, Uganda, Tanzania, Mozambique, Malawi, Rwanda/Angola), *gari* (Nigeria, Cameroon, Benin, Ghana, Liberia and Sierra Leone), or boiled and eaten with stew or soup among these countries of consumption [11]. In Ghana, cassava is mainly consumed as *fufu*, *gari* or as a dried milled product known as *kokonte* [12].

With the promotion of biofortified cassava, there has been the need to understand the consumption patterns of cassava and what Ghanaians know and perceive about the biofortified cassava or yellow flesh cassava. This research therefore sought to map out the consumption of white cassava in the Greater Accra Region of Ghana and gather information on the knowledge and/or acceptance of the yellow flesh cassava when introduced largely into the Ghanaian market.

2. Materials and Methods

A survey was conducted on the consumption patterns of white cassava, and the knowledge and perception of yellow flesh cassava between the month of January and March. A pretested questionnaire was used to interview adult Ghanaians in the Greater Accra Region who consumed cassava. Data on their socio demographic characteristics were also collected. Descriptive statistics were computed using SPSS v.17 for demographic data, consumption patterns and knowledge of yellow cassava. Logistic regression was computed using Statistical Analysis System v. 9.01. Multinomial regression was used and this logic provided the opportunity to see the interaction between more than two categories of an outcome (knowledge and 'willingness to accept' yellow flesh cassava) and predictors (in this case, selected sociodemographic factors). The sociodemographic factors; education status, marital status, age and gender were considered as the independent variables. Ethical clearance was sought from the College of Basic and Applied Science (CBAS) Ethical Clearance Board of the University of Ghana. Informed consent was obtained from all participants before they were interviewed.

3. Results

3.1. Socio-demographic Characteristics of Study Population

Two hundred and eighty seven (287) respondents were interviewed for the survey, 135 (47%) being males and 152 (53%) females. Ninety-four (94%) of the study population were between 18-39 years, with 4% between 40-59 years and the remaining 1.9% above 60 years. Regarding marital status, 78% of the population were single, 15.7% were married and 1.7% were widowed or cohabiting. About 56.8% had tertiary education, 18.5% had up to primary education, 11.5% and 2.8% for post-secondary and no formal education respectively (Table 1).

Table 1. Socio-demographic characteristics of study population (Na=287)

Variable	n (%)
AGE (YEARS)	
18-39	262(94)
40-59	19(4)
Above 60	6(1.9)
GENDER	
Male	135(47)
Female	152(53)
MARITAL STATUS	
Single	224(78)
Married/Cohabitating	50(17.4)
Divorced	8(2.8)
Widow	5(1.7)
EDUCATIONAL LEVEL	
No formal education	8 (2.8)
Primary/JHS/ middle school	53(18.5)
SHS/secondary	30(10.5)
Post-secondary	33(11.5)
Tertiary	163(56.8)
OCCUPATION	
Student	131(45.6)
Fixed income	64(22.3)
*Non-fixed income	77(26.2)
AVERAGE MONTHLY INCOME(GHC)	
0-100	104(36.2)
100-1000	143(49.8)
1000-2000	14(4.9
2000 and above	26(9.1)
HOUSEHOLDS WITH CHILDREN UNDER 15 YEARS	
Yes	170(59.2)
No	117(40.8)

*Non fixed income - (beautician, carpentry, caterer, Craftsmanship, driver, hairdressing, marketer, self -employed, sound engineer, steel bender, petty trading, farming, dressmaking).

Table 2. Predictors of knowledge and 'willingness to accept' yellow flesh cassava (N=284)

Variable	Knowledge of yellow cassava (O.R)(C.I)	Willingness to accept yellow cassava(O.R)(C.I)
AGE		
18-39(ref)	1.00	1.00
18-39 versus 40-59	**4.44 (1.63- 12.07)***	2.18 (0.81-5.92)
18-39 versus above 60	4.09 (0.74-22.80)	0.50 (0.09-2.80)
GENDER		
Male(ref)	1.00	1.00
Male versus female	0.72 (0.45-1.12)	0.65(0.41-1.04)
MARITAL STATUS		
Single (ref)	1.00	1.00
Single versus Married	1.81 (0.95-3.47)	**2.49 (1.26-4.94)***
Single versus Cohabitating	1.38 (0.23-8.44)	3.38 (0.67-17.09)
Single versus Divorced	2.07 (0.50-8.51)	0.281 (0.03-2.56)
Single versus Widow	3.10 (0.51-18.98)	0.75 (0.12-4.58)
EDUCATIONAL STATUS		
No formal education(ref)	1.00	1.00
No formal education versus up to middle school	2.98 (0.64-13.88)	1.94 (0.43-8.70)
No formal education versus secondary	1.11 (0.22-5.54)	1.50 (0.31-7.19)
No formal education versus Post-secondary	0.56 (0.11-2.86)	0.52 (0.11-2.51)
No formal education versus Tertiary	0.65 (0.15-2.82)	0.90 (0.21-3.70)

Ref.: Reference age category *. Means were computed at p -value<0.05.

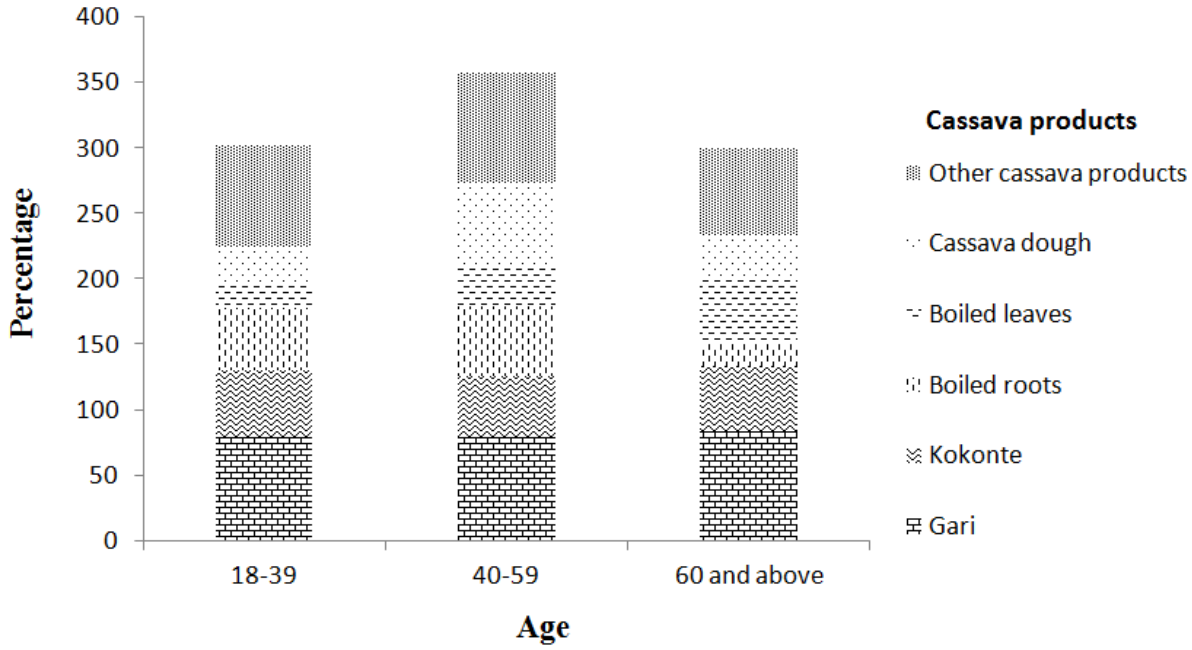

Figure 1. Frequency of the consumption of cassava products

3.2. Consumption Patterns and Reasons for Consuming White Cassava among Ghanaians

Data from the consumption patterns of white cassava indicated that *gari* had the highest frequency of consumption for the age group 18-39 years but for those in age group 40 and above, other cassava foods (*fufu*, fried cassava balls and chips, tapioca and *yakeyake*) were the highest frequently consumed food. Boiled leaves however, were the least consumed cassava product among the participants (Figure 1).

There were a number of reasons given by the respondents for the consumption of cassava. Reasons given for the consumption of cassava included it being a staple food, affordable, available and having lots of uses. Other reasons stated were that cassava served as a source of nutrients and was easy to prepare. The frequencies of responses are shown in Figure 2.

3.3. Knowledge of Nutritive Value of White and Yellow Flesh Cassava, Acceptability and the Perceived Use of Yellow Flesh Cassava

The survey showed that 70.4% of respondents knew the nutritive value of white cassava. Out of this population, 63.9% knew white cassava to be a major source of macronutrients, but only 6.5% of this same population knew it to be a source of micronutrients. 36.6% of the respondents had knowledge about yellow flesh cassava and 13% of this population had knowledge of the nutritive value of the yellow flesh cassava. Of the total population,

51.2% were willing to accept yellow flesh cassava. The reasons given for "willingness to accept" were diet diversity and curiosity. Unwillingness to accept yellow flesh cassava was due to lack of knowledge about the yellow flesh cassava.

Some of the respondents (64.3%) perceived that yellow flesh cassava could be used for *gari,* cassava dough, starch and other cassava products that white cassava is being used for. The remaining 35.7% did not know what yellow flesh cassava could be used for (Figure 3).

3.4. Predictors of Knowledge and "willingness to accept" Yellow Flesh Cassava

Results of the logistic regression (Table 2) indicate that in comparison with people who were between the ages of 18 to 39 years (the reference age), those whose ages ranged from 40 to 59 above were four times more likely to have knowledge about yellow flesh cassava. Married people were also two times more likely to 'willingly accept' yellow flesh cassava than those who were not married.

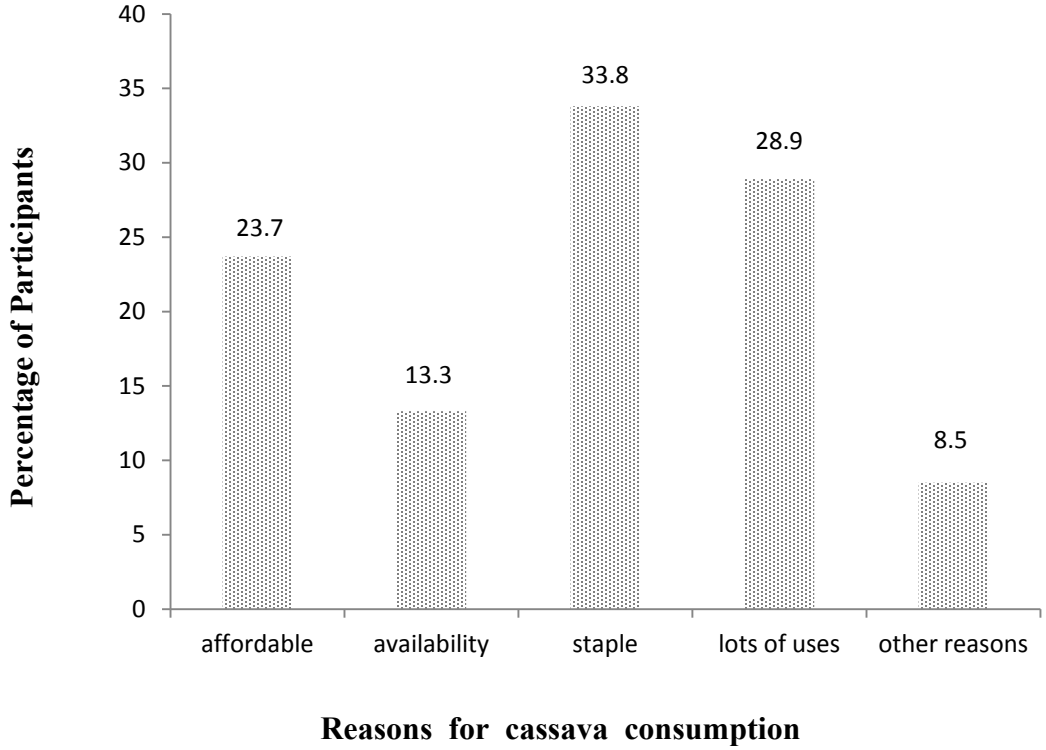

Figure 2. Reasons given by participants for their consumption of cassava

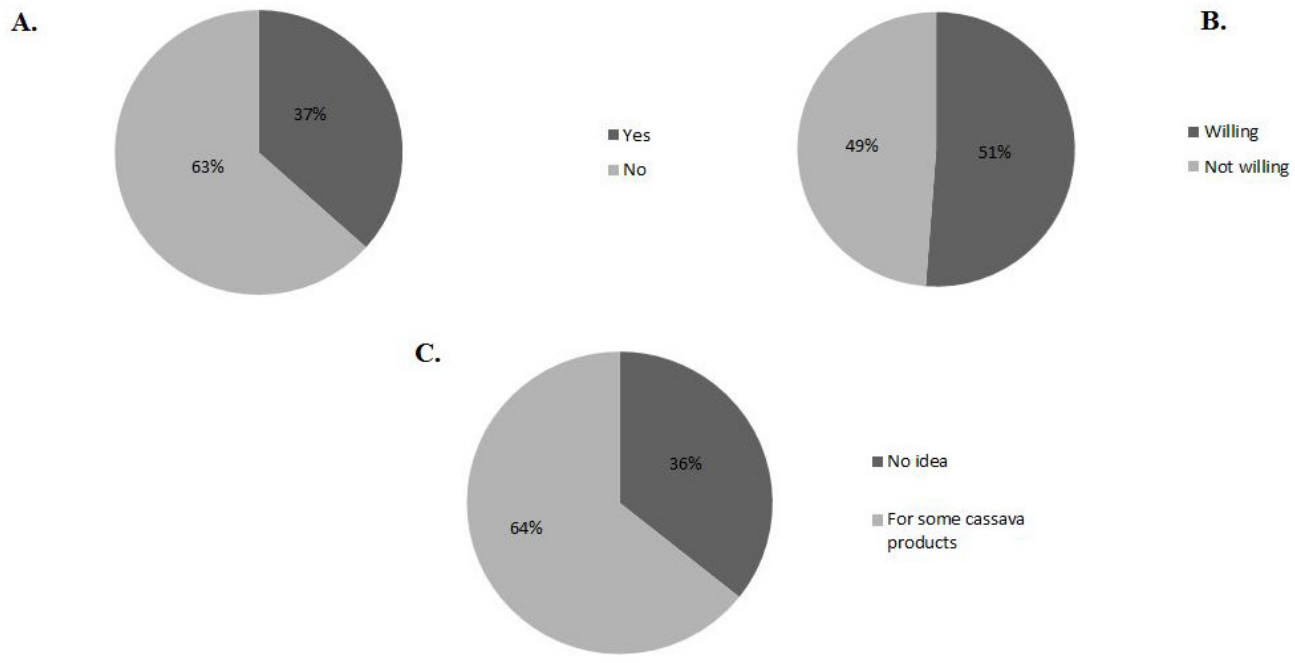

Figure 3. Knowledge and willingness to consume yellow flesh cassava. **(A)** Knowledge of yellow flesh cassava. **(B)** Willingness-to-accept yellow flesh cassava **(C)** Perceived usage of yellow flesh cassava

4. Discussion

Majority of the participants in the survey (n = 262) were between the ages of 18-39 years and this population represented the highly reproductive part of the population who are also vulnerable to vitamin A deficiency [22]. Most of the participants had up to tertiary education. In spite of their high educational background they did not have corresponding levels of knowledge about yellow flesh cassava. Many of the households that participated in the survey also had children less than 15 years of age, another vulnerable group to vitamin A deficiency [21]. This suggests that an early adaptation to the use of yellow cassava would be a good step in curbing the prevalence of vitamin A deficiency in their households.

The consumer survey for this research revealed that *gari* was most eaten by the participants while cassava leaves were least consumed. *Gari* has a longer shelf life and thus may be a factor to it being the most consumed food for that population. [15] also reported *gari* to be the highest consumed cassava product making it a more viable vehicle for the introduction of yellow cassava to the Ghanaian populace. However, for participants between the ages of 40-59 years, the most consumed cassava food were other cassava products which included *fufu*. *Fufu* is known to be more energy dense because of the addition of cocoyam, plantain or yam and this age group prefer more energy dense foods probably because of their family size and economic status. Food choices influenced by cultural and social factors for this age group make them more likely to prefer fufu than any other cassava product [3,19].

Nutrition education is an important tool in communicating the nutritional and health benefits of biofortified crops and also an important factor that affects acceptability of biofortified crops [18]. [4] reported that mothers in Uganda easily adopted biofortified foods after receiving nutrition education. From this study, about half of the consumers who took part in the survey were not willing to accept yellow flesh cassava because they did not have any knowledge about it and this is similar to studies on the acceptability of biofortified foods. Some studies have shown that consumer preferences for biofortified foods have also been influenced by providing nutritional information. This means that consumers were more likely to consume biofortified foods if they were provided with information on the nutritional value of the food [5,20]. When given the same information, "willingness-to-pay" studies for orange sweet potato, orange maize, and yellow cassava showed that consumers liked the sensory characteristics of the biofortified crops and will pay a higher price for high pro-vitamin A varieties than for white varieties [4,13].

Socio-economic characteristics of most consumers such as their income, amount of land owned, age, education level, household size and number of young children they have in their household might play an important role to the success of a bio-fortification program [8]. Results from this study showed that socio-demographic characteristics such as age and marriage affected a person's knowledge and willingness to accept yellow cassava significantly.

5. Conclusions

The study showed that cassava was widely consumed in Ghana. A greater number of the participants consumed cassava in the form of *gari*. More than half of the participants of the survey did not have any knowledge of yellow flesh cassava. However the elderly and individuals who were in a form of marriage contract were more likely to know about yellow flesh cassava than the young and single individuals. Approximately half of the individuals interviewed were willing to accept yellow flesh cassava and consume it in the same way as they consume white cassava. This is largely because of its increased nutritional value. More work has to be done on sensitizing the populace on the nutritional benefits of biofortified cassava to help reduce vitamin A deficiency in Ghana.

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References

[1] Akinpelu AO, Amamgbo LEF, Olojede AO, Oyekale AD. Health implications of cassava production and consumption. *JASR*. 2011; 11(1): 118-125.

[2] Akinwale MG, Aladesanwa RD, Akinyele BO, Dixon AGO Odiyi AC. Inheritance of β-carotene in cassava (Manihot esculenta Crantz). *International Journal of Genetic Molecular Biology* 2010; **2**: 198-201.

[3] Alonso EB. The impact of culture, religion and traditional knowledge on food and nutrition security in developing countries. FOODSECURE working paper 30.2015:7-16

[4] Chowdhury S, Meenashi JV, Tomlins KI, Owori C. Are consumers in developing countries willing to pay more for micronutrient-dense bio fortified foods? Evidence from a field experiment in Uganda. *American Journal of Agriculture and Economics*. 2011; 93(1):83-97.

[5] De Groote H, Kimenju SC. Comparing consumer preferences for color and nutritional quality in maize: Application of a semi-double-bound logistic model on urban consumers in Kenya. Food Policy.2008; 33: 362-370.

[6] De Moura,QF MiloffA, Boy E. Retention of Provitamin A carotenoids in staple crops targeted for biofortification in Africa: Cassava, maize, and sweet potato. *Critical Revised Food Science and Nutrition* 2015; 55: 1246-1269.

[7] Egesi C, Mbanaso E, Ogbe F, Okogbenin E, Fregene M. Development of cassava varieties with high value root quality through induced mutations and marker-aided breeding. *NRCRI, Umudike Annual Report*, 2006: 2-6.

[8] Etumnu, Chinonso E,"Behavioral Determinants of Biofortified Food Acceptance: The Case of Orange-fleshed Sweet Potato in Ghana" (2016). Master'sThesis.Paper 173. http://repository.usfca.edu/thes/173.

[9] FAO. Save and Grow: Cassava. A guide to sustainable production intensification. FAO, Rome, 2013: 6-18.

[10] Gegios A, Amthor R, Maziya-Dixon B, Egesi C, Mallowa S, Nungo R, GichukiS, Mbanaso A, Manary MJ. Children consuming cassava as a staple food are at risk for inadequate zinc, iron, and vitamin A intake. *Plant Foods and Human Nutrition* 2010; 65: 64-70.

[11] Hahn SK.Overview of traditional processing and utilization in Africa. In: Proceedings of workshop of the potential utilization of cassava as livestock feed in Africa, pp. 16-27. Hahn, S.K., Reynolds, L., and Egbunike, G.N., Eds., Ibadan, Nigeria. IITA/ILCA/Univ.

[12] Kleih U, Phillips D, Wordey MT, Komlaga G. Cassava Market and Value Chain Analysis, Ghana Case Study, Final Report. *CAVA*.2013:19.

[13] Meenakshi JV, Banerji A Manyong VK,Tomlins N, Mittal Hamukwala P. "Using a Discrete Choice Experiment to Elicit the Demand for a Nutritious Food: Willingness-to-Pay for Orange Maize in Rural Zambia." *Journal of Health and Economics* 2012; 31: 62-71

[14] Nassar NMA, Ortiz R. Review - Cassava improvement: challenges and impacts. *Journal of Agricultural Science*. 2007; 145; 163-171.

[15] Onyemauwa CS. Analysis of Household Consumption of Cassava Products in Ohaozara, Ebonyi State, Southeast Nigeria. Researcher.2010; 2 (6):1-6.

[16] Parkes EY, Fregene M, Dixon A, Boakye-Peprah B, Labuschagne MT. Combining ability of cassava genotypes for cassava mosaic disease and cassava bacterial blight, yield and its related components in two ecological zones in Ghana. Euphytica. 2013; 194:13-24.

[17] Stephenson K, Amthor R, Mallowa S, Maziya-Dixon B, Gichuki S, Mbanaso A, Manary M. Consuming cassava as a staple food places children 2-5 years old at risk for inadequate protein intake, an observational study in Kenya and Nigeria. *Nutrition Journal* 2010; 9: 9.

[18] Tanumihardjo SA. Food-Based Approaches for Ensuring Adequate Vitamin A. Nutrition. Comprehensive Revised in Food Science and Food Safety. 2008; **7**(4): 373-381.

[19] Vabø M. Hansen H. The Relationship between Food Preferences and Food Choice: A Theoretical Discussion. *International Journal of Business and Social Science*. 2014; 5(7): 145-157.

[20] Vecchione M,Feldman C, Wunderlich S. Consumer knowledge and attitudes about genetically modified food products and labelling policy. *International Journal of Food Science and Nutrition*. 2015; 66(3): 329-335.

[21] West KP. Extent of vitamin A deficiency among preschool children and women of reproductive age. *Journal of Nutrition.* 2002; 132: 2857-66S.

[22] World Health Organization. Vitamin A deficiency and iodine deficiency disorders: prevalence estimates for the global burden of disease. Micronutrient Deficiency Information System (MDIS), Geneva, Switzerland: World Health Organization, 2001.