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Consumer Awareness of Vitamin A Bio-fortified Staple Foods in Peri-Urban Areas of Abia State, Nigeria

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Abstract

This study examined consumer awareness of Vitamin A biofortified staple foods in peri-urban areas of Abia State, Nigeria. A multistage sampling procedure was used to select two hundred and ten (210) consumers for the study. Data were collected using a questionnaire. Frequency, percentage, mean score, and logistic regression were used to analyse the data. Findings indicated that consumers were mostly aware of UMUCASS (82.9%), UMUSPO3/Mother's Delight (52%), and Ife Hybrid (38.1%) varieties of Vitamin A cassava, orange-fleshed sweet potato, and maize, respectively. Prevention of blindness (M= 4.82) as a nutritional benefit of Vitamin A ranked first among all the benefits listed. Consumers identified yellow colour (53.3%) as the colour for Vitamin A biofortified staple food. There is a significant positive relationship between age (0.079), education (1.059), household size (0.412) and awareness of Vitamin A biofortified staple foods. The study recommended a shift from general publicity to targeted extension education campaigns that include specific information on the nutritional functions of Vitamin A.

Key words: Vitamin A biofortified, consumer, awareness, staple, peri-urban

Introduction

Staple foods are foods eaten daily or regularly, and form the dominant part of a population's diet. Staple foods provide the basic source of energy and nutrients in the human diet. Specifically, 21% of the population in Africa consumes staple foods such as rice, maize, and cassava, which provide satiety and energy but lack the micronutrient density needed for health (FAO et al., 2020). Essentially, a person may consume enough calories to survive or even gain weight but lack essential vitamins and minerals, thereby triggering hidden hunger and malnutrition (Lowe, 2021). Given that micronutrient deficiencies have significant implications for public health and economic development, measures such as biofortification have been employed to address the situation (Ridier et al., 2021).

Biofortification is a process of genetically improving staple crops to address malnutrition by integrating essential vitamins and minerals (Owusu, 2019). Biofortification is crucial because vulnerable people, especially in developing

countries, suffer from nutritional deficiencies. According to Mani et al. (2023), there is a worldwide deficit in Vitamin A, zinc, and iron, resulting in compromised immune function, cognitive deficiency, and increased mortality rates.

Vitamin A deficiency contributes to blindness and increased susceptibility to infectious diseases, notably among children and women of childbearing age (Nankumbi et al., 2023). This can be linked to reliance on energy-dense staple foods low in micronutrients and a lack of dietary diversity (Ayieko et al., 2024). To address this, bio-fortification programs have focused on developing nutrient-enriched staple crops as a sustainable intervention to improve public health (Mulwa et al., 2022).

Bio-fortified crops are easily identified by their distinct yellow or orange colour. Bio-fortified crops promoted across Nigeria between 2012 and 2025 include Vitamin A cassava, Vitamin A maize, Vitamin A sweet potato, zinc rice, and iron pearl millet (HarvestPlus, 2023). Biofortified vitamin A cassava varieties provide as much as 120 micrograms (ug) of provitamin A (HarvestPlus, 2023), while Vitamin A sweet potato incorporates around 1,403 mcg of vitamin A (National Institute of Health, 2025) and Vitamin A maize contains 700 micrograms (ug) of provitamin A carotenoids (HarvestPlus, 2022). Considering the enormous benefits of bio-fortified staple foods, many countries have adopted food fortification to address acute and chronic Vitamin A deficiency, especially for young children (HarvestPlus, 2022). Onyeneke et al. (2020) reiterated that adopting bio-fortified provitamin A cassava substantially reduces Vitamin A deficiency-related health outcomes.

Despite the potential of Vit-A bio-fortified staple foods, consumer acceptance depends on awareness, preferences, and consumption patterns (Mani et al., 2023; Adeyemo et al., 2022). According to Oteh et al. (2020), the success of Vit-A bio-fortified staple crops is closely related to the extent to which consumers accept and consume them because opinions and perceptions vary. Assessing consumers' awareness of the benefits of Vit A staple crops (Alam et al., 2021) is essential because many consumers remain unaware of the health benefits, while others are hesitant due to changes in the crop's physical traits. Despite the promotion of biofortified staples, their consumption in peri-urban areas has not been fully explored.

Without a clear understanding of consumer awareness levels in peri-urban areas, Vitamin A biofortification efforts may fail to reach their full potential. Hence, this study aimed to examine consumer awareness of Vitamin A biofortified staple food in peri-urban areas of Abia State, Nigeria. Specifically, the study

i. examined consumers' awareness of Vitamin A biofortified staple food;
ii. determined consumers' visual (colour) differentiation of Vitamin A bio-fortified staples;
iii. examined the perceived nutritional benefits of biofortified staple food;
Ho: There is no significant relationship between some selected personal characteristics and the awareness of Vitamin A biofortified staple foods.

Methodology

The study was conducted in Abia State, Nigeria. It is located at approximately 5.4541° N latitude and 7.5153° E longitude. Abia State has seventeen (17) local government areas. Abia State covers 6,320 km2 and has an estimated population of

4 million. Agriculture is a major occupation in the state, with staple crops produced in large quantities (Owoh, 2023).
The study employed a multi-stage sampling procedure. First, Umuahia and Aba agricultural zones were selected for the study. In the second stage, eight (8) Local Government Areas were randomly selected (Aba North, Ugwunagbo, Osisioma, Aba South, Umuahia North, Umuahia South, Bende and Ikwuano) from the two agricultural zones. In the third stage, fourteen (14) peri-urban areas (Osisioma, Ogborhill, Abayi, Arongwa**,** Obegu, Ubakala**,** Ama-Achara,Umuagu, Umudike, Uzuakoli, Umukabia, Ariam,Isiama, and Olokoro) were randomly selected. In the fourth stage, fifteen (15) respondents from each of the peri-urban areas were randomly selected for the study, cumulating in 210 respondents for the study.

Questionnaire was used to collect data for the study. Frequency and percentage were used to analyze the awareness of Vitamin A staple food crops. Perceived benefits of Vitamin A staple foods were ascertained using a four-point Likert-type scale of 4(very aware, 3(aware), 2(moderately aware, 1(slightly aware), 0(not aware). The mean was computed for the scores, and the cut-off mean was 2.5. Variables with a mean less than 2.5 were considered as low awareness. Frequency and percentage were used to determine consumers' visual (colour) differentiation of Vitamin A bio-fortified staples. The hypothesis was tested using logistic regression. The regression equation for the hypothesis was:
$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \upsilon$
where
Y = awareness of Vit A biofortified staple food
β1- β3= Regression coefficient
X1 = age
X2 = education
X3 = household size
υ **=** error term

Results and Discussion
Socio-demographic Characteristics of Consumers

Data presented in Table 1 show that 39.1% of consumers were between the ages of 40 and 49 years, while 7.1% were aged 60 years and above. This finding corroborates Oguizu and Ikpeazu's (2022) findings that about 38.8% of consumers in Abia State were between the ages of 36 and 55 years. Akinsola et al. (2022) also observed that 34.2% of consumers were aged between 41 and 50 years. This implies that most consumers of Vitamin A bio-fortified staple foods were in their forties. Most consumers (45.7%) had secondary education, while 29.5% had tertiary education and only 4.3% had postgraduate education. According to Mbanasor et al. (2023), 64.2% of consumers in Abia State had secondary education. Oguizu and Ikpeazu (2022) reported that about 46.0% of mothers and fathers had secondary education, while 32.7% of mothers and 32.5% of fathers had tertiary education in Abia State. Results from Table 1 also show that 53.8% had a household size of 6 to 10 persons. This finding contradicts Akinsola et al. (2022), which stated that 29.2% of consumers had a household size of 6 to 10 persons. The majority (93.3%) of consumers were aware of vitamin A-biofortified staple foods. This finding supports Oguizu and Ikpeazu (2022), who reiterated that most (66.6%) households are aware

of vitamin A-rich foods in Abia State. According to Adetomiwa and Iseoluwa (2020), 71.5% were aware of Vitamin A garri.

Table 1: Personal characteristics of consumers

Variable	Percentage (n=210)	Mean
Age		
20-29	13.8	
30-39	22.9	43years
40-49	39.1	
50-59	17.1	
60 and above	7.1	
Education		
No formal education	5.7	
Primary education	14.8	
Secondary education	45.7	
Tertiary education	29.5	
Postgraduate	4.3	
Household size		
1-5	35.7	7persons
6-10	53.8	
10 and above	10.5	
Awareness of Vit A biofortified staple foods		
Aware	93.3	
Not aware	6.7	

Source: Field survey, 2025

Vitamin A Varieties of Staple Food Crops that Consumers are Aware of

Table 2 reveals that 82.9% of consumers were aware of the UMUCASS Vitamin A variety of cassava,52% of consumers were aware of the UMUSPO 3 (Mothers Delight) Vitamin A variety of orange-fleshed sweet potato, while 38.1% were aware of the Ife Hybrid variety of Vitamin A maize. This indicates a relatively high level of awareness of Vit A biofortified staple foods in the study area. Ariyo (2023) observed that 55.0% of women in urban areas of Ikire are aware of pro-Vit A cassava food, indicating a relatively high level of awareness. However, this finding contradicts Atanasova et al. (2025), who stated that 30.0% were aware of Vit A biofortified cassava, 16.67% were aware of Vit A biofortified maize, while 20.85% were aware of Vit A biofortified sweet potato in Enugu State, showing a low level of awareness. Peri-urban residents generally live close to health centres where health workers promote Vitamin A staple foods to combat Vitamin A deficiency in children. Moreover, many peri-urban schools are involved in feeding programs that introduce these varieties to children who in turn inform their parents. Also, peri-urban areas are close enough to rural areas where demonstration plots are usually established for learning and information and also close enough to urban areas to receive radio and television broadcasts.

Table 2: Vitamin A varieties of staple food crops that consumers are aware of

Vitamin A varieties of staple food crops	f (%) n=210
Cassava	
UMUCASS	174 (82.9)
Orange-fleshed Sweet potato	
UMUSPO 3 (Mother's Delight)	109 (52)
UMUSPO 1 (King J)	61 (29)
UMUSPO 4 (Solo Gold)	40 (19)
Maize	
Ife Hybrid	80 (38.1)
Oba Super	79 (37.6)
Hakimi	19 (9.1)
Sammaz	32 (15.2)

Source: Field survey, 2025

Consumers' Visual (colour) Differentiation of Vitamin A Bio-fortified Staples

Results in Table 3 show that consumers (53.3%) identified Vit A bio-fortified staple foods as yellow, while 40.0% identified them as orange. Unlike traditional white cassava or maize, Vit A bio-fortified staple foods are distinctly yellow (cassava, maize) or orange (sweet potato). Peri-urban consumers' ability to differentiate Vitamin A staple foods by colour is supported by proximity to markets. Peri-urban markets are often the first transit points for produce coming from rural areas; hence, consumers come in contact with it. Moreover, dual rural-urban exposure sharpens consumers' ability in peri-urban areas to differentiate agricultural commodities by colour. Atanasova et al. (2025) observed that 30.0% of consumers in Nigeria can distinguish biofortified from non-biofortified cassava, while 60.0% can distinguish biofortified from non-biofortified maize and sweet potato, respectively. According to Osunbade et al. (2023), consumers in South-East Nigeria prefer yellow garri/cassava. A minority (6.7%) still perceive Vitamin A bio-fortified staple foods as white, concurring with the ab initio finding that 6.7% of consumers are not aware of Vitamin A bio-fortified staple foods.

Table 3: Consumers' visual (colour) differentiation of Vitamin A bio-fortified staples

Colour	% n=210
Yellow	53.3
Orange	40
White	6.7

Source: Field survey, 2025

Awareness of Nutritional Benefits of Vitamin A Staple Food

Results in Table 4 reveal that consumers were aware that Vitamin A prevents blindness (M = 4.82) and fights disease (M = 3.75). However, consumers had low awareness regarding other perceived nutritional benefits of Vitamin A, such as giving immunity (M=2.41), necessary for growth and development (M=2.10), helps in the production of white blood cells (M=1.42), maintains the skin (M=1.88), vital in reproduction (M=1.35), and increases life expectancy (M=1.28). This finding implies

that while consumers understand that Vitamin A is good for them, they understand the specific biological mechanisms less well. Consumers know the immediate benefits (sight) but have very little awareness about the systemic benefits (reproduction/longevity). Moreso, this finding aligns with global concerns regarding hidden hunger, where individuals may be aware of general health benefits but lack specific nutritional literacy. Ariyo (2023) opined that about 36% of consumers were aware of the benefits of Vitamin A, suggesting a low level of awareness. Chiemela et al. (2022) observed that households had little or no knowledge of food nutrition and balanced diet.

Table 4: Perceived nutritional benefits of Vitamin A that consumers are aware of

Perceived Nutritional benefits of Vitamin A	Mean score	SD
Prevents blindness	4.82	0.35
Gives immunity	2.41	0.88
Fights against diseases	3.75	0.81
Necessary for growth and development	2.10	0.75
Helps in the production of white blood cells	1.42	0.51
Maintains the skin	1.88	0.64
Vital in reproduction	1.35	0.48
Increases life expectancy	1.28	0.42

Source: Field survey, 2025

Relationship between Selected Personal Characteristics of Consumers and Awareness of Vitamin A Biofortified Staple Foods

Results in Table 5 reveal that age (0.079), education (1.059) and household size (0.412) had a significant positive relationship with awareness of Vitamin A biofortified staple foods; hence, the null hypothesis was rejected. Table 5 also shows that for every unit increase in age, awareness will likely increase by 1.08 times; for every unit increase in education, awareness will likely increase by 2.88 times; and for every unit increase in household size, awareness will likely increase by 1.51 times; hence, the null hypothesis was rejected.

As individuals age, they become more attentive to health-related information about the food they consume. Education enhances information processing capabilities. Educated individuals are more likely to understand the term “fortified”, read food labels, follow public health advisories issued through formal media, and understand the health outcomes of Vitamin A. The larger the household size, the greater the tendency to prioritise nutritious staple foods that can feed the whole family and keep them healthy.

Table 5: Relationship between selected personal characteristics and awareness of Vitamin A biofortified staple foods

Variable	Coefficient	SE	Odds ratio (95% C.I)
Age	0.079*	0.01	1.08
Education	1.059*	0.19	2.88
Household size	0.412*	0.10	1.51

***Significant**

Conclusion and Recommendations

Most consumers in peri-urban areas of Abia State were aware of Vitamin A biofortified staple foods, which can be identified visually by colour. Age, education and household size were not merely demographic markers but pivotal in determining awareness of Vitamin A biofortified foods. However, consumers have only a peripheral awareness of the benefits of Vitamin A.

This study recommends a shift from general publicity to targeted educational campaigns that provide specific information on the nutritional functions of Vitamin A. Social media platforms should be used to increase consumers' awareness of biofortified foods and their benefits. Pre-natal and post-natal counselling sessions should be integrated into maternal/reproductive health education and explicitly highlight the necessity of Vitamin A for both mother and child development. Use of infographics in community centres that link Vitamin A directly to specific body parts (for example, the skin) should be intensified in order to make abstract benefits more tangible. Most importantly, extension officers should strategise nutritional literacy programmes that focus on the lesser-known biological benefits of essential micronutrients.

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