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Original Article

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ACCEPTABILITY OF COMPLEMENTARY PORRIDGE ENRICHED WITH CRICKETS (*Acheta domesticus*) AMONG WOMEN OF REPRODUCTIVE AGE IN ALEGO-USONGA SUB-COUNTY, KENYA

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ABSTRACT

Protein-energy malnutrition is common among children of under five years of age in sub-Saharan Africa. This is mainly attributed to poor complementary foods and feeding practices, which are often cereal-based and characterized by low nutrient density. Soybean is commonly used to enrich complementary foods, nonetheless, its prospects for use as a rich source of protein and minerals is limited by its low protein digestibility and bioavailability of minerals, costly production and contribution towards environmental degradation. Crickets provide cheap and sustainable source of protein and other nutrients, and holds the potential for substituting soybean in complementary porridge formula. To evaluate acceptability of complementary porridge enriched with crickets, Famila complementary porridge flour, a composite of maize, wheat and defatted soybean was enriched with cricket flour by substituting soybean with cricket flour at 0%, 25%, 50% and 75%. Four porridges were prepared from the flours and coded as CP, CPB1, CPB2 and CPB3, respectively. A total of 40 semi-trained women evaluated the porridges on colour, taste, aroma, texture, mouth-feel and overall acceptability on a 9 -point hedonic scale. The overall acceptability of the porridges were as follows; CP (8.5 ± 0.72), CPB1 (7.08 ± 0.94), CPB2 (5.75 ± 1.53) and CPB3 (3.60 ± 1.95). Control porridge (CP) was highly rated in all sensory attributes while CPB3 was rated the lowest in all the attributes. Unlike CP, the overall acceptability of CP1, CPB2 and CPB 3 improved with experience in insect consumption, age and level of education. The ratings for colour, aroma and taste of cricket-based porridges were higher among women aged 30 years and above, and those with post-primary education. The most accepted cricket-based porridges were CPB1 and CPB2. Enrichment of Famila complementary porridge with cricket flour affected its sensory attributes which were perceived differently by the women. This informs the need for both low and high substitution levels to cater for their diverse preferences.

Key words: Malnutrition, Entomophagy, Soybean, Crickets, Sensory attributes, Consumer acceptability

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INTRODUCTION

The 2020 joint malnutrition report indicates that child undernutrition is a persistent global health challenge impacting negatively on the economies of most developing countries [1]. In sub-Saharan Africa, two out of five children of under 5 years of age die annually due to undernutrition [2]. Kenya in particular is envisaged to lose approximately US$ 38.3 billion in Gross domestic product (GDP) by 2030 due to losses in work force productivity as a result of undernutrition [3]. This calls for transformation in complementary feeding focusing on the development of more nutritious and high quality complementary foods for improving child nutrition.

Soybeans (*Glycine max*) has been promoted extensively for use in the enrichment of cereals in developing complementary porridge and other foods due to its relatively higher nutrient content than other legumes and pulses. Soybean is rich in plant protein (42g/100g) with eight essential amino acids, carbohydrate (23g/100g), fat (20g/100g) and minerals especially potassium [4]. The development and use of Corn-Soy Blends (CSBs) has been regarded as one of the sustainable ways of combating protein-energy malnutrition in developing countries [5]. Even though CSBs have contributed towards improving nutritional status of children, their full potentials are limited by soybean's low protein digestibility and low bioavailability of essential minerals caused by ingrained trypsin, chymotrypsin and amylase inhibitors impairing the digestion of protein. The legume also possesses antinutrients such as phytic acids and tannins which interact with readily available minerals to form complex and insoluble compounds reducing their bioavailability [6, 7]. Furthermore, its production is not only costly and difficult to resource poor households but also its intensive production contributes to ecosystem degradation, climate change and loss of biodiversity. This creates the need for cheap, nutritious and sustainable food resources for use in the development of complementary foods, which crickets have demonstrated.

Crickets are rich in highly digestible animal protein (60g/100g edible portion), energy (1777Kcal/100 edible portion), fats (25g/100g edible portion) and a host of essential minerals [8]. They are also cheap and easy to produce with less negative impact on the environment. Despite their nutritional quality and environmental friendliness, crickets' consumption is still generally low mainly due to food neophobia feelings instigated by their visual and textural attributes [9]. This evokes the need for their gradual incorporation into complementary food formulations in order to increase their acceptability and, progressively replace soybean in such formula.

This study evaluated acceptability of Famila complementary porridge formulated by partial substitution of soybean with cricket flours at various levels. Famila complementary porridge flour is a composite of maize, wheat and defatted soybean flour. The flour is popular and widely used in Kenya for child feeding. One kilogram of Famila complementary porridge flour costs an average of US$ 1.25, making it affordable to most households.

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MATERIALS AND METHODS

Materials and processing

The main ingredients for the experiment were maize grains (*Zea mays*), soybean (*Glycine max)*, wheat flour and house crickets (*Acheta domesticus*) that were 10 weeks old and obtained from Jaramogi Oginga Odinga University of Science and Technology (JOOUST) insect rearing farm. Wheat flour was sourced from a local supermarket, maize and soybean grains were purchased from a local grocery and sorted to remove those damaged and foreign materials. Soybean grains were carefully defatted in an oven at 180^0C for 20 minutes to deactivate antinutrients, enhance protein digestibility and improve flour's flavor as reported by Deepika [5]. All the grains were milled separately and the flours sieved through a 250 um mesh sieve to obtain fine flour. Crickets were first frozen at -20°C, blanched at 98^0C for a minute, oven dried at 50^0C for 72 hours, milled to flour and the flour sieved through the same sieve used for the grains flour. The four flours were packed separately and stored in a cooler at 25°C and used the following day for composite flour formulation.

Flour Formulations

Four composite flours were formulated according to World Health Organization (WHO) recommendation of 3:1 for main source of carbohydrate to main source of protein in complementary feeding. The control composite flour coded as CP was formulated in the ratio resembling that of Famila complementary porridge flour (2:1:1 for maize, wheat and soybean flours respectively). The other three composite flours (coded as CPB1, CPB2 and CPB3) were formulated in the same ratio of 2:1:1 but with substitution of soybean with cricket flour at 25%, 50% and 75%, respectively and mixed thoroughly. The flours were then packed separately and stored at 25°C and used after four weeks to make porridges.

Porridge preparation and Sensory evaluation

A standard recipe was used to prepare the porridges from CP, CPB1, CPB2 and CPB3 flours [10]. One part of flour was mixed with four parts of water then boiled to simmer. The porridges were allowed to cool to 60^0C then kept in different thermo flasks to maintain temperature, and each porridge was coded with the corresponding letters of the flour. A total of 40 women, including mothers and caregivers who were residents of Karapul Sub-location, Karemo Division, Alego Usonga Sub-County were randomly recruited to participate in the sensory evaluation of the porridges. The mothers and caregivers were allowed to participate in the study instead of their infants because this was a dyad and mothers' acceptability is normally key in feeding the same to their infants. The number of women recruited to participate in the study met the threshold of 40 participants required for consumer test and descriptive analysis [11].

The women were organized into four groups consisting of 10 members each and were trained on sensory evaluation parameters as well as the nine-point hedonic rating scale on the same days the porridges were presented. Presentation of the porridges was single-blinded, with an interval of mouth rinsing with clean drinking water after tasting each sample [12]. In a well-lit room, the women rated the porridges for colour, texture, taste, aroma (smell), mouth-feel and overall acceptability under guidance. All the

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women had the opportunity to evaluate the four porridges and their scores captured on a 9-point hedonic scale form (from "9" – like extremely, to "1" - dislike extremely) according to Villanueva [13]. Data on demographic characteristics such as age, level of education, marital status, breastfeeding status, occupation, income level and history of insect consumption were also captured on the same forms containing the hedonic scale.

Statistical analyses

All statistical analyses were performed using SPSS software version 25. Descriptive statistics was used to present data in means and standard deviations. Analysis of variance (ANOVA) was carried out independently for each dependent variable and significant differences determined at $p \leq 0.05$. Tukey's studentized range test was used for mean comparison to identify statistically homogeneous subsets at $\alpha=0.05$.

Ethical Considerations

Ethical approval was obtained from Jaramogi Oginga Odinga University of Science and Technology Ethics Review Committee with approval number ERC/23/6/20-1 and a research permit granted by National Commission for Science, Technology and Innovation (NACOSTI) with identification number 347723. Permission and support were also sought from the Local Administration. Prior to their participation, the women were informed of the ingredients and safety of the porridges. Those with known history of allergic reactions to any ingredient of the porridges or underlying health conditions were excluded from the study. Those who agreed to participate first gave informed consent verbally and thereafter signed consent forms.

RESULTS AND DISCUSSION

Socio-Demographic Characteristics of the respondents

A total of 40 women in the age range of 15-45 years participated in the study. Socio-demographic characteristics of the respondents are presented in Table 1. Majority (40%) of the women were in age group 20-29 years, 22.5% in 30-39 years, 20% in 40-45 years and 25% were teenagers (15-19 years). Most of the women were married (72.5%) while 27.5% were not. At the time of the study, 40% of the women were breastfeeding while the remaining 60% consisted of those who had breastfed before and those hopeful of breastfeeding in the future. In terms of education, majority of the women (78.5%) had attained post-primary education. Those under formal employment were only 15%, while the rest were engaged in informal employment which included; farming (32.5%), small scale business (25%) and 27.5% were students under the care of their parents or guardians. Twenty percent (20%) of the women reported a monthly income of less than US$ 50, majority of them (42.5%) earned a monthly income between US$ 50-100, 20% earned between US$ 101- 150, 7.5% earned between US$ 151-200 and only 10% reported a monthly income more than US$ 200.

Poor maternal feeding practices are the leading causes of child malnutrition and, are commonly associated with poverty, ignorance and infections [14]. With majority of the women attaining post-primary education, they had adequate knowledge and information necessary to make informed evaluation and choices of the porridges. Knowledge and information have been identified as key factors influencing consumers'

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decisions on food choices [15]. Most women were married, thus had household responsibilities including making decisions regarding households' food choices, purchase and consumption. The main source of income was informal employment attracting low income. More than half of the women earned less than US$ 100 per month translating into less than US$ 3.3 per day, available for both food and non-expenditure. In terms of entomophagy, most women had experience of insect consumption, which is an important factor in repeat purchase and consumption of insects and insect-based foods [15].

Commonly consumed insects and their level of consumption

Majority of the women (92.5%) had history of entomophagy while 7.5% had no history of entomophagy. Five insects were predominantly consumed by the women: winged termites, black ants, grasshoppers, lake flies and crickets as shown in Figure 1. Winged termites and black ants were the most popular and commonly consumed insects, while lake flies and crickets were the least consumed. When asked whether they would consume whole insects, all respondents expressed displeasure with the consumption of whole grasshoppers, lake flies and crickets presented to them as either cooked or uncooked but were comfortable with consumption of cooked or uncooked winged termites

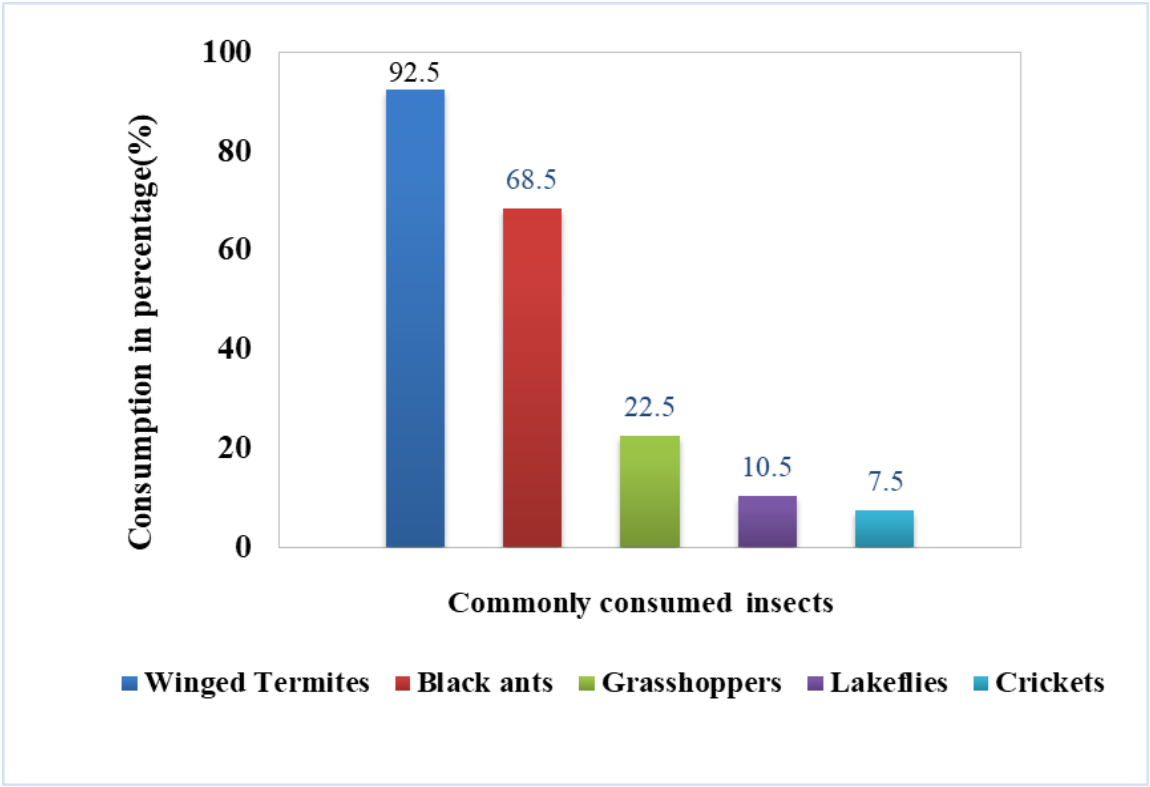

Figure 1: Insects consumed by participants and their level of consumption expressed in percentages

Lake Victoria region, which covers Karapul Sub-location is known for abundance of edible insects; however, many people are not familiar with more edible insects as only

five are known and consumed in the area. Winged termites are the most common and widely consumed due to their frequent emergence especially during rainy seasons. Black ants are also consumed but relatively lower than winged termites. Previously, there have been fears of likelihood extinction of black ants in the region [17]. This could be the reason for their low consumption compared to winged termites. Crickets are the least consumed insects notwithstanding their nutritional quality. Karapul Sub-location is part of Alego Usonga sub-county where crickets rearing and consumption have been promoted by Jaramogi Oginga Odinga University of Science and Technology, with farmers trained on their rearing. However, their extensive consumption is yet to take up, informing the need for their further promotion as food.

Low entomophagy has been linked to food neophobia where some insects are viewed in disdain and their consumption considered a primitive act [9]. Apparently, the form in which insects are presented significantly affects their acceptability. Despite expressing displeasure with the consumption of whole crickets, the women accepted to participate in sensory evaluation of cricket-based porridges including their tasting. Development of insects-based foods is therefore a good strategy for enhancing consumption of edible insects in alternative forms. Similar findings were reported in acceptability studies of muffins, biscuits, wheat burns and porridge enriched with different edible insects [18, 19, 20].

General acceptability of the porridges

The overall acceptability of the porridges was rated as follows: CP (8.5 ± 0.72), CPB1 (7.08 ± 0.94), CPB2 (5.75 ± 1.53) and CPB3 (3.60 ± 1.95) as shown in Table 2. There were significant differences in the ratings for colour, texture, aroma, mouth-feel and overall acceptability of the porridges ($p<0.000$). Although CP porridge had no cricket inclusion, it was the most accepted and highly rated porridge in all sensory attributes. Otherwise, CPB 1 and CPB 2 were the most accepted cricket-based porridges. Surprisingly, CPB 3 porridge which had the highest cricket flour inclusion and probably the most nutritious flour was disliked and rated low in all sensory attributes.

The control porridge which resembled Famila complementary flour was the best porridge for the women. Seemingly, they were used to this formula and addition of cricket flour made it unique and less attractive. Low acceptability of foods enriched with edible insects have been previously reported [18, 19]. According to the studies, foods with low edible insects' inclusion were more preferred to those with high inclusion levels conforming to the findings of this study. From this study, it is evident that the overall acceptability of a food product depends on acceptability of individual sensory attributes. More important attributes are the colour, taste and aroma which are perceived before food intake. Although these attributes were rated higher in an earlier related study, they were rated low for cricket-based porridges, thus affecting their overall acceptability [21]. Control porridge (CP) was brownish-yellow in colour but changed to dark-brown on addition of cricket flour, with the colour becoming more intense on addition of more cricket flour.

Fortification of foods with fats adversely affects the quality of their colour, taste and aroma due to high rancidity development caused by high fatty acid content [19].

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Crickets are rich in fatty acids including lauric acid and myristic acid. At the same time, storage of cricket-based flours for four weeks before use could have instigated rancidity, thereby affecting the colour, taste and aroma of their porridges and rendering them less attractive to the women [8]. Additionally, the dark-brown colour of the cricket-based porridges can be associated with Maillard browning caused by heating of foods rich in amino acids and reducing sugars as the latter contribute to the formation of Maillard reaction products (melanoidins), which reduces the light colour of food products [22,23]. Cricket flour is rich in protein of upto 60g/100g with diverse amino acids and boiling the cricket-based gruels could have also contributed to the dark-brown colour of the porridges. Concurrent with the findings of this study, enrichment of muffins with cricket flour was reported to have changed their colour making them less attractive to consumers [18].

Besides colour, the texture and mouth-feel of cricket-based porridges were rated low. Although the unblended flours were finely sieved, the lower rating for texture and mouth-feel of cricket-based porridges indicates presence of more fibre in the gruels and this can be linked to the exoskeleton cover of the crickets. Apparently, sensory attributes of cricket-based porridges are critical for their acceptability. Colour and aroma are the most important attributes as they are perceived before food intake and their unattractiveness outrightly made the cricket-based porridges less acceptable compared to the control [24, 25]. Although enrichment of foods with edible insects enhances their nutritional value, the low acceptability of cricket-based porridges indicates that food acceptability is not necessarily informed by their nutritional value and health benefits but must also be accompanied with attractive sensory attributes [26].

Acceptability of the porridges based on experience in insect consumption

The overall acceptability of the porridges for women with history of insect consumption was as follows: CP (8.40 ± 1.03), CPB1 (7.30 ± 0.61), CPB2 (6.43 ± 1.01), CPB3 (5.43 ± 0.43), while those without history in insect consumption rated the porridges as follows: CP (8.6 ± 0.60), CPB1 (6.70 ± 0.44), CPB2 (5.73 ± 0.95), CPB3 (4.83 ± 1.02) as shown in Figure 2. Those with experience in insect consumption rated cricket-based porridges higher than those without experience in insect consumption. However, CP was the most accepted and highly rated porridge between the two groups of women.

Consumer behaviors are always complex and dynamic, and often their food choices and preferences are informed by their perceptions of food products based on their past experiences with such foods. Positive experiences with foods inform their repeat choice, purchase and consumption [15]. The higher rating for cricket-based porridges among women with experience in insect consumption is a probable indication of previous positive interactions with insects or insect-based foods.

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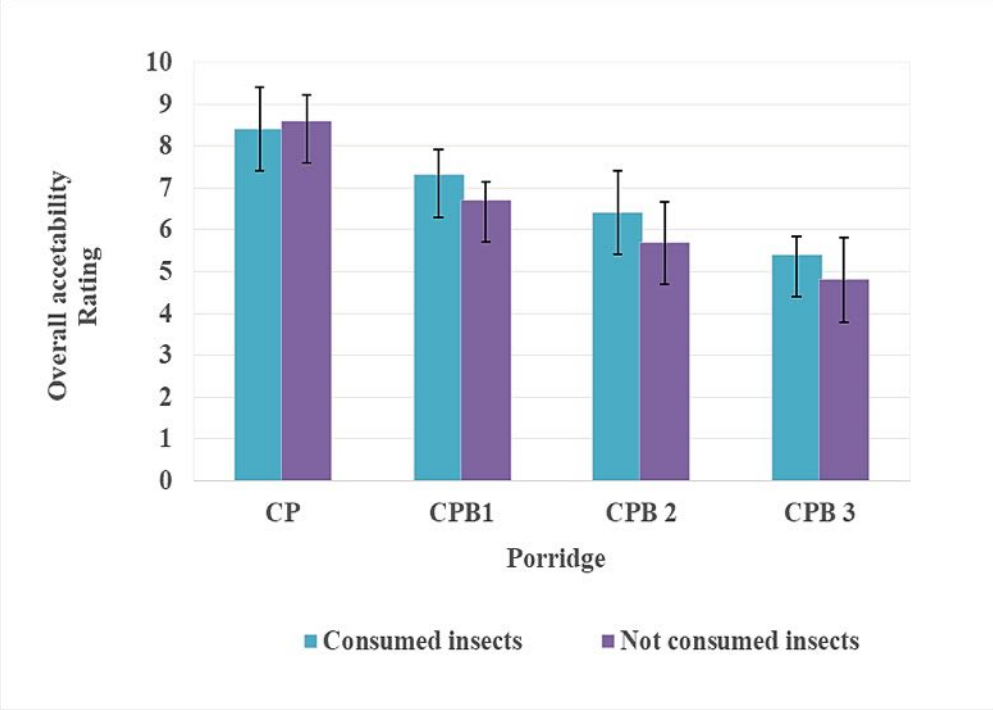

Figure 2: Overall acceptability of porridges based on experience in insect consumption

Acceptability of the porridges based on age

Age had an influence on the acceptability of the porridges as shown in Table 3. The mean ratings for colour, texture, aroma, taste and overall acceptability decreased significantly with increased substitution levels among teenagers (15-19 years), young women (20-29 years) and middle-aged women (30-39 years). No significant difference was observed in the overall acceptability of all the porridges between women in the age groups 30-39 years and 40-45 years ($p>0.05$). Although CP porridge was the most preferred in all the age groups, cricket-based porridges were more accepted by women of 35 years and above compared to the teenagers and young women.

Unlike older women, teenagers and young women rated cricket-based porridges poorly in all sensory attributes compared to the control porridge. Seemingly, their choices of the porridges were largely informed by the attractiveness of their sensory attributes. In a rapidly evolving society, civilized diets are associated with conspicuous, sweet-tasting and scented foods, and the positive feelings associated with such foods is the motivation behind their choices especially among young people [15]. Contrastingly, older people's food choices are informed by nutritional value and health benefits attached to the foods and not necessarily attractiveness of their sensory attributes. This group is keen on choosing foods that strengthen and maintain their health systems unlike those that expose them to diet-related illnesses.

Acceptability of the porridges based on level of education

Women in all the levels of education preferred CP porridge to other porridges. The overall acceptability of the porridges based on the levels of education is as shown in

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Table 4. Except for CPB 3, all the porridges were accepted among those with primary level of education. Unlike for CP porridge, the colour, taste, aroma and overall acceptability of cricket-based porridges improved with the level of education becoming, more accepted among those with tertiary level of education. Interestingly, no significant difference was observed in the overall acceptability of all the porridges among those with tertiary level of education ($p>0.05$).

Education is a significant factor in consumer choices and preferences [15]. It provides knowledge and builds consumers' opinions regarding their choices. The higher ratings of cricket-based porridges among those with post-primary education is an indication that this group could be having adequate information on the nutritional and health qualities of edible insects and their importance in the human diet. Maternal education has been reported to affect child nutrition, where mothers with high levels of education tend to feed their children on safe, sufficient and nutritious foods capable of supporting their optimal growth and development [27, 28]. Ordinarily, women without formal education and those with low levels of education tend to have difficulties in making proper decisions regarding the choice of quality foods for their children. In most cases, their children's diets are mainly composed of energy dense foods, which are low in protein, fats and micronutrients resulting into undernutrition [27, 28]. The low acceptability of cricket-based porridges among women with primary education could be due to inadequate awareness of the nutritional value and health benefits of edible insects and insect-based foods.

CONCLUSION

Although enrichment of complementary porridges with crickets improves their nutritional content, acceptability of cricket-based porridges varies with experience in insect consumption, age and level of education. This enrichment affects their sensory attributes which are perceived differently by different groups of women. Attractive sensory attributes are necessary for increased acceptability of the porridges especially among young women and those with low level of education. Conversely, the focus of older women and those with high level of education is on the nutritional and health benefits of foods. These variations suggest the importance of different cricket inclusion levels in meeting the diverse needs of consumers. However, there is need to improve and ensure uniformity in acceptability of the porridges especially among individuals with similar expectations. Furthermore, there is need to explore ways of improving sensory attributes of cricket-based porridges in order to make them more appealing and acceptable without compromising their nutritional quality. At the same time, sensitization and awareness should emphasize the nutritional and health benefits of cricket-based porridges and other insect-based foods to improve their acceptability.

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Table 1: Socio-demographic characteristics of the respondents

Characteristics	Category	Frequency	Percentage (%)
Age	15-19	10	25
	20-29	16	40
	30-39	9	22.5
	40-45	8	20
Marital status	Single	11	27.5
	Married	29	72.5
Education	Primary	9	22.5
	Secondary	13	32.5
	Tertiary	18	45
Occupation	Student	8	20
	Farmer	9	22.5
	Business	13	32.5
	Formal employment	10	25
Level of income/month	Less than US$ 50	8	20
	US$ 50-100	17	42.5
	US$ 101-150	8	20
	US$ 151-200	3	7.5
	Above US$ 200	4	10
Breastfeeding status	Breastfeeding	16	40
	Not breastfeeding	24	60
Experience in entomophagy	Yes	37	92.5
	No.	3	7.5

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Table 2: General acceptability of porridge

Porridge flour	Colour	Texture	Aroma	Taste	Mouth-feel	Overall acceptability
CP	8.08±1.47[a]	7.60±1.67[a]	8.25±1.28[a]	8.35±0.74[a]	7.65±1.70[a]	8.5±0.72[a]
CPB1	6.98±1.14[b]	6.88±1.52[a]	6.98±1.42[b]	6.85±1.48[b]	6.90±1.48[a]	7.08±0.94[b]
CPB2	5.83±1.72[c]	5.4±1.95[b]	4.85±1.64[c]	5.05±1.90[c]	5.08±1.97[b]	5.75±1.53[c]
CPB3	4.25±2.25[d]	3.35±2.10[c]	3.43±1.99[d]	3.65±2.13[d]	3.40±1.93[c]	3.60±1.95[d]

Values within each column followed by different superscripts differ significantly (P≤ 0.05). Values are presented as Mean ± SD, n=40

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Table 3: Sensory evaluation and acceptability of porridges based on age

Age(years)	Porridge	Colour	Texture	Aroma	Taste	Mouth- feel	Overall acceptability
15-19	**CP**	9.0±0.00^{a}	7.75±1.50^{a}	8.25±1.50^{a}	8.50±0.58^{a}	8.50±0.58^{a}	8.67±0.00^{a}
	CPB1	6.00±1.63^{b}	7.00±1.41^{a}	6.50±1.73^{b}	6.25±2.87^{b}	7.25±2.36^{b}	5.75±1.71^{b}
	CPB2	4.75±2.63^{c}	5.75±2.06^{b}	4.50±2.38^{c}	4.25±3.20^{c}	5.00±2.16^{c}	4.25±2.22^{c}
	CPB3	2.50±1.73^{d}	2.00±1.41^{c}	1.75±0.96^{d}	2.50±0.58^{d}	3.00±2.45^{d}	2.25±2.50^{d}
20-29	**CP**	8.29±1.26^{a}	7.59±1.66^{a}	8.47±0.87^{a}	8.35±0.70^{a}	7.24±1.28^{a}	8.23±0.72^{a}
	CPB1	7.35±1.06^{b}	7.24±1.25^{a}	7.18±1.24^{b}	7.00±1.41^{b}	7.12±1.22^{b}	7.12±0.70^{b}
	CPB2	6.24±1.56^{c}	5.94±1.48^{b}	5.41±1.46^{c}	5.82±1.67^{c}	5.41±1.73^{c}	5.73±1.06^{c}
	CPB3	4.88±2.32^{d}	4.35±1.97^{c}	4.35±1.94^{d}	4.94±2.29^{d}	4.18±1.78^{d}	4.00±1.67^{d}
30-39	**CP**	7.67±1.88^{a}	7.73±1.87^{a}	8.00±1.73^{a}	8.33±0.82^{a}	7.93±1.91^{a}	7.23±0.74^{a}
	CPB1	6.93±1.03^{a}	6.73±1.83^{b}	6.93±1.53^{b}	7.00±1.07^{b}	6.60±1.68^{b}	7.50±0.99^{a}
	CPB2	5.60±1.68^{b}	4.80±2.87^{c}	4.47±1.64^{c}	4.67±1.68^{c}	4.87±2.39^{c}	6.82±1.79^{a}
	CPB3	4.00±2.24^{c}	2.93±2.19^{d}	2.80±1.82^{d}	2.73±1.44^{d}	2.93±1.91^{d}	6.43±2.13^{ab}
40-45	**CP**	7.35±0.50^{a}	7.00±1.41^{a}	8.50±0.58a	8.25±0.96^{a}	7.50±0.58^{a}	7.22±0.82^{a}
	CPB1	6.50±1.00^{b}	5.75±1.26^{b}	6.75±1.89^{b}	6.25±1.71^{b}	6.75±0.96^{a}	7.57±0.58^{a}
	CPB2	6.00±1.63^{b}	5.00±1.83^{b}	4.25±1.50^{c}	4.00±1.41^{c}	4.50±1.29^{b}	7.20±0.96^{a}
	CPB3	4.25±2.06^{c}	2.00±0.82^{c}	3.50±2.08^{d}	2.75±2.36^{d}	2.25±1.50^{c}	6.80±1.50^{a}

Values within each column followed by different superscripts differ significantly ($P \leq 0.05$)
Values are presented as Mean ± SD, n=40

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Table 4: Sensory evaluation and acceptability of porridges based on level of education

Education	Porridge	Colour	Texture	Aroma	Taste	Mouth-feel	Overall acceptability
Primary	**CP**	8.43 ±2.24^{a}	8.11±1.36^{a}	8.42±1.97^{a}	8.33±0.87^{a}	8.33±0.87a	8.67±0.71^{a}
	CPB1	6.44±1.24^{b}	7.53±1.32^{a}	6.78±2.22^{b}	7.11±1.27^{b}	7.44±1.01^{b}	6.54±0.71^{b}
	CPB2	5.44±1.67^{c}	5.34±2.22^{b}	5.36±1.81^{c}	5.27±1.83^{c}	5.78±1.72c	5.37±1.94^{c}
	CPB3	4.00±2.83^{d}	4.30±1.67^{c}	2.56±2.13^{d}	2.67±2.06^{d}	3.88±1.27d	3.78±2.44^{d}
Secondary	**CP**	7.52±1.44^{a}	7.75±1.55^{a}	8.41±1.00^{a}	8.47±0.62^{a}	7.47±1.88^{a}	8.53±0.62^{a}
	CPB1	6.71±1.21^{a}	6.88±1.27^{a}	6.88±1.27^{b}	6.53±1.74^{b}	6.76±1.25^{a}	7.22±1.00^{b}
	CPB2	5.71±2.11^{b}	5.50±1.41^{b}	5.12±1.76^{c}	5.06±2.16^{c}	4.47±2.00^{b}	6.59±1.74^{b}
	CPB3	4.24±2.17^{c}	3.65±2.03^{c}	3.76±2.14^{d}	3.82±2.27^{d}	3.71±2.11^{c}	5.36±2.00^{c}
Tertiary	**CP**	7.58±0.52^{a}	6.88±2.36^{a}	8.13±1.13^{a}	8.13±0.84^{a}	6.88±2.32^{a}	7.57±0.89^{a}
	CPB1	7.50±0.54^{a}	5.50±2.45^{b}	7.25±0.71^{b}	7.25±0.89^{b}	5.38±2.39^{b}	6.34±0.84^{ab}
	CPB2	6.88±0.64^{a}	4.13±2.30^{c}	5.25±1.28^{c}	6.25±0.71^{c}	3.13±2.03^{c}	6.75±0.54^{ab}
	CPB3	5.38±1.77^{b}	3.12±2.12^{d}	4.38±1.19^{d}	4.75±1.28^{d}	2.11±1.64^{d}	6.85±1.49^{ab}

Values within each column followed by different superscripts differ significantly ($P \leq 0.05$)

Values are presented as Mean ± SD, n=40

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