

Promotion and Utilization of Niche Foods for Food and Nutrition Security

Waswa J.^{1,*}, Ngugi L.W.¹, Asiko L.A.¹, Ambani R.S.²

¹Department of Food Science and Nutrition, Karatina University, Kenya

²Department of Agriculture, Bukura Agricultural College, Kenya

Copyright©2016 by authors, all rights reserved. Authors agree that this article remains permanently open access under the terms of the Creative Commons Attribution License 4.0 international License.

Abstract Food and nutrition security exist when there is availability and accessibility of food in terms of quality and quantity. Each environment has foods adapted to the region and culturally acceptable to the inhabitants. Niche foods have in the recent past been neglected yet they have a great potential of solving the food and nutrition security issues among communities. This paper takes particular interest in traditional vegetables and insects that were popularly used in the past but are being viewed by the current generation as ‘overtaken by time’ hence being neglected. African Leafy Vegetables like black night shade, amaranth, cowpeas, and many others are quite nutritious apart from possessing some medicinal qualities. Insects like grasshoppers, termites, caterpillars are a good source of protein of high biological value. Food Agriculture Organization (FAO) has in the recent past advocated for the utilization of insects as a way of combating food insecurity in the world. The purpose of this paper was to review the importance of niche foods as used in parts of the world with an aim of promoting their use in Kenya.

Keywords Food Security, Nutrition Security, Niche Foods, Insects, African Leafy Vegetables

1. Introduction

Retaining the native food systems in developing countries which contain immense agricultural biodiversity is one sustainable way of ensuring food and nutrition security for poor populations [1]. In Sub-Saharan Africa, this biodiversity contributes greatly to food and livelihood security. However, the current technological changes which come together with socio economic changes are contributing to changes in dietary patterns and food habits. These changes contribute immensely to the current epidemiological trends in the region. Sub-Saharan Africa continues to be overburdened by nutritional and diet related

health problems, most of which can be attributed to insufficient micronutrient intake and the consumption of cheap, calorie-dense staple foods (which have recently gained popularity) leading to increased incidences of obesity and other diet-related non-communicable diseases [2].

Traditional foods are often under-utilized and are therefore threat ended with extinction. If niche foods have to be promoted sustainably then, the knowledge of traditional food should be encouraged. Deliberate efforts should therefore be made to develop and promote these foods to reduce the loss of bio-diversity in the regions for improved nutritional status [3].

2. Insect Consumption as Food

One of the ways to address food and nutrition security is through insect farming. Insects are everywhere, they reproduce quickly, and they have high growth and feed conversion rates and a low environmental footprint over their entire life cycle. Insects have been used as food in many parts of Africa, and form part of traditional delicacies [4]. Insects have high protein, fat and minerals content. These nutrients’ content varies with the type of insect and body part. They are cheap to since some can be reared on waste streams like food waste. Moreover, they can be utilized in many forms; they can be eaten whole or ground into a powder or paste, and incorporated into other foods. The use of insects on a large scale as a feed ingredient is technically feasible, however, it has not been given focus. Majority of insect collection occurs through wild gathering. Modern technology combined with valuable traditional knowledge and food culture can contribute to innovation and the scaling up of mass-rearing technologies. Farming insects as mini livestock offers great opportunities to increase supply without compromising wild insect populations and without damaging the ecosystems [5].

A consumption of insects has been misconceived as a poor man’s delicacy in times of hunger. However, in most

instances where they are a staple in local diets, insects are consumed because of their taste, and not because there are no other food sources available. Certain insect species, such as termites in Western, Nyanza and parts of the Rift valley regions of Kenya attract high selling and are hailed as delicacies by all social classes.

In many parts of the world where insect eating has been a common element of traditional culture, the practice is declining due to modernization that has changed people's attitudes towards the food. In these areas, reviving the tradition of eating insects has significant potential to improve rural livelihoods, enhance nutrition and contribute to sustainable management of insect habitats. This will not only reduce of hunger, but could contribute to revitalizing traditional cultures, instilling a sense of connection with nature and fostering a better understanding of the role of humans in the natural world[5].



Source [6]

Figure 1. Insects on sale alongside other delicacies (northern Thailand)

Table 1. Number of edible insect species reported in the world

Order Common	English name	Number of species
Anoplura	Lice	3
Coleoptera	Beetles	468
Diptera	Flies, mosquitoes	34
Ephemeroptera	Mayflies	19
Hemiptera	True bugs	102
Homoptera	Cicadas, leafhoppers, mealybugs	78
Hymenoptera	Ants, bees, wasps	351
Isoptera	Termites	61
Lepidoptera	Butterflies, moths (silkworms)	253
Neuroptera	Dobson flies	5
Odonata	Dragonflies	29
Orthoptera	Grasshoppers, cockroaches, crickets	267
Thysanura	Silverfish	1
Trichoptera	Caddis flies	10
Total		1681

Source: [7]



Figure 2. Honey ants in Australia (source : [6])

Table 2. Common edible insects in Kenya

Common name	Scientific name	Kiswahili	Kikuyu	Luo
Desert locust	<i>Schistocerca gregaria</i>	N/A	Gitono/ gitarariki	Bonyo
Longhorn grasshopper	<i>Ruspoliadifferens</i>	Senene	Ndahi	Senene
Grasshopper	<i>R. Nitidula</i>	Senene	Ndahi	Senene
Two-spotted cricket	<i>Gryllus bimaculatus</i>	Nyenje	Ngiria	Onjiri
House cricket	<i>Achetadomesticus</i>	Nyenje	Ngiria	Onjiri
Termite	<i>Macrotermes bellicosus</i>	Kumbikumbi	Nguya	Ng'wenAgoro
Termite	<i>Macrotermes subhyalinus</i>	Kumbikumbi	Nguya	Ng'wenSisi
Honey bee	<i>Apis mellifera</i>	Nyuki	Njuki	Kich
Black ant	<i>Carebaravidua</i>	N/A	Thigiriri	Onyoso
Moth	<i>Buneaalcinoe</i>	Nondo	Kihuruta	N/A
Black soldier fly (only Feed)	<i>Hermetia illucens</i>	N/A	Kigunyu/wakaguku	Luang'ni

source [8]

3. The Termite

Scientific name – *Macrotermesspp*

Local name – Luhya – Chiswa, Luo - Ng'wen Agoro

Swahili name – Kumbikumbi



Figure 3. Termites after harvesting in western Kenya

In Western Kenya, termites form part of the delicacies when they are in season. They are either consumed raw or fried and eaten with ugali or plain. They are also an economic activity since 1 kilo gram of the dried ones would go at between Ksh 500- 1000. This forms a cheap source of proteins for the poor masses who harvest them. However, their importance has not been given more emphasis [9]

4. Harvesting of Different Termite Species in Western Kenya

Normally, people erect a small tent (*siswa*) which they cover with blankets leaving an opening that leads to a special hole dug at the opening where termites will slide into then they are collected. The special hole is called 'efubo' which has banana leaves inside and at the entrance where termites slide and fall into the hole. There are different species that come out at different seasons of the year making the delicacy available in all seasons [9].

Chiswachisisi (local name) which are blackish in colour and the smallest in size. These ones are mostly seen during the rainy season from about 2pm to 4pm in the months of September to December. Early in the morning women and children collect three shot sticks which are used to invite the termites. Sticks are beaten, this is to sound like rain and because termites emerge when it begins to rain, they all come trooping out during the day. Another group of termites is called *Chinunda* which are brownish in colour and mostly comes out from 5 pm in the evening common in the months of December to February [9]

There is also another group called *Kamabuli* that are

common in the months of December to February that appear late in the evening from 6pm to 7pm. They are blackish in colour and usually take a very short time after they start coming out. *Chimome* are blackish in colour and normally come out when it is raining, commonly in the months of June to October. *Chindawa* termites are blackish in colour and also appear when it is raining, are common in the months of April-May. *Kamaresi* are dark brown in colour, the biggest in size and normally appear at night. This season as from April to June is for *Kamaresi* that people capture at night. They are attracted to the light and that is how Bamasaba people get them using light. *Kamaswakhe* are blackish in colour and also appear at night. *Chingalabuwatermite* species are common in the months of September to November and are brownish in colour. *Kamaachichi* are common in April to May and their appearance resembles wasps and they are blackish in colour. They appear mostly at around 9am to 11am. *Bikeke* are blackish in colour and are associated with some species of termites [9]

5. Nutritional Value of Insects

A diverse diet, with a balanced contribution from plant and animal-source foods, is the best way of securing nutrient security. In food insecure populations, diets often lack sufficient amounts of animal source foods like meat, fish, milk and eggs to support good nutrition and health [8]. Micronutrient deficiencies are widespread and are a cause of serious public health problems.

Vitamin B₁₂ is derived exclusively from animal-source or fermented foods, while critical micronutrients such as vitamin A, iron and zinc exist in more bio available forms in animal-source foods compared to plant foods. Animal-source foods also provide a higher proportion of essential amino acids as well as the essential n-3 fatty acids [8]. Insects contain most nutrients present in animal food sources and should be consumed to utilize the advantage.

6. African Leafy Vegetables

Indigenous fruits and vegetables were consumed by the rural populations for nutrition and food security. The hidden potential of indigenous fruits and vegetables needs to be exploited as they could play a crucial role in solving malnutrition, food insecurity and poverty challenges facing Africa [10]. There exists rich diversity of African indigenous vegetables which when consumed they contribute to good nutrition and health [11]. African leafy vegetables are now a preferred choice by most people in Kenya [12]. A study in Nairobi revealed that a significant proportion (34%) of the people living in urban and peri-urban Nairobi consume indigenous leafy vegetables. The vegetables are liked because of the nutritional and medicinal value attached. The

major constraints to consumption of indigenous leafy vegetables were the cost, lack of time and knowledge in food preparation. These constraints pose a challenge to promotion of production, utilization (preparation and processing) and commercialization of indigenous leafy vegetables[13]. Common indigenous vegetables consumed in Kenya are cowpea leaves (*Kunde*), Jute (*mrenda*), pumpkin leaves (*Seveve, malenge leaves*) *Amaranthus* (*Terere*) *Bacella alba* (*Nderema*) spider plant (*Saget, saga*), Black night shade (*Managu, osuga*), *Crotolaria* (*Mitoo*).[11].



Figure 4. African leafy vegetable on the market for sale (source :Biodiversity international)

7. Nutritive Value and Health Benefits of African Leafy Vegetables

With reference to food security and nutrition, indigenous vegetables are rich in vitamins, minerals, proteins and anti-oxidants. They improve palatability and add variety to diets, especially those who consume. They are particularly valuable sources of food during emergency periods such as occur during flood, famine, drought and war[10]. A nutritional evaluation of indigenous vegetables in two sites in Kenya considered that the nutritional contribution of cooked and uncooked vegetables was enormous [10,14].

African indigenous fruits and vegetables have medicinal properties and health benefits. Spider plant (*Cleome gynandra*), for example, has been reported to relieve constipation and facilitate child birth [15], while African nightshade (*Solanumscabrum*) has been documented to cure

stomach ache [16]. They are also known to contain substantial amounts of antioxidants that scavenge for and bind to harmful radicals, which have been linked to ailments such as cancer, diabetes and cardiovascular diseases.

8. Conclusion and Recommendations

Niche foods have a high potential of improving food and nutrition security and at the same time as an economic activity hence an impetus to the production and consumption is necessary.

Most edible insects in Kenya are harvested directly from nature by traps or hand gathering. Research into sustainable technologies of harvesting should be exploited through better understanding of their biology, ecology and their ecosystem functions.

Improved production technologies are required to increase yields of Niche foods. Appropriate management, preservation and processing procedures for the priority species of insects and vegetables are required.

REFERENCES

- [1] Padulosi, S., Bhag Mal, S., Bala Ravi, J., Gowda, K.T.K., Gowda, G., Shanthakumar, N., Dutta, M. (2009) 'Food security and climate change: role of plant genetic resources of minor millets', *Indian J Plant Genet, Resources*, vol 22, no 1, pp.1–16.
- [2] Mendez, M.A., Monteiro, C.A., Popkin, B.M. (2005) 'Overweight exceeds underweight among women in most developing countries', *Am J Clin Nutr*, vol 81, pp.714–721
- [3] Omo, 2003.
- [4] Kelemu, S., Niassy, B., Torto, B., Fiaboe, K., Affognon, H., Tonnang, H., Maniania, N.K., Ekesi, S. (2015). African edible insects for food and feed: inventory, diversity, commonalities and contribution to food security. *Journal for Insects as Food and Feed* 1(2), pp. 103-119.
- [5] FAO (2015) *The contribution of insects to food security, livelihoods and the environment*. Rome. FAO.
- [6] FAO (2010) *Forest insects as food: humans bite back* Proceedings of a workshop on Asia-Pacific resources and their potential for development 19-21 February 2008, Chiang Mai, Thailand
- [7] Ramos-Elorduy (2005).
- [8] GREEINSECT (2016) Technical brief #1: Insects as food and feed in Kenya – past, current and future perspectives. International Conference on Legislation and Policy on the Use of Insect as Food and Feed in East Africa
- [9] Kitale Museum, 2015
- [10] Abukutsa, M.O.O., Kavagi, P., Amoke, P. and Habwe, F.O. (2010). Iron and protein content of priority African indigenous vegetables in the Lake Victoria Basin. *Journal of Agricultural Science and Technology* 2(1): 67-69.

- [11] Maundu P, Judith Kimiywe, Maryam Mbumi, I. F. Smith, T. Johns, P.B. Eyzaguirre. (2007) Nutrition and Indigenous Vegetables in Urban and Peri-Urban Agriculture in Kenya. Bioversity International Shiungu & Oniang'o. vegetables. Poster: International Research on Food Security, Natural Resource Management and Rural Development. Tropentag, Zurich, Switzerland. <http://www.tropentag.de/2010/proceedings/node63.html>
- [12] Kimiywe J, Judith Waudu, Dorcus Mbithe and Patrick Maundu (2007). Utilization and Medicinal Value of Indigenous Leafy Vegetables Consumed in Urban and Peri-Urban Nairobi, African Journal of Food, Agriculture, Nutrition and Development vol 7 #4.
- [13] Habwe, F., Walingo, M. and Abukutsa, M. (2010). Copper and ascorbic acid content of cooked African indigenous
- [14] Heever, E. van den and Venter, S.L. (2007). Nutritional and medicinal properties of *Cleome gynandra*. *Acta Horticulturae* 752: 127-130.
- [15] Adesina, S.K. and Gbile, Z.O. (1984). Steroidal constituents of *Solanum scabrum* subsp. *nigericum*. *Fitoterapia* 55 (6): 362-363.