**A**

**SEMINAR PRESENTAION**

**ON THE TOPIC:**

**THE PLACE OF ENTOMOPHAGY IN BRIDGING THE ANIMAL PROTEIN GAP IN NIGERIA**

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**INTRODUCTION**

**1.1 Background of the Study**

For as long as the history of man goes, the search for adequate nutrition through appropriate nutritional sources has been an ongoing struggle. Man has explored both plant and animal sources to meet up his nutritional needs. While there appears to be an abundance of nutritional sources, the attainment of levels of specific nutrients in the food consumed through various foodstuffs, be meet specific body requirements or demands, has posed a lingering challenge cheaply. Nutrients that are more readily obtained include carbohydrates found in thousands of cereals, tubers and others, all over the world. These foodstuff being widely processed into pastas, noodles, flours and other ready-to-eat food. For proteins on the other hand, food sources of plant origin have also been abundant, ranging from peas, nuts, and various grains. However, animal protein, which supplies a different protein quality, has been on the rise in terms of production, and in terms of cost. This economic implication of animal protein food sources, has created an apparent scarcity of animal protein, especially among individuals of low economic status, and in developing countries like Nigeria. Oyedeje (2019) has reported that in countries of South and Central America, Africa and Asia, including Nigeria, the daily intake of protein is far below the FOA requirements, and that Africa is only meeting 32g of the daily protein requirement of 52g. The report also states that the net protein utilization is 62% in Africa, as against 110% in North America. While FAO has recommended that one third of the daily protein intake should be of animal origin in Africa, Nigeria inclusive, only 20% of the low protein intake is of animal origin, that is, the average African is meeting only 33% of his daily animal protein requirement, while meeting about 66 of his daily plant protein requirement. While the ongoing struggle between man and livestock for nutrient sources persists, the incorporation of insect-based feed sources into livestock feed has become a norm in livestock nutrition. Maggot meals, weevil-meals amongst other insect-based feed sources continue to be explored to meet up with the protein demands of livestock, at economically lower cost implications as compared to protein sources like fish meal. Besides direct incorporation into livestock feeds, livestock reared extensively especially in the avian family, have scavenged and utilized thousands of insect species, utilizing them as feed supplements, while innocently caring for their protein needs. With the revelation from Oyedeje (2019) as would be synonymous with various other research findings of this nature and aspect, it becomes glaringly clear that the search for, and consumption of various animal protein foodstuff become intensified. But owing to poverty rate in the developing countries and in general and in Nigeria in particular. But what with the poverty situation ravaging the country? It becomes a case then, of each one fighting for himself. It is on this glaring reality, that enomorphagy, becomes not a last resort, but a necessity as thousands, of insect structures species, abound, roaming the wild free, with protein-lader waiting just o be harvested, processed and consumed.

* 1. **Meaning of Entomophagy**

Entamohagy refer to the practice of eating insects, especially by people. The Science Refreence Guide, library of congress, has defined entomophagy as human consumption of insects for food. Bygora (2021) reveals that while eating bugs has gained more attention in recent years, that the practice has been around for thousands of years that throughout the history of entomophagy, individuals choose to eat insects for enjoyment, with native Americans opting to eat grasshopper flour, bug fruitcakes, and fried cicadas. In the same study, the Food and Agriculture Organization has reported that our population has been eating insects for thousands of years. That insects are more prominently found in tropical climates, where they are readily available throughout the year in large quantities, making them an excellent protein-rich food option.

**1.3 Justification of the Study**

Beato (2013), has suggested that the definition of livestock be explained to include such under utilized food sources as mea worms, grasshoppers and sago grabs, amongst other insects. In the said report, 37 international experts in January 2013, are revealed to have met to discuss “the potential benefits of using insects for food and feed as part of a broader strategy to achieve global food security”, at the U. N. Food and Agricultural Organization. This throws light then, on insect eating, as being not just a primitive bizarre act, but a world-renowned area that is being explored as to possible incorporation, into the world of conventional livestock resources. A 100gram portion of a grasshopper meat contains 20.6 grams of protein, just 7 grams less than an equivalent portion of beef. In addition, insect farming requires less water, less feed and less land per calorie than traditional livestock farming, and it produces much lower greens house gas emission (Beato, 2013).

* 1. **Objectives of the study**
* To evaluate the importance of entomophagy in bridging animal protein gap in Nigeria

**LITERATURE REVIEW**

**Edible Insects Around the World**

Nine hundred thousand different kinds of insect species have been recognized and documented, thus revealing insect species to be more than any other group species in the world (Smithsonian, 2023). Amongst the identified and documented insects, the following have been processed and consumed by man overtime, though the list is not exhaustive. Cricket, meal worm, termite, orthoptera, giant water bugs, African Palm Weevil, migratory locust, brown Marmorated stink bug, Mopane worm, Gryllus Bionaculatus, Black Solider fly, Odonata, Stink bugs, Imbrasia, Amphimallon Solstitiale, Rhynochorus Ferrugineus, Weaver ant, Lethocems Indicus, Atta Laevigata, Acheta, water boatmen, Comadia Redtenbacheri, Treehoppers, Cossidae, True Weevils, Gryllus Assimillis, Melolonthinae. Pacheco-Hernandex *et al.,* (2022), has indicated that 2000 edible insect species are consumed around the world, the most commonly consumed group of insects being; Beetles, Caterpillars, Bees, Wasps, Ants, Grasshoppers, Locusts and Crickets, True bugs, Dragonflies, Termites, Files, Cockraches, Spiders and other orders. With the proliferation of edible insects in the wild, their rich protein content their general acceptance as healthy nutritional sources, and their undeniable rich heritage of origin, it stands to reason then, that the practice of entomophagy be not viewed as a side-business or last resort, nutritionally, but that it takes its rightful place – in the concentrated livestock ‘hall of fame’, as it has remained continuously ‘novel’ for far too long, while man in general, and the Nigerian populace in particular, continue to grapple with animal-protein needs.

**2.0** **ENTOMOPHAGY, A GLOBAL PRACTICE**

Rather than just being a habit peculiar to a particular tribe of people, insect-eating is a way of life of people all around the globe. As already established, the practice has a long-standing history dating back to the very origin of man. While entomophagy is gradually becoming extinct in certain parts of the world, it has continued to be explored in other parts. It has even become a business that contributes immensely to gross domestic product (GDP), and in certain cases, generating foreign exchange earnings up to millions of dollars. Though there appears to be a class distinction separating the insect eaters from the non-insect eaters in certain regions of the world, the nutritional value of insect-eating remains a universally accepted fact as the reports collected across the globe indicates.

**2.1 Entomophagy in Africa**

According to Grabowski *et al.,* (2020), edible insects have been part of human diet from the dawn of mankind on. However, food habit changed over the millennia and while consuming insects was largely lost in Europe after the classical antiquity, the tradition lingered on in Africa. This study also reported that there are hundreds of insect species consumed in Africa as foodstuff or as traditional medicine. Insects are traded in relatively small to medium level. The economic benefit varies with the species and is seldom accounted for, but one of the most significant ones seems to be phane caterpillars of a saturnid emperior moth *Gombrasia belina*, reaching a yearly trade value of more than 85 million in southern Africa. The study of Das, 2020, reported that numerous species of insects belonging to orders such as Hymenoplera, Lepidophera, Hemipetera, orthophera and isophera of class ‘insecta’ are consumed by a large number of communities. The study also states that insect eating is a common practice among rural and urban people of Africa. The edible insects and their products can be collected in large number and are sold in most of African food markets. In South Africa, edible insects have formed part of human diet since pre-historic times (Ledger, 2009) this study also reported that South Africans consumed *Trienervitermes triner voides* (a termite) and *Apis mellifera Unicolor* (a honey bee) in early 100,000 BC.

Quin and Bodenhemier (2019) revealed an ongoing consumption of insect for nutritional benefits by the Bapedi people in south Africa in the early 1950s. The study also reported that nowadays in South Africa, edible insects consumed include caterpillars, termites, grasshoppers, jewel beetles, ants and stink bugs. Edible insects also create seasonal employment opportunities for unemployed people across the continent, reducing poverty and improving human well-being.

**2.2 Entomophagy Antarctica**

The insect that is consumed in Antarctica is called“The Antarctic midge”. It is smaller than a pea, but it’s the continent’s only native insect. The midge has clearly evolved to survive in extreme conditions, yet a warming climate could threaten its existence. It is the most widely insect reported to be consumed in Antarctica.

**2.3 Entomophagy in Asia**

Six most popular insects have been reported by Chung (2013), (silk worm, cricket, Beetles, Grasshopper, caterpillars, Weaver ant eggs) as being consumed in Asia. The study reveals that these insects may be prepared with rice or cooked in a combination of soy source. Once prepared, the insect has been found to be crunchy and their flavor mild and nutty. The dishes are often served as a snack with beer or tea or with other dishes.

Many of the rural and elderly local communities in Sabah (Malaysia) however, have experienced eating insects of some other forms, though it is seldom taken now due to modernization and urbanization (Chung, 2013).

**2.4 Entomophagy in Europe**

The herders and peasants in traditional Europe had a vast knowledge of the biota including invertebrates, the folk knowledge and use of insect is very little. (Suanberg *et al.,* 2011). The study also reported that in Europe, insects such as cockchafer, silk moth larvae, locusts and grasshoppers are prepared in different ways such as the use of cockchafer to make soup called cockchafer soup, this recipe is the most popular dish prepared by sucking a handful of cockchafer after removing the wings and legs, it is then fried in butter. The silk moth larva is consumed by peasants after intense working days by frying the bugs in butter or olive oil. Moving towards the eastern part of Europe between Russia and Ukraine, these parts are known for grilling locusts and grasshoppers and generally considering insects in the integral part of their diet. In Crete, the islanders eat the juicy protuberance that are formed by the plant after an insect bite or stink which develop a sweet and slightly sour taste.

**2.5 Entomophagy in Oceania**

MDPI (2019) has stated that insects are used as protein sources by humans and as part of the feed for farm animals under the regulations of the Australia pesticides and veterinary medicine authority. Globally there has been growing interest in the composition of dietary feed using meals for many different animal feed. Entomophagy is considered a traditional practice among Aborigines, many edible insects are legislatively categorized as a novel food in Australia, Aboriginal people ate termites and grubs long before the British settlement in Oceania and many continue to maintain this tradition. The grub is the most consumed insect amongst the Aboriginals as it is reported that it tastes similar to scrambled eggs.

**2.6 Entomophagy in South America**

A total of 135 species of edible insects are found in the country. The most commonly consumed are the hymenoptera (an order that includes many ants), with 63% of the total, followed by the coleoptera (beetles), with 16%, and the orthopterans (grasshoppers and crickets), at 7%.In the North, especially on the river island of Marajó, there is an indigenous tradition of eating the “tucumã bug,” the larva of a beetle species *(Speciomerus ruficornis)* that lives in the seeds of the *Astrocaryum aculeatum* palm tree. They can be eaten raw or fried. Insect oil (or lard) can also be extracted from the larvae, which can be eaten pure, as a substitute for butter in bread, or used to fry of eggs and meat. In the Xingu National Park, insects are a food source for many indigenous ethnic groups. Ant species such as the saúva or tanajura (of the genus Atta), as well as cicadas, termites, and grasshoppers, are also commonly eaten. In rural Pernambuco, tanajuraants are often served as bar snacks. The delicacy is most commonly available when the insects swarm in April and May. The tradition of eating tanajura ants is also popular in the Northeast of Brazil, rural areas of Minas Gerais, and the Paraíba Valley in São Paulo State, where they are ground into flour. In Minas Gerais and parts of the North and Northeast, people commonly consume the larvae of the beetle species *Pachymerus nucleorum,* which develop inside coconuts, babassus, and carnauba fruit. They are usually fried and then served with tapioca or rice.

**2.7 Entomophagy in North America**

Insect has been an important part of food culture for many different places and people across North America's history (Shockey *et al,* 2018). The report by Sara (2018) clearly lists best places to dine on isect in south America, Among the places list were audliban butterfly garden and Insectarium -New Orleans. Crispy cricket, Mange with apple and wax worms, Cinnamonbug crunch and turkey with corn cranbread and Meal worm stuffing, as well as wax worm cranberry sauce and cricket pumpkin pie are some of the numerous insect dishes mentioned by Skekua (2020) to be prepared and sold in the butterfly garden. The study also reveals trendy restaurant in Denver, as sorting it insect from Rocky Mountain Micro Ranch, Colorado's first and only edible insect farm, which raised insects for wholesale to restaurants and food manufacturers. In Mexico, Play Viva is a resort renowned for termite cuisines which visitors munch on, as they learn about the insects role on the landscape and how their nests are turned into fertilizer. Cuchamas are green caterpillars from Mexico, when in season, they are fried as a centuries old practice in Southern Mexico, once fried, these caterpillars are usually eaten with Salsa, Chilli or Lemon juice. Bugs are also revealed to be used as appetizer. In Portland, ice creams with chocolate covered with crickets and coconut coffee brittle meal worms are common.

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