Preliminary Survey on Traditional Knowledge of Consumption of Insect and Laboratory Trials on Rearing Rhynchophorusphoenicis (Fabricius (Coleoptera: Curculionidae) on Locally Sourced Materials

***Okore, Oghale O'woma & Ogbonna Chisom H.**

Department of Zoology and Environmental Biology, Michael Okpara University of Agriculture, Umudike, Abia state, Nigeria

***Corresponding author**

DOI: https://doi.org/10.51584/IJRIAS.2025.100600113

Received: 23 May 2025; Accepted: 29 May 2025; Published: 16 July 2025

ABSTRACT

The use of insects as food is not new across many communities in Nigeria and the world at large. Breeding trials are also being carried out to ascertain if some of the candidate insect species can reared to make for easy availability. Entomophagy among the people of Umuokpo Community in Abia State, Nigeria was assessed using Open ended questionnaires administered in the community. A follow up breeding trial was carried out in the Laboratory trial to evaluate different substrates for rearing *R. phoenicis*. The result from the questionnaire survey revealed a total of six species from three Orders namely; Coleoptera, Lepidoptera and Orthoptera. The Palm weevil had the highest number of respondents (84) making 31.23% of indigents indicating interest in its consumption. This was followed by Winged termite with (71; 26.4%), Cricket (50; 18; 59%), Soldier termite (38; 14.13%) and then Grasshopper and Locust which both recorded (16; 5.59%) and (10;3.72%) respectively. These insect were mostly sourced from the bush/wild. 75% of the respondents regularly consumed insect as a common practice in the community, 21% of the respondents consumed it out of curiosity and 4% of the respondents' motivation on consumption of insect was out of no money to buy meat or fish. The survival rate of *R. phoenicis* larva on the different substrates was used as a measure of to ascertain the suitability of this species to any of the substrates. The substrates were made from locally available materials namely Sugarcane, Bread, and Chi-exotic (juice made of pineapple dried ground coconut and plantain flour The result from the rearing attempts was a success with Sugarcane, Bread, Chi-exotic; of the 50 first/second instar larvae harvested, only 15 (3%) were raised to the fifth instar. Also, out of 26 second/third instar, larvae harvested only 5 were successfully raised to adult; males and females. This shows 3% and 9.23% survival rate. The adults raised from the substrates when allowed to mate laid eggs that hatched out first instar larva.

Keywords: Insects, Rhychophorusphoenicis, Sugar cane, Rear, Survival

INTRODUCTION

Palm weevil Rhychophorusphoenicesis a Coleopteran of Curculionidae family; it is commonly known as the African palm weevil. It is widespread throughout tropical Africa, and used as food source by many populations. African palm weevil is consumed as a delicacies and form part of the normal diet throughout the year and during times of shortage by rural populations (Womeni*et al.,* 2012; Tamsen *al.,* 2016). They now can be breed and small production units are being developed (Muafor*et al.,* 2015). *R. phoenices* larvae are rich in lipids and proteins and contain vitamins A, B_2 and C, while minerals and carbohydrates are minor compound (Rumpoid and Schluter, 2013). *R. phoenices* larvae contain high proportions of total lipids (80.9g/100g) and neutral lipids (1kg/100) (of lipids (Ekpo*et al.,* 2009).

The larvae of the beetle *R. phoenices* is cherished as food among the many communities in Nigeria and around the world, especially in those places where palms (oils, raphia and coconut) are cultivated on commercial basis (Aflotey and Mpuchan, 2003; Choon-fan *et al.,* 2008). In the Niger Delta area and Eastern states of Nigeria, thus larvae is often a cherished delicacy. In fact, it can be seen hawked along major roads and markets in Edo and

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue VI June 2025

Delta states of Nigeria (Ekrakene and Igeleke, 2007). From Sapele where it is called edible worm or maggot to Warri (Delta State, Nigeria) where they call it diet, down to Bayelsa, Rivers, Cross Rivers, AkwaIbom and all the Eastern States of Nigeria, it is widely consumed either raw, boiled, fried, smoked and sometimes used in the preparation of stews and soups, a part of a meal or as a complete meal. Promoting *R. phoenicis* as a traditional food among the average people living in remote areas can help minimize malnutrition across Africa (DeFoliart, 2002). Van Huis (2013) reported that the consumption of *R. phoenicis* provides 76% of protein and 100% of vitamin of the total body requirement. In many developing countries and among various cultures throughout the world, *R. phoenicis* remain vital and preferred food source of protein, fat, minerals and vitamins (Nonaka, 2009).

Insect protein has remained an unharnessed animal protein source (Ebenebe and Okpokpo, 2015) thus it is necessary to improve animal protein supply and consumption especially for animal protein deficient country like Nigeria. Ebenebe and Okpoko (2015) posited that edible insect farming and consumption (entomophagy) can be a major strategy for reducing animal protein deficiency in the country. Nutritional and other health benefits of edible insects has been documented by many authors (Ekpo and Onigbinde 2004, Banjo *et al.,* 2006, Ebenebe*et al.,* 2007, Edijala*et al.,* 2009, Ebenebe*et al*., 2022). Edible insect consumption has been reported in most parts of Africa, Asia, America and even Europe.

There is need for alternative means of culturing edible insects outside their natural habitat to ensure year/round supply. Hoodle (2013) described two methods of rearing palm weevil, in Thailand, one involved grinding of the palm trunk and rearing the weevil in containers filled with ground palm log materials while the other method involved direct use of the palm trunk. This method though successful, involved felling down of palm trees and therefore appears environmentally unfriendly. Other authors have also described techniques for rearing the weevil species (Giblin*et al.,* 2013, Bong *et al.,* 2008 and Shashma*et al.,* 2009). The use of agricultural waste for rearing of *R. phoenices* is more tenable in Africa; in Nigeria, Ebenebe and Okpoko (2016) reported the rearing of African palm weevil (APW) in different substrates (agricultural waste) and discovered that the larva can survive in them. This research therefore was carried out to determine the traditional knowledge associated with consumption of insect in our locality and to evaluate different substrate for rearing *R. phoenices.* The survival and growth performance of the larva in sugarcane and other locally sourced materials (substrates) was recorded.

MATERIALS AND METHOD

Study Area/Experimental Site: The research was carried out at the Laboratory of Zoology and Environmental Biology Department, Michael Okpara University of Agriculture Umudike, Abia State. Umudike is located in Abia State in the eastern part of Nigeria, a tropical rain forest zone (Latitude 05-26 - 525N and Longitude 0734 - 736E). The dry season starts in November and ends in March while the rainy season starts in April and ends in October. The total annual rainfall ranges from 1800- 2400mm.

Administration of Questionnaire: 100 questionnaires were distributed across the village of Umuokpo in Obingwa L.G.A Abia State. The age ranges of the respondent were below 20 years, 21 - 30, 31 - 40, and 41 above. Uneducated members of the community were interviewed orally using the questions pose in the questionnaire. The different ages were assessed to know how entomophagy spreads across the population.

Sample Collection: Six adult African palm weevil (APM) (*R. phoenicis*) used for the experiment were collected from raffia palm by a palm wine tapper at "Umuomai area" of Umuokpo Community in Obingwa Local Government of Abia State and then transported to the Laboratory of Zoology and Environmental Biology (MOUAU).

Two males and four females were identified using the key provided by Giblin - Davies *et al;* (2013). A tapered Scutellum distinguishes *R. phoenicis* from other *Rhynchophorus* spp. They also reported that the male is differentiated from the female using the length of the rostrum and presence and absence of tuft of hairs on the rostrum. Longer curved rostrum without tuft of hairs identified female while shorted less curved rostrum identified the male.

Experimental Procedure: Production of Eggs and First Stage Larva of *R.phoenicis*

The collected insects were placed at a sex ratio of 1:4:1 in a plastic container, perforated to allow ventilation,

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue VI June 2025

pieces of split sugarcane were added to be used as food and laying substrate and renewed every three days.

Extraction of Eggs and Larvae: Eggs and first stage larvae were retrieved from pieces of sugarcane remained in the plastic container for three and six days respectively. To do that, pieces of sugarcane were carefully torn with a knife and individuals (eggs or first sage larvae) were collected. Once collected, eggs and larva were then placed in petri dishes and introduced to various substrates. The three substrates were a mixture of

- Sugarcane (*Saccharum officinarum*) Tops (SCT) (cut off tips of sugarcane stem) as reported by Shashina*et al*. (2009) and Giblin - Davies *et al*. (2013),

- Bread (weighed and cut into pieces) and Chi-exotic juice made of pineapple (*Ananas comosus*) and

- Dried ground sugarcane baggase, dried ground coconut (*Cocos nucifera*) and dried ground plantain.

The experiment was carried out using seven (7) perforated containers to allow ventilation whereby each container containing 10g of bread, 20ml of chi-exotic juice and sugarcane Tops were infested with ten (10) larvae. The top of each container was covered with mosquito net to keep away insects and other predatory animals. Fresh substrates were used to replace old ones in each container every week to minimize accumulation of microbes and infestation by fruit-flies. Survival was monitored by counting and recording number of larva alive in each container and taking records of mortality. The process was done repeatedly until the pupation and then adult emergence.

Data analysis: Simple percentages were used to show proportion and SPSS was used to ascertain statistical differences where applicable

RESULT

Preliminary Survey on Traditional Knowledge of Consumption of Insect

The one hundred (100) respondents interviewed consisted of thirty-nine (39) male and sixty-one (61) female. Twenty-one percent were below 20, Thirty-seven percent were between ages 21- 30, Twenty-two percent were between 31 - 40 and twenty percent were 40 years and above (Figure 1). The responses indicate that 98% from all age groups actively consumed insect. On the reason behind the entomophagy practice, (75%) of the individuals indicated that consumption of insect was a common practice in the community. The motivations for consumption of insect by other respondents were out of curiosity (21%) and no money to buy meat or fish (4%). (see fig 1a and b)

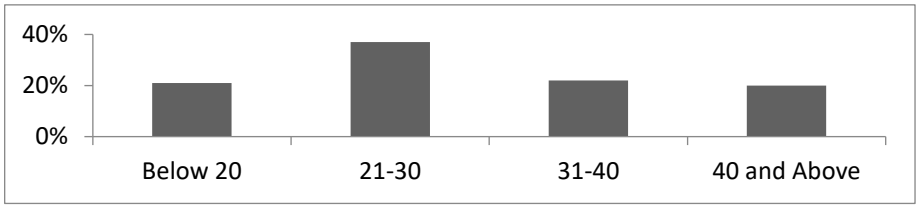

Fig. 1a: Showing the age bracket among the respondents

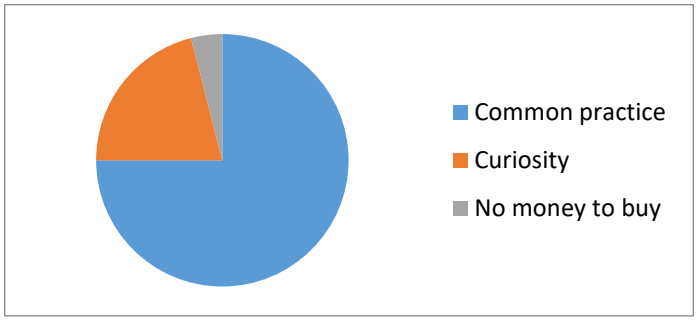

Figure 1b: Showing different reasons for consumption of insects

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue VI June 2025

Ninety percent (90%) of the individuals accessed referred to the *R. phoencis* larvae locally as "Eruru", winged termite as" Aku", soldier termite "Akika", cricket "Abuzu" and grasshopper as "Okpara". The survey however, showed that of the respondents sourced their insect from the bush/wild, while purchase from the market and of the respondent got from a friend.

Insect species consumed by the people of Umuokpo Community

A total of six (6) species insect were recorded. The species are from three (3) Orders namely; Coleoptera, Lepidoptera and Orthoptera. The Palm weevil had the highest number of respondents (84) making 31.23% of indigents indicating interest in it's consumption. This was followed by Winged termite with (71;26.4%), Cricket (50;18.59%), Soldier termite (38;14.13%) and then Grasshopper and Locust which both recorded (16;5.59%) and (10;3.72%) respectively. The percentages are shown in figure 2.

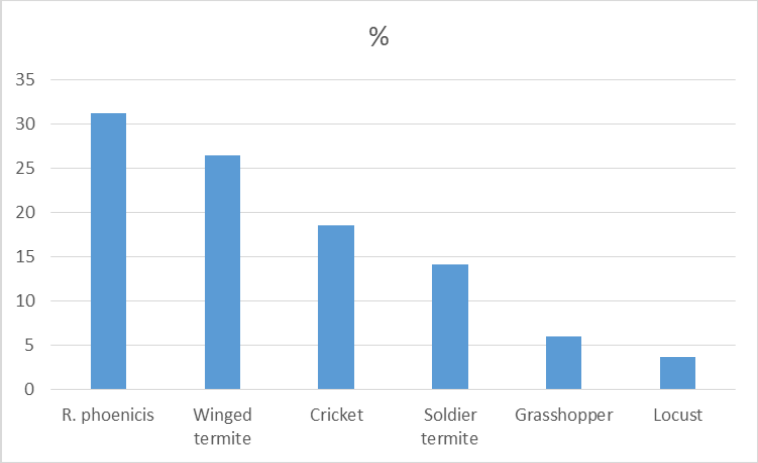

Figure 2: Percentage values of the different insects consumed by the people of Umuokpo Community.

Breeding attempt on R. phoenicis (palm weevil)

a. On sugarcane, bread and chi-exotic juice mixture

The survival rate of the first and second larval was not encouraging. Out of 50 first/second instar larvae harvested, only 15 (3%) were raised to the fifth instar (Table 1). Also, out of 26 larvae harvested second/third instar, only 5 were successfully raised to adult; males and females. This shows 3% and 9.23% survival rate. The adults raised from the substrates when allowed to mate laid eggs that hatched out first instar larva thus they were able reproduce. The values at $p \geq 0.43$ were not significant.

Table 1: Survival rate of *R. phoenicis* fed with sugarcane, bread and chi-exotic juice

Larval instar	Total number of larva	Number survived	Stages	% survival	p-value
1st- 2nd	50	15	5th instar	3%	0.43
2nd-3rd	26	5	Pupation	9.23%	

(b) Other food materials

The trial experiment to rear the larva on dried ground sugarcane baggase, dried ground coconut and dried ground plantain failed as 100% mortality was recorded. The substrates were thus not suitable.

DISCUSSION

Entomophagy is a welcomed practice among the people of Umuokpo village, it is not new and it cuts across all ages. Insect are regarded as a delicacy among residents of this community as 98% actively consume insect. It is

thus a surprise that 21% of the respondent claim they eat insect out of curiosity. The consumption of insects out of curiosity is not new as Niaba *et al.* (2012) reported that 17.7% of the respondents consumed winged termite out of curiosity.

The survival of the first and second instar though not encouraging provides the assurance that the larva of *R. phoenicis* can be reared outside its natural source. Out of 50 first/second instar larvae harvested only 15 (3%) were able to raise the 5th instar while 26 larvae from second/third instar only 5 in number were successfully raised to adult both males and females. These adults were able to lay eggs and reproduce. The hatched eggs were infested to three different substrates, dried ground sugarcane baggase, dried ground coconut and dried ground plantain which recorded 100% mortality.

CONCLUSION

The studies have revealed that most females (61%) consumed insect in Umuokpo community than males (39%), this is related to Shadrack (2016) who reported that the rate of female consuming *R. phoenicis* is 56% while that of male is 43%. However 98% of the respondents actively consumed insect and *R. phoenicis* (Palm weevil) recorded highest (84%) on individual interest in it's consumption, closely followed by Winged termite (77%). The survey however showed that 75% respondent reason for consumption of insect was as a common practice and 21% was out of curiosity while 4% of individual motivation for consumption of insect was out of no money to buy meat or fish, this result was not in accordance with the report of Shadrack, (2016) who recorded curiosity 7.6% and common practice 27.8%.

The laboratory studies showed that sugarcane, bread and chi-exotic juice were suitable for rearing of *R. phoenicis* which recorded 3% survival on a total number (50) first/second instar to fifth instar and 9.23% survival on a total number of (26) second/third instar to pupation stage and then adult emerges. These figures were lower than what was reported by okore *et al.,* (2014). Compared to dried ground sugarcane, dried ground coconut and dried ground plantain which recorded 100% mortality. In addition sugarcane naturally contain fiber with which palm weevil make their cocoon.

In general, an insect are consumed by indigents in Umuokpo Community and has the potential to reduce food insecurity in Africa. This paper may help to disabuse people's minds of the negative impressions they have about Entomophagy. Also, the paper shows that *R. phoenicis* can be reared using materials that abound in our environment. There is therefore need to explore more on these materials so that there will be no reliance on obtaining *R. phoenicis* from the wild.

REFERENCES

1. Banjo, A.D., Lawal, O. A. and Songonuga, E.A. (2006). The nutritional values of fourteen species of edible insects in South Western Nigeria. African Journal of Biotechnology 5(3):208-301.
2. Bong, C.F.J., Er, C.C., Yiu, P.H. and Rajan, A. (2008). Growth Performance of the Red-Stripe Weevil RhynchophorusschachOliv. (Insecta: Coleoptera: Curculionidae) on Meridic Diets. American Journal of Agricultural and Biological Sciences, 3(1):403-409.
3. Defoliart, G. R. (1999). Insects as food: Why the western attitude is important. Annual Review Entomology, 44:21-50.
4. Ebenebe, C.I. and Okpoko, V.O. (2015). Edible Insect Consumption in the southeastern Nigeria. International Journal of Science and Engineering, 6(6). https://www.academia.edu/15308898/Edible_Insect_Consumption_in_the_South_Eastern_Nigeria.
5. Ebenebe, C.I. and Okpoko, V.O. (2016). Preliminary studies on Alternative Substrate for Multiplication of African Palm weevil (Rhynchophorusphoenicis) under captive management. Journal of Insect for Food and Feed, 2(3):171-177.
6. Ebenebe, C.I. Anizoba, M.A., Okeke, J.J., Okpoko, V.O, Madu, B. and Uzocukwu, C. (2007). The Potentials of Palm Grub (Rhynchophorusphoenicis) and manure grub (Rhynchophorusferrugineus) as Food and Feed. Journal of Advancement in Medical and Pharmaceutical Research. 1(4):41-45.
7. Ebenebe C. Okweche, S. Okore O, Okpoko, V., Amobi M, Eze, J. N., Ezenyilimba B. and Okonkwo M. (2022). Arthropods in Cosmetics, Pharmaceuticals and Medicine: A Review In: Arthropods; Are they

beneficial for Mankind Chapter One ed. Ramón Eduardo RebolledoRanz pp.1-32 Intechopen.
8. Edijala, T.K., Eghogbo, O. and Anigboro, A.A. (2009). Proximate Composition and cholesterol concentrations of Rhyncophorusphoenicis and Orytcesmonocerus larvae subjected to Different Heat Treatments. African Journal of Biotechnology, 8(10):2346 -2348.
9. Ekpo, K.E. and Onigbinde, A.O. (2004) Pharmaceutical Potentials of Rhyncophorusphoenicis larval oil. Nigerian Annals of Natural Sciences, 9(2):28-36.
10. Ekpo, K.E., Onigbinde, A.O. and Asia, I.O. (2009). Pharmaceutical potentials of the oils of some popular insects consumed in southern Nigeria. Afr. J. Pharm. Pharmacol. 3(2):51-57.
11. Ekrakene, T. and Igeleke, C.L. (2007). Microbial Isolates from the roasted larva of the palm weevil (Rhynchophorusphoenicis (F)) from Edo and Delta States of Nigeria. Am. J. Biol. Applied Sci., 1:763-768.
12. Giblin, D.R.M., Faleiro, J.R. and Jacas, J.A. (2013). Biology and Management of Palm weevils. University of Florida/IFAS Fort Lauderdale Research and Education Centre. www.cisr.urc.edu./..../giblindavisrobin-biology-an. Accessed on the 13th September, 2018.
13. Muafor, F.J., Gnetegha, A.A., Le Gall, P. and Levang, P. (2015). Exploitation, trade and farming of Palm Weevil Grubs in Cameroon. Working Paper Pp: 178, Bogor Indonesia: CIFOR.
14. Niaba, K.P.V., Ocho-Anin, A.L., Gbassi K., Gildas, Beugre A.G., Adou Marc, Anon Adoh, B. and Gnakri, D. (2012). Consumption survey of edible winged termites in Cote d'Ivoire. International Journal of Agricultural and Food Science 2(4): 149-152.
15. Nonaka, K. (2009). Feasting on insects. Entomological Research. 39(5):304-312.
16. Okore, O., Diane, A. and Ifediora, N. (2014). Edible Insects of the Niger Delta Area in Nigeria. 4(5):72.
17. Tamesse, J.L., Kekeunou, S., Tchatchouang, L.J., Ndegue, O.L.M., Aissatou, L.M., Tombouck, D. and Youssa, B. (2016). Insects as food, traditional medicine and cultural rites in the west and south regions of Cameroon. J. Insects Food Feed 2(3):153–160.
18. Van Huis, A. (2013). Potential of insects as food and feed in assuring food security. Annual Review of Entomology. 58:563-583.
19. Vantomme P., Göhler, D. and Ziangba, F. (2004). Contribution of forest insects to food security and forest conservation: the example of caterpillars in Central Africa. In: ODI wildlife policy briefing, Volume 3. Available at: http://tinyurl.com/nkfx24m.
20. Womeni, H.M., Tiencheu, B., Linder, M., Nabayo, M.C., Tenyang, N., Tchouanguep, F., Villeneuve, P., Fanni, J. and Parmentier, M. (2012). Nutritional value and effect of cooking, drying and storage process on some functional properties of Rhync*hophorusphoenicis*. *Int. J. Life Sci. Pharm. Res.* 2(3):203–219.