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SWARMING INDUCEMENT OF *Pseudocantotermes grandiceps* ALATES IN RESPONSE TO FOOD SECURITY IN KENYA

[1]JACOB N. MAKILA, [2]ROBERT W NYUKURI, [3]ALBERT W.MWONGULA

[1]Department of Biological Sciences, School of Science, University of Eldoret, P.O.Box 1125, Eldoret, Kenya
[2]Department of Biological Sciences, Kibabii University P.O. Box 1699 Bungoma, Kenya
[3]Department of biological sciences, Alupe University College P.O. Box 845 Busia, Kenya

Abstract: **The termite alates of *Pseudocanthotermes grandiceps* are eaten as a substitute dietary element in Kenya. Artificial inducement of the alates was evaluated based on a traditional method that has been used for decades. The idea is to imitate the natural weather conditions required by swarming alates. In natural situations, the most conducive weather is when rain is accompanied by thunderstorms and then stops for at least 2days with intervals of clear and sunny skies. Such weather conditions stimulate the emergence of alates during day time. In artificial situation, producing the sound of rain to strengthen the impression of rain was found to work with *Pseudocanthotermes* species. Through field manipulation of weather conditions, the alates of *P. grandiceps* responded to external changes and were harvested for consumption by local community. The following weather conditions were found necessary in stimulating nest activities and emergence of alates: a) hot and dry weather for a week prior to artificial inducement; b) sunny and hot afternoon at time of swarming. The time taken from the onset of the experiment to the end of swarming was approximately 8 hours. The artificial inducement of alates was found to be effective, seasonal and limited only to the genus *Pseudocanthotermes.***

***Keywords: Pseudocanthotermes*, artificial, inducement, termite alates, weather, swarming.**

1. INTRODUCTION

Kenya faces acute food shortages to satisfy the increasing population as traditional food stocks continue to be depleted as a result of environmental changes and increasing population. Faced with problems of food insecurity, increasing food prices and overreliance on the traditional food items, there is need for Kenyans to diversify their food sources. In Kenya, the termite alates have a long history of consumption during the rainy seasons by many communities. A major problem is that little has been done to make them readily available. Most interest has been focused on plant resources like African indigenous vegetables and others existing in the wild (Ojiako and Igwe, 2008). With the increase in food prices, protein foods are not within the reach of poor and low income earning households who unfortunately form the major part of the population in Africa, Ojiako et al. (2010). The high pricing of the available animal protein sources and few available plant protein sources should prompt an intense research into the possibility of availing insects as food source particularly the termite alates which are highly accepted as food in most communities in Kenya. Traditionally, edible insects have served as important foods for Africans, Asians, Australians and Latin Americans for many years (Allotey and mpuchane,2003). Similarly, entomophagy has gained prominence in recent years as a result of climate change meanly drought and poor economic conditions. This habit may have undoubtedly played an important role in reducing kwashiorkor among young

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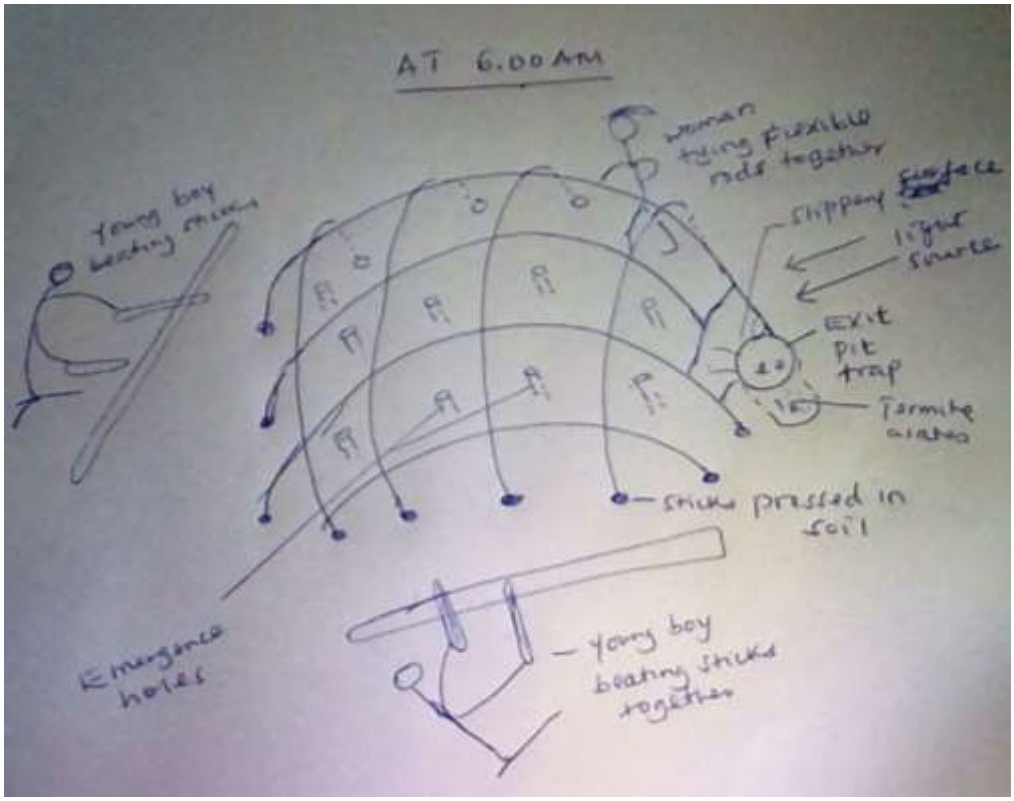
children of low income parents Igwe et al. (2011). Ominde`s (1988) African cookery book offers authentic African recipes representing a cross section of east African cousins'. It includes recipes for insects eaten as delicacies such as termite alates, fried grasshoppers and locusts. Bryk (2000), states that the swarming sexual of *Odontotermes* are caught in large quantities and are an important food in Mt. Elgon region where several methods are used for harvesting. The alates are the winged adults that are the most sought for as food.

Plate1. Boys aged between 10 and 15

Rhythmically beating sticks to produce sound

Fig 1: Layout of the experiment in the field



The delicious taste of the termite alates when dried or fried makes them acceptable to all groups of people. Since termite swarm in rainy seasons when conditions are favorable, they can only be naturally harvested during this period. Bryk (2000) notes that only a small portion of the emerging termite alates are captured while many become the prey of birds. To feed large families one would require large quantities of alates. Thus traditionally women and children spend time in the field searching for this valuable and nutritionally important food source. In some communities human beings have no other sources of energy and protein in their diet, they use traditional methods to induce termite alates to emerge from their nests. They alter the normal conditions around or in the termite mound and create a conducive microclimate that is enough to induce the emergence of termite alates. The artificial inducement *A. tenax* indicate that the alates can only be collected during the dry season usually between November and march in Kenya Bagine et al,(2014). Bagine (2014) also notes that sometimes the artificial inducement of termite alates is not so effective because not all holes that are opened and the rhythmic beating of sticks then pouring water may not be sufficient to stimulate all alates in the nest.

This paper was first to examine traditional ways of artificial inducement of alates belonging to the termite genus *Pseudocantotermes* recorded in East Africa Wanyonyi et al. (1984) and secondly, to undertake an evaluation of the effectiveness of one of the traditional method of harvesting edible insects.

2. MATERIALS AND METHODS

The field experiment was carried out at Naitiri 35km North of Bungoma town in Western Kenya. In this region, edible termite species are abundant and alates are harvested for food by many homesteads. Communities know the nests after a successful swarming naturally from their subterranean nests. *P. grandiceps* are not mound building, have an underground nest therefore difficult to notice the nest until swarming. During the time of swarming various nests produce the alates at ago. Therefore, the selection of a termite nest to induce was random and located within the community farm. The field harvesting of alates experiment involved; identification of the termite mound, clearing to expose emergence holes, rhythmic beating of wooden sticks, constructing a traditional trap using flexible wooden rods by pressing them into soft soil around the termite nest and tying them together using strings such that the rods directly opposite each other were tied together to form a tent like structure (Fig. 1), covering the tied rods with an opaque blanket material followed by a black polythene allowing only one end 15cm in diameter to remain open and digging of a pit trap 25cm deep and 15cm diameter.

The materials used include two dry wooden rods one meter in length ten centimeters in diameter, four dry wooden rods measuring 30cm in length and about 5cm diameter each, freshly prepared sticky mud made from some sticky soil enough to smear the top circumference of the pit trap, sizeable containers for carrying alates after collection, a panga and slasher and a hoe / jembe.

The termite nest of *Pseudocantotermes* species was identified in the field then the bushes, grass and other litter were removed around the nest with a slasher to expose emergence holes. The field operation required three people; they had to wake up at 6am in the morning. One had to clear the termite nest as the other was doing the rhythmic beating of sticks (plate1). The two wooden rods were laid on either side leaving the termite mound at the center. With the two smaller wooden rods in each hand, the two people on either side knocked on the longer rod in order to create a continues rhythmic sound like pouring rains lasting for more than 30 minutes .

After the rhythmic beating, digging of the pit trap followed. The pit trap was dug at the alate exit point. A plastic container was inserted into the pit then slippery banana leaves were put on the brims of the pit such that they formed a slope into the pit for the alates to slide and then fall into the plastic container in the pit. The banana leaves at the brims were put on wet mud that had been smeared on the circumference of the pit. Making the tent like structure followed that would later be covered with opaque thick blanket like materials followed by black polythene paper when swarming begun.

The nest was monitored from morning until 2pm the time the alates started emerging. The structure was then covered with opaque materials leaving a small opening where the pit trap had been set.

The whole operation took approximately 8 hours and large quantities of edible termite alates were collected. In summary artificial inducement of termite alates involves beating sticks together to produce the sound of rain

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Plate 2. Termite alates collected in a polythene bag during artificial l inducement experiment in the field

3. RESULTS

Traditionally, the method of artificial inducement of termite alates has been used for decades by local communities in Western Kenya. Our research established that this method is limited only to one termite species *P.grandiceps*, which swarms during rainy seasons and the best time for collecting alates in nature is on a hot afternoon. The field study revealed that local communities identify termite mounds only after swarming. *P.grandiceps* is a subterranean species and does not form an epigeal mound and a nest can only be identified after swarming. This was found to be true for this experiment. The best time for swarming inducement is mostly during long rains when the species is in season. The species swarm after a day's interval and time of day stimulate the emergence of alates. They emerge between 12pm to 2pm on a hot sunny day. There should be no rain recorded the previous day before inducement. In this experiment, it was found that a week free of rain before inducement yielded better results. In one harvest and depending on the maturity of the termite nest the termites collected can weigh 8 to 15kgs. Our experiment yielded 9kgs of alates (plate 2) and was given to the family who owned the farm for consumption, preservation and selling to the neighbouring families.

The termite alates were induced to swarm at a season different from their natural swarming period. This was done by a rhythmic beating of dry wooden sticks laid on the ground early in the morning. The rhythmic beating was to emulate the impact of rain on the ground or thunderstorm. The collection of the alates involved children aged between 10-16 years of age and their elder sisters or mother so that the youth provided the rhythmic beating and the mother or elder sister made the trap. The exercise was labour intensive and required 2 people who maintained the rhythmic beating of sticks to emulate rain for one hour. In our experiment and most likely during artificial inducement of alates by communities, some holes are not seen and not covered hence some active alates use them to escape the trap. In our case once uncovered holes were seen being used by swarming alates they were immediately blocked with wet mud. The assumption was that those emerging alates will use other underground tunnels to locate the emergence holes enclosed by the trap to emerge, but if they are unable to redirect themselves they will remain in the nest.

4. DISCUSSION AND CONCLUSION

The emergence of termite alates is highly controlled by prevailing environmental conditions. However this will depend on whether the termites are in season. The artificial inducement of termite alates of the species *p. grandiceps* indicate that the alates can only be collected during the rainy season usually between August and October in Kenya. Sometimes the artificial inducement of termite alates is not so effective because; a) not all holes that are opened are utilized by swarming alates and b) Changes in the weather may alter the swarming behaviour of alates since they swarm only during a hot afternoon as we established.

Traditional method of artificial inducement of termite alate was found to be very effective and though labour intensive; it provides a source of cheap protein and food security. Environmentally friendly termite harvesting technologies are required to help communities to maximize on insect production.

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