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Full Length Research Paper

Swarming inducement of *Allodontermes tenax* alates: in response to food security in Kenya

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ABSTRACT

The termite alates of *Allodontermes tenax* 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 2hours with intervals of clear and sunny skies. Such weather conditions stimulate the emergence of alates during day time or in the evening at dusk. In artificial situation, producing the sound of rain and by pouring water down the emergence holes to strengthen the impression of rain was found to work with A*llodontermes* species. Through field manipulation of weather conditions, the alates of *Allodontermes tenax* 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 month prior to artificial inducement; b) sunny and dry weather with calm evening at the time of inducement. The time taken from the onset of the experiment to the end of swarming was approximately two hours . The artificial inducement of alates was found to be effective, seasonal and limited only to the genus A*llodontermes*.

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

INTRODUCTION

In Kenya food shortages have been experienced from time to time due to unpredictable weather conditions and demand from the growing population. Such situation exposes women and children as the most vulnerable group. To address food security crises it is important that think of diversifying food sources and return to traditional food habits. For example various insects groups have been eaten as delicacy by many tribes in Kenya, although 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 Ojiado 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 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 (1927), 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

Plate 1. A woman mixing soil and water around termite nest to block open holes and mold termite flight tunnels

commonly caught and consumed. 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 favourable, they can only be naturally harvested during this period. Bryk (1927) 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 where 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 create a conducive environment by changing the surrounding weather conditions which in turn affects termite nest microclimate which in turn stimulates the emergence of termite alates. This paper was first to examine traditional ways of artificial inducement of alates belonging to the termite genus *Allodontermes* 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.

MATERIALS AND METHODS

The field experiment was carried out at Tulwet, 4km southwest of Kitale 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 with mature alates by simply counting the number of mature mounds in a given nest. 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 , flattening of termite mounds, pouring water around the nest, rhythmic beating wooden sticks and using sticky soil to make molding traps . The field operation required three people, two to maintain the rhythmic beating of sticks and one person to make traps by molding pipe like models from wet sticky soil right from the emergence holes to the central collecting center.

The materials used include two dry wooden rods one meter in length and 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, 0.5 $m^{3,}$ 20 liters of water, sizeable containers for carrying alates after collection, a panga /slasher and a hoe / jembe were used .

The termite nest of *Allodontermes* species was identified in the field then the bushes, grass and other litter were removed around the nest with a slasher. The nest mounds were flattened in order to expose the alate emergence holes and also to get a flat ground for laying the two one meter long wooden rods. One litter of water was poured into each of the exposed emergence holes. A sticky mud l was used to cover the emergence holes. The two wooden rods were laid on either side leaving the termite mound at the centre. 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 an hour. The third person whose duty was to prepare the sticky mud and cover the exposed flight holes would continue mixing the soil thoroughly to make it sticky mud in readiness for making tube like (tunnels) passages (plate 1). As the beating of sticks went on the person would inspect the covered flight holes one at a time to check for the presence of soldiers and workers. Once they were discovered to be present the cover was removed and the sticky soil was molded around the emergence hole to form a tube/pipe like (channels) passage leading to the main passage. On every exposed

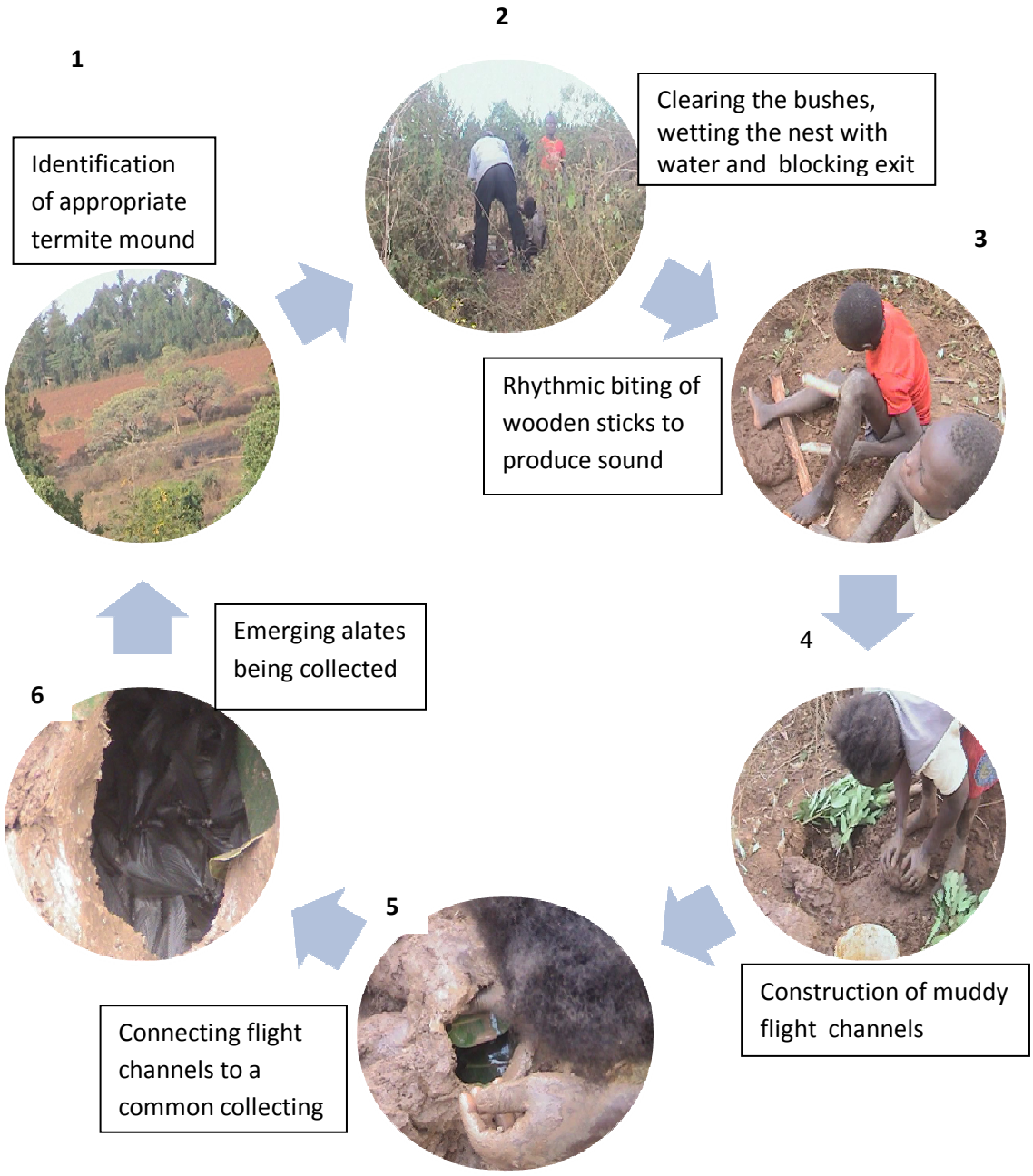

Figure 1. A stepwise Pictorial demonstration of the process of inducing termite alates in the field.

hole, the molding was done linking each other and leading to the main passage that emptied into a collecting hole with a container. These steps are shown in the flowchart below (Figure 1). The rhythmic beating was continuous from the time of pouring water in the emergence holes until the end of swarming. The whole operation took approximately two 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 and by pouring water down the emergence holes strengthens the impression of pouring rain.

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 *Allodontermes. tenax*, which swarms during rainy seasons and the best time for collecting alates in nature is on a calm evening.

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

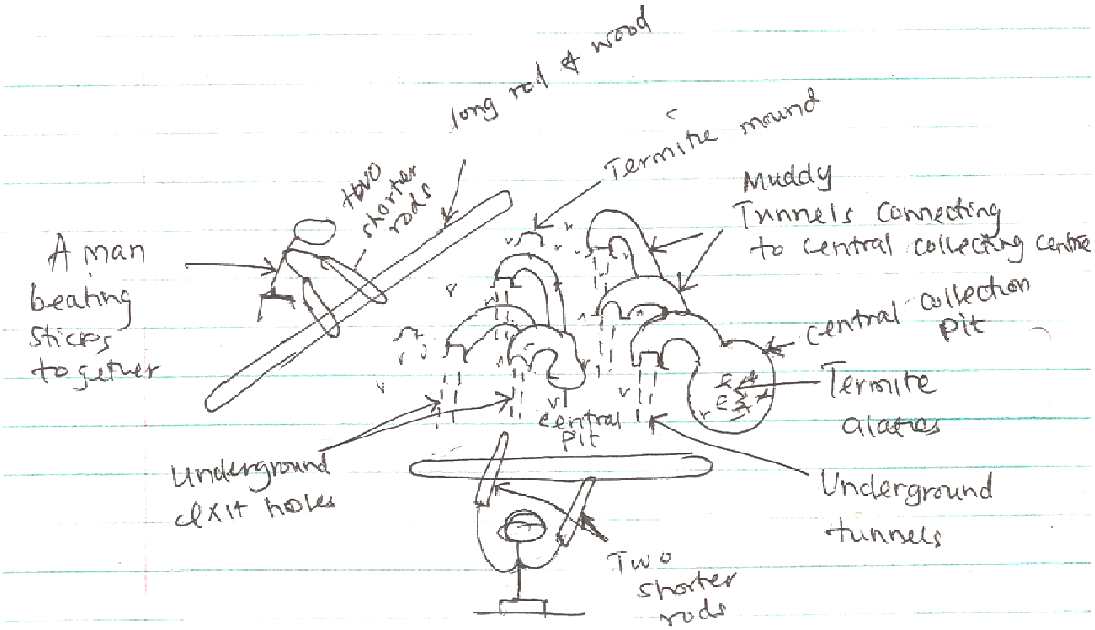

Figure 2. The layout of artificial inducement of termite alates in the field.t

The field study revealed that the local communities identify mature termite nest that have ready to swarm alates by counting the number of mature mounds within a given termite nest. The termite species, *Allodontermes tenax* usually make small mounds about 20cm above the ground with a diameter of about 10cm and the top of each mound is usually open. If a termite nest has more than five mature mounds, it's considered to be mature for artificial inducement. This was found to be true in this field experiment.

The best time for artificial inducement is mostly done during dry season or at least more than a month after the last rainfall. The time of the day or hour does not determine or stimulate the emergence of termite alates during inducement period. In one harvest and depending on the maturity of termite nest, the termite alates collected can weigh between 2 to 6kgs. Our field experiment yielded 3kgs 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 normal swarming period. This was done by imitating the rain; water was poured in the emergence holes until the holes were completely soaked, this was followed by a rhythmic beating of dry wooden sticks laid on the ground. The water was necessary to stimulate rain. 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 did the molding of the tunnels.

The exercise was labour intensive and required 2 people who maintained the rhythmic beating of sticks to emulate rain and another one molding muddy tunnels. 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 artificially constructed flight channels to emerge, but if they are unable to redirect themselves they will remain in the nest.

DISCUSSION AND CONCLUSION

The emergence of termite alates is highly controlled by prevailing environmental conditions. However this will depend on whether the termite nest has mature alates or not. The artificial inducement of termite alates of the termite species *A. tenax* indicate that the alates can only be collected during the dry season usually between November and march 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) the rhythmic beating of sticks and pouring water may not be sufficient to stimulate all alates in the nest.

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

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