



THE FEEDING BEHAVIOUR OF THE FIELD ANT (*Formica subsericea*) TOWARDS SOME SELECTED FOOD ITEMS IN MAKURDI, NIGERIA

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ABSTRACT

The study provides account of the feeding behaviour of field ants *Formica subsericea* on some selected food items; Sugar, Salt, Nescafe, Lemon and Water as control in Makurdi zoological garden, Benue State, Nigeria. All experiments were carried out in the dry season from November to December 2011. *F. subsericea* species were found to be more attracted to sugar and generally fed more in the afternoons when the temperatures were warmer. The ant species also took in a lot of salt and water while lemon was the least food item fed on. In fact, most of the ants that attempted to feed on the lemon died in the process. Our findings therefore suggests that like other ant species, *F. subsericea* also has a high preference for sugar as there was no significant difference in the rate at which sugar was fed on at all time periods while water was fed on most in the afternoons and for lemon, the rate remained the same for all time periods. This behaviour can therefore, be exploited in the baiting strategy for a successful control program of the species.

KEYWORDS: Terrestrial ecosystem, nesting sites, feeding behavior, geographical distribution.

INTRODUCTION

Ants are ubiquitous in most terrestrial ecosystems, they are among the most wide spread, diverse and dominant life forms, particularly in the tropical regions of the world where their diversity is unearthed (Tobin, 1993). They account for only 2% of all insect species described to date, it is estimated that they constitute more than half of the world's insect biomass (Holldobler *et al.*, 1994). Ants like many other animals require food to maintain their living tissues, to grow, build and repair body parts, to reproduce and energize the whole system. Many ant species are known to use resources within a predictable area, and occupy permanent nesting sites with restricted foraging and feeding ranges (Alonso and Agosti, 2000). The family formicidae is characterized by an extreme variety of diet and foraging strategies (Holldobler and Wilson 1990). Many authors have documented findings based on comparative studies on feeding and foraging behaviour of ants species (Beckers *et al.*, 1989 Bernstein *et al.*, 1979 Klotz 1984, straddling 1978, Paul *et al.*, 2003 Wong 2007), only a few have focused on the feeding behaviour of a particular species (Baker *et al.*, 1985 Hansen *et al.*, 1985 and Pie, 2004).

F. subsericea is a member of the fusca group of ant's species and are known to be generalist predators' feeding on a variety of small arthropods and annelids, occasionally collecting extra floral nectar and hemipteran honeydew (Fernandez, 1991; Oliveira and Brandao, 1991; Del-Claro and Oliveira, 1999). Most species within the fusca group forms small colonies (often a few hundred workers) and foraging is not highly organized; They do not lay odour trails and no marked foraging trails, they forage singly, however, recruitment of foragers to a rich food source occurs with facility (Wallis 1964). Similarly, *F. subsericea* are common ant's species with broad overlapping geographic distribution (Creighton, 1950) they are found

nesting in open and dry habitats and often construct low mounds nest with multiple entrances, the workers are monomorphic and are among the largest in the genus. Nests are shallow with fairly small colonies; usually composed of about 100-200 workers, typically, workers of *F. subsericea* rapidly recruit to food resources and monopolize the resources (Fellar 1987; Fellar 1989). A gap exists in the knowledge base especially due to feeding behaviour of ant's species inhabiting savannahs and forests in North Central Nigeria. The study provides information on the feeding behaviour of *F. subsericea* on selected food items (Sugar, Salt, Nescafe, Lemon and Water) with emphasis on the following aspects: (1) Daily foraging rhythm (2) most attracted food item (3) most depleted food item

MATERIALS AND METHODS

Study site

Field work was carried out in Makurdi zoological garden, Benue State, Nigeria (07° 49'N and 08° 36' E). The garden covers an area of about 26 hectares and is composed of several species of wildlife which include Lion, Ostrich, Crocodiles and different species of Monkeys and Birds (Torhile, 2006). *Mangifera indica*, *Anacardium occidentale*, *Daniella oliveri*, *Elaeis guineensis*, *Parkia biglobosa* and *Psidium guajara* are some of the common tree species found in the area. Immediately behind the area to the northern boundary is the lower river Benue. The river provides domestic water supply to the villages and township, fishing, excavation of sands and stones are major activities going on in the river.

Sampling method

During the dry season of November and December 2011, five (5) anthills which were about 50 meters away from each other were located and marked with red pieces of

clothes on sticks. At each anthill, the ants were presented with petridishes containing some measured quantities of selected food items such as; Sugar, Salt, Lemon and Nescafe while Water was the control. These food items were placed 1 meter away from the hills, each hill was observed three times a day between the hours of 0900-1100, 1200-1400 and 1600-1800 respectively. The following parameters were recorded at every 5 minutes intervals *i.e.* the food item that attracted most of the ants, ants response to food item (*i.e.* from the time the food was set out to the time the first ant visited & quantity of food taken from each Petri dish.

Data analysis

All analysis were done using software package SPSS (version 17, 2010). Descriptive statistics was used to show

mean number of ants species recorded on food items. Analysis of variances (ANOVA) was used to determine which food item the ants were most attracted to; the bar chart showed the total number of ants attracted to the different food items at different time periods.

RESULT

Mean number of ants recorded on each food item during the experiment

The distribution of *F. subsericea* species based on relative abundance on the various food items in the studied site showed that sugar had the highest number ($N=72$, 22.734 ± 1.350), while lemon had the least number ($N=72$, 0.350 ± 0.645) Table 1.

TABLE 1: A descriptive table of the mean number of ants on different food items.

Food items	N	RANGE	MEAN	STD ERR
Sugar	72	0.22-52.56	22.734	1.350
Salt	72	0.01-22.89	13.003	0.789
Nescafe	72	0.01-13.89	3.941	0.442
Lemon	72	0.01-1.78	0.350	0.452
Water	72	0.01-15.00	0.645	0.645

Analysis of variances (ANOVA) shows that the number of *F. subsericea* species seen on each food item at different time periods differed significantly, except for sugar which there seemed to be no significant difference.

TABLE 2: A table of analysis of variance (ANOVA) for different food items preferred

Variables	F	df	Significance
Sugar	2.453	2.69	0.094
Salt	40.697	2.69	0.0001
Nescafe	105.967	2.69	0.0001
Lemon	30.234	2.69	0.0001
Water	687.329	2.69	0.0001

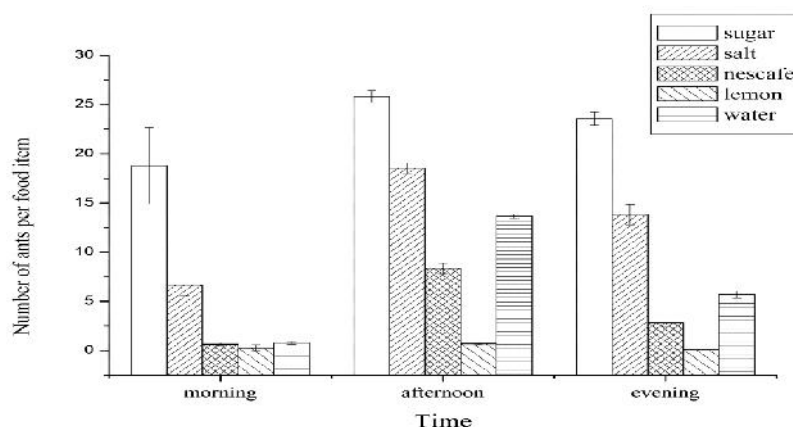


FIGURE 1: Total number of ants attracted to different food items at different time period

TABLE 3: Total amount of food depleted during the experiment

Food items	weight of food consumed	Percentage (%)
Sugar	11.78g	49
Salt	7.38g	31
Nescafe	1.12g	4.7
Lemon	0.10ml	0.4
Water	3.57ml	15

DISCUSSION

Preference and feeding activity

Previous studies have shown that ants have certain nutritional requirements and are selective of foods with

high carbohydrate and protein even when the diet is catholic (including a variety of foods) (Straddling 1978). Accordingly, the present study showed the same pattern of feeding activity. *F. subsericea* ants were mostly attracted to

food items presented in the following order; Sugar (22.734), Salt (13.00), Nescafe (3.941) Lemon (0.350) and Water (0.645) respectively (Table 1). Though, this is only an indication that ants fed extensively on sugar compared to other food items presented before them (Table 3). Also, there was a high percentage depletion rate as follows thus; sugar (49%), salt (31%), water (15%) Nescafe (4.7%) and lemon (0.4%). This finding agrees with the work of Wong 2007 and Caroline 1986, who in their respective experiments established the fact that ants show high preference for sugar compared to other food items. This however disagrees with work of Emily 2007, who reported that ants preferred hot dog to sugar, this may be due to the high amount of fats in the hot dog. In this study, sugar was the most preferred food item compared to other food item presented before the ants and this finding is consistent with Went et al 1972 studies, they concluded that ants prefer sugar as it is abundant, easy to store, provide high levels of energy and is easy to digest.

Effect of time of the day on feeding activity of *F. subsericea*

A primarily diurnal foraging and feeding activities is common to many ants' species (Overall 1986, Paiva and Brandao 1989, Passera *et al.*, 1994), although slightly seasonal variation may occur (Lachaud, 1990). Large numbers of *F. subsericea* in Benue garden were observed to feed mainly on sugar irrespective of the time of the day (table 2, figure 1), however, time was a factor that determined ants numbers and rate they fed on salt, water, Nescafe and lemon that was presented in this study. This shows that sugar was always preferred to other food items irrespective of the period and quantity that was fed to the ants. This may be due to the fact that sugar is an energy giving food and ants need this energy for their daily activities. Surprisingly, *F. subsericea* species showed a lot of interest in water (control), drunk mostly in the afternoon (Figure 1), this disagrees with the findings of Barbani 2003 and Caroline 1986. Barbani said the ants showed least interest in water and according to Caroline, only one ant was found drinking on water. These difference could be attributed to the high temperatures here in Nigeria (in a tropic region) compared to the low temperatures in the temperate region where Barbani and Caroline worked. Similarly, ants species visited the Nescafe (bitter flavor) and Lemon (sour flavor) on rare occasion which agrees with Caroline 1986. Interestingly, most of the ants that fed on the lemon died in less than 10 minutes, probably this was due to citric acid content of the lemon. In addition, the feeding bouts between the various food items showed that sugar (12minutes) had the highest activity, followed by salt (28 minutes), water (76 minutes) Nescafe (96 minutes) and lemon (164 minutes) respectively. This corresponds with the amount and percentage of food depleted during this study (Table3).

CONCLUSION

Formica subsericea species were mostly attracted to sugar and also fed heavily on sugar followed by salt, water, Nescafe and lemon. While there was a significant difference in the rate at which the ants fed on all other food items, there was no significant difference in the rate at which they fed on sugar at different time periods which shows that the ants prefer sugar to other food items.

The time of attraction to various food items and the percentage of food depletion during the experiment conform to the order of preference for the food items.

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