

## Relative abundance of weaver ant trail from different host plants within IBB University Lapai permanent site

<sup>1,2</sup>Olayemi, I.K., <sup>2,3</sup>Salihu, I.M., <sup>1</sup>Abolarinwa, S.O., <sup>1,2</sup>Ukubuiwe, A.C., <sup>8</sup>Usman, A., <sup>4</sup>Shittu, K.O.,  
<sup>7</sup>Salaudeen, M.T., <sup>5</sup>Adebola, M.O., <sup>9</sup>Adeniyi, K.A., <sup>10</sup>Oyibo-Usman, K.A., <sup>1</sup>Mustapha, O.M.,  
<sup>1</sup>Sodangi, C.J., <sup>6</sup>Jacob, J.O., <sup>3</sup>Usman, M.D., <sup>3</sup>Aliyu, M.A and <sup>3</sup>Silace, P.

<sup>1</sup>Department of Animal Biology, Federal University of Technology Minna, Nigeria

<sup>2</sup>Center for Genetic Engineering and Biotechnology, Federal University of Technology Minna, Nigeria

<sup>3</sup>Department of Biology, Ibrahim Badamasi Babangida University Lapai, Nigeria

<sup>4</sup>Africa Center of Excellence for Mycotoxin and Food Safety, Federal University of Technology Minna, Nigeria

<sup>5</sup>Department of Plant Biology, Federal University of Technology Minna, Nigeria

<sup>6</sup>Department of Chemistry, Federal University of Technology Minna, Nigeria

<sup>7</sup>Department of Crop Production, Federal University of Technology Minna, Nigeria

<sup>8</sup>Department of Animal Production, Federal University of Technology Minna, Nigeria

<sup>9</sup>Department of Biological Sciences, Federal University Duse, Nigeria

<sup>10</sup>Department of Biological Science, Federal University Gusau, Nigeria

### ABSTRACTS

Weaver ant (*Oecophylla longinoida*) an obligate arboreal insect species well-distributed throughout the Tropics including Nigeria, whenever they travel, they leave behind a pheromone trail to communicate with any ants of same species / colony that may follow. When a scout ant finds a new food source, it will lay down a heavy pheromone trail with the message of where to find that food. Relative abundance of weaver ant trail from different host plants within IBB University Lapai permanent site was elucidated. Trees of mango (*Mangifera indica*), Mahogany (khaya senegalensis), Cashew trees (*Anacardium occidentale*), and Shea Butter trees (*Vitellaria paradoxa*) were selected for the sampling. Relative abundance using different indices revealed Mahogany had the highest abundance of weaver ants 80.0%, 80.0% and 64.7% for Peng 1 index, peng 2 index and offenberg index respectively. Whereas cashew recorded the least in all the three types of index analyses 51.5%, 61% 33.8% respectively. The result has provided baseline information on checkmating routine or annual abundance of this insects as they are used widely in biological control.

**Keywords:** Pheromone, Density, Index, Trail

\*Corresponding author: isreal.olayemi@futminna.edu.ng

### INTRODUCTION

Weaver ant (*Oecophylla longinoida*) an obligate arboreal insect species well-distributed throughout the Tropics including Nigeria (Olotu, 2016). The insect species lives in a nest which it constructs

by weaving young flexible leaves together with the aid of a silk material produced by its larvae Aswathi and Thomas (2014), and a mature colony is usually vast with up to 500,000 ants (Langthasa *et al.*, 2017). *O. longinoida* actively patrols all foliage parts of its host plant, and prey on a wide range

of arthropods and even vertebrates that enter their territory.

Weaver ants are aggressive and prey on most arthropods entering their territory and additionally scavenge on a wide range of organisms including vertebrate. Due to their predatory habit *Oecophylla* ants are recognized as biological control agents in tropical tree crops as they are able to protect a variety of crops against many different insect pests (Van mele, 2008). They are used in many regions for food, medicine. *Oecophylla* species show much geographic variation in color, their appearance, behaviour and nest construction are so distinctive for easy identification.

Workers exhibit a clear bimodal size distribution between the major workers (8-10mm) and minor workers (about half the length of the major). Major workers forage, defend, maintain and expand the nests where they care for the brood and milk scale insect in or close to the nest. Adult ant are reddish to brown in colour and have ten segmented antennae with two segmented clubs, their eyes are relatively large, they do not have stingers but can give a painful bites caused by chemical secreted from their abdomen. Colonies can be extremely large consisting of more than a hundred nest spanning numerous trees and contain more of workers (Sullivan 2012).

The weaver ant is known to produce a very potent repugnant odour that is offensive not only to predators but herbivores as well. Through its odorous secretions and predatory behaviour, the species has been recorded to control over 50 pest species in 8 different crops (Offenberg *et al.*, 2013).

Whenever ants travel, they leave behind a pheromone trail to communicate with any

ants of same species / colony that may follow. When a scout ant finds a new food source, it will lay down a heavy pheromone trail with the message of where to find that food. This message will "call" the other worker ants in that area to their food source. Trail pheromone trails serve as a vital communication mechanism in ant societies, displaying their remarkable ability to coordinate and adapt. As with many other insect ants rely on these chemical signals-pheromone to interact and navigate their environment. Trail pheromone can either be short and long-term pheromone trails:

short term pheromone trail decays within 20 minutes and external long term pheromone memory allows ant colonies to re-use trails laid one or two days previously. Therefore, the present study tends to evaluate relative abundance of weaver ant trails in some tree using different index method in relation to their host plant environment for field monitoring of their abundance and extinction.

## MATERIALS AND METHODS

### Study Area

The study was conducted in mango, cashew, mahogany and Shea-butter plantations in Lapai LGA of Niger State. Lapai lies at 9°06'00"N and 6°57'00"E. It has an area of 3,051 km<sup>2</sup> and a population of 110 127 at the 2006 census. The dominant tribe is Nupe. They are characterized by mixed farming systems (Usman *et al.*, 2023), the area is characterized by two seasons: wet and dry seasons. The area records its highest temperature of about 35 °C during the dry season (November to March) while during the rainy season (April to October), the temperature drops to about 24 °C. The

vegetation type is Guinea Savannah and the area is mostly dominated by shrubs and grasses sandwiched by tall trees (Usman *et al.*, 2023).

### Sample Collection

A modified sampling method of Usman *et al.* (2024), was adopted during sampling. Trees of mango (*Mangifera indica*), Mahogany (khaya senegalensis), Cashew trees (*Anacardium occidentale*), and Shea Butter trees (*Vitellaria paradoxa*) that were between 20 to 41 years old were sampled and counted during the morning hours of each sampling day at all sampling occasions. During each sampling, a whole tree was completely observed, taking note of number of branches and number of weaver ant nests on each tree as well as their branches.

### Monitoring of weaver ant abundance

Modified method of Vayssières *et al.* (2016) was used in the three branch methods of monitoring weaver ant abundance, weaver ant abundance was assessed weekly in each tree from March 2022 to May 2022 in all the selected tree plantation. In total, ant densities were estimated 12 times for each tree using these methods. The counting of ant trails on the trees was conducted between 09:30 and 13:30 hours which is within the most active period of weaver ants. The same sampling session was used to calculate all three branch abundance indices.

**The Peng 1 index** was calculated as the number of main branches with at least one weaver ant divided by the total number of main branches on the tree. This number was multiplied by 100 to convert it into a

percentage according the modified method of Peng and Christian, (2004).

**The Peng 2 index** was calculated by counting the number of main branches with 1 – 10 ants and the number of branches with more than 10 ants. Low density trails (1 – 10 ants) were then assigned a half trail score and the high density trails assigned a full trail score. The sum of trail scores on each tree was then divided by the total number of main branches on the tree and multiplied by 100 according to modified method of Peng and Christian, (2005).

**The Offenbergl index** was calculated by dividing ant trails into trails with 1 – 9 ants per m (low density trail), trails with 10 – 50 ants per m (medium density trail) and trails with more than 50 ants per m (high density trail). The low density trail was assigned 1/3 trail score, the medium density trail 2/3 trail score and the high density a full trail score. The sum of trail scores on a tree was then divided by the number of main branches on the tree and multiplied by 100 to produce the index value according to Offenbergl and Wiwatwitaya, (2010). Assessing the branch index on a tree takes approximately 40 s, 1 min and 1 min 30 s, for the Peng 1, Peng 2 and Offenbergl index, respectively.

## RESULTS

Relative abundance (Peng 1 index) of weaver ants from selected tree plantations in IBB University Lapai was presented on table 1. There relative high abundance of weaver ant on main branches of selected trees of mango and mahogany (81.3 and 80.0%) respectively in peng 1 index analysis. However, cashew recorded the least with 51.5%.

Table 1: Relative abundance (Peng 1 index) of weaver ants from selected tree plantations in IBB University Lapai

host plant	No. of tree (A)	No. of main branches (B)	No. of main branches with at least one ant ©	Peng 1 index B/C*100
Mango	167	32	26	81.3
Cashew	260	68	35	51.5
Mahogany	42	15	12	80.0
Shea-butter	48	24	15	62.5

Relative abundance of weaver ants using Peng 2 index from selected tree plantations in IBB University Lapai is presented in table 2. The result revealed a

higher relative abundance in Mahogany of 80.0% and cashew tree recorded the lowest of 61.0%.

Table 2: Relative abundance (Peng 2 index) of weaver ants from selected tree plantations in IBB University Lapai

host plant	No. of tree (A)	No. of main branches (B)	No of low density trail 1-10 ants/branch (C)	No of high density trail more than 10 ants/branch (D)	Total score on each trail (C+D)= E	Peng 2 index (E/B*100)
Mango	167	32	5	17	22	68.8
Cashew	260	68	10.5	31	41.5	61.0
Mahogany	42	15	3	9	12	80.0
Shea-butter	48	24	4	12	16	66.7

Low density trail has 0.5 score      High density trail has 1 score

Relative abundance of weaver ants using Offenbergs index from selected tree plantations in IBB University Lapai is presented in table 3. The result of offenbergs index revealed that Mahogany

had the highest weaver ant relative abundance of 64.7% followed by Mango 60.3% and cashew had the least of 33.8% respectively.

Table 3: Relative abundance (Offenberg index) of weaver ants from selected tree plantations in IBB University Lapai

host plant	No. of tree (A)	No. of main branches (B)	Trail with 1-9 ants /min (C)	Trail with 10-50 ants /min (D)	Trail with more than 50 ants /min (E)	Total sum of trail score (C+D+E = F)	Offenberg index (F/B*100)
Mango	167	32	2	5.3	12	19.3	60.3
Cashew	260	68	4.3	6.7	12	23	33.8
Mahogany	42	15	0.7	2	7	9.7	64.7
Shea- butter	48	24	1	2.7	8	11.7	48.8

1-9 ants/min = 1/3 score      10-50 ant/min = 2/3 score      More than 50 ants/min = 3/3 score

## DISCUSSION

There is relative high abundance of weaver ant on main branches of selected

trees of mango and mahogany (81.3 and 80.0%) respectively in peng 1 index analysis and cashew recording the least

with 51.5%. could be because of wider canopy coverage in mango and mahogany tree than cashew. This is in agreement with the work of Rasin *et al.* (2015). However higher relative abundance in Mahogany of 80.0% and cashew tree recorded the lowest of 61.0% could be because of the same reason stated earlier. Finally offenberg index revealed that Mahogany had the highest weaver ant relative abundance of 64.7% followed by Mango 60.3% and cashew had the least of 33.8% respectively. All the evaluation index used in estimating relative abundance showed that Mahogany has the highest abundance in the sampling area, the higher abundance in Mahogany might be due low disturbance by individuals and children scouting for mango and cashew fruit regularly and might also be because of the tree height that is not friendly for children. This is in agreement with the report of Navarro-Matinez *et al.* (2018). Who reported that Mahogany is specially recognized as big tree, but his study did not discuss on the distribution of weaver ant on mahogany tree

### CONCLUSION

The study has revealed that mahogany recorded the highest relative abundance using different index approach viz; Peng 1 index, Peng 2 index and Offenberg index. More so the study has identified cashew tree with least abundance of weaver ant. The result has provided baseline information of the checkmating routine or annual abundance of this insects as they are used widely in biological control.

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