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# ASSESSMENT OF INSECT INVADERS OF DECAYING BANANA AND PLANTAIN (*MUSA SPP.*) PSEUDO STEMS IN UMUAGWO, OHAJI – EGBEMA LOCAL GOVERNMENT AREA, IMO STATE, NIGERIA.

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## ABSTRACT

***Insect invaders of decaying banana and plantain pseudo stems in Umuagwo, Ohaji-Egbema, Imo State were investigated in randomly selected crop plots near living homes (<500 m) and far from living homes (≥500m). Investigation was done by the use of trapping systems, dissections of cut decaying pseudo stems and culturing of immature stages of insects to adulthood. A total of 10 insect orders of economic and medical/veterinary importance were sampled. Members of the orders Coleoptera 903 (39.50%) and Diptera 692 (30.27%) were more prevalent. The remaining 30.23% were members of orders Hymenoptera 252 (11.02%), Dictyoptera 115 (5.03%), Orthoptera 85 (3.72%), Isoptera 69 (3.02%), Dermaptera 59 (2.58%), Hemiptera 43 (1.88%), Collembola 41(1.79%) and Siphunculata 27 (1.18%). The result of this study also showed that the number of insects found in banana and plantain pseudo stems in plots near homes 1085 (47.46%) did not significantly differ from those found in plots far from living homes 1,201 (52.54%) [P (Z>1.78) = 0.0375]. This suggests that site of crop plot has no obvious impact on the abundance of insect invaders of banana and plantain pseudo stems. Insects of medical/veterinary importance to man (Diptera, Siphunculata and Dictyotera) were found to be significantly more abundant in crop plots nearer homes [P (Z>2.00) = 0.0228]. This significant observation could implicate the health of man and his domestic animals.***

Keywords: Insect invaders, pseudo stems, trapping systems, living homes, culturing.

## INTRODUCTION

Banana and plantain (*Musa spp*.) are important food and cash crops (FAO, 1995 and Nkendah and Akyeampong,2003) with proven medical and industrial relevance (Rahman,1964; Paul and Southgate, 1978; Ogazi, 1996 and Faturobi *et al*.,2007). As a result, an increase in the production of these crops in the global traditional agricultural system has been recorded (Ogazi, 1996).

PANS (1977), Kerrmarrec *et al.*, (1993), Gowen (1995) and Mclntye *et al*., (2001) recorded that numerous insect pests attack banana and plantain pseudo stems while Hill and Waller (1999) stressed that more than 470 species of insects and mites attack banana. Ordinarily, the decaying banana and plantain pseudo stems serve as a biotope for many organisms, a role that has been neglected by many researchers, at least in this part of the world.

To that effect, the present work focussed on the insect invaders of decaying pseudo stems of banana and plantain crops irrespective of the species, with a view to identifying those with possible economic or medical/veterinary relevance to man. Insects facilitate the decay of organic matter and soil formation (Saba, 1995), a role which is of agricultural interest. They assist bacteria and fungi, which are the primary decomposers in any terrestrial ecosystem (Fullock 1994; Raven Johnson, 1996 and Taylor, 1997).

The role insects play in the life of man, especially in terms of his health and economy has made insects to be of great concern. Therefore, any study that reveals the type of insect haboured by crop residues (example, pseudo stems of banana and plantain) should be of great scientific interest. The result of such study may necessitate the proper handling or disposal of the implicated crop residue. Moreover, identification and documentation of insects in any ecosystem aids in designing an appropriate control measure for those that exert negative influence especially on man (Molta *et al*., 1999).

Therefore, this study sought to document the insect invaders of decaying banana and plantain pseudo stems with a view of projecting their level of economic importance in the area. The study also aimed at determining if site of crop (banana and plantain) plot could have relationships with the abundance of insect invaders of decaying banana and plantain pseudo stems in the area.

## MATERIALS AND METHOD

### The Study Area

This study was carried out in selected plots at Umuagwo, Ohaji – Egbema Local Government Area known as the "food basket" of Imo State (figure 1). Umuagwo is located in the South Western part of Imo State (figure 1).It lies between longitudes 6° 55 □E and 6° 60 □E and latitudes 5° 10 □N and 5° 15 □N of the equator. Although this area has mixed population of diverse occupations, her people are largely farmers and hunters. The native farmers grow banana and plantain crops for subsistence and commercial purposes.

### Site Selection

Two different sites were randomly selected at Umuagwo for this study as follows:

1. **Crop plots near living homes:** These were backyard/kitchen garden sites of local residents that were less than 500 m from homes.
2. **Crop plots far from living homes:** These were sites located far from living homes which were greater than or equal to 500 m and unlikely to receive kitchen waste.

Criterion for classifying plots in terms of nearness (<500 m) or farness (≥500 m) with regards to receiving treatment from living homes, was inferred from questionnaire administered to local owners of banana/plantain plots.

### Sampling Method

A total of 10 crop plots near (100 randomly- selected) living homes were also randomly selected for the study and another set of 10 crop plots far from the living homes were randomly selected for the study. An average of five banana/plantain pseudo stems in every selected plot were sampled for insect invaders for a period of six months (March to August, 2009). Available and randomly selected (when there was need) pseudo stems/stumps were identified, marked and numbered.

The split pseudo stem trap and netting were employed in the field. In the laboratory, dissection of decaying pseudo stems was followed by their immersion in water to facilitate extraction of their insect contents. Immature stages collected were cultured to adulthood. All identifications were done using morphological or taxonomic features. Crop plots and specimens from the two categories of sites received equal attention.

### Field Collection of Insect Invaders

Using a sharp knife, fresh pseudo stem pieces were cut to fit the open ends of stumps. The pseudo stem pieces were placed on top of two stumps as traps to attract insects from the deteriorating pseudo stem. Each set-up was left for four days before being examined. The trap pieces of pseudo stems were lifted to confirm invasion. Observed insect species were noted and the pieces were then put back. Collection and counting of encountered insect species were not done at this stage because they were later removed at the end of each month in the period of study and taken to the laboratory where they were subjected to detailed dissection and thorough examination. The three remaining randomly selected stumps (in each of the plots being sampled) were then dissected in the field to collect noted insect species for adequate laboratory examination. All collected insects in the field were preserved in 4% formalin prior to later use in the laboratory, except representatives of immature stages that were cultured for proper identification.

Net was used to confine flying insects likely to emerge from experimental stumps. The nets were tied over the open ends of decaying stumps using straws and ropes. The net material was of the mosquito-net type. The netted enclosures were checked once every four days to ensure they are in place.

### Laboratory Collection of Insect Invaders

1. **Dissection of cut decaying pseudo stems:**

Decaying stumps used as traps had their pseudo stems cut into convenient pieces, each about 0.3 m in length. The pieces were immediately transferred to the laboratory inside wooden boxes. In the laboratory, dissection of the pseudo stems and preservation of the specimens were done immediately. The hand-sorting and flotation methods of Raven and Johnson (1996) were employed to collect insects from the dissected piece of pseudo stems.

2. **Rearing of Immature Stages:**

The immature stages of insects realised were sorted into their various categories and cultured in different tagged jars containing pseudo stem pieces that provided food and moisture. Culture jars made of plastics, were covered with muslin cloth to ensure proper ventilation and also to enable sprinkling in of water to keep the pseudo stem pieces moist. Adult insect species, on emergence, were collected and matched against their respective immature stages that had been carefully preserved in 4% formalin.

**Identification of Insects**

Sampled insect species, fresh, killed or mounted were sorted and adequately classified using taxonomic features.

**Statistical Analysis**

The abundance of insect invaders of banana/plantain pseudo stems and of medical/veterinary importance sampled from crop plots near homes and crop plots far from living homes were compared using the test of variance, Z – statistic (Wadley, 1967)

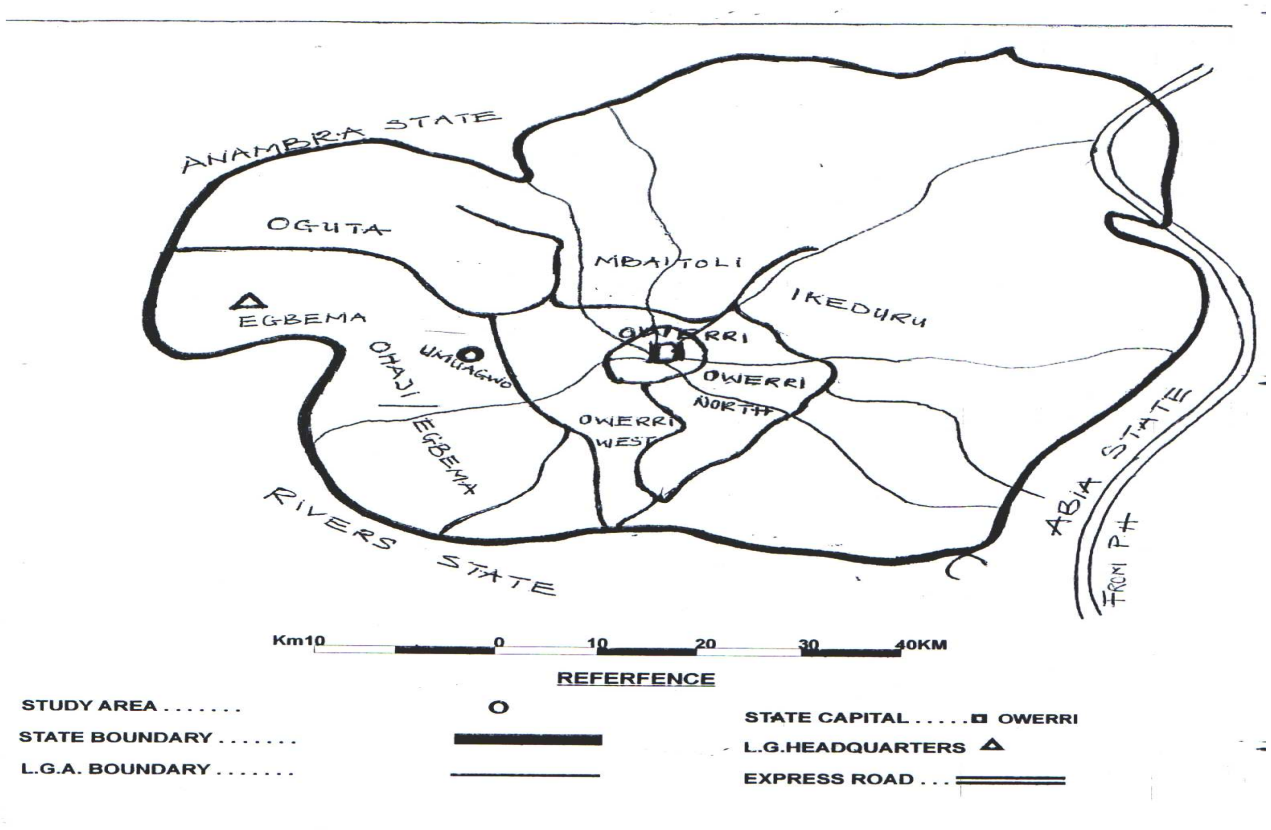
## RESULTS

A total number of 2,286 insects belonging to 10 insect orders were collected from pseudo stems of banana and plantain plots near living homes and far from living homes in Umuagwo, Ohaji – Egbema (Table1). Comparatively, 1,201 (52.54%) insect invaders were found in sites far from living homes while 1085 (47.46%) were found in sites near living homes (Table 2). The difference did not prove significant (P>0.05). The highest number of insect invaders were recorded in the orders Coleoptera 903 (39.50%) and Diptera 692 (30.27%). Orders with less number of members include Hymenoptera 252 (11.02%), Dictyoptera 115 (5.03%), Orthoptera 85 (3.72%), Isoptera 69 (3.02%), Dermaptera 59 (2.58%), Hemiptera 43 (1.88%), Collembola 41 (1.79%) and Siphunculata 27 (1.18%) (Table2).

Five orders of medical/veterinary importance to man 1,129 (49.38%) were sampled. These orders were Diptera 692 (30.27%), Hymenoptera 252 (11.02%), Dictyoptera 115 (5.03%), Hemiptera 43 (1.88%) and Siphunculata 27 (1.18%). Three of these orders Diptera, Dictyoptera and Siphunculata 834 (36.48%) were significantly (P>0.05) more abundant in plots near living homes 602 (26.33%) than in plots far from living homes 232 (10.15%) (Table 2).

Also five orders of economic importance to man 1,157 (50.61%) were sampled from decaying banana and plantain pseudo stems. Distribution of these orders near living homes were as follows: Coleoptera 212 (9.27%), Orthoptera 40 (1.75%) Isoptera 35 (1.53%), Dermaptera 31(1.36%) and Collembola 20 (0.87%). Similarly, their distribution far from living homes were as follows: Coleoptera 691(30.22%), Orthoptera 45 (1.97%), Isoptera 34 (1.49%), Dermaptera 28 (1.22%) and Collembola 21 (0.92%) (Table 2 ).However, data on insect orders of economic importance to man seemed not to have clear pattern in distribution with respect to crop site.

**Figure 1: Map of Imo State Showing Umuagwo, the Study Area.**




**Source: Owerri Municipal Council.**

**Table 1: Insect Invaders Encountered and their Stages at Collection from Decaying Banana / Plantain Pseudo stems**

| Insect Order | Family | Genus | Species | Life Stage Encountered | Number (%) |
|---|---|---|---|---|---|
| Coleoptera | Curculionidae Curculionidae | *Cosmopolites Temniosciota* | *sordidus* | Adults | |
| | Curculionidae Curculionidae | *Hylobius* | *quadripustulata* | Adults | |
| | Curculionidae Curculionidae | *Calandra* | *abietis* | Larvae, pupae, Adults | |
| | Curculionidae | *Calandra* | *granaria* | Adults | |
| | | *Ceuthorrhynchus* | *oryzae* | Adults | |
| | | *Rhynchophorus* | *pleurostigma* | Adults | |
| | | | *ferrugineus* | Adults | 903 (39.50) |
| | Scarabaeidae Scarabaeidae | *Gonocephalam Pachnoda* | *simplex* | Adults | |
| | Scarabaeidae Scarabaeidae | *Gnathelopes Sericesthis* | *marginella* | Adults | |
| | | | *chantanayi* | Adults | |
| | | | *germinate* | Adults | |
| | Coccinellidae | *Scymnus* | *Coccivora* | Larvae, Pupae, Adults | |
| | Staphylinidae | *Ocypus* | *Olens* | Adults | |
| Diptera | Culicidae | *Culex* | *dultoni* | Eggs, Pupae, and Adults | |
| | Culicidae | *Anopheles* | *gambiae* | Adults | |
| | Culicidae | *Anopheles* | *funestus* | Adults | |
| | Striatiomyidae Striatiomyidae | *Plecticus* | *elongatus* | Larvae, Pupae, Adults | 692 (30.27) |
| | Striatiomyidae | *Nemotelus* | *nigripennis* | Larvae, Pupae, Adults | |
| | | *Nemotelus* | *capensis* | Pupae and Adults | |
| | Psychodidae | *Psychoda* | *Alternate* | Larvae and Adults | |
| | Anisopodidae | *Sylvicola* | *Notatus* | Larvae and Adults | |
| | Chironomidae | *Zavrelimyia* | *Harrisi* | Larvae and Adults | |
| | Coelopidae | *Chaetocoelopa* | *Littoralis* | Larvae and Adults | |
| | Keroplatidae | *Macrocera* | *unipunctata* | Larvae and Adults | |
| Hymenoptera | Formicidae | *Crematogaster* | *africana* | Colonies of Adults | 252 (11.02) |
| | Formicidae | *Dorylus* | *nigricans* | Adults | |
| | Formicidae | *Ponera* | *punctatissima* | Colonies of Adults | |
| Dictyoptera | Blattidae | *Blattella* | *germanica* | Eggs, Nymphs, Adults | 115 (5.03) |
| | Blattidae | *Blatta* | *orientalis* | Adults | |
| Orthoptera | Gryllidae | *Gryllus* | *bimaculatus* | Adults | 85 (3.72) |
| | Gryllidae | *Acheta* | *domesticus* | Adults | |
| Isoptera | Termitidae | *Amitermes* | *Evuncifer* | Mixed colony of Adult Soldiers and Workers | 69 (3.02) |
| Dermaptera | Chelisochidae | *Chelisoches* | *Flavipenis* | Nymphs and Adults | 59 (2.58) |
| Hemiptera | Reduviidae | *Arilus* | *Cristatus* | Adults | 43 (1.88) |
| Collembola | Sminthiridae | *Sminthurus* | *Viridis* | Adults | 41 (1.79) |
| Siphunculata | Haematopinidae | *Haematopinus* | *Suis* | Adults | 27 (1.18) |
| | Pediculidae | *Pediculus* | *Humanus* | Adults | |

Note: Insect Identification was Achieved by the Combined Efforts of the Entomologists and Curator, Insect Museum, University of Ibadan,Ibadan,Nigeria.

**Table 2: Distribution of Medical/Veterinary and Economic Important Insect Invaders of Banana/Plantain Pseudo stem in Crop Sites near Living Homes and Crop Sites Far from Living Homes.**

| S/N | Insect Order | Site of Plot | | Total |
|---|---|---|---|---|
| | | Near Home [n(%)] | Far From Home [n(%)] | [n(%)] |
| 1. | Diptera | 498(21.78) | 194(8.47) | 692(30.27) |
| 2. | Dictyoptera | 85(3.72) | 30(1.31) | 115(5.03) |
| 3. | Siphunculata | 19(0.83) | 8(0.35) | 27(1.18) |
| | | **602(26.33)** | **232(10.15)** | **834(36.48)** |
| 4. | Hymenoptera | 125(5.47) | 127(5.55) | 252(11.02) |
| 5. | Hemiptera | 20(0.87) | 23(1.00) | 43(1.88) |
| | **Total** | **747(32.67)** | **382(16.71)** | **1,129(49.38)** |
| 6. | Coleoptera | 212(9.27) | 691(30.22) | 903(39.50) |
| 7. | Orthoptera | 40(1.75) | 45(1.97) | 85(3.72) |
| 8. | Isoptera | 35(1.53) | 34(1.49) | 69(3.02) |
| 9. | Dermaptera | 31(1.36) | 28(1.22) | 59(2.58) |
| 10. | Collembola | 20(0.87) | 21(0.92) | 41(1.79) |
| | **Total** | **338(14.78)** | **819(35.83)** | **1,157(50.61)** |
| | **Grand Total** | **1085(47.46)** | **1,201(52.54)** | **2,286(100)** |

**S/N 1 – 5: Insect Orders of Medical/Veterinary Importance**
**S/N 6 – 10:Insect Orders of Economic Importance**

## DISCUSSION

The analysis of the result showed that various insect orders were incriminated on decaying banana and plantain pseudo stems in Umuagwo, Ohaji – Egbema, Imo State. This observation and assessment were corroborated by Swain (1948), Borror *et al.,* (1976) , Frauz (1999) and Claudia and Lawrence (2007) that reported habourage of insects by crop residues.

That no significant difference occurred in distribution of insect invaders of banana and plantain pseudo stems between plots near living homes and plots far from living homes suggests that most of the sampled insect groups are polyphagous and can therefore adapt to a wide range of habitats. The polyphagous habits of majority of the sampled insect orders are supported by Imms (1964), Gold *et al*. (2004) and Abera-Kalibata (2007).

However, the difference, (though not statistically significant) in the number of insect invaders of pseudo stems in plots near living homes and in plots far from living homes may be an index of disturbance in terms of cultivation and associated cultural practice, since it is known that farms/plots near living homes are subject to repeated cultivation (Okigbo and Lal, 1979). The same literature reported relationship between repeated cultivation and gradual loss of useful fauna, resulting in impoverishment of soil.

The high abundance of Coleoptera and Diptera recorded in this study may suggest that the regular wetness of decaying pseudo stems seemed to synchronize the life cycles of these moisture – loving organisms. That Dipteran organisms are exceptionally moisture – loving is reported by Imms (1964). Also, the importance of decaying pseudo stems of banana and plantain as sure source of moisture for certain developmental stages of insects has been documented (Graham, 1957 and De Graaf and Govender,2008). Therefore, it can be inferred that the decaying banana/plantain pseudo stem provided food and moisture for the invading insects.

The orders Diptera, Dictyoptera and Siphunculata, which significantly showed higher abundance in plots nearer homes, could be attributed to the interest to maintain closer and more stable association with their human and domestic hosts. Thus, nearness of banana and plantain plots to human habitations may spell some yet unnoticed health hazards beside known ones like malaria, whose devastating effect on humans is now known to be comparable to AIDS (Acquired Immune Deficiency Syndrome) (Curtis, 1994).

The presence of members of the orders Coleoptera, Diptera, Hymenoptera, Orthoptera and Isoptera was a significant observation. This means that crop residues (that is, the banana and plantain pseudo stems) have been implicated in maintaining pest population. Various literatures confirmed most members of Coleoptera, Diptera, Orthoptera and Isoptera pests (Imms, 1964 ; Kumar,1999 and Claudia and Lawrence,2007). These pest groups which exert negative influence especially on man and his crops, also known to be important decomposers (Imms, 1964; Zlotin and Khodashova, 1980 and Frauz, 1999) and (collembola, ground beetles, ants and fly maggots) also sampled are known to be involved in compost making (Muller – Samann and Kotschi, 1994 and Saba, 1995) help to improve soil fertility through their habits and actions.

## CONCLUSION

The results from this study showed that insects of both economic and medical/veterinary importance to man are incriminated on decaying banana and plantain pseudo stems. It was also found that site of crop plot has no obvious impact on the abundance of insect invaders of banana/plantain pseudo stem but its nearness to living homes can implicate the health of man and his domestic animals.

That Coleopteran and Dipteran orders were more prevalent insect invaders of banana and plantain pseudo stems may be attributed to the regular wetness of the decaying pseudo stems that synchronize their life cycles.

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