IMPACT OF CULTURAL PRACTICE ON THE CONTROL OF *Cosmopolites sordidus* IN BANANA AND PLANTAIN COMMUNITIES IN ORE, ODIGBO LOCAL GOVERNMENT AREA, ONDO STATE, NIGERIA.

NWOSU, L. C.

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Abstract

In a study of the assessment of the banana weevil, Cosmopolites sordidus in an environment that sustains high production of banana and plantain in Ondo State, Nigeria, low levels of C. sordidus population and infestation were discovered. Population surveys of the weevil were conducted in randomly selected crop plots near living homes (< 500m) 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 number of 23 C. sordidus (Coleoptera: Curculionidae) were collected from 50 sampled plots that showed 10% infestation. Number of near – living home infested plots 2 (4%) did not significantly differ (P>0.05) from number of far-from living home 3 (6%) infested plots. The result of this study also showed that the number of the pest found in banana and plantain crops in plots near living homes 11 (47.83%) did not significantly differ (P> 0.05) from those in plots far from living homes 12 (52.17%). This suggests that site of crop plot has no obvious impact on the prevalence of *C. sordidus* in banana and plantain communities. In this study, the relationship between backyard / kitchen waste and the population of *C. sordidus* needs further investigation while the low population and infestation levels recorded strongly indicate cultural practice effect.

Key words: Banana weevil, high production, population, living homes, trapping systems.

Introduction

Banana and plantain (*Musa spp*) are important food and cash crops (FAO, 1995; Nkendah and Akyeampong, 2003; Nwosu and Lawal, 2010) with outstanding and proven medical and industrial relevance (Rahman, 1964; Paul and Southgate, 1978; Ogazi, 1996; 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 and Nwosu and Lawal, 2010) and therefore any short fall in their availability will adversely affect the health of man and impinge on his economy.

PANS (1977), Kerrmarrec *et al*, (1993) and Mclntye *et al*, (2001) recorded that numerous insect pests attack banana and plantain crops while Gowen (1995) and Gold and Messiaen (2000) stressed that among the concerned insect pests, *Cosmopolites sordidus* (the banana weevil) is the principal pest of banana and plantain crops, affecting seriously the pseudo stem and rhizome.

Even though *C. sordidus* is a native of the Indo-Malaysian region (Cuille, 1950) but incidentally, it is found in most banana growing regions of the world (Simmonds, 1966) and Odigbo Local Government Area, Ondo, Nigeria may not be an exception. In fact, it has been reportedly said that the pest adversely infests banana and plantain crops in the tropics (Oritz *et al*, 1995) to which Ondo is part and therefore, it has been recognized as a threat to the production of these crops since the commencement of commercial production.

The various control measures applied against the pest (chemical, physical, biological) apparently have not yielded a sustainable result.

Department Of Science Laboratory Technology, Federal Polytechnic Ede, Osun State, P.M.B 231, Ede, Osun State, Nigeria.
E-mail: Luke2007ambition@yahoo.com

For instance, in a recently concluded study in another region of Nigeria, Nwosu and Lawal (2010) recorded high prevalence of *C. sordidus*.

Odigbo Local Government Area of Ondo State, Nigeria sustains large production of banana and plantain, and given the cosmopolitan distribution *C.sordidus* in the crop-growing regions, there is need for an investigation. Therefore, this study sought to document the prevalence of *C. sordidus* (an important pest of banana and plantain) in a banana and plantain doing – well environment with a view to projecting their actual level of economic importance in the area and providing new insight on the biology of this species. In addition, the relationship between site of crop plot and banana/plantain pests with regards to either receiving or not receiving treatment from living homes (Nwosu and Lawal, 2010) deserves further investigation. Moreover, identification and documentation of insect pests in any ecosystem aids in designing an appropriate control measure for those that exert a negative influence especially on man (Molta *et al*, 1999).

Materials and Methods

The Study Area

This study was carried out in selected plots in Ore, Odigbo Local Government Area, Ondo State, Nigeria known to sustain large production of banana and plantain crops. Ore with an area of 1,818km^2 and a population of 230,351 (NPC, 2006) is the headquarters of Odigbo L. G. A. It lies between latitudes 06^{0}17'57′N and 06^{0}43'21′ N and longitudes 04^{0}49'47"E and 05^{0}10'26"E of the equator. Although this area has mixed population of diverse occupation, the 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 Ore for this study using the method of Nwosu and Lawal (2010) as follows:

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

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

Sampling Method

Pest sampling was done using the method of Nwosu and Lawal (2010) but with an increase in sample size. A total of 25 crop plots near (100 randomly selected) living homes were also randomly selected for the study and another set of 25 crop plots far from the living homes were randomly selected for the study. An average of 5 banana/plantain pseudo stems in every selected plot were sampled for *Cosmopolites sordidus.* 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 of insects collected were cultured to adulthood to ensure error-free identification of the target pest. All identifications were done using morphological or taxonomic features. Crop plots and specimens from the 2 categories of sites received equal attention.

Field Collection of the Insect pest

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 2 stumps as traps to attract the pest from the deteriorating pseudo stem. Each set-up was left for 4 days before being examined. The trap pieces of pseudo stems were lifted to confirm invasion. Observed insects species were noted and the pieces were then put back.

Isolation, collection and counting of encountered *Cosmopolites sordidus* were not done at this stage because they were later removed at the end of each month in the periods of study and taken to the laboratory where they were subjected to detailed dissection and thorough examination. The 3 remaining randomly selected stumps (in each of the plots being sampled) were then dissected in the field to select the insect species for adequate laboratory examination and identification. All collected *C. sordidus* and other insects alike 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 (with mesh size of 1.2mm x 1.2mm) were tied over the open ends of decaying stumps using strains and ropes. The netted enclosures were checked once every 4 days to ensure they are in place.

Laboratory collection of *Cosmopolites sordidus*

1. **Dissection of cut decaying pseudo stems:** Decaying stumps used as traps had their pseudo stems cut into convenient pieces, each about 0.3m 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 realized 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 plastic 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 to identify *C. sordidus.*

Identification of *Cosmopolites sordidus*

C. sordidus was sorted and identified from sampled insect species (fresh, killed or mounted) using taxonomic features.

Statistical Analysis

The population and infestation levels of *C. sordidus* sampled from banana/plantain plots near homes and crop plots far from living homes were compared using the test of variance, Z –statistic (Wadley, 1967).

Result and Discussion

A total number of 23 *Cosmopolites sordidus* (the banana weevil) belonging to the insect order Coleoptera and family Curculionidae were collected from 50 sampled plots in Ore, Odigbo Local Government Area of Ondo State, Nigeria. Five out of 50 sampled crop plots (10.0%) had *C sordidus* infestation (Table 1). This observation was corroborated by Swain (1948), Borro *et al*., (1976), Gowen (1995), Fraus (1999), Gold and Messiaen (2000), Claudia and Lawrence (2007) and Nwosu and Lawal (2010) that implicated *C sordidus* as a pest of banana and plantain crops but disagrees with the findings of Cendano (1922), Gowen (1995), Oritz *et al*., (1995) and Nwosu and Lawal (2010) that documented high population levels of *C sordidus* in banana and plantain communities. Indeed, the analysis of the result showed low level of economic importance of the pest in the area. The inference from the analysis here is supported by literature (De Graaf and Govender, 2008). That sampled *C. sordidus* population and infestation levels were relatively low compared with high populations recorded by the author and other researchers in other parts of the world can reasonably be attributed to cultural practice effect. For further commercial purposes, the rural farmers in Odigbo have taken to the practice of thoroughly removing the drying/decaying banana and plantain mats and significant portions of their drying/decaying pseudo stems (whose decay would give *C sordidus* shade, shelter, nutrients and high chances of reproduction and invariably cause more damage), oblivious of the relationship between this practice and the population of the concerned weevil. That decaying/decayed plantain/banana mats and pseudostems give harborage, nutrients and high reproductive chances to *C. sordidus* and generally sustains high pest populations has been recorded (Swain, 1948; Borror 1976 ; Nwosu and Lawal, 2010). It is now obvious why De Graaf and Govender (2008) indicated high potential of cultural practice as a control measure against *C. sordidus* in South Africa.

On comparison, the result further showed that both population and infestation data of the pest obtained from banana/plantain plots near living homes [11 (47.83%) and 2 (4.0%)] did not significantly differ ($P>0.05$) from those obtained from plots far from living homes [12 (52.17%) and 3 (6.0%)] respectively (Table 1). That no significant difference occurred in the distribution of *C. sordidus* between plots near living homes and far from homes agrees with the findings of Nwosu and Lawal (2010) and suggested that this species is polyphagous and can therefore adapt to a wide range of habitats. The polyphagous habit of *C. sordidus* is supported by Imms (1964), Gold *et al*. (2004) and Nwosu and Lawal (2010).

However, the difference (though not statistically significant) in the number of the weevil in plots near living homes and those far from living home may be an index of disturbance in terms of cultivation and associated cultural practices, since it is known that farms/plots near living homes are subject to repeated cultivation (Okigbo and Lal, 1979) but receives more frequently, treatments (backyard/kitchen wastes) from nearby homes. The same literature reported relationship between repeated cultivation and gradual loss of fauna to which *C. sordidus* is part.

Table1. Population and Infestation Data of the Banana Weevil, *Cosmopolites sordidus* in Ore, Odigbo Local Government Area, Ondo State, Nigeria during 2010/2011.

Location of plots	No. of plots studied	No. of plots infested	% of plots infested	No. of crops sampled	Population of *C. sordidus* recorded	% population represented
Near living home	25	2	4	125	11	47.83
Far from living home	25	3	6	125	12	52.17
Total	50	5	10	250	23	100

Conclusion

The results from this study showed that *Cosmopolites sordidus* occurred among banana/plantain communities in Ore, Odigbo Local Government Area, Ondo State, Nigeria but with very low population and infestation rates in an environment that sustains high production of banana and plantain. This was a significant observation.

It was also found that although domestic wastes may have potentials for cultural control of the pest but site of crop plot has no obvious impact on the abundance of *C. sordidus* in banana and plantain crops. This work has provided more impetus for the study of banana weevil, *C. sordidus.*

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REFERENCES

Borror, D.J. Delong, D.M and Triplehorn, C.A . (1976), An Introduction to the study of insects (4th edition), Hoit, Reinchart and Winston, New York, 852pp.

Cendano, S. (1992), The banana weevil. *Philipp Agrio,* 10,367-377.

Cuille, J. (1950). Recherches surle charancon du bananier. *Inst Fr Agric Col. Ser. Tech* 4:225.

Claudia, D. and Lawrence, A.I. (2007), Microbial control of arthropod pest of tropical tree fruits. *Neotrop. Entomol.,* 36(2), 79-88.

De Graaf, J. and Govender, A.S. (2008), Efficacy of cultural control measures against the banana weevil *Cosmopolites sordidus* (German) in South Africa. *Journal of applied Entomology,* 132(1), 36-44.

FAO (1995), Food and agriculture Organization, Year book, 1994 Rome, Italy.

Faturoti, B.O,Madukwe, M.C., Tenkouano, A. and Agwu A.E. (2007), A review of policy acts and initiative in plantain and banana innovation system in Nigeria. *African Journal of biotechnology* 6(20), 2297-2302.

Frauz, J. (1999), Use of soil dwelling Diptera (Insecta, Diptera) as bio indicators: a review of ecological requirements and response to disturbance. *Agriculture Ecosystems and Environment,* 74,167-816.

Gold, C.S. and Messiaen, S. (2000), The banana weevil, *Cosmopolites sordidus* 1 NIbap.

Gold , C.S., Night, G., Ragama, P.E., Kagezi, G.H and Tinzaara, W. (2004), Field distribution of banana weevil adults in cooking banana stands in Uganda. *Insects Science and its Application.* 24, 242-248.

Gowen, S. (ed) (1995), Bananas and Plantain. Chapman and Hall, London 611pp.s

Imms. A.D. (1964), *Outlines of Entomology*: Revised by Richard, O.W and Davies, R.G. Methuen and Co. Ltd. London.

Kerrmarrec, A., Sirjusingh C., Manleon, H. and Sarah. J.L. (1993), Biological control of weevils and whitegrubs on banana in the Caribbean: A review in Gold, O.S and Gemmill, B. (eds). *Biological and Integrated Control Highland Banana and Plantain Pests and Diseases*, Proceedings of a Research Co-ordination Meeting, Cotonou, Benin 12 – 14 NOV. 1991 IITA Davis California.

Mclntyre. B.C. Gold, I., Kashaija, H., Ssali N.E. and Bwamiki, D. (2001), Effects of legume intercrops on soil born pests, biomass, nutrients and soil water in banana. *Bio Fertile. Soils,* 34(5), 342-348.

Molta, N.B.,Bdliya ,H.H., Akinsola, O.A. and Buahin, G.K.A. (1999), Insects of Medical and veterinary importance at the Hadejia- Nguru wetland of Nigeria. *Nigerian Journal of Entomology,* 16,1-13.

Nkendah, R. and Akyeampong, E. (2003), Socio economic data on the plantain Commodity chain in West and Central Africa,*InfoMusa,* 12(1), 8-13.

Nwosu, L.C. and Lawal, I.A. (2010), Assessment of insect invaders of decaying banana and plantain (*Musa spp.)* psendo stems in Umuagwo, Ohaji – Egbema Local Government Area, Imo State, Nigeria. *Agro-Science Journal of Tropical Agriculture, Food, Environment and Extension,* 9(2), 84 – 89.

Okigbo, B.N and Lal, R. (1979), Soil fertility maintenance and conservation for improved agro forestry systems in the low land humid tropics. In Mongi, H.O and Huxley. P.A (Editors), *Soil Research in Agroforestry* Proc. of the ICRAF Soils Working Group 26-31 March 1979, Nairobi, Kenya pp 11-47.

Ogazi, O.P (1996), *Plantain Production ,Processing and Utilization*. Pamon and Association Ltd Okigwe, Imo State,Nigeria.

Oritz, H., Vuylsteke, D. Dumpe, B. and Ferris,. R.S.B. (1995), Banana weevil resistance and corn hardness in *Musa* germplasm *Enplytica* 86:95 – 102.

PANS (1997). *Pest Control in Bananas.* PANS Manual No. 1 Center for Overseas Pest Research, London.

Paul, A. A. and Southgate, D.A.T. (1978), *The Composition of Foods* 4ed Mc Cancance and Windowson/HMSO. London.

Rahman, A.K. (1964), The development of plantain flakes, *J. agric Puerto Rico,* 48(3), 212.

Raven, P.H and Johnson, G.B. (1996*), Biology.* Mc. Graw Hill Comp.

Simmonds, N.W. (1966), *Bananas,* 2nd edn Longman, London.

Swain, R.B. (1948), *The insect Guide.* Donbic dey New York 187pp.

Wadley, F.M. (1967), *Experimental Statistics in Entomology.* Washington D.C. Graduate School Press 133pp.