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CASSAVA MEALYBUG'S INCIDENCE, SPECIES, STATUS AND ALTERNATIVE HOST PLANTS IN ETHIOPE EAST AND OSHIMILI SOUTH AGRO-ECOLOGICAL ZONES, DELTA STATE

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ABSTRACT
Mealy bugs are major insect pests of cassava, *Manihot esculenta* Crantz. The pests decrease cassava growth and significantly affect stem and root yields. Incidence, species, infestation status of the pest and alternative host plants in Ethiope East and Oshimili South Agro-ecological zones, Delta State, were observed and determined by a survey in 2013 at both locations. Major cassava farms were visited and observed for the pest and the level of infestation was visually rated/scored, on a scale of 0 to 5 points. The results showed that cassava in Ethiope East (sweet cassava) agro-ecological zone has been attacked and infestation status is high - 2.49. In Oshimili South, the pest was also observed; however, infestation level was low (0.67) compared to Ethiope East. The species of mealybugs currently attacking cassava in the two (2) cassava producing zones are *Phenacoccus manihoti* Mat Far (Homoptera: pseudococcidae) and *P. madeiresis* Green. Nine plants (alternative host plants) were found attacked by *P. manihoti* in Oshimili South area. The survey is a wakeup call on cassava farmers in these areas, particularly in Ethiope East zone, of the need to embark on control measures and second, on farmers in neighbouring cassava growing zones of Delta State, of their possible spread.

KEYWORDS: Cassava, mealybugs, infestation, alternative host plants, Ethiope East, Oshimili South, survey.

INTRODUCTION

Major insect pests of cassava, *Manihot esculentus* Crantz are homopterans, the cassava mealybug species, not new to Nigeria. They attack cassava throughout the year (IITA, 1982), but more during the dry season and the effect on the crop can be severe and devastating. Toxic substances are injected into tissues of young cassava plants (Egho, 1984), the effect reduces the internodes and renders the plants stunted and bunchy. At the peak population, cassava leaves wear dry look and the plant progressively withers and bears "candle stick" appearance due to the adult insect mass population, egg bags (ovi-sacs) and nymphs. Cassava farms at this stage look like "burnt farms" (Egho, 1984). Ultimately, the farmer loses the crop if there is prolonged dry season. An estimated yield loss of infested plants (due to mealybugs and spider mites) of 100 percent of leaves and 60 percent of roots has been reported (Herren, 1981; Obiazi & Ojobor, 2013).The importance of cassava to man and livestock cannot be over emphasized. In Nigeria, cassava is a stable food crop to majority of people in the West and East. It is cheap source of calories, consumed in various forms such as garri, starch, tapioca and fufu (akpu). It is also eaten as bread and biscuits. The crop has uses in industries such as starch and both men and women in many African countries rely on it as cash crop (Nweke and Haggblade, 2009). It has also been reported that the leaves are rich in B-carotene and iron (Yang & Keding, 2009; Maundu *et al*., 2009). With three million tons per year, Nigeria became the largest producer of cassava globally in the early 2000s (Nweke, 2009). In 1979, cassava mealybug was accidentally introduced into Nigeria through infested planting materials and the insect has been attacking and reducing stem and root yields (Emehute & Egwuatu, 1990). A survey conducted (Akinlosotu and Leuschner, 1981) showed that cassava in all the cassava producing states (except defunct Bendel state) were severely infested. Efforts (control measures) made have not completely eliminated the pest problem as the pest is still thriving in eastern and Delta States of Nigeria (Personal observations). Besides cassava, many other plants (alternative host plants) such as weeds (Arif *et al*., 2009; Abbas *et al*., 2010), ornamental plants (Saini *et al*., 2009), cash crops *e.g*. cotton (Zain-Ul-Abdin *et al*., 2012) and vegetables such as okra, pawpaw and tomato have been reported attacked. What is the current status of mealy bugs as pests of cassava three decades after a general survey?

The present study is a report of up-to-date information on the incidence, infestation status of mealybug species and alternative host plants in Ethiope East and Oshimili South Agro-ecological zones (cassava growing zones) of Delta State, Nigeria.

MATERIALS & METHODS

The survey was conducted in Ethiope East on the 18th and 20th February 2013. Ethiope East Local Government Area (LGA, Fig.1) is made up of about thirty towns. The LGA is 389.56 sq. km. in size. It is bordered by Okpe LGA in the West, Ukwuani LGA (in the east), Edo State (in the North) and Ughelli North LGA (in the South). The area lies within the tropics along latitude $5^{o}\ 14^{I} - 5^{o} - 51^{I}$ and longitude $5^{o}\ 32^{I} - 5^{o}\ 46^{I}$; and experiences dry and rainy seasons. Oshimili South on the other hand is small in size consisting of Asaba, Oko, Okwe, Anwai, Iyiabi and Mike 5 towns/villages.

The survey was carried out following the method of Akinlosotu and Leuschner (1981). In Ethiope East, twenty one (21) different towns/villages along major roads were visited and in each, three different cassava farms (a, b and c) about 1 kilometre apart were visited and cassava with red petioles (sweet cassava) were observed for mealybug infestation. Altogether, 63 farms were visited. In Oshimili South, the same method was followed in the survey. Five (5) out of the six (6) towns were visited; fifteen farms were covered. The infestation level in farms at both locations was visually rated/scored on a scale of 0 to 5 points based on population of adult insects, eggbags (ovi sacs) and nymphs on cassava plants (Akinlosotu and Leuschner, 1981). The cassava attacked/infested were categorised into severe, fairly high, moderate and no infestation by mealybugs. Cassava mealybug species were collected from the farms and identified based on the identification of mealybug species by the Commonwealth Institute of Entomology, London (Egho, 1984). Other plants beside cassava that were attacked by mealybug species at both locations were observed and collected for identification.

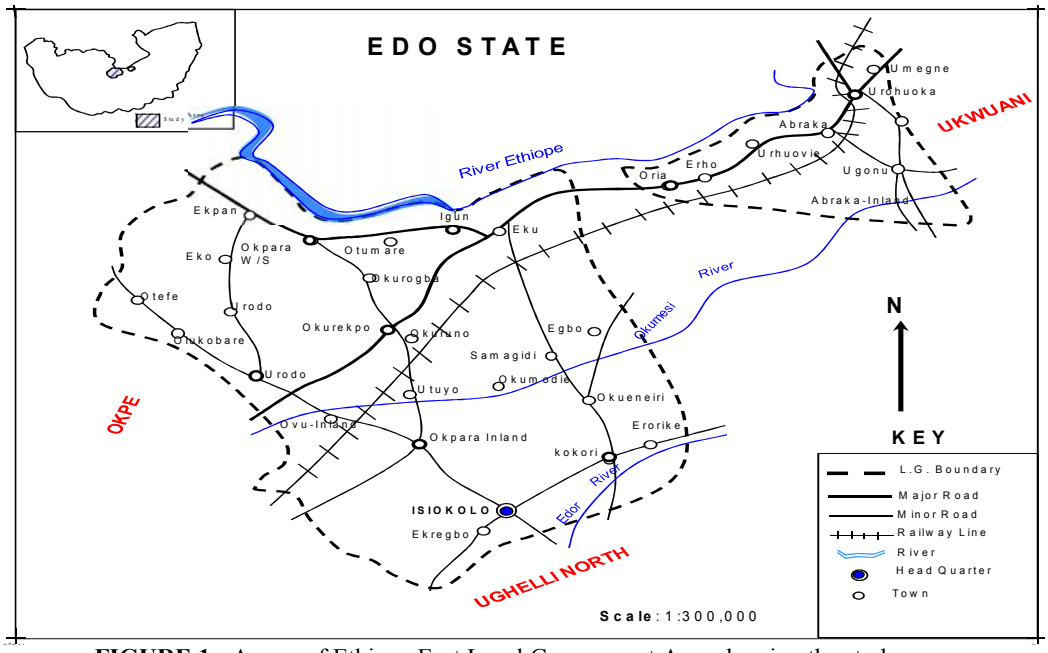

FIGURE 1: A map of Ethiope East Local Government Area showing the study area
Source: Ministry of Lands, Survey & Urban Development, Asaba (2004).

RESULTS

TABLE 1: Cassava mealybug infestation status in Ethiope East Area, Delta State.

Town/Village	Farm Location and Score	Total Score	Mean Score
Abraka	Loc.a(3), Loc.b (4), Loc.c(3)	10	3.33
Ajanomi	Loc.a(2), Loc.b (2), Loc.c(2)	6	2.00
Desert	Loc.a(0), Loc.b (0), Loc.c(0)	0	0.00
Egbon	Loc.a(2), Loc.b (3), Loc.c(3)	8	2.67
Ekpan	Loc.a(3), Loc.b (4), Loc.c(2)	9	3.00
Eku	Loc.a(4), Loc.b (3), Loc.c(3)	10	3.33
Erho	Loc.a(3), Loc.b (4), Loc.c(4)	11	3.67
Igun	Loc.a(4), Loc.b (0), Loc.c(0)	4	1.00
Ishiokolo	Loc.a(4), Loc.b (2), Loc.c(3)	9	3.00
Kokori	Loc.a(2), Loc.b (3), Loc.c(4)	9	3.00
Okpara inland	Loc.a(4), Loc.b (4), Loc.c(3)	11	3.67
Okpara w/side	Loc.a(3), Loc.b (3), Loc.c(1)	7	2.33
Okurekpo	Loc.a(2), Loc.b (1), Loc.c(0)	3	1.00
Orhorka	Loc.a(2), Loc.b (1), Loc.c(3)	6	2.00
Ovia	Loc.a(3), Loc.b (3), Loc.c(3)	9	3.00
Oviorie	Loc.a(2), Loc.b (3), Loc.c(2)	7	2.33
Ovun	Loc.a(3), Loc.b (4), Loc.c(4)	11	3.67
Reserve	Loc.a(1), Loc.b (0), Loc.c(0)	1	0.33
Ufoma	Loc.a(3), Loc.b (4), Loc.c(3)	10	3.33
Urhodo	Loc.a(4), Loc.b (2), Loc.c(1)	7	2.33
Urhuovie	Loc.a(4), Loc.b (3), Loc.c(2)	9	3.00
Total		157	51.99

TABLE 2: Cassava mealybug infestation status in Oshimili South Area, Delta State.

Town/Village	Farm Location and Score	Total Score	Mean Score
Asaba metropolis	Loc.a(2), Loc.b (0), Loc.c(0)	2	0.67
Iyiabi	Loc.a(0), Loc.b (2), Loc.c(1)	3	1.00
Anwai	Loc.a(0), Loc.b (0), Loc.c(0)	0	0.00
Mike 5	Loc.a(0), Loc.b (0), Loc.c(0)	0	0.00
Okwe	Loc.a(3), Loc.b (2), Loc.c(0)	5	1.67
Total		10	3.34

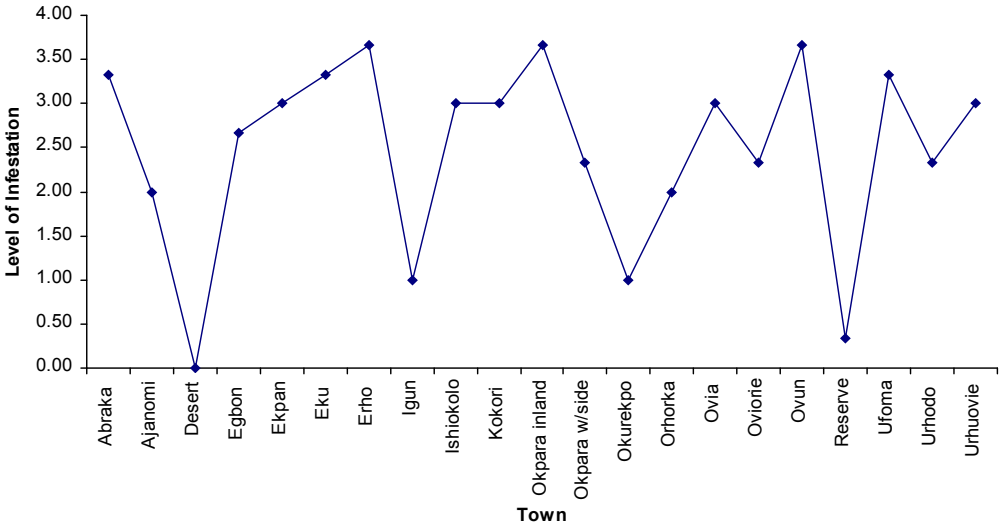

FIGURE 2: Graphical presentation of Mealybug infestation in Ethiope East LGA

Table 1, gives the result of the survey while Fig. 2 shows the graphical presentation of the sixty-three (63) farms visited. Fifty-five (55) farms were infested with mealybugs. These farms showed varying degrees of infestation level as follows:

Localities severely infested had a score of 3.67 each. They were Erho, Okpara inland and Ovu. Localities with fairly high infestation were: Abraka (3.33), Eku (3.33), Ufoma (3.33), Ekpan (3.00), Isiokolo (3.00), Kokori (3.00) and Urhuovie (3.00) Localities with moderate infestation were Ajanomi (2.00), Orhoka (2.00), Okpara Water Side (2.33), Oviorie (2.33), Urhodo (2.33) and Egbon (2.67). Localities with low infestation were: Igun (1.00), Okurekpo (1.00) and Reserve (0.33). Localities void of infestation included Desert (0). Of the fifteen (15) cassava farms visited in Oshimili South Area, five (5) were infested and at low level (Table 2)

Mealybug Species

Phenacoccus manihoti Mat Far. and *P. madeiresis* were the two mealybug species encountered during the survey. *P. manihoti* (Plate 1) occurred more frequently than *P. mandairensis*.

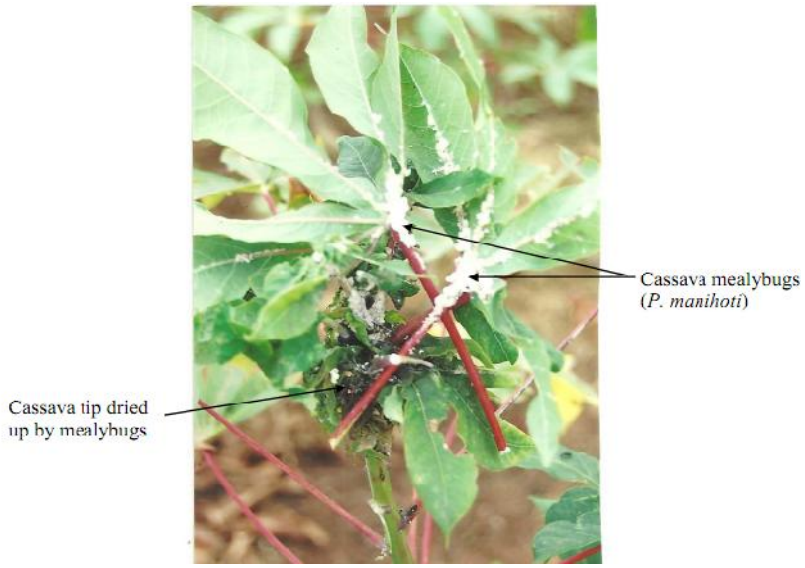

PLATE 1: Cassava twig infested with mealybugs.
(Ovi-sacs, nymphs and adults) obtained from Ethiope East Area.

Alternative/secondary host plants

Nine (9) host plants were observed in Oshimili South cassava producing area (Table 3). Some alternative host plants infested by mealy bugs are indicated in plate's 2A-2E.

TABLE 3: Alternative Host Plants in Oshimili South Agro-ecological Zone.

Name of Plant	Parts Attacked
Pawpaw (*Carica papaya* L*)*	Stem, petiole, leaf blade and fruits
Tomato (*Lyperscion esculentum*)	Stem, leaf blade and flowers
Groundnuts (*Arachis hypodea* L)	Stem and leaves
Okra (*Hibiscus esculentus*)	Stems and leaves
Eupatorium odoratum	Stems and leaves
Yam (*Dioscera sp.*)	Body surface and vine
Pineapple (*Anana comosus* L (Merr)	Fruit base
Tree cassava	Tender stems and leaves
Awolowo weed *(Chromolaena odorata)*	Stems and leaves

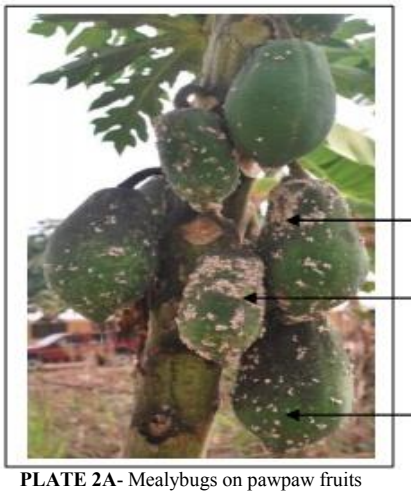

PLATE 2A- Mealybugs on pawpaw fruits
(Arrows indicate insects)

PLATE 2B- Mealybugs on tomatoes
(Arrows indicate insects)

PLATE 2C- Mealybugs on groundnuts
(Arrows indicate insects)

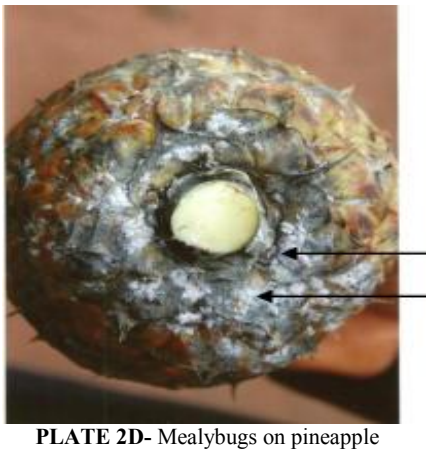

PLATE 2D- Mealybugs on pineapple
(Arrows indicate insects)

PLATE 2E- Mealybugs on yam tuber
(Arrows indicate insects)

DISCUSSION

The incidence of cassava mealy bugs has been reported from many African countries such as Malawi (Neuenschwander, 2008) and Sierra Leone (James, 2008). In Nigeria, it was first reported by Akinlosotu and Leuschner (1981). All cassava producing states in the country (except defunct Bendel State) were highly infested. Cassava production was threatened and farmers had to seek control measures as root yields were poor. Three decades after the survey in Nigeria, what is thepresent status of the pests? The results of the Ethiope East revealed that the insect is well established on cassava with mean infestation level of 2.49 and widespread. It is possible, too, that the insects have crossed borders to neighboring LGAs (areas for follow-up survey). Cassava mealy bugs spread rapidly by wind current and planting infested cultivars (Egho, 1984). The widespread

infestation in Ethiope East Area is probably due to these factors. The local variety of cassava grown in this area is sweet cassava (with red petioles). The sugary taste derived from the plant could have encouraged the insect to establish readily. The survey suggests that farmers could cultivate the green petioled cassava (bitter cassava) or improved varieties such as TMS30572, TMS91934, TMS81/01635, TMS50395, TMS82/00661, TMS82/00058, TMS81/0010, TMS90059, TMS82/00942, TMS4(2)1425, TMS30555, TMS82/00959, etc reported to be tolerant/reduce pest damage to cassava (Enujeke *et al*., 2013; CIAT, 1993). Similarly, Obiazi and Ojobor (2013) reported 60444 and 53101 as cassava varieties developed by the National Root and Tuber Crop Research Institute, Umudike. These varieties mature early and are high yielding, up to 50 tons per hectare (Komolafe *et al*., 1979). Some also suppress weed (Nweke, 2009) and resistant to mealybugs and green spider mites. The study suggests enlightenment campaigns by Agricultural Extension Officers to create awareness in Ethiope East Area where the incidence is pronounce, of existing improved cassava varieties and their qualities in terms of pest management, early maturing and high yielding. Nevertheless, the present status of mealybug infestation in Ethiope East zone requires urgent control to improve cassava yield and prevent its spread so that it does not assume a national problem as it was between 1979 and 1984. At Oshimili South Area, the infestation level was relatively low. However, this should be monitored. Of alternative/secondary host plants of mealy bugs, Egho (1984) documented twenty (20) plants including weeds, ornamental plants and vegetable crops. Many of the plants observed in the survey in Oshimili South cassava producing area have been reported elsewhere by earlier researchers (Arif *et al.,* 2009; Abbas *et al.,* 2010; Saini *et al.,* 2009; Zain-Ul-Abdin *et al.,* 2012). Recently, however, pawpaw (*Papaya papaya*) added to the list of mealybug host plants in Nigeria, with severe infestation on the leaves of young pawpaw and fruits of older plants.

CONCLUSION

The survey indicated that:

(i) Cassava mealybugs are resident in Ethiope East and Oshimili South cassava producing areas of Delta State; the sweet cassava variety is highly susceptible to the pest in Ethiope East Area.
(ii) Infestation status is 2.49 on a scale of 0-5 points.
(iii) *P. manihoti* and *P. madeiresis* are the mealybug species in Ethiope East while *P. manihoti* occurred in Oshimili South.
(iv) There is need to institute control and prevent the widespread of the insect in Ethiope East to neighbouring areas of Delta State.

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