STUDIES ON THE OCCURRENCE AND DAMAGE BY YAM TUBER BEETLES (HETEROLIGUS SPP) IN ANIOCHA AND OSHIMILI AREAS OF DELTA STATE, NIGERIA

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ABSTRACT

A two-year (2001 and 2002) studies to evaluate the occurrence, population distribution and damage by yam beetles: Heteroligus spp was undertaken in four Local Government Areas in Delta State, Nigeria namely: Oshimili South and North, Aniocha South and North. Beetle population were sampled from farmers fields using light traps in selected locations in the Council areas. Sampling period was April to December for both years. Data collected were number of beetles caught per month, damage indices such as number and size of beetle feeding holes, percentage tuber attacked and tuber yield. Beetle occurrence began in May and were encountered till November. Peak population of beetle occurred in August across the location for the two-year trials. Beetle species comprised of H. meles Billb and H. appiusBurm with the former, the most abundant species regarding the number caught across the locations. Oshimili North and South had higher beetle feeding holes significant at ($P < 0.05$) than Aniocha South and North for both years and across the locations. No significant difference in size of feeding hole but in terms of percentage tuber attacked, Oshimili South showed higher attack significantly different than Aniocha North both in 2001 and 2002 but not significantly higher than attacked in Oshimili North and Aniocha South in 2001. However, there were no significant difference in the yield of tuber across the locations and for the two-year period. Yam beetle is still a serious insect pest of yam and the two species responsible for tuber damages are H. meles Billb and H. appius Burm in these areas.

Key words: Damage indices, location, occurrence, population, yam beetle.

INTRODUCTION

Yam belongs to the genus Dioscorea. It is a major stable food for an estimated 60 million people in the region stretching from Ivory Coast to Cameroon, an area commonly referred to as "Yam zone" of West Africa [2] The crop is widely cultivated in other parts of the world like Asia, South America, South Pacific etc. with world production exceeding 30 million metric tonnes per annum [1].

One major constraints to yam production is the damage inflicted on yams by the yam tuber beetles Heteroligus spp. [6, 4]. Species of Heteroligus reportly found in the southern parts of Nigeria include: Greater yam tuber beetle, H. meles and lesser yam beetles, H. appius [6]. Heteroligus meles is a very serious insect pest of yam in riverine areas particularly in the forest zones, up to the Savana regions along the Benue - Niger rivers and tributaries [3]. Adult H. meles is about 23 – 33mm in length while H. appius is about 21 – 23mm long. Both are brown to black, short distance fliers and usually oviposit in moist and damp sites [6].

The interference of these beetles are known to cause untold losses and drastic reduction in the yield of yams and market values. Adult beetles feed on tubers making large hemi-semi hemispherical holes 1 – 2cm on the tuber prior to harvest resulting in low market value and a predisposition to fungal and bacertia attacks during storage. Death could occur in extreme cases resulting from feeding by adult beetle. [6, 3].

Yam setts are attacked by the beetles shortly after planting and feeding continues for 4 – 5 months. This is followed by a quiescent period around August – September while other serious attack may occur when the crop is matured prior to beetle breeding migration in November – December [6].

Since the ban on the use of organochlorine insecticides such as aldrin dust, dieldrine
and related insecticides due to their persistency and residual effect in the environment, the control of yam beetle has been of great concern to yam producing farmers.

In an effort to keep the status quo of yam production in these endemic beetle infested areas of Delta North, these studies were carried out to re-assess the occurrence distribution and beetle damage in farmers' fields as earlier reported many decades ago.

MATERIALS AND METHODS

A two-year studies of the incidence and population distribution of yam tuber beetle (Heteroligus spp.) in Aniocha and Oshimili areas of Delta State was conducted from April 2001 to December 2002. The study areas were located in the moist woodland rain-forest ecosystem with an annual mean solar radiation of 18mg/m^2/day. The annual rainfall averaged 2000mm and the pattern is bimodal. The studies covered the upland yams planted between April to June each year. Yam tuber varieties and sett size planted were white yams (Dioscorea rotundata poir) cv Adaka, Ekpe, obioturugo and 200 – 300g sett size respectively. None of the farmer applied fertilizer rather they practiced shifting cultivation system of agriculture with appreciable level of nutrients in the soil. Staking was about 3 – 4 meter tall made of bamboo in a pyramidal form. The study was conducted in four local government area namely: Oshimili South and North: Aniocha South and North. Eight (8) farmers fields with about 300 yam stands were selected from each local government council, where observations and monitoring of the insect occurrence and population distribution was made with the cooperation of the contact field farmers on a daily basis.

SAMPLING METHODS

Sampling consisting of 32 rechargeable white fluorescent lamps (Suncan model) 60cm long and 32 kerosene powered Hurricane Lantern (Butterfly model) were set up. These were each suspended 15cm above plastic basins holding 50ml of Tricel (Chlorphyriphos) in 20 litres of water to kill and prevent beetles attracted and trapped to the light sources from escaping. A 60cm x 60cm corrugated iron roofing sheet was placed on the traps to prevent the lamps and the insecticide solutions from rain damage. Two traps (flourscent and Hurricane lantern) lamps were each set up per fields on 1st April 2001 and monitored from 7:30p.m. to 12 midnight daily till December 15th. The sampling repeated 2002. Chemical solution was changed twice a month to maintain potency and number of adult beetle caught recorded on daily basis. The exercise was carried out in all the selected fields through the four local government councils. Adult specimens collected from each study areas sent to Department of Crop Protection, ABU, Zaria and Crop Protection and Environmental Biology Unibadan were identified as Heteroligus meles and Heteroligus appius.

DAMAGE ASSESSMENT AND DATA ANALYSIS

Sixty tubers representing 20% of the entire yam stands/field were harvested per field after maturity for the assessment of beetle damage. The damage indices used were: the number and size of feeding holes on the yam tuber % tuber attacked and fresh tuber yields. Data collected were subjected to analysis of variance

and significant means were separated by Fisher's Least Significant Difference Tests [5].

RESULTS AND DISCUSSION

The number of adult yam beetles caught during the 2-year sampling in farmers' field in the four Local Government Areas are presented in. Figures I and II, while the damage indices such as number of feeding holes, size and percentage tuber attacked by the beetles during the same period are indicated in Table I. Species composition of the insect pest is presented in Figure III.

Figure I indicated the total beetle number caught per month from April to December in 2001 while Figure II, showed the monthly population and distribution of the beetles in 2002. The occurrence of beetle started in May while the peak population occurred in August for both years across the locations. Beetle population build-up started in April (Oshimili South 3 and Aniocha North 2 in 2001 while none in 2002. Highest beetle populations were recorded between July and September across the location for the two-year studies Tables I and II. Thereafter, the population of adult beetle caught declined. The finding confirmed the early report by [6] that feeding migration particularly in Heteroligus mele begins around April to June in the rainforest zone of Southern Nigeria. The beetles caught comprised of two species; H. meles and H. appius. Fig. III indicated species composition where H. meles had the highest number of 528 (19.8%), 653 (93.5%), 320 (89.8%) and 231 (88.1%) adult beetle in Oshimili South-North; Aniocha South and North caught respective in 2001 whereas H. appius was as low as 31 in Aniocha North with highest number of 47 adults in Oshimili South. The same trend of population distribution and species composition was obtained in 2002 across the locations.

H. appius occurred more in the Aniochas than in the Oshimilis comparing the percentages in which they occurred, table III. This is indicative of less damage to yam tuber

since they have been reported to cause less feeding holes than H. meles [6]. The same pattern of occurrence, distribution and species composition was obtained in 2002 experiment across the locations. It does appear that

Table I: *Mean feeding hole, feeding size percentage tuber attacked by yam beetle and tuber yield.

Treatment (Location)	Feeding hole	Feeding size	% tuber attacked	tuber yield (t/ha^{-1})
		2001		
Oshimili South	12.87	1.14	45.37	11.8
Oshimili North	15.00	1.12	41.37	12.2
Aniocha South	5.59	1.01	33.37	13.5
Aniocha North	4.12	0.96	31.12	12.7
LSD (P < 0.05)	**5.37**	**0.22**	**12.57**	**NS**
		2002		
Oshimili South	13.25	1.26	51.00	10.3
Oshimili North	11.50	1.09	44.12	12.5
Aniocha South	5.62	1.08	34.62	12.9
Aniocha North	4.50	1.07	32.12	13.1
LSD (P < 0.05)	**4.87**	**0.25**	**10.40**	**NS**

*Means of 60 freshly harvested tuber/plot (20% of sample size).

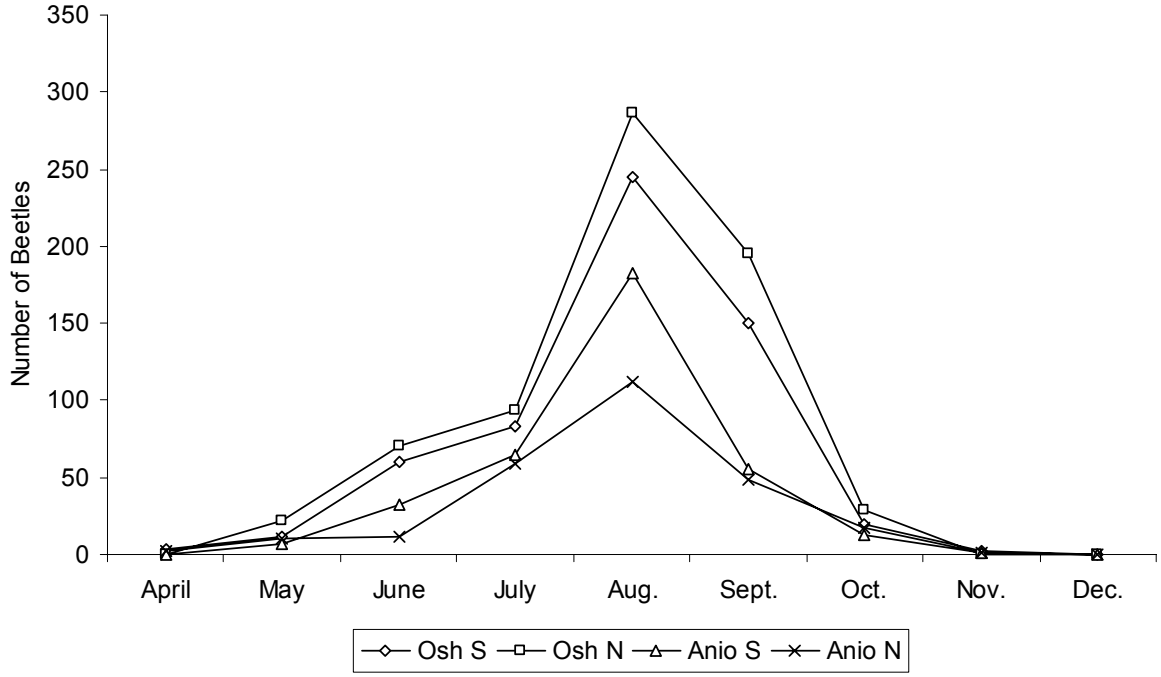

Figure 1: Population Distribution of Beetle in Four Local Govermment Areas in Delta State, 2001

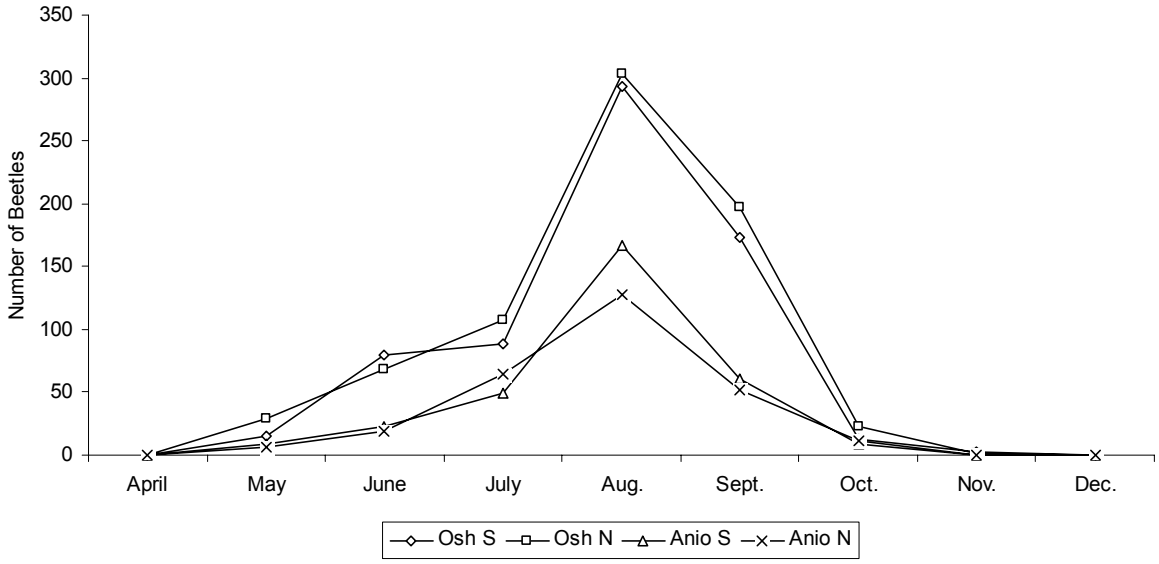

Figure 2: Population Distribution of Beetle in Four Local Govermment Areas in Delta State, 2002

most attacks and injuries inflicted on yam tubers in these areas are caused by H. meles as indicative of the number in which they occur.

For damage indices, Table I, Oshimili South and North had higher beetle feeding holes significant at ($P < 0.05$) than Aniocha South and North both in 2001 and 2002. However, there were no significant differences in the size of feeding hole across the locations for the two – year experiment. In terms of percentage tuber attacked by the beetles, Oshimili South had higher attack, significantly higher than Aniocha North ($P < 0.05$) both in 2001 and 2002 but not significantly higher than attacks in Oshimili North and Aniocha South 2001. There were no significant differences in the tuber yields ($P < 0.05$) across the locations and for two-year trial, (Table I). This may probably be attributable to some edaphic and other uncontrolled factors that affects yield and may not necessarily be as a result of less beetle attack on the

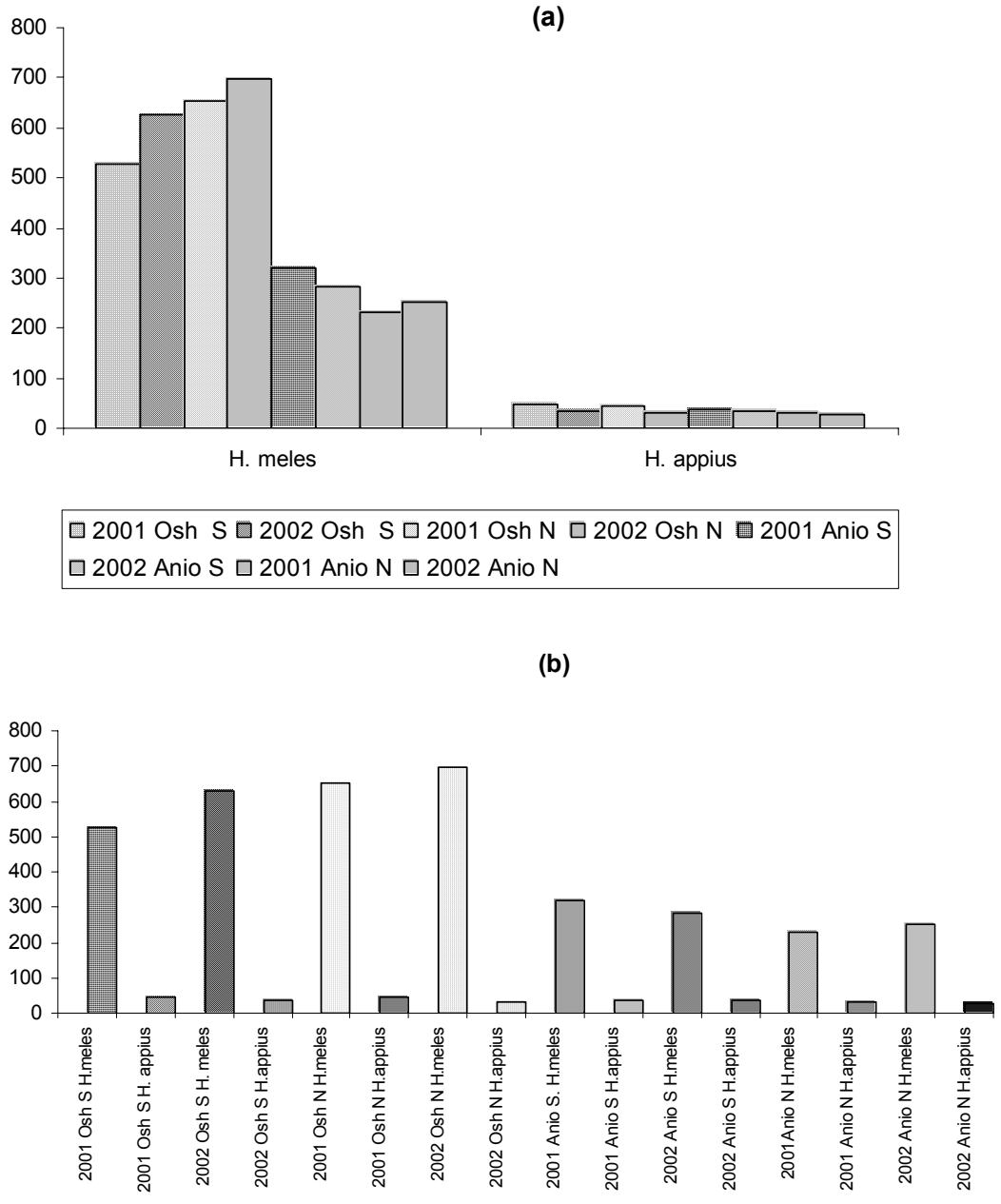

Figure 3: Beetle Population and Species Composition

tubers.

Beetle infestation in the Old Asaba Province which covered the four local government areas where the current study was carried out is usually serious, over 20% attack rate [6]. This corroborated the results obtained from this study which indicated higher rate of beetle attack and infestation ranging from 31% to 45% and 32% to 51% in 2001 and 2002 studies respectively. Yam growers in the Eastern parts of Nigeria were reported to suffer mostly from the infestation and devastation of yam tuber beetle species [6]. Major areas reported included Anam, Aguleri, Ogbaru, Nnewi (Anambra), Ekiadolor, Agenebode (Edo), Asaba, Ugbolu, Illah, Ebu, Aboh, Koko (Delta) among others [6].

It is important to stress that the rates of beetle attack appear to vary from year to year and place to place depending on the prevailing biotic and abiotic factors [7, 6]. However, yam beetle attack rate is usually reported to be serious and heaviest in the areas within and borders of the major yam beetle breeding of sites along river Niger, its creeks and tributaries.

CONCLUSION

The outcome of these studies showed that yam beetle is still a very serious constraint to yam production in these areas where most of the annual expected tubers are being produced. Two species of the beetles are responsible for the yam destruction in these areas. There is therefore urgent need to identify other major beetle infested areas, vegetation and soil type that favour their breeding and hibernation. Control strategies that are environmentally friendly and compatible with sustainable production such as the use of botanicals, planting dates manipulation etc. should be further researched into. Studies on damage scoring for the yam beetle to quantify accurately the degree of attack and infestation as obtained in other crop plants is advocated.

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