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Evaluation of depredation activities of Vertebrate pest species in Cassava cultivation at Sasa-Ajibode, Ibadan, Oyo State, Nigeria

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ABSTRACT

Cassava is the fourth most important food crop in developing countries, after rice, maize, and wheat. African giant rats (*Cricetomys gambianus*), cane rats/grasscutter (*Thryonomys swinderianus*), and birds such as bush fowl (*Francolinus bicalcaratus*), among others, cause considerable damage to cassava crops. The present study was conducted on an existing cassava farm located at Shasha- Ajibode, Akinyele Local Government of Ibadan, Oyo state. Systematic sampling was used to collect quantitative and qualitative damages in the study area. Data were analyzed using Analysis of variance (ANOVA) and means were separated using Least Significant Difference (LSD) at the level of significance of $P \leq 0.05$. The results showed that there were evidences of root damage done in plot 1 (21.67%), plot 2 (14.00%), and plot 3 (20.00%) at 14 Weeks After Planting (WAP). Plot 2 had the highest total stem cut percentage (36.36%) while plot 1 and 2 had the same percentage of total stem cut (31.82%). It was revealed that the position of the plots had no significant effect on the damage level caused by the vertebrate pests on cassava roots and stems. It can be inferred that even though the damage level was not significant, attention should be given to managing those rodent populations and damages so that they do not escalate to causing unbearable economic loss.

Keywords: African giant rat, Cane rat, *Manihot esculenta*, Bush fowl, Vertebrate pest, damage

INTRODUCTION

Vertebrate pests can be found in almost any terrestrial ecosystem that supports life, whether it is wild, agricultural, or urban (Conover, 2002). Many species have small individuals that can proliferate quickly (Buckle and Smith, 2015). In fact, rodent species have high reproductive tendency as they produce several litters per year (Odeyemi and Daramola, 2000). Rodents are omnivores that eat a variety of plant materials such as leaves, roots, whole young plants, fruit, grain, and tree bark (Smith *et al.*, 2002). African giant rats *Cricetomys gambianus*, cane rats/grasscutter *Thryonomys swinderianus*, and birds such as bush fowl (*Francolinus bicalcaratus*), among others, cause considerable damage to cassava crops, lowering overall productivity (Buckle and Smith, 2015). The vertebrate pests generally cause pre- and post-harvest losses to food produce across the world (Happold, 2013).

Cassava is a tropical African staple meal. Cassava is significant not just as a food crop but also as a significant source of revenue for rural families. Cassava is widely consumed in Nigeria because it is processed into a variety of products such as food, animal feed, and flour. Its usage in industry and livestock feed is well recognized, but it is gradually rising, particularly as import substitution becomes more significant in the industrial sector (Onyenwoke and Simonyan, 2014). In comparison to other staples, cassava delivers the most cash

revenue for most of the households.

With the probable exception of vertebrate pests, about which very little is known concerning farming activities, practically all agents that cause crop losses have received a lot of attention.

There is little or no indication of what damage is produced by whatever pests, how widely it is disseminated, or how much damage it does give the scarcity of information on vertebrate pests. Some species of vertebrate pests are unlikely to be detected in destroying crops because of their nocturnal, secretive nature and high mobility. The vertebrate pests of cassava were identified using indirect evidence by researchers, farmers, and agricultural workers. Varieties of larger animals (elephants, primates, and ungulates), rodents, and birds are considered pests of cassava.

Birds, rats, monkeys, pigs, and domestic animals are the most prevalent vertebrate pests of cassava (Buckle and Smith, 2015). Bush fowl (*Francolinus bicalcaratus*) and wild guinea fowl are the most common bird pests. They feed on exposed storage roots. They also scratch the surface of the soil to reveal the store roots. The remaining portions of the roots that were attacked eventually rots. Birds are a particular problem where cassava is grown in loose, easy-to scratch soils, necessitating research into the depredation activities of vertebrate pest species in cassava cultivation, evaluation of their effectiveness, and possible solutions for dealing with the vertebrate pest of cassava cultivation.

Rodents, like other vertebrate pests, serve an important part in the ecosystem, but they have also been implicated for being the most destructive species on the planet (Aplin *et al.*, 2003). Unfortunately, few studies evaluate the qualitative and quantitative damage that this root tuber crop has suffered. Therefore, this study seeks to evaluate the depredation activities of vertebrate pest species in cassava cultivation at the Sash-Ajibode agroecosystem.

MATERIALS AND METHODS

Description of the study area

The experiment was conducted on an existing Cassava farm located at Shasha-Ajibode, in the Akinyele local government of Ibadan, Oyo state.

The cassava farm was located at latitude 07 27'N and longitude 03 53'E on the equator. There are several other farming activities being carried out in the study area. Other crop planted include maize, cucumber and groundnut majorly on subsistence level, though from report from the farmer, they also keep some out for commercial purpose.

The study area was bordered by cassava and maize cultivations with some uncultivated land where weeds were just growing, this was at a distance of 17.437m to the study area.

The agroecosystem has a river close to the study area, at a distance of 36.5m to where the cassava was planted. Notably, all these features are part of what renders support to the successful habitation and existence of vertebrate pests at Shasha-Ajibode Agro-ecosystem. Cassava farm serves as a major source of food for the sustenance of vertebrate pests such as giant rat *Cricetomys gambianus*, cane rats/grasscutter *Thryonomys swinderianus*, bush fowl *Francolinus bicalcaratus*, etc. availability of water bodies around serve source of drinking water, and bush as hideout/shelter for them.

The Area of the Cassava farm was 1360.87m^2 and the Area of each block was 113.41m^2.

Data Collection

The Systematic sampling method was used. This is a type of probability sampling method in which sample members from a larger population are selected according to a random starting point but with a fixed, periodic interval.

Qualitative data collection

This entails the determination of the damage done to the various partof the cassava which includes the stem and the root tubers.

Scoring was done based on the observable damage done to the roots by the culprits. The scores were awarded based on the extent of damage observed on the roots ranging from number 0 to 3. Each of the scores was representing a level of damage inflicted by the pest to the roots of the cassava. Mark zero (0) was showing that no feasible damage was recorded on the cassava root being sampled while others were showing the different levels and extent of damage on the roots (1- Low, 2- Moderate, 3- High).

Stem cuts down could happen at any stage of germination whereby the growing stem of the cassava plant are attacked, cut down and chewed by rodents. This is one of the serious damages done to the plant aside from the damage done to the roots.

Quantitative data collection

This usually accounts for the number of damages by count. These include the number of damaged roots, number of stem cuts, and number of the active burrow. Records of stem cut and active burrow were taken as sampling was done across the plots.

Other droppings were also noted on the farm including the faecal droppings, the shape and size of the droppings, feathers in the case of birds. Activities and mode of attack to the cassava by some of these culprit pests are used to determine the likely culprit causing what damage to the plant. The grasscutter or cane rat (*Thryonomys swinderianus*), among others, is known to cut down and chews the stems, and also feeds on the storage roots. The giant rat (*Cricetomys gambianus*), as reported by Ajayi (1975) prefers cool, dry, and dark places to locate their burrows as they are sensitive to heat. These were some of the activities found on the study area to identify the culprits.

Data analysis

Data were analyzed using Analysis of variance (ANOVA) and means were separated using Least Significant Difference (LSD) atthe level of significance of $P \leq 0.05$.

RESULTS

The result of the present study shows that the position of the plots had no significant effect on the damage level caused by thevertebrate pests on cassava roots on the cassava farm at Shasha-Ajibode Agroecosystem. It was however observed at 4 weeks after planting (WAP) that plots 1 and 2 had the highest percentage of damage (8.34%), while the least percentage damage of 5.0% was observed from plot 2. At 6 WAP, the same trend was observed as in 4 WAP with plot 1 and plot 3 having the same percentage damage of 10.00%, although, no increase in the level of damage was recorded from plot 2 (Table 1). The level of damage increased across plots at 8 WAP, with plot 1 having the highest percentage damage of 18.33% followed by plot 3 with 13.00% damage and plot 2 having the least percent damage of 10.00%. We could observe from 10 WAP that plot 1 still has the highest level of damage with 20.00% followed by plot 3 having 16.67% and plot 2 with a record of 11.67% (Table 1). The same trend was recorded for 12 WAP which has the same record for plot1 and plot 2 as the previous WAP except for plot 3 having 20.00% damage (Table 1). The 14 WAP recorded an increase in the damage done in plot 1 with 21.67%, 14.00% damage in plot 2, and 20.00% damage in plot 3. At the 16 WAP, damage done to the roots were the same as what was recorded at the 14 WAP (Table 1).

The results showed that the highest number of stems cut, 8 (36.4), was recorded in plot 2 (which was the plot situated between the plot 1 and plot 3). The same number of stems cut, 7 (31.8), was recorded in both plots 1 and 3 (Table 2).

Active burrow recorded between 4 WAP and

16 WAP ranges between 8 and 12 each week. Plate 1 shows a Cassava stand already cut down in the study area.

Table 1: Percentage damage of cassava root caused by vertebrate pests on cassava farm at Sasa-Ajibode Agroecosystem as influenced by plot location

Treatments	Damage percentage (%)						
	Weeks after planting (WAP)						
	4	6	8	10	12	14	16
Plot 1	8.34	10.00	18.33	20.00	20.00	21.67	21.67
Plot 2	5.00	5.00	10.00	11.67	11.67	14.00	14.00
Plot 3	8.34	10.00	13.00	16.67	20.00	20.00	20.00
LSD Value	17.3	15.74	12.89	14.51	14.76	11.37	11.37

Values represent mean of Percentage damage. Means were separated using Least Significant Difference at $P \leq 0.05$.

Table 2: Number of the active stem cut (Quantitative data) collected caused by vertebrate pests on cassava farm at Shasha-Ajibode Agroecosystem as influenced by plot location

	Weeks after planting (WAP)							
Plot	4	6	8	10	12	14	16	Total (%)
1	2	0	2	1	2	0	0	7 (31.8)
2	0	2	2	0	3	0	1	8 (36.8)
3	3	0	0	2	1	1	0	7 (31.8)

Plate 1: Cassava stand already cut down in the study area

DISCUSSION

Several factors are particularly responsible for the successful existence of the vertebrate pest in an environment. Availability of food sources influences the abundance of rodents, Presence of water, and availability of harborage determine the establishment of population in an environment.

Witmer (2007) previously observed that rodent species traveled from areas frequently flooded to a less disturbed area where they could survive and breed. Shasha-Ajibode agroecosystem seems to be one that still favours the life cycle of vertebrate pest that are of importance to cassava roots and stem.

The major rodent pests of cassava are the grasscutter or cane rat (*Thryonomys swinderianus*), the giant rat (*Cricetomys gambianus*), other rats, mice, and squirrels. Among these, the grasscutter causes the greatest damage to cassava. It was also reported by Poubom *et al.* (2005) that farmers considered the major pests of cassava to be vertebrates. It cuts down and chews the stems, and also feeds on the storage roots. The giant rat also,

as reported by Buckle and Smith (2015), exposes and feeds on the developing roots of cassava under the soil. This further exposes the roots for further infection by pathogens.

All these activities of rodent infestation were noticeable at the Sasa-Ajibode cassava farm from the records taken for both seasons. The soil was exposed and the roots were gnawed within the different blocks of the study site. Some stems were also cut down which were significant of the presence the *Thryonomys swinderianus*.

In addition, recently, rodent have been identified to be part of the world's most significant pests relishingmomentous damage to agricultural production throughout the globe even though it has been estimated that less than 10% of rodent species are major pest species of agricultural and urban areas (Buckle and Smith, 2015). Appropriate control measures are needed when severe economic loss is anticipated.

The highest number of stems cut recorded in the mid plot (Plot 2) could be attributed to the fact that rodent species are highly secretive in habit. They prefer to inflict the damage to crops in such a way that it would not be easily noticed by the farmers. Therefore, their damaging activities are relatively more intense in the middle of the farm. Witmer (2007) also reported that rodent species are highly secretive, nocturnal and have well developed sense of smell, taste, and hearing.

Active burrow recorded between 4 WAP and 16 WAP ranges between 8 and 12 each week. A burrow represent hideout as well as escape route for the animals. It is a tunnel or hole that an animal (rodent in this case) digs for habitation (a place to live) or as a temporary refuge (a place of protection). Burrows can also be the byproduct of locomotion—moving from one place to another (Ofuya and Lale, 2001).

A record of cassava stands which was taken to have been cut down at the study site was indicative of the Grasscutter (*Thryonomys swinderianus)* which cut down and also chewed the cassava stem.

CONCLUSION

The main crops grown in the Sasa-Ajibode agroecosystem are maize, cassava, groundnut at subsistence level. Different damages recorded were caused by the rodent pest species and few activities by bush fowl which simply scatters the topsoil, and if done close to the roots of cassava, exposes the roots. Based on the sign of damages noticed on the cassava farm, giant rats and grasscutter were responsible for major damages recorded on the farm and effective measure of control should be used to prevent the damage level from rising to have caused overall yield loss.

REFERENCES

Ajayi, S. (1975). Domestication of the African Giant rat (*Cricetomys gambianus* Waterhouse). Kwara State Printing and Publishing Corporation, Ilorin.

Aplin, K. P., Brown, P. R., Jacob, J., Krebs, C. J., and Singleton, G. R. (2003). Field methods for rodent studies in Asia and the Indo-Pacific (No. 435-2016-33720). Australian Center for International Agricultural Research, Canberra.

Buckle, A.P. and Smith, R.H. (2015). Rodent Pests and their Control. 2nd Edition. CPI Group (UK) Ltd, Croydon, CR0 4YY.

Conover, M. (2002). Resolving Human and Wildlife Conflicts. Boca Raton, FL: Lewis Publishers.

Happold, D.C.D. (2013). Mammals of Africa. Volume III: Rodents, Hares and Rabbits. Bloomsbury Publishing, London.

Odeyemi, O.O. and Daramola, A.M. (2000). Storage practice in the tropics. Vol.1. food storage and pest problems. 1st ed. Dave Collins Publications, Nigeria. Pp 253

Ofuya, T.I. and Lale, N.E.S. (2001). Pests of stored cereals and pulses in Nigeria: Biology, Ecology and control. Dave Collins Publications, Nigeria. Pp. 133-146.

Onyenwoke C. A. and Simonyan K. J. (2014) "Cassava post-harvest processing and storage in Nigeria: A review." *African Journal of Agricultural Research 9*, no. 53: 3853-3863.

Poubom, C.F.N., Awah, E.T., Tchuanyo, M., and Tengoua, F. (2005). Farmers' perception of cassava pests and indigenous control methods in Cameroun. International Journal of Pest Management. 51: 157-164. http://dx.doi.org/ 10.1080/09670870500131863

Smith, V. R., Avenant, N. L., and Chown, S. L. (2002). The diet and impact of house mice on a sub-Antarctic Island. *Polar Biology*. 25, 703–715.

Witmer, G. W. (2007). The ecology of vertebrate pests and integrated pest management (IPM). *USDA National Wildlife ResearchCenter - Staff Publications.* Paper 730.