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Infestation of some crops by Termites (Order: Isoptera) in selected areas of Zuru Local Government, Kebbi State-Nigeria

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Abstract

The study investigated the incidence and effect of termites infestation of agricultural crops (Order: Isoptera) in Zuru Local Government Area Kebbi State. The objectives are to determine socio-economic characteristics of the respondents, termite infestation and most effective control measure. Data obtained from questionnaires were analyzed using descriptive statistics such as frequency, mean and percentages. Results revealed that majority of the respondents (53 percent) are men, high proportion of them (39 percent) are within 18-30yrs), most which (48 percent) of the respondents are married and (47 percent) had formal education, (55 percent) are farmers, while 52 percent of the respondents had farm size between 1-5 hectares, and 47 percent have 0-10 years of farming experience and 30 percent purchased their farm land the rest by inheritance and rent. The results also revealed that 56 percent of the respondents know termites as pests, 53 percent are aware that termites infest crops. It was also gathered that 40 percent sourced their information from friends and about 33 percent reported that termites attacked, 55 percent observed them to attack crops like rice, millet, maize and 47 percent observed that drought foster termites' infestation meaning they are more active when the weather is hot. While in terms of control 44 percent of the respondents adopt chemical control and 37 percent adopt physical control, 47 percent observed chemical control to be more effective than the rest. Infestation reoccurrence by termite after chemical control shows that 56 percent observed non-reoccurrence. In conclusion majority of the respondents agreed that termites attack crops like rice, millet, maize sorghum and groundnut and all respondents used chemical and

physical control measures and no reoccurrence of termites' infestation after chemical control in most areas, because it is more effective.

KEYWORDS: Infestation, Some Crops, Termites, Zuru, Selected Area

Introduction

The termites are social insects which belong to the family Termitidae of the order Blattodea. They live in termitaria, which they build themselves, and the occupants of a termitarium constitute a colony that has various castes, morphologically and functionally different (Revely *et al*., 2021). They have sharp mandibles and have soft bodies and are more or less medium to small in size. Molecular evidence and fossil records suggest that the termites evolved from wood-dwelling cockroach ancestors about 150-200 million years ago (Mizumoto & Bourguignon 2021). Majority of species reproduce winged reproduction forms (*alates*) that have two pairs of similar wings which are shed after swarming as pairs create new nests (Liu *et al*., 2022).

Although termites do not effectively digest cellulose; they rely on symbiotic protists and various gut microorganisms to decompose lignocellulosic matter, by which the colony can mobilize wood and other litter of plants into food (Korsa *et al*., 2023). Termites are now known phylogenetically as highly derived eusocial cockroaches that nest in Blattodea which are closely related to wood-eating cockroaches like Cryptocercus (Wang, 2024). In the world, there have been nearly 3,000 species of termites that are known in approximately 280 genera and seven families, whereby the family termitidae has got most of the species (Hausberger *et al*., 2011). Termites have a high density in tropical and subtropical areas and are most diverse and abundant in the rainforests of the African continent, South America and Southeast Asia (Liu *et al*., 2022).

In the tropical ecosystem, a major ecosystem engineer are the termite: they promotes decay, bioturbation, and soil aeration and their mound-building activities they combine mineral with organic materials in the soil, making soil more fertile (Duran-Bautista *et al*., 2025). Most studies in Africa document that the effect of termites can be beneficial to the soil structure (Lawal and Anyaku, 2025), they may cause immense destruction on agricultural fields of maize, yam, cassava, rice, sorghum, groundnut and cotton (James *et al*., 2019). Termites can selectively prey on both living and dead plant tissues and consequently change the soil characteristics as well as plant growth patterns (Korsa *et al*., 2023). They also have been known to be severe insect pests in forestry and woody perennial crops and are destructive to timber trees and plantation species (Zaman *et al*., 2022).

In most African agro-ecosystems, termites have been consistently reported to be the major maize pests and other staple crops leading to loss of yield by up to 20 percent or more depending on species, crop and

environmental conditions (Loko *et al*., 2019). Termites are very destructive as they are capable of feeding on both dead wood and live plants by damaging roots, stems and sometimes the inner part of the trees without showing on the outer surface and causing breakage (Zaman *et al*., 2022). Besides loss of crops, termites destroy structural timber utilized in structures alongside household furniture and paper products and various stored materials, which can lead to huge financial losses in most African tropical countries (Duran-Bautista et al., 2025). Regardless of the ecological and economic significance, a thorough investigation of termite abundance, distribution, and habitats of infestation in the Sudan Savannah zone in Nigeria is still inadequate. The Local Government Area of Zuru has various crops and agricultural systems that can be used as a perfect habitat where termites' activity and its effects on the soil and agricultural sector can be determined (Lawal and Anyaku, 2025). This research is thus meant to capture the termite presence, infestation and the damage to crops so that vital information will be provided to support sustainable management of termite pests and also improve crop production and soil management.

Study Area

The study was done within some selected locations of Zuru Local Government Area, Kebbi State, which occupies the Sudan Savanna ecological zone (Bello *et al*., 2014). It is an estimated to be 653km2, with a tropical savanna climate with one rainy season of May to October and a dry period of harmattan and hot season (Olayide *et al*., 2023). It has soils that are primarily sandy-loam, which are conducive to agriculture. In Zuru, agriculture and trading form the basis of livelihood as peasant farmers cultivate crops (maize, rice, millet, sorghum, groundnut, cowpea) and rear rural livestock (cattle, sheep, goats, and poultry) (Lami *et al*., 2019).

Sampling and sample size

This is mainly field work and the study of the survey of termites' infestation in Zuru Local Government Area which was carried out within the month of March to July, 2024, in carrying out the study, five districts were selected out of six administrative districts in the Local Government Area. The districts selected include; Dabai, Rikoto, Manga, Ushe and Senchi districts. The districts were selected randomly by writing the names of the six districts each on a Separate sheet of the paper fold than separately and mixed them together shake them and throw on the table and five picked randomly for the study.

Table 1: Selected villages and sample size

S/N0	Local Gov't Area	Districts	Areas	No of Respondents
1	Zuru	Senchi	Kibiya	20
2	Zuru	Ushe	Elenbelu	20
3	Zuru	Manga	Amanawa	20
4	Zuru	Rikoto	T/ doro	20
5	Zuru	Dabai	K'dinti	20
Total			5	100

Source: Field survey, 2024.

Data Collection

For collecting data, a structured questionnaires were designed and distributed to the respondents in each district, irrespective of age, sex, religion, etc. those that cannot read were interviewed and questionnaires filled for them, while those that can read were given the questionnaires which they read and answer the question direct. The information obtained from these questionnaires was presented in tables. While carrying out the research, common infestation or damage cause by termites was observed.

Data Analysis

Data obtained from questionnaires were analyzed using descriptive statistics such as frequency, means and percentages.

RESULTS

Table 3.1 presents the distribution of respondents according to their socio-economic characteristics. The result for gender shows that 53 percent of the respondents were males while 47 percent were females. For the age of respondents, result indicated that respondents within 18 – 30 years constituted 39 percent, 19 percent were between 31–40 years, 24 percent were aged 41–50 years, while 18 percent were 50 years and above. About marital status of the respondents, the result revealed that 48 percent of respondents were married, 22 percent were single, 16 percent were divorced, 8 percent were widowers and 6 percent were widows. Regarding educational background, a total of 47 percent had non-formal education, 16 percent had adult education, 16 percent had primary education, 11 percent attained secondary education, and 10 percent had tertiary education. The household size distribution shows that 38 percent had 1–5 persons, 21 percent had 6–10 persons, 18 percent had 11–15 persons and 23 percent had 16 persons and above. Concerning the Occupation, most respondents (55 percent) were farmers, 30 percent were traders and 15 percent were civil servants. About 52 percent had farm sizes between 1–5 hectares, 25 percent between 6–10 hectares, and 23 percent had 11 hectares and above. Respondents with 0 – 10 years of experience constituted 47 percent of the respondents, 21 percent had 11 – 20 years, 18 percent had 21 – 30 years and 14 percent had over 31 years of farming experience. The result also reveals that about 30 percent acquired land through purchase, 17 percent through inheritance, 16 percent rented or hired their land, 13 percent borrowed, 13 percent received land as a gift, while 11 percent leased it.

Table 3.2 shows that 56 percent of respondents knew termites as insects and pests, while 44 percent do not know termites. 53 percent were aware that termites infest crops, while 47 percent were not aware that termites infest crops. Also, 62 percent indicated that termites infest only crops, while 38 percent do not agreed. Regarding the sources of information, 40 percent heard from friends, 22 percent from the farm, 19 percent from home experience, infestation on furnitures and household materials, and 19 percent learned from practical experience both farm and home. On the types of crops termites attacked, 33 percent reported maize infestation,

18 percent wheat, 10 percent for rice, 10 percent sorghum, 7 percent fibre crops, 6 percent legumes, 10 percent pulses, and 6 percent groundnut respectively. Respondents further reported that termites attack maize, rice, sorghum and millet (55 percent), cassava, cocoyam and yam (25 percent) and cowpea, groundnut and soybean (20 percent). Concerning the factors favouring termite infestation, 47 percent identified drought, 29 percent soil type and liter quality of the soil, while 24 percent reported type of crops cultivated as attractants termites' infestation. Based on the identification of termites 48 percent recognized termites by body size, 25 percent by size and shape, and 21 percent by colour and 6 percent by termite activities. For the level of attacked by termites, result show that 46 percent experienced attacks on 1–5 hectares, 28 percent on 6–10 hectares, 16 percent on 11–16 hectares, while 10 percent on 17–20 hectares. About the methods of controlling termites, 44 percent recommended chemical application, 20 percent hand picking which is physical control method, 19 percent crop rotation, while 17 percent recommended planting time as way of reducing their risk of infestation.

Table 3.3 reveals that 37 percent adopted physical methods, 33 percent used chemical methods this might be as the result of high cost of chemicals and application risk, 16 percent biological control which is reliably done in the study area, while 14 percent used cultural control. On the effectiveness of the control method, 47 percent believed that physical control was most effective, 21 percent chemical, 18 percent cultural, while 14 percent perceived biological control method. Finally, 56 percent reported non-reoccurrence of termites' infestation after chemical control, while 44 percent confirmed reoccurrence after control and might be because of adaptability characteristics and resistance by the pest.

Table: 2 Distribution of the Respondents based on Socio-economic Characteristics

Variables	Frequency	Percentage (%)
Gender		
Male	53	53
Female	47	47
Total	**100**	**100**
Age (Years)		
18 – 30	39	39
31 – 40	19	19
41 – 50	24	24
50 and above	18	18
Total	**100**	**100**
Marital Status		
Single	22	22
Married	48	48

Variables	Frequency	Percentage (%)
Divorce	16	16
Widow	6	6
Widower	8	8
Total	**100**	**100**
Educational Background		
Non-formal Education	47	47
Primary Education	16	16
Secondary Education	11	11
Tertiary Education	10	10
Adult Education	16	16
Total	**100**	**100**
Household Size		
1-5	38	38
6-10	21	21
11-15	18	18
16 and above	23	23
Total	**100**	**100**
Occupation		
Farming	55	55
Trading	30	30
Civil Servant	15	15
Total	**100**	**100**
Farm Size		
1 – 5	52	52
6 – 10	25	25
11 and above	23	23
Total	**100**	**100**
Farming Experience		
0 – 10	47	47
11 - 20	21	21
21 – 30	18	18
31 and above	14	14
Total	**100**	**100**

Variables	Frequency	Percentage (%)
Source of Farm Land		
Purchased	30	30
Inheritance	17	17
Rent/Hired	16	16
Gift	13	13
Leased	11	11
Borrowed	13	13
Total	**100**	**100**

Source, Field Survey, 2024

Table 3: Termites Infestation

Variables	Frequency	Percentage (%)
Do you know termites?		
Yes	56	56
No	44	44
Are you aware they infest crops?		
Yes	53	53
No	47	47
It is only crops they infest?		
Yes	62	62
No	38	38
Source of Information		
Friends	40	40
Farm	22	22
House	19	19
Practical Experience	19	19
Type of crops termites attacked		
Maize	33	33
Rice	10	10
Sorghum	10	10
Wheat	18	18
Fiber	7	7
Legumes	6	6
Pulse	10	10
Groundnut	6	6

Variables	Frequency	Percentage (%)
Type of Crops Termites Attacked More		
Maize, rice, sorghum and millet	55	55
Cassava, Cocoyam and yam	25	25
Cowpea, groundnut and soya beans	20	20
Factors that Favors Termite's Infestation		
Drought	47	47
Soil types and soil litre	29	29
Type of crops cultivated	24	24
Identification of Termites?		
Based on body size	48	48
Based on their Colour	21	21
Based on size and Shape	25	25
Based on their activities	6	6
Level of attack by termites		
1-5 Hectares	46	46
6-10 Hectares	28	28
11-16 Hectares	16	16
17-20 Hectares	10	10
How do you Control termites?		
Application of chemical	44	44
Hand picking	20	20
Crop Rotation	19	19
Changing the time of planting	17	17

Source: Field Survey, 2024

Table 4: Termite Control

Variables	Frequency	Percentage (%)
Method of Termites Control		
Physical method	37	37
Chemical Method	33	33
Cultural Method	14	14
Biological method	16	16
Most Effective Control Method		
Physical method	47	47

Variables	Frequency	Percentage (%)
Chemical Method	21	21
Cultural Method	18	18
Biological method	14	14
Reoccurrence of Termites Infestation after Control		
Yes	44	44
No	56	56

Source: Field Survey, 2024

DISCUSSION

Study revealed that males are dominant respondents in the area with 53 percent, which suggests that men are more engaged in agricultural activities in the area. This agrees with common patterns in rural Nigeria where men perform most farm labour because they are bread winners of their households. The age distribution shows that the large proportion up to 39 percent were young and energetic farmers within 18-30 years, implying availability of active labour force. This supports the understanding that youth contribute significantly to farming operations due to their strength and adaptability. This was in line with Onugu, 2008; Obinyan,2000; Ijere and Mbanasor, 2000 whom observed that socioeconomic characteristics of farmers have crucial ramification on agricultural production. Food production could be affected by the farmers' age, access to credit, gender, and farm size. A high percentage of about 48 percent of married respondents suggests that farming is a family-based occupation where households work together to generate income and ensure food security. Educationally, the large number recording 47 percent with non-formal education implies limited exposure to modern farming techniques. Education plays a vital role in technology adoption, decision-making and risk management; therefore, low literacy may affect productivity this was in conformity with Obinyan, 2000, whom observed that educational level affect farming, it is on record that 50 percent of world's population is dependent on subsistence agriculture.

The household size distribution indicates that most households had 1-5 persons, which may influence labour availability. Large households with 16 and above persons making the 23 percent suggest potential for increased family labour. Farming being the major occupation, 55 percent confirms that the study area is agrarian. Respondents also engage in trading and civil service to diversify income sources. Farm sizes show that majority recording 52 percent operate smallholder farms (1-5 ha), typical of subsistence farming systems. Smaller farm sizes are common in rural areas due to limited access to land and capital. The result of farming experience revealed that 47 percent had 0-10 years of experience, showing that many farmers are still developing skills. Experience improves decision-making and resource allocation. Land acquisition patterns indicate that purchase land is the most common source revealing 30 percent, followed by inheritance, hired, and borrowing. This reflects diverse land tenure systems in rural communities. This is in line with Pawłowska-Tyszko, Soliwoda, 2014 whom

observed that huge differences in income are in farms size classes and different utilization of agricultural areas. it is worth to consider the problem of economic size of agricultural farms. Knowledge about termites and their effects on crops implies that the moderate level of knowledge about the pest was achieved. Reliance on informal systems of knowledge from friends and experience in the farming activity as the significant source of information. Maize was the most attacked crop according to most respondents and this might be it is more cultivated than the rest, then wheat and other cereals. This was in line with recent reports where termites have been identified as a serious pests of smallholder systems, pests of key staples crops like maize, cassava, rice and legumes in Africa as in line with (Yêyinou-Loko *et al*., 2017). Respondents (55 percent) agreed that cereals such as maize, rice, sorghum and millet are most infested by termites, which is in conformity with reports that termites infest a broad host of cereal produce, and can cause significant loss in yield Debelo and Degaga, 2015. Drought was indicated as the biggest factor that favored infestation of termites. This is in tandem with records that termite infestations get their highest peak in dry seasons or when waters are violated because crops become more exposed and when foraging activities of the termites also rise as confirm by Debelo, (2020) the insects are more active when the weather is humid and hot. Those rates between 1 and 20 hectares are indicative of high rates of infestation by the termites which are the major threats to the productivity of the farms in the region. The size and shape of a body are identified as a key method used by farmers, and this finding is supported by existing research that indicates that the identification of the termsite by the farmers is perpetually morphological and experience-dependent (Yêyinou-Loko *et al*., 2017). The reports by the farmers that cereal crops are highly damaged are also in line with the literature that reports severe egg holes caused by termites causing great harm on maize, typically tunneling and lodging that may greatly diminish the harvest (Anyango *et al*., 2019). There were frequent reports of chemical control, but physical, cultural and biological control had also been mentioned by many farmers. Their bias towards physical approaches the most effective of which was deemed so by most farmers possibly can be explained by immediate visible effects which included destruction of nests and galleries. The applied methodology of this study follows the existing recommendation of integrated pest management (IPM) of termites that depends on the combination of cultural, mechanical/physical, biological and chemical treatments instead of using insecticides unaccompanied (Debelo, 2020). According to the recent reviews, sustainable termite management must combine both physical, cultural and biological control (such as entomopathogenic fungi and other biocontrol agents) and reasonable application of termiticides to minimize the risks to the environment and human health as was in lied with Awasthi *et al*., 2024. The greater proportion (56 percent) of respondents who have reported that there is no recurrence upon control would also indicate that methods used worked on the short term. Nevertheless, the fact that it was reoccurring in 44 percent of the cases shows that termite management continues to be a problem. This fact is in line with reports that there would be no such single method to establish permanent control over termites and long-term control would be provided through constant, combined

management and new technologies with respect to the farming systems local to a particular area as confirmed by Rana *et al*., 2021.

CONCLUSION

Based on the findings it can be concluded that; majority of the respondents knows termites and are aware that termite attack crop, such as maize, rice, sorghum and millet etc., drought favours termites infestation and identify termites morphologically body size, they attacks lots of hectares if not properly control. Most respondents adopt physical control method, chemical method is most effective, there is no reoccurrence of termite infestation when properly control. The study investigated incidence and effect of termite infestation (Order: Isoptera) in Zuru Local Government Area, Kebbi State, Nigeria. The specific objectives are to; determine socio-economic characteristics of the respondents determine termite infestation and determine the most effective control measure used in the area. Data obtained from questionnaires were analyzed using describe statistic and simple percentages. The result of the findings revealed that majority (53 percent) were males, about 39 percent are between 18-30 years, 48 percent of the respondents are married, while 47 percent of them have one form of education, majority of the respondents (55 percent) are farmers, and 52 percent of have a farm size between 1-5 hectares, 47 percent of them have farming and termites infestation experience. Farmers should form cooperative societies so as have access to farm inputs such as insecticides, pesticides etc. and loans and government should assist as well, and they should adopt chemical control method since is more effective. Farmers should use a recommended dose and follow the rules guiding chemical application to avoid hazard and re-occurrence of infestation.

RECOMMENDATION

Farmers in Zuru Local Government Area need to be organized into cooperative groups and be assisted with training on integrated termite management (ITM), a combination of safe and recommended chemical control with physical control (mound destruction, hand picking, deep ploughing), cultural control (crop rotation, the adjusted planting dates, moisture and soil conservation) and, where possible, biological control. Through extension agencies and local governments, there should be the provision of locally adapted awareness of the Hausa and other local languages, enhance farmers access to quality termiticides and protective gears at affordable rates, and enhance community based monitoring of the occurrence of termites to reduce termite damages to maize, rice, sorghum, millet and other infected crops and enhance productivity of crops in the region in a sustainable way.

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