Original Research Article

Survey of Termites Infestation (Order: Isoptera) in some selected areas of Danko/Wasagu Local Government Kebbi State-Nigeria

Abstract

Termite infestation is a significant limitation to crop production by smallholder farmers in the study area; however, but the awareness, perceptions, and management practices by farmers have not been examinedwelcomed. This study evaluated the economic and social status of farmers, as well as their knowledge regarding infestation of crops by termites, and the portions of crops they infest, and control methods. Structured questionnaires were used to collect data fromon 100 respondents, and then the data were analyzsed using descriptive statistics. The fFindings showed that most of the respondents were menmale (83% percent) and married (73% percent) people with different levels of education and farm experience. All of the respondents consideredknew termites to be pests of the crop as roots (32%), flowers (29%), and cereals and tuber crops were the most frequently attacked. Physical (48%), chemical (33%), biological (12%), and cultural (7%) forms of control methods were used by the farmers; however, but 48% percent of the cases re-infested, indicating the difficulty in using single control methods. Thise paper demonstrates the necessity to implement integrated termite management (ITM) as a form of combining indigenous knowledge and, cultural practices with physical approaches and the selective use of chemicals or botanical agents. The iImplementation of ITM along with training the farmers and providing them with better access to effective control measures is critical forto effective termite management and high crop output.

Keywords: Termites, Infestation, Crops, perception, and management

Introduction

The *infraorder Isoptera* (presently part of Blattodea) are socially structured complex-colony, insects (termites) thatwhich possess reproductive forms, workers, soldiers, and qQueens, which are morphologically and functionally distinct. Their nesting designs, such as underground galleries, dead-wood galleries, and epigeal mounds, are supportive of cooperative behaviour that is important forto the survival of the colony (Chouvenc, 2022). The termites havecare soft bodiesd but have strong mandibles to chew plant materials, and the winged reproductives are darker in shade and have the deciduous wings utilized during seasonal dispersal flights. Both phylogenetic and genomics evidence confirms that termites branched off fromof wood-eating cockroaches, which placesmakes them squarely under Blattodea and explains their rich evolutionary origin (Bourguignon *et al*., 2015). Over 3,000 termite species are also recorded

globally, and most of these species are also in tropical areas (Lertlumnaphakul *et al*., 2022). Termites are known as ~~the~~ important eco-engineers: mound construction, foraging, and decomposing activities change the soil structure, increase nutrient levels, and manipulate ~~the~~ microbes and vegetation (Govorushko, 2019). These are beneficial; however, ~~but~~ these ecosystem services coexist with the harmful effects that other species of termites have on agriculture, forestry, and confinements. Termites in sub-Saharan Africa are major pests of staple crops (maize, sorghum, yam, cassava, groundnut, and sugarcane) and tree seedlings and cause yield losses and replanting expenses in the infested regions (Yêyinou *et al*., 2017). Structural timber, furniture, and stored products are other areas that termites damage, creating significant economic expenses for~~to~~ households and communities (Govorushko, 2019). Despite the continuing popularity of synthetic termiticides and baits, environmental factors and the necessity to use sustainable alternatives have led to bio-control research, the use of indigenous control, and integrated pest management (Hassan *et al*, 2024).

Although the significance of ~~the~~ termites has been not~~ic~~ed throughout Nigeria, many parts of the country have not been evaluated systematically a~~t~~t~~o~~ the~~a~~ local level. Kebbi State, especially the Danko/Wasagu and Zuru regions, has very little published information on the description of ~~the~~ termite species, the infestation rate on crops by farmers, and the control measures initiated by farmers. This lack of knowledge limits the development of effective, locally appropriate management strategies. Hence, this study~~research~~ evaluated the level of termite infestation i~~o~~n farm products in the Danko/Wasagu Local Government Area, Kebbi State, and provided sustainable management to enhance crop protection in the study site.

Materials and Methods

Study Area

Danko/Wasagu Local Government is one of the twenty Local Government Areas of Kebbi State. It covers a geographical area of four thousand two hundred and eight (4,208 Km^2) square kilometers, with an estimated population of about two hundred and sixty five thousand two hundred and seventy one (265,271) (National Population Commission, 2006). It is boarded in the south by Sakaba Local Government Area, in the west by Zuru Local Government Area, to the North-East by Bukkuyum Local Government Area of Zamfara State (Ministry of Agriculture Birnin Kebbi, 2003).

The Danko/Wasagu Local Government area is locatedlies between 11 °latitude 11°25"N and longitude 5° 40" E of the equator. The area is flat or has low topographically, with a fertile soil covered by sandy soil, sometimes coarse in texture, with andthe several Fadama and alluvial plain soils, which are suitable for aAgricultural activities. The area is made up of eight administrative districts: namely; Danko, Kyabu, Wari, Wasagu, Ribah, Waje, Kanya, and Bena. The weather is chmaracterizked by a single rainying season and a dry season. The average rainfall is approximatelyabout 750 mm.; and the estimated period of rainfall is between Aprils andto October, which lasts for approximatelyabout five months. The average temperature is 37°c, and they area also experiences a period of Harmattan from November to March (Meteorological station College of Agriculture Zuru, 2001). The vegetation of the area is of tropical sSavannah wood land with, tall scattered deciduous trees; the vegetation is greenish during the rainying season andwhile brown and dormant during the dry season (Ministry of Agriculture Birnin Kebbi, 2003.)

Sampling and Sample size

A purposive sampling technique was used, and five villages were selected basedand reasons thearе time and population of farmers in those areas. The villages are; Awala, Machika, Yar'ali,

Waje, and Kanya ~~districts~~. A total of 100~~one hundred~~ questionnaires were distributed in the study area.

Table 1: Selected villages and sample size

S/N0	Local Gov't Area	Districts	Areas	No of Respondents
1	Danko/Wasagu	Ribah	Awala	20
2	Danko/Wasagu	Ribah	Machika	20
3	Danko/Wasagu	Ribah	Yar'ali	20
4	Danko/Wasagu	Waje	Waje	20
5	Danko/Wasagu	Kanya	Kanya	20
Total			**5**	**100**

Source: Field Survey, 2024

Instrument for Data Collection

The basic instrument used for data collection in this study~~research~~ wa~~i~~s a schedule questionnaire. Structured questionnaires containing both open and closed~~close ended~~ questions were~~was~~ used to collect primary data from those who could ~~can~~not read, while secondary data were~~was~~ collected from text-books, journals, magazines, and websites.

Data Analysis

~~The~~ D~~d~~ata collected from the administered questionnaires were analyzed using descriptive statistics, such as frequency counts and percentages.

Result

Socio-economic Characteristics of Respondents

Table 2 results revealed that 83% of the respondents were males and 17% of respondents were females. With regard to age, 32% were aged 18- 30 years, 9% were aged 31- 40 years, 17% were aged 41- 50 years, 29% were aged 51 and above, 60 years. In case of marital status, 73%

of the participants were married, 15% single, 5% widowed and 7% divorced. It was found that 42% were not educated; 13% were primary, 9% secondary and 36% tertiary. Findings on household size showed 40 percent had 1-5 persons, 38 percent had 6-10 persons, 15 percent had 11-15 persons and 7 percent had 16 persons and above. On occupation, half was found to be farmers, quarter traders and twelfth civil servants. The findings also revealed that 59 percent of them were in the 1-5 hectares farm size, 37 percent in the 6-10 hectares farm size and 4 percent at 11 hectares and above. Concerning the farming experience, 40 percent had 0-10 years, 38 percent had 11-20 years, 15 percent had 21-30 years and 7 percent had 31 years and beyond. With regard to the place of farmland, 27% of the farmland was purchased, 17% inherited, 22% rented/hired, 8 percent received by gift, 11 percent leased, and 15 percent borrowed land.

Socio-economic Characteristics of Respondents

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

Variables	Frequency	Percentage (%)
Gender		
Male	83	83
Female	17	17
Total	**100**	**100**
Age (Years)		
18 – 30	32	32
31 – 40	9	9
41 – 50	17	17
51 – 60	29	29
61 and above	13	13
Total	**100**	**100**
Marital Status		
Single	15	15
Married	73	73
Widow	5	5
Divorce	7	7
Total	**100**	**100**
Educational Background		
Primary Education	13	13
Secondary Education	9	9
Tertiary Education	36	36
No Education	42	42
Total	**100**	**100**
Household Size		
1-5	**40**	**40**
6-10	**38**	**38**
11-15	**15**	**15**
16 and above	**7**	**7**
Total	**100**	**100**
Occupation		
Farming	56	56
Trading	26	26
Civil Servant	18	18

Total	**100**	**100**
Farm Size		
1 – 5	59	59
6 – 10	37	37
11 and above	4	4
Total	**100**	**100**
Farm Experience		
0 – 10	40	40
11 - 20	38	38
21 –30	15	15
31 and above	7	7
Total	**100**	**100**
Source of Farm Land		
Purchased	27	27
Inheritance	17	17
Rent/Hired	22	22
Gift	8	8
Leased	11	11
Borrowed	15	15
Total	**100**	**100**

Source: Field Survey, 2024

Termite Infestation

Table 3 shows that 100% ~~percent~~ of the respondents were familiar with termites and 100% ~~percent~~ of the respondents were familiar that termites infest crops, and all the respondents affirmed that termites infest other materials other than crops (100% ~~percent~~). According to the respondents, termites infested the roots (32%), stems (9%), leaves (17%), flowers (29%), and fruits (13%). The f~~F~~indings indicate that maize, rice, sorghum, and millet (56% ~~percent~~) were more frequently~~are~~ attacked by termites ~~more~~ than cassava, cocoyam, and yam (26% ~~percent~~), cowpea, groundnut, and ~~soya~~ soybeans (18% ~~percent~~). It was also found that drought (44%), soil type and litter on soil (33%), and type of crops cultivated (23%) favored~~favour~~ termite infestation. The identification of the termites was done according to body size (40%), colo~~ur~~r (23%), size and shape (21%), and activities (16%). The level of attack was 17 percent on 1-5 hectares, 66 percent on 6-10 hectares, 7 percent on 11-16 hectares and 10 percent on 17- 20 hectares. The ultimate results reveal that, 44 percent used chemical application, 31 percent used hand picking, 17 percent used crop rotation and 8 percent used changing of planting time.

Table 3: Termites Infestation

Variables	Frequency	Percentage
Do you know termites		
Yes	100	100
No	0	0
Are you aware they infest crops		
Yes	100	100
No	0	0
It is only crops they infest		
Yes	100	100
No	0	0
What parts of crop do they infested.		
Roots	32	32
Stem	9	9
Leaves	17	17
Flowers	29	29
Fruits	13	13
Type of crops termites attacked more		
Maize, rice, sorghum and millet	56	56
Cassava, Cocoyam and yam	26	26
Cowpea, groundnut and soya beans	18	18
Factors that favors termites' infestation		
Drought	44	44
Soil types and soil litre	33	33
Type of crops cultivated	23	23
Identification of Termites		
Based on body size	40	40
Based on their Colour	23	23
Based on size and Shape	21	21
Based on their activities	16	16
Level of attack by termites		
1-5 Hectares	17	17
6-10 Hectares	66	66
11-16 Hectares	7	7
17-20 Hectares	10	10
How do you Control termites		
Application of chemical	44	44
Hand picking	31	31
Crop Rotation	17	17
Changing the time of planting	8	8

Source: Field Survey, 2024

Control of Termites

Table 4 findings have shown that 48 percent of them embraced physical approaches, 33 percent embraced chemical approaches, 7 percent embraced cultural approaches and 12 percent embraced biological approaches. On best control method, 39% of them mentioned physical method, 40% of the chemical method, 8% of the cultural method, and 13% of the biological method. Lastly, forty eight percent of the respondents had reoccurrence of termite infestation after control and 52 percent had no reoccurrence

Table 4: Control of Termite

Variables	Frequency	Percentage (%)
Method of Termites Control		
Physical method	48	48
Chemical Method	33	33
Cultural Method	7	7
Biological method	12	12
Most Effective Control Method		
Physical method	39	39
Chemical Method	40	40
Cultural Method	8	8
Biological method	13	13
Reoccurrence of Termites Infestation after Control		
Yes	48	48
No	52	52

Source: Field Survey, 2024

Discussions

The socio-economic profile of the respondents depicts significant structural attributes of ~~the~~ smallholder farming in the study region. This tendency to have men (83%) as the predominant farmers is a reflection of more general trends in Nigeria, wherein men have more influence on land use and other important farm decisions, particularly staple crops (Onuoha & Umebali, 2021). The differences between genders in terms of access to resources and information can affect the choice of innovations and pest management measures. The distribution of ages, with a significant proportion of young adults (32%), who are capable of engaging in labo~~u~~r-intensive activities and adopting new practices, is also an indicator of this. ~~The~~ Y~~y~~oung farmers tend to be more innovative and ~~can be more~~ flexible towards modern farming practices (Shaibu &

Shaibu, 2025). MeanwhileIn the meantime, the more mature and well-established farmers can provide significant amounts of traditional knowledge and stability, which forms thea basise of combined traditional and modern practices. Another important dimension is education: the fact that a significant uneducatednon-educated group (42%) might restrict the level of knowledge of formal agricultural suggestions, adoption of better technologies, or the appreciation of best practices, including integrated pest management. In fact, It was reported that the level of education has a strong influence on the level of technology adoption by smallholders in Nigeria (Obayelu *et al*., 2016). The segment of tertiary education, on the other hand, ihas a source of spreading information and may act as local champions of best practices. This is because majority of respondents cultivate small parcels (1–5 ha), which is typical of smallholder farmers in Nigeria;, over 80% of the farms in the country are small-scale (less than 10 ha) (FAO, 2018). Other limitations that are faced by smallholder farms include inaccessibility to credit, inputs, mechanization, and extension services, which inhibit large-scale investment in pest control or higher technologies (Obayelu *et al*., 2017). With such socio-economic traits, namely gender imbalance, mixed education, youthful labour, and small farm size, termite control and other management measures should be of cheap nature, labour suitable, and available. Over-dependence on costly methods of treatment or technologies that require capital investment might not be sustainable, especially forto farmers with limited resources. Rather, interventions must be based on the promotion of low-cost and context-sensitive solutions (e.g. traditional/indigenous practices, basic physical techniques, knowledge dissemination), accompanied by training and extension services tailored to non-formal or low-literacy farmers.

The fact that all respondents identified that termites are known to infest crops, including roots, stems, leavesf, flowers, and fruits of cereals, tubers, and legumes, is indicative of the conclusion of the recent regional reviews that subterranean and soil-feeding termite species are still widespread threats to smallholder agriculture in tropical Africa (Mosisa, 2022). The

Eextensive research in East Africa and Nigeria can support the notion that termite infestation can lead to the severe destruction of staple crops, such as cassava and cereals, especially in the cases of termite infestation during drought, or when the land is stressed (and, consequently, plants are more prone to termite attack) (Ogbedeh *et al*., 2019). The survey conductedcarried out in Eastern Uganda is another recent study that supports the prevalence of termites and also emphasizes the diversity of the management approaches adopted by farmers in different agro-ecologies (Kagoda *et al*., 2025). The evidence relying on the large host range of termites, their ability to damage many parts of the plant, and environmental variability, underpins the use of an integrated approach to termites management (ITM) that combines ecological and cultural, and, when required, chemical approaches, as suggested by both review and field-based studies (Otieno, 2018).

In the survey, the farmers indicated their preference forof a mix of termite control methods, namely, physical (48%), chemical (33%), biological (12%), and cultural (7%) methods, with mixed success and reoccurrence rates (48%). This trend is based on the recent research that demonstrates that there is no single way to achieve permanent termite control, and that the combination of chemical, cultural, biological, and indigenous practices is the most effective (Abebe, 2024; Ghode and Nema, 2025). Mound destruction is one of the physical means that decreases the pressure of the termites, as well as botanical application (e.g., neem), and crop control; however, re-infestation often occurs unless the strategies are implemented systematically (Efriem *et al*., 2021). Thus, the adoption of integrated termite management (ITM) that can combine scientific and traditional information is critical to the sustainable, cost-effective, and environmentally friendly management of termites in the smallholder farming systems.

Conclusion

The results ~~of findings~~ showed that farmers ~~have~~ commonly accepted termites as key crop pests~~,~~ that ~~they~~ attack different parts of plants, such as cereals, legumes, and tubers. ~~The~~ A~~a~~ge, education, and farming experience a~~we~~re socio-economic factors that affect~~ed~~ farmers'~~the~~ awareness and management practices ~~by farmers~~. Farmers have been using various control measures, such as physical, chemical, and cultural ~~and~~ methods, as well as single ~~-~~method~~s~~ of control, which~~measures~~ have largely~~been~~ been~~found to be~~ ~~largely~~ ineffective in preventing re-infestation. These results indicate that integrated termite management (ITM) is required as a combination of indigenous knowledge, cultur~~cal~~, physics~~al~~, and chemistry~~cal~~ to ensure sustainable and effective termite management in ~~the~~ smallholder farming systems. The findings also suggest~~ed~~ conducting research on low-cost and environmentally friendly ways of controlling termites and increasing~~better~~ the availability of~~to~~ quality control factors to increase the productivity of smallholder farmers.

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