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Indigenous knowledge of termite (*Odontot ermes obesus*) control: A Review

Nikki Bhardwaj[1] and S. S. Tomar[2]

[1] Assistant professor, Agricultural Sciences, Jagannath University
Jaipur, Rajasthan, India

[2]Professor & Dean, School of Agricultural Sciences,
Career Point University, Kota, Rajasthan, India

Abstract

Termites cause a wide array of damages to plantations, trees and manmade structures. Both industrial and food crops as well as forest trees are attacked by termite. Reports on economic losses caused by termite infestations have been made worldwide. The objective was to identify suitable and sustainable indigenous methods adopted by resource poor farmers for termite control. Semi-structured questionnaires were administered to 20 farmers in each of the selected communities who practiced indigenous termite control methods. A total of 100 farmers were interviewed, who had applied various indigenous treatments on their crop fields against termite infestation. The study recorded a total of 24 termite species, which varied in presence at each locality, with a few serious pest species damaging agricultural products such as maize, yam, millet, and other natural resources in the area. Five termite prevention and control methods were identified: (i) burial of plant and animal materials, (ii) application of wood ash, (iii) application of a mixture of salt and Shea butter residue, (iv) planting of elephant grass and (v) 'banchi' methods. Planting of elephant grass was found to be the most common method used by the farmers, while burial of plant and animal materials was found to be the most effective method of termite control. Despite their well known role as pests, termites are considered important in the area because they provide necessary ecosystem services.

1. Introduction

Termite is a group of social insects found across the world in countries with varied climate and land cover systems (Rahman *et al.,* 2013). They have been reported in all the countries of the world (Moawad *et al.,* 2015). Termites feed on wood and other materials that contain cellulose (Ohkuma and Brune, 2011). Termite infestation is prevalent worldwide especially in the tropics where distribution, extent of spread, problems and constraints results in livelihood threats (Dennis, 1987; Fenemore and Prakash, 2006), particularly among rural small scale farmers (Sileshi *et* al., 2008). The ever growing interest in sustainable agriculture and food security on the African continent highlights the need for a more balanced approach to termite control (Sileshi *et* al., 2008) that will prevent serious ecological damage and loss of ecosystem services provided by termites whilst using the available resources without exhausting them (Logan *et* al., 1990). Termites are abundant and diverse throughout the world (Donald and Dweight, 1970). In Ghana, some species (e.g. *Macrotermes*, *Microtermes* and *Odontoter-mes* species) cause widespread damage to crop seedlings whilst others (e.g. *Ancistrotermes*, *Allondoter-mes* and *Pseudacanthotermes* species) cause localized damage to forest trees, rangelands, food crops and other natural resources (UNESCO, 1997). Damage caused by termites is greater during periods of drought than during the periods of regular rainfall (Logan *et* al., 1990; Nyeko and Olubayo, 2005). The problem of termite infestation can have several effects such as agronomic, economic, or social constraints. Chemical control of termites in plantations and farms is expensive and require skilled labour (Logan *et* al., 1990) and may not be effective in all cases (Nair, 2007). The excessive application of termiticides causes environmental pollution and may result in the death of non target organisms (Dennis, 1981), which necessitated the ban of some chemical control measures. Several indigenous methods are used by farmers to prevent and control termites. They include wood ash, sand, toads and shell/scallop of tortoise (Akutse *et* al., 2012). Some of these methods are evaluated and

documented for the southern belt of the country only. Information generated on the indigenous knowledge of termite management within the zone will be vital for priority setting and development of pest management strategies that meet local needs (Nyeko *et* al., 2002). The objective of this study was to identify suitable and sustainable indigenous methods to be adopted by resource poor farmers that best fit the biophysical, economic and socio cultural conditions of termite control.

General information on termites:

Termites are small bodied lightly pigmented insects usually confused to be the white ants. They are phylogenetically related to cockroaches (Inward *et al.,* 2007). They belong to the order Isoptera under which there are seven families and fifteen subfamilies (Grohmann *et al.,* 2010). Latest classification by Engel et al. (2011) lists over 3500 identified species of termites. They are prominent in both tropical and subtropical ecosystems (Kemabonta and Balogun, 2014).

Termite damage and indigenous management methods:

The study revealed that the highest crop damage occurred in maize production followed by yam, while other crop damages were minor. High crop damage in maize confirms the findings of (Umeh and Ivbijara1997), obtained by farm interviews held with famers in south western Nigeria, that 100% damage by termites can occur in maize production. About 55% of the respondents reported that partial damage occurred in various crops ranging from the seedling to harvest phase but peak damage usually occurred when harvest was delayed with a 100% possibility of damage occurring in storage facilities for every crop. Direct observations revealed that in the study area termite damage was not limited only to crops but to all sorts of resources such as buildings, farm huts, trees, wood and products.

The research outcome as indicated in Table 1 revealed five main methods used by farmers in the study area for the control of termite infestations. Some of the methods are commonly used in the southern belt of the country (Akutse *et* al.2012). A single application of any of these methods was said to be enough to protect the field for several seasons, except the wood ash method that required annual application. None of the farmers practiced a combined or an integrated treatment method. It was realized that all the methods they used did not kill termites but some acted as repellents. This may have been intentional, as termites are used by farmers as a cheap source of protein feed for chickens during the first four weeks of the chickens' growth in the area. Apart from the provision of chicken feed (Nyavor and Seddoh 1991) provide quite a number of ecosystem services such as soil enrichment through nutrient cycling and the minimization of wildfire hazards through the removal of fuel litter (Lepage *et* al., 1993). The method of usage by farmers as outlined in Table 1, planting of elephant grass was the method most commonly used by the people (46%). This could be due to the fact that, planting of elephant grass has a higher efficacy then the rest. It could also be partially due to the readily available and accessible planting materials in the study area. Dissolved salt (sodium chloride) in Shea residue was the method least used by farmers (4%). This could be attributed to cost of the materials for application as salt is primarily used as a cooking ingredient it is fairly expensive for farmers to purchase in the quantities needed. The results of the questionnaire indicated that the respondents had no clear indication as to the level of control each particular method exerted on their respective fields. Fields treated with plant and animal materials recorded the highest mean distance of 374 m, while fields treated with salt dissolved in Shea butter residue recorded the lowest average distance of 33 m. During the entomological survey, it was observed that termites had returned to certain fields where "banchi" was used as a termite management tool. Therefore, this supported the claims made by farmers (21%) during the interview that the method had lost its efficacy in the control of termites. For instance, out of the 22 fields that were treated with "banchi", only one showed good control results while the other 21 were invaded by termites. The efficacy loss of this method could be attributed to a reduction in the number of red ants introduced as a biological control mechanism against termite pests when the "banchi" roots decay. Thus, when the "banchi" roots decay, they attract the red ants to the area which are predators to the termites. The presence of these ants on farmsteads could have been prevented by the massive indoor, farm and farm huts residual spraying intended to control weeds and pests in the study area. That, Ugandan elders linked the increasing termite problem and low abundance of predatory ant species to aerial sprays intended to control tsetse flies (*Glossina sp*) during the 1960s and 1970s(Sekamatte and Okwako 2007). The control of termites by elephant grass could be due to the presence of antixenose mechanisms in the plant, properties that deter or prevent colonization of plants with termites. Based on the results, the burial of plant and animal materials proved to be the best method for termite control. The reason for this was the method induced the invasion of large numbers of ants on the field to act as biological enemies of termites. (Logan *et* al. 1990) that protein based bait results in greater ants nesting near maize plants and

hence reducing termite damage. It also affirms (Sekamatte *et* al. 2001) who reported that reduction in termite damage in plots that received a fish meal treatment was due to the increased number of predatory ants

Table 1. Indigenous Management Methods.

Banchi is a plant that resembles cassava (*Manihot ultissima* Phol) in morphology

Method used	Planting of elephant grass	Planting of "banchi/ yoobkarugu"	Burial of plant and animal materials	Wood ash	Salt in shea butter residue
Frequency of application	Once	Once	Once	Any time before storage	Once
Area applied	Farm	Home	Any where	Any where	Termite nest and infested field
Time applied	Rainy season	Rainy season	Any season	Any season	Any season
Method of application	Planting of cuttings in underground tunnel	Planting of cuttings on infested field	Pound plant parts and bury with intestines or whole animal	Spread on floor and keep harvested produce on top	Spray in nest/ on field
% of farmer users (100)	46	22	18	10	4

Conclusion

The existence of 24 species of termites in five localities in Gushegu-Karaga District has serious implication on natural resources especially the presence of the known pest genera such as *Odontotermes*, *Macrotermes* and *Microtermes* in the area. Farmers' innovation was evident in the diversity of indigenous termite control methods that were employed in the study area. Five methods of termite control identified in the study area were said to protect the fields for several seasons upon a single application. These methods included: planting of elephant grass, "banchi/yoobkarugu", burial of plant and animal materials, wood ash and salt in shea butter residue. Reports, direct observations and field measurements gave evidence towards the efficacy of these methods.

References:

[1] Akutse KS, Owusu EO, Afreh-Nuamah K, Perception of farmers' management strategies for termites control in Ghana. J. Appl. Biosci., 49: 3394– 3405, (2012)

[2] Dennis SH, Agricultural insects of the tropics and their control. Second edition. Press Syndicate of the University of Cambridge. New York.169-177, (1981).

[3] Dennis SH, Agricultural insects' pest of temperate regions and their control. Third edition. Press Syndicate of the University of Cambridge. New York. Pp 99, 525, (1987).

[4] Donald JB, Dweight MD, Introduction to the study of insects. Third edition. Holt, Rinehart and Winston INC, 152-158, (1970).

[5] Engel, MS, Family group names for termites (Isoptera), Redux. Pp 171-184 in: Engel M.S (Eds)contributions celebrating Kumar Krishna zookeys 148, (2011).

[6] Fenemore FG, Prakash A, Applied Entomology. Second edition. New Age International (P) Ltd publishers. 200-203, (2006).

[7] Grohmann, C, Oldeland, J, Stoyan, D and Linsenmair, KE, Multi-scale pattern analysis of a mound building Termite Species. Insect. Soc. 57(4): 367-494, (2010).

[8] Inward, DJG, Vogler, AP, and Eggleton, P, A comprehensive phylogenetic analysis of termites (Isoptera) illuminates key aspects of their evolutionary biology. Molecular Phylogenetics and Ecology 44: 953–967, (2007).

[9] Kemabonta, K. A. and Balogun, S. A. (2014). Species Richness, Diversity and Relative Abundance of Termites (Insecta-Isoptera) in the University of Lagos, Lagos Nigeria. FUTA Journal of Resesrch in Sciences 2:188-197.

[10] Lepage M, Abbadie L, Mariotti A, Food habits of sympatric termite species (Isoptera Macrotermtinae) as determined by stable carbon isotope analysis in Guinean savanna. J. Trop. Ecol. Lamto, Cote d'Ivoire. 9:303-311, (1993).

[11] Logan JWM, Cowie RH, Wood TG, Termite (Isoptera) control in agriculture and forestry by nonchemical methods: Rev. Bulleting Entomol. Res., 80:309-330, (1990).

[12] Nair KSS, Tropical Forest Insects Pest: Ecology, Impact, and Management. The Press

Syndicate of Cambridge University. New York, 218-236, (2007).
[13] Nyavor CB, Seddoh S, Biology GAST for Senior Secondary School. Unimax publishers Ltd in association with Macmillan publishers Ltd.58-60pp, (1991).
[14] Nyeko P, Gareth-Jones E, Day RK and Thomas R, Farmers' knowledge and perceptions of pests in agroforestry with specific reference to Alnus species in Kabale District, Uganda. Crop protection. 21(10) 929–41, (2002).
[15] Nyeko N, Olubayo FM, Participatory assessment of farmers' experience of termite problems in Agroforestry in Tororo district. Agriculture Research and Extension Network paper No 143.Overseas Development Institute, London, UK, (2005).
[16] Ohkuma, M. and Brune, A, Diversity, Structure and Evolution of the Termite Gut Microbial Community. In: Bignell, D.E., Roisin, Y., Lo, N. (Eds.), Biology of Termites: A Modern Synthesis. Springer, Dordrecht, pp 413-438, (2011).
[17] Rahman, A, Faragalla, A, and Al and Qhtani, MH, (The Urban Termite Fauna (Isptera) of Jeddah City Western Saudi Arabia. Life Science Journal 10(4): 1695-1701, (2013).
[18] Sekamatte MB, Okwako MJN, The present knowledge on soil pests and pathogens in Uganda. Afric. J. Ecol., 45:9-19, (2007).
[19] Sekamatte MB, Latigo OM, Smith AR, The potentials of proteins and sugar based baits to enhance predatory ants and reduce termite damage to maize in Uganda. Ugandan J. Crop Protectn., 20:653-662, (2001).
[20] Sileshi G, Akinnifesi FK, Ajayi OC, Chakeredza S, Mngomba S, Nyoka BI, Towards sustainable management of soil biodiversity in agriculture and landscape in Africa. J. biodiversity, Zambia. 9:64-67, (2008).
[21] UNESCO, Biodiversity Conservation: Traditional Knowledge and Modern Concepts. Proceedings of UNESCO MAB Regional Seminar on Biosphere Reserves For Biodiversity Conservation and Sustainable Development in Anglophone Africa. March, 9-12. Enviro. Protectn. Agency. Accra, Ghana. 140-146, (1997).
[22] Umeh VC, Ivbijaro MF, Termite abundance and damage in traditional maize- cassava intercrops in southern Nigeria. J. Insects Sci. Appl., 17: 315-321, (1997).