# TITLE PAGE

**PREVALENCE OF PLANT PARASITIC NEMATODES ON GROUNDNUT ROOTS IN SOME SELECTED FARMS WITHIN FEDERAL POLYTECHNIC, MUBI**

**BY**

**MUSA GLORY**

**ST/EB/HND/21/006**

**A PROJECT REPORT SUBMMITTED TO THE DEPARTMENT OF BIOLOGICAL SCIENCE TECHNOLOGY FEDERAL POLYTECHNIC MUBI,**

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**IN PARTIAL FULLFILMENT OF THE REQUIREMENTS FOR THE AWRD OF HIGHER NATIONAL DIPLOMA IN ENVIRONMENTAL BIOLOGY**

**SEPTEMBER, 2023**

# DECLARATION

I **(Musa Glory)** with the registration number **(ST/EB/HND/21/006)** hereby declare that this work is the product of my own research effort, undertaken under the supervision of **(Ahmed Usman)** and has not been presented elsewhere for the award of any certificate. All sources of information have been duly distinguished and appropriately acknowledged.

……………………………….. ……………………

Musa Glory Date

ST/EB/HND/21/006

# CERTIFICATION

This is to certify that this project: **(Prevalence of Plant Parasitic Nematodes on Groundnut Roots in Some Selected Farms within Federal Polytechnic, Mubi)** was done by **(Musa Glory)** with Registration Number **ST/EB/HND/21/006** an defend during the 2022/2023 academic season in the department of Biological Science and Technology Federal Polytechnic Mubi. The work was examined and found to meet the requirement governing the award of Higher National Diploma (HND) of the Federal polytechnic Mubi and it’s approved for its contribution to knowledge and literacy presentation.

……………………………. …………………

Mr. Ahmed Usman Date

(Project Supervisor)

……………………………. …………………

Chief Demshemino PH Moses Date

(Head of Department)

…………………………… …………………

(External Supervisor Date

# DEDICATION

This project is dedicated to Almighty God for given me the wisdom, strength, knowledge, zeal, courage, guidance, protection and aspiration to accomplish this research work. To God be the glory.

# ACKNOWLEDGEMENTS

I wish to express my profound gratitude to God almighty for given me the strength and the ability to make this great task possible.

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My special thanks go to my beloved parents also my special greeting goes to my beloved brother and my lovely sister for their, prayers, and financial support throughout my studies, may the almighty God continue to bless you all Amen.

Lastly my regards go to my colleagues and to friends for their support during my studies with them. May the Almighty God grant them their heart desire. Amen.

# TABLE OF CONTENTS

[TITLE PAGE i](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914178)

[DECLARATION ii](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914179)

[CERTIFICATION iii](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914180)

[DEDICATION iv](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914181)

[ACKNOWLEDGEMENTS v](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914182)

[TABLE OF CONTENTS vi](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914183)

[ABSTRACT viii](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914184)

[CHAPTER ONE 1](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914185)

[INTRODUCTION 1](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914186)

[1.1 Background of the Study 1](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914187)

[1.2 Statement of the Problem 2](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914188)

[1.3 Aim and Objectives 3](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914189)

[1.4 Significance of the Study 3](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914190)

[CHAPTER TWO 4](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914191)

[LITERATURE REVIEW 4](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914192)

[2.1 Intestinal Parasite 4](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914193)

[2.2.3 Flukes (Trematodes) 9](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914194)

[2.2.4 Tapeworms (Cestodes) 12](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914195)

[2.2.5 Roundworms (Nematodes) 13](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914196)

[CHAPTER THREE 16](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914197)

[MATERIAL AND METHOD 16](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914198)

[3.1 Study Area 16](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914199)

[3.2 Study Site 16](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914200)

[3.3 Study Population 16](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914201)

[3.4 Sample collection 17](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914202)

[3.5 Method of Analysis 17](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914203)

[3.6 Data Analysis 17](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914204)

[CHAPTER FOUR 18](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914205)

[4.1 Results 18](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914206)

[CHAPTER FIVE 21](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914207)

[DISCUSSION, CONCLUSION AND RECOMMENDATIONS 21](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914208)

[5.1 Discussion 21](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914209)

[5.2 Conclusion 21](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914210)

[5.3 Recommendations 22](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914211)

[REFERENCES 24](file:///C:\Users\KPONKIUS\Documents\PROJECT%202023\EB\ALHERI\CHAPTER%20ONE%20PREVALENCE.docx#_Toc146914212)

# ABSTRACT

*Intestinal parasites pose a significant public health challenge, particularly in developing regions like Mararaba Mubi, Hong, Adamawa State. This study is aimed at investigating the prevalence of intestinal parasites among pupils attending four primary schools in Mararaba Mubi and providing insights into the distribution of these parasites by location, age, gender, and specific species. The findings revealed varying prevalence rates among the selected primary schools, with school KA exhibiting the highest prevalence (70%) and DS the lowest (50%). The overall prevalence for all schools combined was 59.2%. Age-wise analysis indicated that older pupils (10-12 age group) were more susceptible, with a prevalence rate of 50.7%, while the youngest (4-6 age group) showed the lowest prevalence at 11.2%. Gender-based analysis showed nearly equal prevalence among male (60%) and female (58.3%) pupils. Furthermore, the study examined the prevalence of specific parasite species (E. histolytica, Hookworm, E. coli, A. lumbricoides) across the four schools, highlighting variations in parasite species distribution. In conclusion, this study underscores the need for comprehensive interventions, including health education, routine screening, deworming programs, sanitation improvements, and community involvement, to combat the prevalence of intestinal parasites among school pupils in Mararaba Mubi, Hong, Adamawa State. These findings serve as a foundation for targeted public health initiatives aimed at improving the well-being of pupils and the overall health of the community.*

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the Study

Plant parasitic nematodes are non-segmented, bilaterally symmetrical worm-like invertebrates that possess body cavity and complete digestive system but lack respiratory and circulatory systems (Chitwood, 2002). Nematodes are found in all agricultural soils where they play different roles. According to Ingham and Moidenke (2000), they can help in nutrient cycling. Nutrients such as ammonium (NH4+), stored in the bodies of bacteria and fungi, are released when nematodes eat them. The bacteria and fungi contain more nitrogen than the nematodes need, so the excess is released into the soil in a more stable form where it can be used by plants or other soil organisms. Nematodes also physically break down organic matter which increases its surface area, making it easier for other organisms to break it down further. They can also bring about dispersal of microbes. Bacteria and fungi cannot move around in the soil without ‘hitching a ride’ inside or on the back of nematodes. Nematodes are common economic pests of agricultural crops causing considerable reduction in the yield of many crops including vegetables (Nchore et al., 2010). Yield losses normally results from changes brought about in the morphology and physiology of the roots of affected crops. Chitwood (2003) reported that, plant parasitic nematodes cause annual crop losses estimated at United States Department of the Interior (USDI), 25 billion worldwide (Gregory et al., 2017). All crops are susceptible to nematodes and total crop failures may occur when crops are planted in areas with high nematode population levels (Noling, 2012).

The peanut (*Arachis hypogaea*), also known as the groundnut, goober (US), pindar (US) or monkey nut (UK), is a legume crop grown mainly for its edible seeds. It is widely grown in the tropics and subtropics, important to both small and large commercial producers. It is classified as both a grain legume and, due to its high oil content, an oil crop.

Groundnut (*Arachis hypogea*) is considered to be one of the most important oilseed crops in the world. It originated in South America (Southern Bolivia/north west Argentina region) where it was cultivated as early as 1000 B.C. (Wiess, 2000). Today, it is grown in areas between 40 degrees south and 40 degrees North of the equator, where average rainfall is 500 to 1200 mm and mean daily temperatures are higher than 20 0C (Pattee & Young, 1982). It is grown in over 100 countries of the world and plays a crucial role in the world economy. Groundnut production has reached the mark of around 34 million tons. China (followed by India), is the largest producer of this oilseed crop in the world. The groundnut oil production hovers around 8 million tons annually. The production price of groundnut in India is competitive globally. The market price is only 16 percent above the producer price (Rama Rao et al., 2000).

Plant symptoms which develop in response to nematode parasitism are generally those associated with root dysfunction (Noling, 2012). Development of small, stunted and chlorotic plants generally reflects reduced water and nutrient uptake caused by injury to the root system. The damage to plant tissues by nematodes infecting the shoot includes reduced vigor, distortion of plants parts and death of infected tissues depending upon the nematode species (Lambert & Bekel, 2002). Damages due to plant parasitic nematodes have been reported on sugar cane (Afolami et al, 2014) *Musa* species (Okafor et al, 2015) and other crops in Nigeria. Nematode disease episodes may cause losses of, up to 80%, on vegetables (Galip, 2007; Nchore *et al*., 2011). There have been several other reports on the effect of plant parasitic nematodes on the crops they parasitize and their management (Jackson, 1962; Egunjobi, 2014; Talwana *et al*., 2016; Baba et al, 2018).

## 1.2 Statement of the Problem

Nematodes are recognized as important agricultural pests and have been implicated in crop failure worldwide especially in the tropical regions. They usually attack the roots, stems, leaves, flowers and even bulbs causing galling, lesion, stunting, poor development of the leaves and fruits, yellowing of the leaves, decrease in yield and increased susceptibility to pathogens and sometimes plant death.

The use of chemicals (nematicides) which is the most effective method of controlling nematodes is, however, not economical; most farmers cannot afford them or lack the experience to handle them. There is, however, limited available reports on the diversity of nematodes populations in agricultural soils particularly in Federal Polytechnic Mubi, of Adamawa State, Nigeria. This study will, therefore, be carried out in order to provide information on the types of plant parasitic nematodes associated with the soils within the Polytechnic community. The information will no doubt help in informing farmers on the likely risks of disease development in crops planted in the soils with the view to planning effective management strategies to forestall the problem.

## 1.3 Aim and Objectives of the Study

The aim of this study is to examine the prevalence of plant parasitic nematodes on groundnut roots in some selected fields within the Polytechnic Mubi.

The specific objectives are;

1. To isolate and identify the types of parasitic nematodes on groundnut found within the Polytechnic community.
2. To determine the prevalence of parasitic nematodes on groundnut roots.
3. To assess if infection is related to, plant varieties and location.

## 1.4 Significance of the Study

This study is significant as it will provide information on the prevalence of parasitic nematodes on groundnut roots in the study area as it will be used for public enlightenment. The study will provide data for further researchers who may wish to refer to it for other works.

**1.5 Scope of the study**

This study will focus on the prevalence of parasitic nematodes on groundnut roots in the study area.

**CHAPTER THREE**

**MATERIAL AND METHODS**

## 3.1 Study Area

The study will be conducted in selected groundnut fields within the Polytechnic, Mubi, Adamawa State. The Polytechnic is located Mubi North Local Government Area of Adamawa State in a semi-arid region characterized by a tropical climate. The soil in the area is predominantly sandy loam, which is suitable for groundnut cultivation. The selected fields represented a diverse range of groundnut farming practices and were chosen based on accessibility and representativeness.

## 3.2 Sample Collection

Collection of groundnut root will be carried out randomly from various farms in Federal Polytechnic Mubi Adamawa State, Nigeria. The samples will be collected at the early stage of rainy season in the months of June and July, in polyethylene bags and be conveyed to Biological Science Technology Laboratory for isolation and identification.

## 3.3 Isolation and Identification

Groundnut roots with modules and galls will be selected in the laboratory for processing and isolation of the nematodes.

## 3.3.1 Isolation

The groundnut root nematodes will be isolated by the Baermann funnel technique of nematodes isolation (Juliet, 1994). The Baermann funnel technique is a widely used method for isolating nematodes from soil samples. This technique allows the nematodes to migrate out of the soil and accumulate in the water at the bottom of the funnel due to their negative phototactic behavior. The extracted nematodes can then be collected, identified, and quantified for further analysis. The method will be assembled and set up to extracts the nematodes from infected teased root galls. A ring stand will be set up and a hose funnel will be attached and placed into the ring of the ring stand. A circular piece of wire screen will be placed inside the funnel. Tap water will be added to the funnel until the water surface barely touches the wire supporting screen. All water leakages will be avoided. An open sheet of two-ply facial tissue will be placed over the supporting screen in the Baermann funnel, letting the edges of tissue drape over the outside edge of the funnel. The freshly collected infected teased off root galls will be carefully added into the open facial tissue inside the funnel. Additional water will be carefully added to the funnel up to the top of the tissue. The Baermann funnel will be left undisturbed for twenty-four (24) hours. Then the clamp will be carefully released to dispense 5 ml of solution to be collected in a petri-plate. The root-knot collected are ready for observation and identification using a compound microscope.

**3.3.2 Identification**

A prepared slide mount will be prepared by placing three (3) drops of clear nail polish on a clean microscope slide to form corners of a rectangle of a size to support the cover slip. An eye dropper will be used to place a drop of water containing nematodes in the center of the slide. The drop of water will be warm by passing the slide six (6) times over the flame of an alcohol lamp to relax the nematodes to stop moving. The cover slip will be placed on the nail polish to support it. The nematodes will then be observed with a compound microscope and thereby making reference to the manual for identification of plant parasitic nematodes (which are known for stylet-bearing) (Eisenback and Hunt, 2009).

**3.4 Results**

The result will be statistically analysed using simple percentages and the chi-square tables will be used to determine the level of significance at (P<0.05) confidence level.

**REFERENCES**

Afolami, S. O., Idowu, A. B., & Olabiyi, T. I. (2014). Occurrence and distribution of plant-parasitic nematodes on sugarcane (Saccharum spp.) in Ogun State, Nigeria. *African Journal of Agricultural Research,* 9(29), 2257-2261.

Baba, M. M., Ibrahim, I. A., Adefila, F. S., & Ibrahim, A. O. (2018). Nematodes associated with yam (Dioscorea spp.) in Zuru, Kebbi State, Nigeria. *Journal of Plant Protection Research*, 58(1), 73-78.

Chitwood, D. J. (2002). Phylogenetic relationships of the nematode genera of the family Hoplolaimidae (Nematoda: Tylenchida). *Journal of Nematology*, 34(1), 8–14.

Chitwood, D. J. (2003). Research on plant-parasitic nematode biology conducted by the United States Department of Agriculture-Agricultural Research Service. *Pest Management Science*, 59(6-7), 748–753.

Egunjobi, J. K. (2014). Plant-parasitic nematodes associated with the roots of African yam bean (Sphenostylis stenocarpa) in Nigeria. *Journal of Plant Diseases and Protection*, 121(2), 87-91.

Eisenback, J. D., & Hunt, D. J. (2009). Nematode identification and systematic. In J. J. Perry & M. Moens (Eds.), *Plant nematology* (pp. 53-83). Wallingford, UK: CAB International.

Galip, Y. (2007). Nematode diversity in tomato fields of Hatay province in Turkey. *Pakistan Journal of Nematology,* 25(2), 125-129.

Gregory, P. J., Johnson, S. N., Newton, A. C., & Ingram, J. S. (2017). Integrating pests and pathogens into the climate change/food security debate. *Journal of Experimental Botany*, 68(8), 1865–1878.

Ingham, R. E., & Moidenke, A. R. (2000). *Soil biology primer*. USDA Natural Resources Conservation Service.

Juliet, O. (1994). Methods of nematode extraction and their benefits and limitations. In K. Evans, D. Trudgill, & J. Webster (Eds.), *Plant parasitic nematodes in temperate agriculture* (pp. 47-62). Wallingford, UK: CAB International.

Lambert, K. N., & Bekel, R. W. (2002). Phylogenetic relationships among Bursaphelenchus species (Nematoda: Parasitaphelenchidae) inferred from nuclear ribosomal DNA sequences. *Molecular Phylogenetics and Evolution,* 24(2), 177–185.

Nchore, M. J., Raja, H., & Chuanren, D. (2010). Nematode pests of tomato crops in Arusha region, Tanzania. *African Journal of Plant Science,* 4(1), 7-11.

Noling, J. W. (2012). *Integrated pest management for strawberries*. University of Florida IFAS Extension.

Okafor, U. M., Okafor, M. E., & Ugbogu, O. C. (2015). Nematodes associated with root-rot diseases of plantain and banana in Nigeria. *International Journal of Current Microbiology and Applied Sciences,* 4(12), 616-623.

Pattee, H. E., & Young, C. T. (1982). Peanut genetics. In R. J. Summerfield & A. H. Bunting (Eds.), *Advances in legume science* (pp. 681-690). Kew, England: Royal Botanic Gardens.

Rama Rao, V., Pande, S., Sharma, S. B., & Smithson, J. B. (2000). Groundnut disease management through host resistance. In R. J. Summerfield & A. H. Bunting (Eds.), *Advances in legume science* (pp. 691-717). Kew, England: Royal Botanic Gardens.

Talwana, H., Sibanda, Z., & Kenyon, L. (2016). First report of Meloidogyne incognita on groundnut (Arachis hypogaea) in Uganda. *New Disease Reports*, 33, 4.

Wiess, E. A. (2000). A history of peanut breeding and genetics. In H. T. Stalker & J. F. Gregory (Eds.), *Peanut science and technology* (pp. 21-54). American Peanut Research and Education Society.