**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 species 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 May and June, 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.

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