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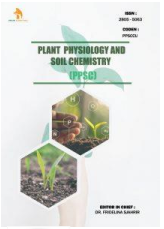

RESEARCH ARTICLE

SURVEY OF PLANT PARASITIC NEMATODES IN YAM GROWING BELT OF MOKWA AND MASHEGU LOCAL GOVERNMENT AREAS OF NIGER STATE, NIGERIA

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ABSTRACT

Yam (*Dioscorea* spp) is one of the staple food for most people in Nigeria and the country account for highest production worldwide. Plant parasitic nematodes are responsible for losses in crop production and quality all over the world. Therefore, the need to survey and identify the types of plant parasitic nematodes within a particular area is important in order to help the yam farmers. The objective of this study was to ascertain the plant parasitic nematodes infecting yams in Mokwa and Mashegu Local Government Areas of Niger State, southern Guinea Savannah of Nigeria. A total number of 30 soil samples were collected randomly using soil auger from both locations during 2019 cropping season. Nematodes were extracted from the soil using decanting and sieving method. Symptoms observed on the field included leaf chlorosis, leaf deformation and stunted growth. *Scutellonema 635 Rotylenchus*, 80 *Meloidogyne 223* and *Pratylenchus 89* were the most abundant of yam plant parasitic nematodes in Mokwa as compared to *Trichodorus*, 57, *Aphelenchus* 20, *Paratylenchus* 78, *Tylenchus* 10, *Helicotylenchus* 20, *Heterodera* 20 *Xiphenema* 10, of the parasitic nematodes while in Mashegu Local Government Areas of Niger State *Scutellonema* 989, Rotylenchus 110, *Meloidogyne* 100 and *Pratylenchus* 517 were the most abundant of yam plant parasitic nematodes in Mashegu as compared to *Trichodorus,* 25, *Aphelenchus* 10, *Tylenchus* 90, *Helicotylenchus* 58, *Heterodera* 30, *Xiphenema* 10, *Longidorous.* The survey result revealed that plant parasitic nematodes in Mashegu Local Government Areas of Niger State were more abundant than Mokwa Local Government Areas of Niger State. The identified plant parasitic nematodes could be cultured for breeding resistant yam cultivars in order to prevent severe yield losses posed by those plant parasitic nematodes.

KEYWORDS

Yam, plant parasitic nematodes, Sieving and decanting methods.

1. INTRODUCTION

Yam (*Dioscorea* spp) is one of the staple food for most people in Nigeria and the country accounts for highest production (70 - 80%) of the crop worldwide (FAO, 2019). It contributes most of the calories requirements for each day and the tubers are consumed in several forms: eaten roasted, boiled, fried or as pounded yam and yam flour. The yam tuber can be put to other uses such as cash/export crop; livestock feed and cultural values (Nwankwo *et al*., 2018). Due to the continued and increasing dependence on yam for food in Nigeria, it is important for food security. Farmers are continually boosting the diversity of their plots by domestication of important high yielding varieties (Asala *et al*., 2012). Major yam production is in the forest and the guinea Savannah zones of Nigeria. Yam is the most important and widely grown in the Guinea Savannah with hundreds of hectares each year (Nwankwo *et al*., 2018).

One of the Variety of yam that is gaining popularity in Sub-Saharan Africa is Water yam (D. *alata*, native to Southeast Asia) because it is easier to propagate than the native white yam. However, it is less acceptable to many consumers because of the higher water content of the tubers, which means it cannot be pounded (Ayo-John *et al*., 2017). Other varieties grown (or sometimes harvested from the wild) for their culinary uses in West Africa include the aerial yam (D. *bulbifera*) and the bitter yam (D. *dumetorum*). (Lava, 2015). In Nigeria, the cooked yam is pounded and kneaded into a sticky mass that is then eaten as small balls of dough often dipped into stew. It can also be processed into various staple, intermediate and end product forms which are used for direct consumption by animals, used as the basic ingredient for snacks or made into flour used for making instant puree (Anjorin *et al*., 2014).

Yam parasitic nematodes have been reported in most of the yam growing

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areas of West Africa (Eni, 2008). Plant parasitic nematodes infecting yam that have been reported in West Africa include *Scutellonema, Pratylenchus, Meloidogyne, Rotylenchus, Ty*lenchus, *Longidorous, Heterodera* (Eni, 2008). In Nigeria, *Scutellonema,* is the most prevalence in the humid forest, reaching an incidence of 70% (Asala *et al*., 2012). These viruses spread through seasons and fields, mostly through infected planting material and their accumulation paralysis yam germplasm movement worldwide. Therefore the plant parasitic nematodes affect yam and also reduces productivity (Njukeng *et al*., 2014). One of the serious problem is Yam cultivation and storage facilities and this has lead to constraints in its production as they have direct negative effect on its quality and yield. Many surveys have reported the presence of several plant parasitic nematodes such as *Scutellonema, Pratylenchus, Meloidogyne, Rotylenchus* (Eni *et al*., 2010). Therefore, there is need for the knowledge of plant parasitic nematodes of yam in major yam producing Local Government Areas of Niger State. This study was essential to facilitate the development of preventive and control measure.

The aim of the study was to determine the state of yam plant parasitic nematodes in some selected Local Government Areas of Niger State. The objective of the study was to quantify the plant parasitic nematodes infecting yam in the study areas.

2. METHODOLOGY

2.1 Survey and sample collection

Survey of farmer's fields were carried out in two selected Local Government Areas (LGAs) of Niger State. Fifteen farmers field was surveyed in each LGA to determine the incidence of plant parasitic nematodes of yam during 2019 wet season in selected local Government (Mokwa and Mashegu). A total of 30 soil samples were collected from the surveyed field; soil samples were collected from yam plants showing typical nematodes symptoms (chlorosis spotting, mottling, stunted growth). The soil samples collected were taken at a depth of 15-30 cm at the base of each plant in order to cover as much of the rhizosphere as possible using soil auger/hand trowel. Samples (soil) from each farm where pooled and sealed in plastic bags and protected from the sun. The samples were properly labeled and taken to Nematology Unit, Department of Crop Protection, Faculty of Agriculture, Ahmadu Bello University, Zaria- for extraction, identification and quantification of plant parasitic nematodes. Plant parasitic nematodes were extracted from the soil using the sieving and decanting method (Coyne *et al*., 2011).

3. RESULTS

The result of the survey of yam parasitic nematodes associated with yam field in Mokwa and Mashegu Local Government Areas of Niger State is summarized in the table below. The result of this investigation shows that twelve nematode genera are associated with yam fields in the two Local Government Areas in Niger State with variation in frequency and relative abundance. *Scutellonema* genera have the highest frequency of occurrence in Mashegu (989), followed by *Pratylenchus* (517) Rotylenchus (110) and *Meloidogyne* (100) were the most abundant of yam plant parasitic nematodes in Mashegu as compared to *Trichodorus,* 25, *Aphelenchus* 10, *Tylenchus* 90, *Helicotylenchus* 58, *Heterodera* 30, *Xiphenema* 10, *Longidorous* 10 in the same Local Government Areas. While in Mokwa Local Government Areas, *Scutellonema* (635) is widely distributed indicating that it is the most abundant nematode genera followed by *Meloidogyne* (223), *Pratylenchus (89*), *Rotylenchus* (80) and *Paratylenchus* (78) were the most abundant of yam plant parasitic nematodes in Mokwa as compared to *Trichodorus*, 57, *Aphelenchus* 20, *Tylenchus* 10, *Helicotylenchus* 20, *Heterodera* 20 *Xiphenema* 10, of the parasitic nematodes in the same Local Government Area.

Table 1: Frequencies of occurrence of Nematodes isolates in Mashegu Local Government Area Of Niger State.

Names of Farms in Mashegu L.G.A	Scute (fo)	Praty (fo)	Meloido (fo)	Rotylenc (fo)	Tylenc (fo)	Xiphine (fo)	Helicoty (fo)	Trichodo (fo)	Aphelench (fo)	Longido (fo)	Heterode (fo)
Igade 1	40			25	15						
Igade 2	66	48	10	20							
Igade 3	68	34	10				20				
Kawo 1	44	38			10		10				
Kawo 2	80	66		10	20						
Kawo 3	65		20		25					10	
Kasanga 1	65	44									
Kasanga 2	82	28	15	20	10					22	
Kasanga 3	76	48				10					10
Gbabagi 1	80	44		15					10		
Gbagabi 2	65	35						25			
Gbagabi 3	42	38		20	10		28				
Dapangi 1	64	46	20							10	
Dapangi 2	76		25								10
Dapangi 3	76	48									10

KEYS: fo – frequency of occurrence, scutellonema, pratylenchus, meloidogyne, rotylenchus, tylenchus, xiphinema, helicotylenhchus, trichodorus, aphelenchus, longidorous, heterodera

Table 2: Frequencies of occurrence of Nematodes isolates in Mokwa Local Government Area Of Niger State.

Names of Farms in Mokwa L.G.A	Scute (fo)	Praty (fo)	Meloido (fo)	Rotylenc (fo)	Tylenc (fo)	Xiphine (fo)	Helicoty (fo)	Trichodo (fo)	Aphelench (fo)	Paratyle (fo)	Heterode (fo)
Kpaki 1	44		28	20							
Kpaki 2	28	10	12								
Kpaki 3	28		10								
Jebba North1	55		32						10	40	
Jebba North2	22		12		10		10				
Jebba North3	80	10		10				10			
Muwo1	22			10				10	10	38	
Muwo 2	40		22			10					10
Muwo 3	44	28	25	10							
Takuma 1	66		10	10				12			
Takuma 2	42	10	28								
Takuma 3	32	10		10				25			
Mokwa Central 1	84	20	44	10						10	
Mokwa Central 2	48	10		10	10	10	10				
Mokwa Central 3	38										10

4. Conclusion and Recommendations

Organic manure should be used to amend soil in this area as this organic amendment has negative impact on plant parasitic nematodes via population reduction due to toxic by-product of decomposition. Other strategies that farmers can manage properly should be introduced to the study area. Such methods include crop rotation with non-susceptible crops, used of nematicides such as Carbofuran, solarisation and use of plant part as nematicides. This wide spread distribution of plant parasitic nematodes has been known to cause poor yield in Nigeria. It could be a factor in low yam production in the study area. The nature of damage cause by plant parasitic nematode make their damage potential to be underestimated and mistaken for damage caused by other plant pathogens. It is imperative that awareness be created for farmers on the damaging effects of plant parasitic nematode damage to yam.

Adoption of early planting, good field sanitation, weeding and rouging of infected yam fields will also serve as other management technique (Adeniyi *et al*., 2012). The identified plant parasitic nematodes could be utilised for breeding resistant yam varieties in order to identify and prevent severe yield losses posed by all the plant parasitic nematodes.

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