Pathogenicity Study of *Meloidogyne incognita* and *Scutellonema bradys* on White Yam Cultivars in Nigeria

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**Abstract:** Investigation was carried out to study the pathogenicity of *Scutellonema bradys* and *Meloidogyne incognita* nematodes on five different white yam cultivars in Nigeria. White yam cultivars used as test crops are ‘Lasinrin’, ‘Agatu’, ‘Dodola’, ‘Tegunde’ and ‘Ewuru’. The plant parasitic nematodes caused warty, knobby, unappealing appearances and dry root symptoms on the white yam tubers. Both the quality and the quantity of white yam tubers were affected by the plant parasitic nematodes. The result of this research shows that white yam is susceptible to plant parasitic nematodes. Out of the five white yam cultivars that were assessed for nematode susceptibility potentials, ‘Ewuru’ cultivar proved to be fairly resistant to both *M. incognita* and *S. bradys*. Nigeria farmers are therefore advised not to plant white yam cultivars on plant parasitic nematode endemic areas and also, white yams should not follow *M. incognita* and *S. bradys* susceptible crops on crop rotational scheme.

**Key words:** White yam, *Meloidogyne incognita*, *Scutellonema bradys*, pathogenicity, Nigeria

**INTRODUCTION**

Yam belongs to the family *Discoreae* and to the genus *Discorea* [1]. Yams, *Discorea* species are probably one of the oldest food crops known to man [2]. Yams are valuable source of carbohydrate to the people of tropical and sub-tropical Africa, central and South America part of Asia, the Caribbean and pacific Island [1]. There are over 150 species of yam grown throughout the world. The most cultivated species in Nigeria are *D. rotundata* (White yam), *D. cayenensis* (Yellow yam) and *D. alata* (Water yam). Moreover there are also few wild species of yam growing in Nigeria which are eaten in times of food shortage or scarcity.

Yam had been reported to be susceptible to nematodes. The economically important nematodes are *Scutellonema bradys* and *Meloidogyne incognita* [3]. These nematodes especially the root knots are capable of forming galls on tubers but in some cases, tubers may carry large numbers of females without showing knots or galls. In a survey of root-knot nematodes attacking yams in four eastern states of Nigeria (Anambra, Cross rivers, Imo and Rivers), *M. incognita* was identified from *D. alata* while *M. javanaica* were identified from *D. rotundata* [4].

Soil borne nematodes *M. incognita* and *S. bradys* causes great reduction in size and qualities of yam produced on infected soil and even causes a great destruction to the inner part (food) of the yam. This paper attempts to find out which cultivar of white yam is more resistant or susceptible to *M. incognita* and *S. bradys* in Nigeria.

**MATERIALS AND METHODS**

**Choice of Land and Land Preparation:** The experiment was carried out at the Teaching and Research Farm of the Ladoke Akintola University of Technology, Ogbomoso, Nigeria in 2006 and 2007 cropping seasons. A piece of land which had been left fallow for a period of two years was examined and assessed to be suitable for yam cultivation. The parcel of land was cleared; shrubs and stumps were removed and constructed into small heaps of 1m by 1m distance apart.

**Field Experiment:** Five different white yam cultivars were purchased (in seed form) from neighboring markets within and around Ogbomoso. The different yam cultivars used as test crops for this research work were ‘Lasinrin’, ‘Agatu’, ‘Dodola’, ‘Tegunde’ and ‘Ewuru’. Planting was
Table 1: Effect of plant parasitic nematodes on different yam cultivars

<table>
<thead>
<tr>
<th>Yam cultivars</th>
<th>Tuber weight (kg)</th>
<th>Tuber length (cm)</th>
<th>Number of leaf per plant</th>
<th>Vine length (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>Lasinrin</code></td>
<td>4.00a</td>
<td>28a</td>
<td>200c</td>
<td>260b</td>
</tr>
<tr>
<td><code>Tegunde</code></td>
<td>3.35a</td>
<td>25a</td>
<td>272b</td>
<td>220b</td>
</tr>
<tr>
<td><code>Dodola</code></td>
<td>3.30a</td>
<td>25a</td>
<td>187c</td>
<td>195c</td>
</tr>
<tr>
<td><code>Agatu</code></td>
<td>3.50a</td>
<td>27a</td>
<td>476a</td>
<td>300a</td>
</tr>
<tr>
<td><code>Ewuru</code></td>
<td>4.80a</td>
<td>31a</td>
<td>526a</td>
<td>340a</td>
</tr>
</tbody>
</table>

Means followed by the same letter(s) along the same column are not statistically different at 5% probability level.

Table 2: Soil nematode population at planting (initial population) and harvest (final population), root gall index and dry rot infection

<table>
<thead>
<tr>
<th>Yam cultivars</th>
<th>Initial Nematode population</th>
<th>Final nematode population</th>
<th>Root gall index (M. incognita assessment)</th>
<th>Dry rot infection (S. bradys assessment)</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>Lasinrin</code></td>
<td>245</td>
<td>741b</td>
<td>3.0</td>
<td>Moderately susceptible</td>
</tr>
<tr>
<td><code>Tegunde</code></td>
<td>270</td>
<td>755b</td>
<td>3.5</td>
<td>Moderately susceptible</td>
</tr>
<tr>
<td><code>Dodola</code></td>
<td>231</td>
<td>731b</td>
<td>3.1</td>
<td>Moderately susceptible</td>
</tr>
<tr>
<td><code>Agatu</code></td>
<td>227</td>
<td>801b</td>
<td>3.6</td>
<td>Moderately susceptible</td>
</tr>
<tr>
<td><code>Ewuru</code></td>
<td>241</td>
<td>493a</td>
<td>2.0</td>
<td>Fairly resistant</td>
</tr>
</tbody>
</table>

NS: Not significant

Means followed by the same letter(s) along the same column are not statistically different at 5% probability level.

Data Collection: At harvest (10 months after planting) data were collected on the tuber weight, tuber length, root-knot nematode gall index, number of leaf per plant, vine length and soil nematode population. Three months after harvest, yam tubers were assessed for dry rot infection. The data collected at both years were pooled together and analyzed.

RESULTS

It was observed that the yam cultivars responded to plant parasitic nematodes (Scutellonema bradys and Meloidogyne incognita) differently. This is reflected in the tuber weight, tuber length, number of leaf per plant and vine length (Table 1). `Lasinrin` and `Ewuru` cultivars had the highest tuber weight; this is closely followed by the weight of `Agatu` and `Tegunde` respectively while `Dodola` variety had the least tuber weight. Similar variation, like that of tuber weight, was observed on the tuber length. The number of leaf per plant is significantly highest in `Ewuru` while `Dodola` had the least. The length of yam vines also varied significantly across the different white yam cultivars. It was observed that `Ewuru` variety had the longest vine length which was closely followed by `Agatu` variety and `Dodola` had the least vine lengths.

The soil nematode population count at planting (initial nematode population) was not significantly different across the different white yam cultivars (Table 2). However, the soil nematode population count at harvest (final nematode population) differed significantly across the different white yam cultivars. `Lasinrin` cultivar had the least soil nematode population count which was closely followed by `Dodola` cultivar. The root gall index also varied significantly across the different white yam cultivars. `Ewuru` and `Lasinrin` had the least significant root gall index, which is closely followed by `Dodola`. Dry rot assessment revealed that all but one of the white yam cultivars was moderately susceptible to S.bradys. Only `Ewuru` cultivar is fairly resistant to S. bradys.

DISCUSSION

The result of this research shows that white yam is susceptible to M. incognita and S. bradys. Plant parasitic nematodes cause unappealing, warty or knobby appearances on white yam causing white yam tubers to have extremely low market value. The results obtained from this current research corroborate earlier findings of several other researchers. The yam nematodes, S. bradys, has also been found to cause decay of yam tubers known as dry rot disease. This type of dry rot of yam occurs in the outer 1 to 2cm of tubers. The internal stage of the
nematodes dry rot consists of cream and light yellow lesion below the outer stem of tubers. No external symptoms are found at the stem at this stage but as the disease progress it spread into the tuber, normally to a maximum depth of 2cm but sometimes deeper. In these later stages of dry rot, infected tissues first became light brown and turn chattel brown to black. External cracks appear in the skin of the tuber and park can flake off exposing dark brown patches and dry rot tissues. However, weight differences between healthy and diseased tubers harvested from the fields have been estimated to be 0 to 29% in Nigeria [4].

Knotting or galling and internal rotting of yam tubers have been found to be associated with Meloidogyne species. In certain yam species sprouting in galled tubers are often reduced or suppressed and root proliferation from galls of tubers can occur [4,6,7]. It is estimated that there is a reduction of 34 to 52% in the price of galled tuber compared to healthy ones. Other diseases caused by M. incognita and M. javanica in stored tubers are reduction in the edible portion (more peels have to be removed), a weight loss and an increase in the number of rotted tubers in both D. alata and D. rotundata [4].

Nematode problems with yams in Nigeria did not achieve effective control with spot application of fungicides into yam mounds. It has been suggested that a non-phototoxic compound should be applied as a post-plant treatment at a stage nematodes are migrating from old infested yams into the soil before invading the young developing tubers [7, 8]. This have suggested the need for further studies into the effective control of soil borne nematode pests of yam and mechanism of increasing the production of yam that will further suppress the action of soil borne nematodes in Nigeria.

REFERENCES