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Evaluation of Nematode Pests and Fungal Diseases of *Ceratotheca Sesamoides* in Ilorin

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Abstract

Field and Laboratory experiments were conducted to find out the incidence of diseases caused by nematode pests and fungal pathogens associated with two cultivars (tall and short) of black *sesame, Ceratotheca sesamoides (L) Endl.* Two cultivars of *C. sesamoides* were planted at random on the field in a completely randomized block design. Rate of fungal infection significantly differed in the two varieties and the tall cultivar had higher rate of infection. The nematode genera found associated with the plant in were *Meloidogyne, Pratylenchus, Helicotylenchus, Trichodorus,Hemicricomoides,* and *Scutellonema* while fungal pathogens were *Septoria, Fusarium*, and *Penicillium.* Although not significantly different, there was appreciable difference in the nematode population of the soil at planting, one and two months after planting. The nematode counts in and around the root did not significantly differ.

Introduction

Vegetables are extremely important components of our daily diets as well as high value cash crops for small and large growers alike (Schippers, 2000). Vegetables, especially the leafy ones are rich in protein, vitamins, minerals and fiber. Nigeria is naturally endowed with numerous vegetables, but most of them are indigenous, largely unknown and unexploited beyond traditional localities where they are found and eaten. False or black sesame, *Ceratotheca sesamoides* fall into this group. There are two varieties – the tall and the dwarf varieties (Fasakin, 1991).

Apart from the mucilaginous leaves which are harvested for mainly for soup, the seeds which contain 37% oil are also eaten to adulterate beniseed. In Ghana, the leaves are used in preparation of shea butter. The leaves are mixed with chopped grass and hay to serve as adhesive agent for building purpose. The root peel can be used as beauty treatment for the eye and the foot in Southern Nigeria (Fasakin 1991). The Kanuris in Northern Nigeria use the leaves in soap making (Akinniyi et al., 1984).

Although very scanty documented works exist on the nematode and fungal diseases of this vegetable, nematode pests of vegetables cannot be underscored. Presence of plant parasitic nematodes in the soil has contributed great loss to crops both in yield and quality. Apart from the direct damage done by nematodes to crops, they also act as vectors of some diseases. The wound they create serve as entrance for virus, fungi and bacteria.

The objective of this study therefore, is to identify the nematode pests and fungal diseases of *Ceratotheca sesamoides* and compare the disease severity on the two cultivars of the vegetable.

Materials and Methods

The field experiment was carried out at the University of Ilorin Teaching and Research farm while the laboratory trials were conducted at the Department of Crop Protection Laboratory.

Tillage was carried out on the field using a tractor. The land was ploughed, harrowed and made into ridges. The ridges were later flattened as this was suitable for vegetable cultivation. Eight plots of 2m x 4m were laid out in a completely randomized block design with 1m spacing in between plots. The seeds of the two varieties were planted in four replicates. Each plot consists of six rows having 30cm spacing in between rows.

Planting was done using drilling method and seed germination was observed on the 5^{th} and 6^{th} day after planting. Weeding of the plots was done manually with hoe. Application of NPK fertilizer, 25:15:5 was done 28 days after planting.

Collection of soil samples from each plot for nematode assay was done at planting, first and second month after planting. Root samples of *C. sesamoides* were collected at the end of the experiment and taken to the laboratory for

nematode extraction. Nematode populations in 200ml of soil in each plot were extracted using the modified Baermann's technique (Whitehead and Hemming, 1965). Nematodes were identified and counted under the stereo – microscope.

Outbreak of fungal infection was observed 1 ½ months after planting. Number of plants infected and number of leaves affected on each plot was scored. Two (2) stands of plants were considered in each row in a plot and two leaves from each of the stand were scored for number of spots on the leaves.

To identify the fungi present on the leaves, the infected leaves collected from both varieties were moistened with water and put in the incubator for 72 hours for adequate growth of micro-organism. The materials were then isolated on nutrient agar and later sub-cultured into potato agar at 20^0C for 72 hours. Thereafter, it was observed under a stereo- microscope (x250 magnification) and counted using a Doncaster counting dish.

Statistical Analysis
All data collected were subjected to Analysis of variance and where necessary, the means were separated using Duncan's Multiple Range Test (DMRT).

Results

Field Infections
The fungi that were isolated and identified after incubation on both cultivars were *Septoria* and *Fusarium* species while *Penucillim* species were identified on the leaves of the tall variety only. There was significant difference to the disease incidence on the two varieties at P = 0.05 (Table 1). The tall variety was infected more than the dwarf variety. About 92.28% of plants of the tall variety were infected by fungal attack while only about 26.28% of the plants of the dwarf variety were infected. However, the number of leaves infected per plant in the two varieties did not significantly differ. There was no significant difference in the number of spots observed per leaf for the two varieties.

Nematode Species Identified
The nematodes encountered in the soil were *Meloidogne* spp, *Pratylenchus* spp. and *Helicotylechus* spp. These were found in the soil at planting and first month after planting. In addition to these ones, at the end of two month after planting, *Trichodorus* spp. *Hemicricomoides* spp. and *Scutellonema* spp. were also found. There was no statistical difference among the two cultivars in the populations of the nematodes at any of these times (Table 2).

Meloidogyne spp and *Pratylenchus* spp were the only parasitic nematodes identified in the root extracts of *C. sesamoides* and the population in the two cultivarss was not significantly different (Table 3).

Discussion

This study has shown that the two varieties of *C. sesamoides* are susceptible to both nematode and fungal attack.

Fungal disease outbreak on the field plots showed that the disease incidence was more prominent on the plots planted with the tall variety compared with the dwarf variety. This may not be unconnected with the better vegetative growth of the tall cultivar which resulted in more contact between the tall plants.

The lack of significant difference in respect to the number of leaves infected per plant and number of spots observed per infected leaf for the two varieties of *C. sesamoides* suggests that the same amount of damage was done to them by the attack of fungi. It goes further to show that though both cultivars were equally susceptible to the attack of fungi, but the infection was more quickly spread on the plots planted with the tall variety because of close contact between the plants.

Although, nematode population encountered in the soil at planting, one and two months after planting showed no significant difference, there was appreciable increase in the populations of *Meloidogyne* spp., *Pratylenchus* spp. and *Helicotylenchus* spp. at planting as compared to populations one month after planting (Table 2). This shows that the two varieties of *C. sesamoides* are susceptible or potential hosts to these species of nematodes and any control measure should be aimed at them. On the other hand, non existence of *Trichodorus* spp., *Hemicricomoides* spp. and *Scutellonema* spp. at planting and one month after planting may suggest the migration of these nematodes from adjacent plots to the Ceratotheca plots, thus indicating suitability of this crop as a host for nematodes.

The presence of different species of nematodes is not uncommon in field conditions due to polyspecific nature of nematodes communities. Like many other pathogens, nematodes seldom attack plant roots as pure populations, but constitute multipathogenic complexes in which the component species interact continuously under field conditions (Nickle, 1991 and Powell, 1971). From the present study, it is obvious that the transmission and etiology of an important group of soil-borne plant virus disease must not be taken for granted due to the appearance of *Trichodorus* spp. later in the field. *Trichodorus* spp. are vectors of TOBRA viruses (Taylor

and Brown, 1997). Though the acquisition time may be less than an hour to several days depending on the feeding characteristics of the nematode, they may retain the virus for up to one year. This suggests that the plants in that field stand the danger of viral infection which might possibly be carried over to the next cropping season if not properly checked. It is therefore pertinent that adequate control measures be adopted to manage the nematodes present, especially the *Trichodorus* spp. with the view that nematode virus vectors in very low populations have the potential to cause significant damage to crops. Some suggested management practices include; keeping the crops free of weed hosts (Charlton, 2006), fallowing, use of resistant varieties and integrated pest management (I.P.M) among others.

Table 1: Score of Fungi Attack on Ceratotheca Sesamoides

	Tall Variety	Dwarf Variety	
Percentage of plant affected	92.28[a]	26.28[b]	
Average number of plants affected	1070.5[a]	214.3[b]	
Average number of affected leaves per plant	7.3	6.8	N.S
Average number of spots observed per leaf	20.8	10.8	N.S

Scores in the same row followed by different letters are significantly different at $P \leq 0.05$ according to Duncan's Multiple Range Test.
N.S = Not Significant

Table 2: Mean Soil Nematode Population for *C. sesamoides* Varieties

Period	Pratylenchus		Helicotylenchus		Meloidogyne		Trichodorus		Hemicricomoides		Scutellonema	
	Tall Variety (TV)	Dwarf Variety (SV)	TV	SV	TV	SV	TV	SV	TV	SV	TV	SV
At planting	3.75	3.25	4.50	4.20	5.25	5.75	-	-	-	-	-	-
1st month after planting	15.25	12.50	26.25	19.25	52.75	39.00	-	-	-	-	-	-
2nd month after planting	24.25	20.25	15.50	20.75	24.50	22.25	13.25	13.75	0.5	1	2.5	2.5

Table 3: Mean Root Nematode Population

Variety	Meloidogyne	Pratylenchus
Tall variety	0.75	1.25
Dwarf variety	1.50	2.25

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