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SUSCEPTIBILITY OF CROPS UNDER YAM INTERCROP TO ROOT-KNOT NEMATODE (*MELOIDOGYNE INCOGNITA* (KOFOID AND WHITE) CHITWOOD RACE 2) IN SOUTH-WESTERN NIGERIA

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Abstract

Twelve commonly grown crops in association with yam in South-Western Nigeria were evaluated for resistance to root-knot nematode (Meloidogyne incognita race 2) in 1998 and 1999 planting seasons. Observations, based on gall indices and recovery of the juvenile larvae from the roots and soil indicated that Abelmoschus esculentus, Corchorus olitoris cv Angbadu, and Sphenostylis stenocarpa cv Nsukka Brown were highly susceptible, while Arachis hypogaea cv UGA 4, Cajanus cajan cv Cita-2, Cucumis melo cv Bara To139, Manihot esculenta cv TMS 30572, Sorghum bicolor and Zea mays cv DMR-LSR-Y were moderately susceptible while Crotalaria juncea, Mucuna cochinchinensis and Stylosanthes gracilis were highly resistant. These intercrops if planted on yam mounds will play a prominent role in altering the populations of root-knot nematodes.

INTRODUCTION

A large number of plant-parasitic nematodes associated with yam cultivation have been reported from various yam producing areas of the world (Ayala and Acosta, 1971; Bridge, 1972; Thompson *et al*., 1973; Adesiyan and Odihirin, 1977; Caveness 1982, Hahn *et. al*., 1989; Caveness 1992; IITA 1995; Green and Florini, 1996; Agbaje *et. al*., 2000). Some of these nematodes have been found either in or on yam roots and tubers, while others are found in the yam rhizosphere. Amongst these nematodes, three have been recognized as constituting major constraints to yam cultivation. These are the yam nematode, the root-knot nematode and the lesion nematode, which are all field and post-harvest pests (Hahn *et. al*., 1989; Caveness, 1992).

Green and Florini (1996) noted that planting yam with crops susceptible to root-knot nematodes would increase the nematode population, increase yield loss and reduce tuber quality in both field and storage. In fields, where root-knot nematodes are problems, one should select resistant intercrops to control the pest (Hahn *et al.,* 1989; Sasser and Taylor, 1978; Atu and Enyinnia, 1983 and Singh *et al*., 1974). This paper reports on the host status to root-knot nematode of crops commonly intercropped with yam in South-Western Nigeria.

MATERIALS AND METHOD

The two-year study was carried out at Institute of Agricultural Research and Training, Moor Plantation, Ibadan and Ilora derived Savanna Research Station in 1998 and was repeated in 1999. The propagules of intercrops were sourced locally and are twelve most commonly used in South-Western Nigeria. They were *Abelmoschus esculentus* cv V35, *Arachis hypogaea* cv UGA4, *Cajanus cajan* cv Cita-2, *Corchorus olitorus* cv Angbadu, *Crotalaria juncea, Cucumis melo* cv Bara To139, *Manihot esculenta* Crantz, cv TMS 30572, *Mucuna cochinchinensis, Sorghum bicolor, Sphenostylis stenocarpa cv Nsukka Brown, Stylosanthes gracilis* and *Zea mays* cv DMR-LSR-Y.

Five seeds or propagules of each intercrop were planted in 15-litre plastic buckets containing sterilized sandy loam, 5000 *Meloidogyne incognita* Race 2 eggs were added. Each treatment was replicated five times, the experiment being a randomized block design. Five weeks after planting (WAP), 500ml samples of soil were collected from the buckets for root-knot nematode bioassay; two week-old tomato seedlings grown on steam-sterilized soil were transplanted into the soil samples for comparison. Ninety-days after planting, the intercrops were carefully uprooted, washed and root-galls rated

according to Sasser and Taylor (1978) on a scale of 0 – 5 (0 = 0, 1 = 1-2, 2 = 3-10, 3 = 11-30, 4 = 31-100 and 5 = >100 galls). Larvae per 5g of roots were extracted by maceration/ filtration technique (Escobar and Rodriguez-Kabana, 1980). Larvae per 250ml of soil were also extracted with extraction trays according to the method of Whitehead and Hemming (1965). Doncaster's (1962) counting dish was used for population estimate under a stereoscopic microscope.

RESULTS AND DISCUSSION

The intercrops differed in their status as hosts to *Meloidogyne incognita* race 2 (Table 1). The root-gall index ratings on the tomato plants for the two-year study (1998 – 1999) indicated that *Meloidogyne incognita* race 2 reproduced highly on *Abelmoschus esculentus* cv V35, *Corchorus olitorus* cv Angbadu and *Sphenostylis stenocarpa* cv Nsukka Brown while no appreciable root-gall index occurred on soil sample containing *Crotalaria juncea, Mucuna cochinchinensis* and *Stylosanthes gracilis*.

In 1999, gall indices for *Arachis hypogaea* cv UGA4, *Cajanus cajan* cv Cita-2, *Cucumis melo* cv Bara To 139, *Manihot esculenta* cv TMS 30572, *Sorghum bicolor* and *Zea mays* cv DMR-LSR-Y were significantly lower from those of *Abelmoschus esculentus* cv V35, *Corchorus olitorus* cv Angbadu and *Sphenostylis stenocarpa* cv Nsukka Brown.

Observation in both years, showed that the root-gall indices were lowest for *Crotalaria juncea, Mucuna cochinchinensis* and *Stylosanthes gracilis*. In 1999,no galling was observed on the roots of these crops but nodulation was profuse (Caveness 1980, Rhoades 1964, Rhoades and Forbes 1986, Ayala *et. al.*, 1967 and Haroon and Smart 1983). The amount of *M. incognita* Juveniles extracted from the plant roots and rhizosphere reflected the amount of galling on the plants (Table 2). Intercrops with high gall indices supported high nematode populations. Low gall indices were recorded in 1998 in both locations, with high larval populations on *Arachis hypogaea* cv UGA4,, *Cucumis melo cv Bara To 139, Manihot esculenta* cv TMS 30572, *Sorghum bicolor* and *Zea mays* cv DMR-LSR-Y. This type of response had been reported by the following workers (Sasser 1977, Ibrahim and El-Saedy 1976, Fassuliotis 1979, Caveness 1980, Page 1985, Ediz and Dickerson 1976, Becerra and Sasa-Moss 1977 and Idowu 1981) while fewest larvae were recovered from soil samples of *Crotalaria juncea, Mucuna cochinchinensis* and *Stylosanthes gracilis* which were significantly lower in numbers than from other intercrops.

From this study, *Abelmoschus esculentus* cv V35, *Corchorus olitoris* cv Angbadu and *Sphenostylis stenocarpa* cv Nsukka Brown could be classed as highly susceptible; *Arachis hypogaea* cv UGA4, *Cajanus cajan* cv Cita-2, *Cucumis* melo cv Bora To139, *Manihot esculenta* cv TMS 30572, *Sorghum bicolor* and *Zea mays* moderately susceptible while *Crotalaria sp., Mucuna cochinchinensis* and *Stylosanthes gracilis* highly resistant. Some of these intercrops are planted on yam mounds. If highly susceptible crops like *Abelmoschus esculentus* cv V35, *Corchorus olitorus* cv Angbadu and *Sphenostylis stenocarpa* cv Nsukka Brown are placed close to yam plants, attack on yam by *Meloidogyne incognita* Race 2 will be more severed thereby increasing the nematode population and reduce the quality of the tubers (Green and Florini 1996).

In South-Western Nigeria, several crops are incorporated into yam cultivation and planting of resistant intercrops like *Crotalaria juncea, Mucuna cochinchinensis* and *Stylosanthes gracilis* would prevent nematode populations build-up around yam plants.

Table 1: Root-gall Indices in Roots of Inoculated Intercrops.

	Root-Gall Indices			
	Ibadan		Ilora	
	1998	1999	1998	1999
Abelmoschus esculentus cv V35	5.0a	5.0a	4.8a	4.7a
Arachis hypogaea cv UGA4	2.6b	3.8b	2.8b	3.8b
Cajanus cajan cv Cita-2	3.0b	4.0b	3.2b	4.0b
Corchorus olitorus cv Angbadu	4.6a	4.8a	4.8a	4.8a
Crotalaria juncea	1.0c	0.0c	1.0c	0.0c
Cucumis melo cv Bara To139	2.5b	3.8b	2.3b	3.8b
Manihot esculenta cv TMS 30572	2.4b	3.8b	2.6b	3.8b
Mucuna cohinchinensis	1.0c	0.0c	1.0c	0.0c
Sorghum bicolor	2.4b	3.8b	2.5b	3.7b
Sphenostylis stenocarpa cv Nsukka Brown	5.0a	5.0a	4.8a	4.8a
Sylosa[illegible] gracilis	1.0c	0.0c	1.0c	0.0c
Zea mays cv DMR-LSR-Y	2.4b	3.7b	2.6b	3.8b

a. Each figure is the mean of five replicates.
Means followed by the same letter do not differ significantly (P = 0.05) according to DMRT.

Table 2: Number of nematode juveniles recovered from roots and soil samples.

	IBADAN		ILORA	
	Juveniles/ 5g roots	Juveniles/ 250ml soil	Juveniles/ 5g roots	Juveniles/ 250ml soil
Abelmoschus esculentus cv V35	58a	525a	62a	556a
Arachis hypogaea cv UGA4	42b	385b	47b	420b
Cajanus cajan cv Cita-2	44b	400b	48b	435b
Corchorus ditorus cv Angbadu	54a	485a	57a	515a
Crotalaria juncea	2c	15c	3c	20c
Cucumis melo cv Bara To139	43b	388b	44b	398b
Manihot esculenta cv TMS 30572	43b	387b	44b	400b
Mucuna cochinchinensis	3c	16c	3c	25c
Sorghum bicolor	42b	380b	43b	388b
Sphenostylis stenocarpa cv Nsukka Brown	57a	515a	63a	565a
Stylosanthes gracilis	2c	16c	2c	19c
Zea mays cv DMR-LSR-Y	41b	375b	43b	388b

Means followed by the same letter do not differsignificantly (P = 0.05) according to DMRT.

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