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Short Communication

Community analysis of phytoparasitic nematodes associated with ornamental plants at Jimma University Agriculture Campus, Ethiopia

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Under the hypothesis, this work was carried out to determine that a complex of plant-parasitic nematode groups are involved in the growth suppression and death of the ornamental plants and hence establishing records of their type and abundance is necessary to minimize the risk to future plantings.

To assess the incidence of plant-parasitic nematodes, soil samples were collected in December 2016, from three locations of Agriculture Campus of Jimma University located at 356 km Southwest of Addis Ababa, Ethiopia, at 7°68'N latitude and 36°83'E longitude with an altitude of 1752 m.a.s.l. The annual temperature ranges from 11.8-26.8°C with a relative humidity and mean rainfall of 91% and 1500mm, respectively. Collections were made from the rhizosphere of eight species of ornamental plants *viz*., *Rosa* spp., *Colocasia esculenta*, *Salvia splendens*, *Ctenanthe oppenheimiana*, *Phoenix abyssinica*, *Aster novea-angliae*, *Washingtonia rubusta* and *Doronicum grandiflorum* growing along the roadsides in the campus showing severe infestation of phytoparasitic nematodes. Following the procedure of Baermann modified techniques (Hooper *et al*., 2005) nematodes were extracted and identified (Siddiqi, 2001) up to genus level and enumerated from a 1 ml capacity counting dish using a Leica compound microscope.

A total of ten genera of plant parasitic nematodes (*Helicotylenchus*, *Hemicycliophora*, *Meloidogyne*, *Pratylenchus*, *Scutellonema*, *Paratrichodorus*, *Rotylenchulus*, *Trichodorus*, *Mesocriconema* and *Tylenchorhynchus*) were recorded associated with these ornamental plant species. *Helicotylenchus* and *Scutellonema* were found associated with all ornamental plants followed by *Meloidogyne* that was not found in the rhizophere of *A. novea-angliae*. On the other hand, *S. splendens* harbored eight of the detected genera other than *Rotylenchulus* and *Pratylenchus*. Moreover, *Helicotylenchus* and *Meloidogyne* were the most frequently encountered nematode genera with relatively high population densities.

Total mean population densities (PD), frequency of occurrence, prominence value of each

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nematode genus from all ornamental species were determined based on Norton (1978). Prominence value (PV) was calculated as PV= PD*(FO-1/2)*10-1(De Waele *et al*., 1998). The frequency of occurrence (FO), mean population density (PD) and prominence value (PV) of the afore mentioned phytoparasitic genera is shown (Table 1). This result revealed that density and occurrence of each nematode PPN genera varied with host species. The highest mean population density recorded for *Meloidogyne* was 130 J2in *S. splendes*, followed by 73 J2 in *P. abyssinica*. The host species, *C. oppenheimiana* was found to be the least host for *Meloidogyne* with a mean population density of 13 J2. *Helicotylenchus* became the most abundant among all genera recorded with mean population density of 380 nematodes recorded on *D. grandiflorum* while the least host for this genus was *C. esculenta* with a population density of 13 nematodes per100 ml soil. *D. grandiflorum* and *S. splendes* appeared to be the best host for *Scutellonema* which was detected with a mean population density of 183 and 180 nematodes 100 ml-1 soil, respectively. *P. abyssinica* hosted the lowest population of *Scutellonema* i.e. 7 nematodes ml^{-1}soil. The mean population density of rest of the PPN genera ranged between 7 and 27 nematodes 100 ml^{-1}soil.

Trichodorus, *Rotylenchulus* and *Pratylenchus* that were only found in a single sampling site of their respective hosts had generally low mean population density of 17, 13 and 7 nematodes, respectively. *Rosa* spp., *S. splendes* and *C. oppenheimiana* equally hosted *Mesocriconema* (10 nematodes100ml^{-1}soil) while *C. esculenta* hosted the lowest mean density (7 nematodes100ml^{-1}soil). *P. abyssinica* hosted *Tylenchorhynchus* better than *D. grandiflorum* and *S. splendes* with a mean density of 27 nematodes. Similar to their density, the frequency of occurrence of each PPN genera varied among host species (Table 1). *Helicotylenchus* was detected (FO=100%) in all examined perennial ornamental crops except on *Rosa* spp. and *C. esculenta* (33%). The highest frequency of occurrence (100%) of *Meloidogyne* was recorded on *Rosa* spp., *C. esculenta*, and *S. splendes* followed by (67%) in *W. robusta* while the least (33%) recorded in *D. grandiflorum*, *C. oppenheimiana* and *P. abyssinica* plant species. The highest frequency of occurrence of *Scutellonema* (100%) was found on *C. esculenta* followed by *D. grandiflorum* and *S. splendes* (67%) and occurred uniformly across the rest of the plant species (FO= 33%). *Tylenchorhynchus* was detected from three sampling sites (100%) associated with *P. abyssinica* 67% was associated with *S. splendens* and with *D. grandiflorum* (33%). The rest of nematode genera (*Hemicyclophora*, *Mesocriconema*, *Pratylenchus*, *Rotylenchulus*, *Paratrichodorus* and *Trichodorus*) were all with least frequency of occurrence (33%) in all plant species.

Helicotylenchus was the most prominent nematode (PV= 1,202) followed by *Scutellonema* (PV =473) on *D. grandiflorum*. *Meloidogyne* was prominent on *S. splendens* (PV=411). The other nematode genera such as *Hemicycliophora*, *Mesocriconema*, *Paratrichodorus*, *Trichodorus* and *Pratylenchus* were less prominent in all the plant species. It has already been reported that *Salvia* cultivars are as suitable host for root-knot nematodes (Goff, 1936). Four cultivars of *S. splendens* were evaluated for their responses to an isolate of *Meloidogyne incognita* and *M. javanica* showed higher nematode population on all cultivars (McSorley & Frederick, 2001). *W. robusta* was reported to support the reproduction of *Rotylenchulus reniformis* (Inserra *et al*., 1994), in the present study this nematode was only recorded from *C. esculenta* known to parasitize it and impact the production. Higher susceptibility of *Washingtonia* spp. to *M. javanica* is also documented (Brito *et al*., 2010).

The root-knot nematodes are well known to infect nearly all plant species causing root galls (Moens *et al*., 2009). However, the presence of differential hosts indicates that a host known to be susceptible to one *Meloidogyne* species could be resistance to the same species (Hartman &

Table 1. Frequency of occurrence and abundance in 100 of ml soil and prominence value of major nematode genera from the soil rhizosphere of ornamental plant species at the Agriculture College Campus of Jimma University, Ethiopia

Ornamental plant species	Nematode genera	PD	FO (%)**	PV***
Rosa spp.	*Meloidogyne*	48	100	151
	Helicotylenchus	57	33	104
	Scutellonema	13	33	24
	Hemicycliophora	7	33	12
	Mesocriconema	10	33	18
Colocasia esculenta	*Meloidogyne*	60	100	190
	Scutellonema	67	100	211
	Rotylenchulus	13	33	24
	Mesocriconema	7	33	12
	Helicotylenchus	13	33	24
Salvia splendens	*Scutellonema*	180	67	465
	Hemicycliophora	13	33	24
	Tylenchorhynchus	20	67	52
	Meloidogyne	130	100	411
	Helicotylenchus	187	100	590
	Paratrichodorus	23	33	43
	Trichodorus	17	33	30
	Mesocriconema	10	33	18
Ctenanthe oppenheimiana	*Helicotylenchus*	173	100	548
	Scutellonema	60	33	110
	Meloidogyne	13	33	24
	Mesocriconema	10	33	18
	Paratrichodorus	7	33	12
Phoenix abyssinica	*Helicotylenchus*	43	100	137
	Meloidogyne	73	33	134
	Scutellonema	7	33	12
	Tylenchorhynchus	27	100	84
Aster novae-angliae	*Helicotylenchus*	70	100	221
	Scutellonema	27	33	49
Washingtonia robusta	*Helicotylenchus*	133	100	422
	Meloidogyne	57	67	146
	Pratylenchus	7	33	12
	Scutellonema	40	33	73
Doronicum grandiflorum	*Helicotylenchus*	380	100	1202
	Meloidogyne	23	33	43
	Scutellonema	183	67	473
	Tylenchorhynchus	10	33	18

*Population density = mean number of individual nematodes genus per 100 ml soil/number of sampling sites (n=3)
**Frequency of occurrence (FO%) = number of sites with positive detected/total number of sites sampled*100.
***Prominence Value (PV) = Mean population density $*(FO)^{1/2} *10^{-1}$.

Sasser,1985). In this respect, the fact *Meloidogyne* was not recovered from *A.novae-angliae* could be ascribed to the chemical characteristics of the family Asteraceae so is does this species (Furtado *et al*., 2011).

Except *Meloidogyne*, *Helicotylenchus* and *Hemicycliophora* which previously reported from *Rosa* species (Meressa *et al*., 2014), no host-nematode relationship of these plants species along with their respective associated nematode genera has been reported from Ethiopia. The fact that this study was conducted for the first time, it is difficult to associate a particular nematode genus to the frequent death of these ornamental plants in the campus.

However, in Brazil, *Pratylenchus*, *Rotylenchulus*, *Meloidogyne* and *Helicotylenchus* were reported to be responsible for serious injuries to most ornamental plants species reducing their ornamental properties (Gimenses *et al*., 2010). The loss of beauty caused by *Mesocriconema*, *Helicotylenchus*, and *Pratylenchus* damage on various ornamental species was also reported in Tehran city (Saeedizadeh, 2016). Similarly, a greenhouse study in the city of Kyiv (Sigarovova & Karpliyk, 2015) indicated that *Tylenchorhynchus*, *Pratylenchus*, *Rotylenchus* and *Helicotylenchus* can cause a severe damage to landscape plants reducing their economic value. Recently, there have been deaths of some trees of *P*. *abyssinica* in the sampling area.

A study by Mani *et al*., (2005) reported *Helicotylenchus diagonicus* and *Meloidogyne javanica* as important parasitic nematode species of date palm trees in Sultanate of Oman. The fact that these two species were recorded in the campus may signify their potential to kill the plant.

Doronicum spp. are known to be infected by different species of *Aphelenchoides* (Kohl, 2011), although their economic damage is not known. Thus, this study adds four new host-parasite relationships that need exploration for extent of damage that can be caused by those associated nematode genera.

The present study revealed the presence of various economically important phytoparasitic associated with different ornamental plant species that could be vital for future management plan. *Meloidogyne*, *Helicotylenchus* and *Scutellonema* can be considered more potential constraints for the establishment of most of the ornamental plants at the campus. Nevertheless, it is paramount important that their population dynamics and damage thresholds to the host plants is further studied. The frequent occurrence of the other genera in less population levels probably indicates that they are likely to parasitize the ornamentals but cause less damage.

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