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Preliminary evaluation of coffee germplasm collection for resistance to root-knot nematodes (*Meloidogyne* spp) in Tanzania

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ABSTRACT

Root-knot nematodes (*Meloidogyne* spp) is one of the important pest devastating Arabica coffee in Tanzania. A survey conducted in 1984 by John Bridge identified root-knot nematodes causing yield losses estimated to be more than 20% especially in the Northern part of Tanzania. The survey was carried out in 2019 to identify the resistant coffee lines in the germplasm collection at TaCRI, Lyamungu, Kilimanjaro. Total of 108 coffee lines replicated into 16 trees each was assessed by scoring for nematodes infestation by observation of roots removed from standing coffee plants in the field. Results indicated different levels of infestation by root-knot nematodes observed in different coffee lines ranging from "0" to "9" (root-knot nematode rating index). Among the 108-coffee lines, crosses and selections screened in the field, ten of them which includes; Conuga - 261/4-2-4/1030/3 Clone, Hybrid 262/6 387 (Arab x Dew) Clone (A), C. can. 1604/5 Bengelan - col. l. Clone, Arab. Hyb. F1 H.127/ 6-213/18 (H.39) x 87/1 (Geisha), Arab. Hyb. F1 H.50/4-93/6 (H.66) x 134/4-23 (S.12 Kaffa) clone, Arab. Hyb. F1 26/13-19/1 (Cutura) x 832/2-13 (Hybrid de Timor clone), 34/63 (C.R 1345/5 Racemosa), 32/63, 30/63 and 29/63 were found to have no galling with root-knot nematodes ("0" rating index) and one coffee line, Dewevrei var. excelsa-879 was found to have very few galls. The eleven coffee lines which indicate to be resistant ("0" galling index) to *Meloidogyne* spp may be used in the breeding programme in the future if proved to be resistant.

INTRODUCTION

Root knot nematodes of the genus *Meloidogyne* are widely distributed throughout the world in coffee plantations than any other major group of parasitic nematodes. The most common, damaging and well known root-knot nematodes species worldwide on coffee includes; *M. Africana, M. incognita* and *M. decalineata;* while the less wide spread include; *M. Africana, M. inornata, M. janica, M. occifae, M. arenaria and M. thames* (Vicent *et al;* 1990). In Tanzania the coffee root-knot nematode which caused problems was identified by Bridge (1984) as *M. dealineata,* White head, *M. hapla. M.* sp (b) and *M.* sp (c). The latter two are probably new species as they do not possess the characters of described species. These species in Tanzania together with *Melodogyne* spp in other African countries form a complex which can be grouped under heading the African coffee root-knot nematodes. If infested seedlings (Figure 1) are planted to the field, the surviving plants will have abnormal root growth of main roots as well as laterals adding further to poor growth and yield losses in the mature crop. Harmonious or more restricted integrated control measures is by improving moisture levels, use of resistant varieties, farm manure, establishment of free seedlings from nematode infestation, prevention of introduction and screening or possibly breeding for resistance. Although nematodes in Tanzania was known many years ago but its infestation is under estimated. The objective of this study is to evaluate the resistance varieties by screening the coffee varieties which are resistant to root–knot nematodes.

METHODOLOGY

The root-knot rating index of 0-10 as described by Bridge and Page (1980) (Figure 2) was used to identify the resistant coffee lines in the Variety Collection Extension (VCE) at TaCRI, Lyamungu, Kilimanjaro. Total of 108 coffee lines replicated into 16 trees each was assessed by scoring for nematodes infestation after observation of roots removed from standing coffee plants in the field

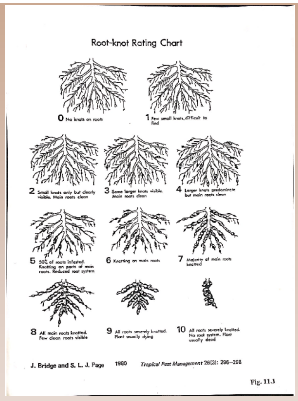

Figure 2: Root-knot rating chart index

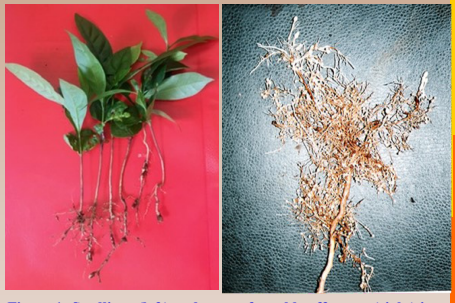

Figure 1: Seedlings (left) and roots of an old coffee tree (right) infested with root-knot nematodes

RESULTS AND DISCUSSION

Results indicated different levels of infestation by root-knot nematodes observed in different coffee lines ranging from "0" to "9" (root-knot nematode rating index). Most of the lines were found to be susceptible to the nematodes, including some Robusta coffee. No coffee lines which was observed to have all roots severely knotted with nematodes ("10" rating index). Among the 108-coffee lines, crosses and selections screened in the field, ten of them which includes; Conuga - 261/4-2-4/1030/3 Clone, Hybrid 262/6 387 (Arab x Dew) Clone (A), C. can. 1604/5 Bengelan - col. l. Clone, Arab. Hyb. F1 H.127/ 6-213/18 (H.39) x 87/1 (Geisha), Arab. Hyb. F1 H.50/4-93/6 (H.66) x 134/4-23 (S.12 Kaffa) clone, Arab. Hyb. F1 26/13-19/1 (Cutura) x 832/2-13 (Hybrid de Timor clone), 34/63 (C.R 1345/5 Racemosa), 32/63, 30/63 and 29/63 were found to have no galling with root-knot nematodes ("0" rating index) and one coffee line, Dewevrei var. excelsa-879 was found to have very few galls (Figure 3).

Accession	Coffee spp, crosses & selections	Melodogyne root-knot	Susceptability
24/53	CD - Dewevrel excelsa - 373	1	MS/R?
29/63		0	R?
30/63		0	R?
32/63		0	R?
34/63		0	R?
38/63	C. Conuga -261/4-2-4/1030/3 clone	0	R?
39/63	Hybride 262/6 387(ARAb x DEW) clone	0	R?
8/67	C. con. 1604/5 Bengelan - cl. L. clone	0	R?
18/67	Arabhyb F1 H.127/6-213/18(H39)x87/1 (Geisha)	0	R?
13/67	Arabhyb F1 H.50/4-93/6 (H.66)x34/4-23 (S.12 Kaffa) clone	0	R?
12/67	Arabhyb F1 H.26/13-19/1 (cutura)x832/2-13(H de Timor)	0	R?

Note: R = Resistance

Figure 3: List of breeding lines and species of coffee at TaCRI, Lyamungu examined for their susceptibility to root-knot nematodes (*Melodogyne* spp)

CONCLUSIONS & PERSPECTIVES

The eleven coffee lines which indicate to be resistant ("0" galling index) to *Meloidogyne* spp may be used in the breeding programme in the future if proved to be resistant. Evaluation to confirm the level of resistance of these coffee lines is underway by planting the seedlings in the soil infested with *Meloidogyne* spp and examining the infection

REFERENCES

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