Tropentag, September 20-22, 2017, Bonn

"Future Agriculture:
Socio-ecological transitions and bio-cultural shifts"

African Nightshades and African Spinach Lures Plant Parasitic Nematodes to a Dead-End

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Abstract

Modern cropping systems are characterised by genetically uniform crop plants. These crop plants are normally cultivated at high densities with very little variation in species composition at both spatial and temporal scales. Consequently, this has fueled the rapid evolution and transmission of crop pests and pathogens such as parasitic nematodes. Parasitic nematodes, particularly root-knot nematodes (RKN: *Meloidogyne* spp.) and potato cyst nematodes (PCN: *Globodera* spp) are plant pathogens of economic importance causing severe yield loss. African nightshades (*Solanum* spp) and African spinach (*Amaranthus* spp) are important leafy vegetables in many parts of Africa as a rich source of nutrition and income. However, their potential use as trap crops for parasitic nematodes remains largely unexplored. Therefore, we tested resistant *Amaranthus dubius* and *Solanum scabrum* as a trap crop for RKN and PCN respectively over 2 years in an experimental station in Kenya. The effects of the 2 trap crop on plant damages and soil infestation were compared with susceptible crop species. After first, second and third implementation of *Amaranthus dubius* trap crop our results show that RKN infestation of the soil decreased by 90, 85 and 90 % respectively, whereas *Solanum scabrum* trap crop decreased *Globodera* spp by 85, 80 and 80 % respectively. Over a period of 2 years, the gall index measured on susceptible *Solanum villosum* decreased from 3.5 to less than 1. To gain some insights into the mechanism behind the suppression of parasitic nematodes by the 2 trap crops hatching and infection assays were carried out. *Solanum scabrum* trap crop stimulated the hatching of *Globodera* spp by more than 65 %. Later, the infection process in both trap crops was blunted by nematode triggered cell death and cell wall reinforcement following nematode detection. Here, we show for the first time the design of a cropping system using resistant African spinach and African nightshades as a trap crop for RKN and PCN, respectively. This approach creates dynamics in cropping systems allowing more diversity to inflict disruptive pressure on RKN and PCN populations and increase the sustainability of agriculture.

Keywords: Genetic resistance, sustainable agriculture, trap crop

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