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Genetic structure and evolution of potato cyst nematodes populations

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relative abundance) represented a small proportion of the nematode community. This nematode community structure suggests Michigan vegetable fields have resource-rich, but relatively basic soil food webs.

SOIL AMENDMENTS WITH EXTRACTED JUICES AND OILS OF FIVE PLANT SPECIES OF CITRUS FRUITS FOR THE CONTROL OF *MELOIDOGYNE* SPP ON TOMATO UNDER GLASSHOUSE AND FIELD CONDITIONS. **Grace, T., M.S. Daneel, W.P. Steyn, C.S. Arries, and T.D. Selabela.** ARC-Institute for Tropical and Subtropical Crops, Private Bag X11208, Nelspruit 1200, South Africa.

Previously glasshouse experiments were conducted to evaluate the effect of soil amendments with extracted juices (grapefruit, lemon, sweet orange, and naartjie) and oils (lemon, lime and orange) for the control of *Meloidogyne incognita*. The organic amendment consisting of lemon juice gave the best reduction of nematodes but had no positive impact on yield. Orange juice persistently gave the best improvement in plant growth. Oils consistently performed weaker than the juice. Further studies have been carried out to confirm the potential of these organic amendments on the control of *Meloidogyne* spp. in the field. The field was naturally infested with a mixture of *M. incognita* and *M. javanica*. The trial was designed in completely randomised blocks. Similar juice extracts used in the glasshouse experiment were applied in the field @ 50ml/plant to determine the long term effect of the amendments on nematode control and yield. Considerable reduction of rootknot nematodes was achieved with lemon juice extract which compared well with standard nematicides. On the other hand orange juice extract gave the highest plant growth. Trials in the field are continuing to determine the long term effect of the amendments on nematode control and yield enhancement.

GENETIC STRUCTURE AND EVOLUTION OF POTATO CYST NEMATODES POPULATIONS. **Grenier, E.¹, P.-Y. Véronneau², J. Lafond-Lapalme², J. Montarry¹, S. Fournet¹ and B. Mimee².** ¹INRA, Institute of Genetic, Environment and Plant Protection, Le Rheu, France, 35653, ²AAFC, St Jean-sur-Richelieu, QC, Canada, J3B 3E6.

To understand the mechanisms leading to the breakdown of plant resistance by potato cyst nematodes (PCN; *Globodera rostochiensis* and *G. pallida*), an understanding of the genetic structure and variation in populations and the processes that govern their evolution is required. Microsatellites and single nucleotide polymorphisms (SNPs) obtained by genotyping-by-sequencing (GBS) were used for phylogeographic and population genetic studies of PCN. The highest genetic diversity was consistently observed in populations from South America where these nematodes coevolved with their hosts. At a worldwide scale, results showed that, (i) both PCN species may share a single common introduction origin into Europe; (ii) the uplift of the Andes Mountains triggered a variety of adaptive biotic radiations representing a key factor in PCN evolutionary history. At a smaller spatial scale (regional, field), the genetic structure of different *Globodera* species showed that PCN exhibit much higher levels of gene flow at the intra-regional level compared to tobacco cyst nematode (*G. tabacum*), highlighting the importance of passive gene flow due to cultural practices in the dispersion and evolution of PCN populations. Additionally, most of the genetic variability observed at the field scale, or even regionally was already observed at the scale of a single plant within a field. Finally, as populations of *Globodera* differ in virulence against the various resistance sources used in potato varieties, it is of paramount importance to be able to identify pathotypes/variants or to be able to identify novel gene pool introductions. To this end, GBS has been used to identify SNPs to quickly distinguish PCN variants or groups that strongly differ in their development rates on a set of resistant potato cultivars.

PREPARATION OF A DIAGNOSTIC TOOL FOR *MELOIDOGYNE* SPECIES DIFFERENTIATION IN ALABAMA. **Groover, W.¹ and K. Lawrence¹.** ¹Department of Entomology and Plant Pathology, Auburn University, AL 36849.

Meloidogyne species identification is important for growers in the state of Alabama, because it helps in the decision of crop rotations. Depending on what species is present in a root-knot nematode infestation, a year to year crop rotation can be implemented as a means to help with control. It also helps growers determine if resistant varieties are needed based upon certain root-knot species levels. Currently, identification of *Meloidogyne* species for Auburn University is performed via a host-differential test. The host-differential test is a commonly used method for species identification. This test can take as long as forty-five to sixty days for successful species determination. A broader assay is currently in development to expedite the identification time to as quickly as a week. This process includes morphological measurements as well as the use of molecular techniques to provide an accurate depiction of what species are present. The molecular technique involves the use of a single *Meloidogyne* (root-knot) second stage juvenile that is ruptured in a droplet of water, and then added to a PCR mixture. Primers currently used screen for the following common *Meloidogyne* species: *M. incognita*, *M. arenaria*, *M. javanica*, *M. hapla*, *M. chitwoodi*, and *M. enterolobii*. Samples from known root-knot infested fields throughout the state of Alabama are currently being taken for analysis. The southern root-knot nematode, *M. incognita*, has been the most prevalent species identified to date. Peanut root-knot nematode, *M. arenaria*, has also been discovered on peanut fields in the southern part of the state. Each of these species has been identified via a host-differential test. For *M. incognita*, gall formation and nematode egg numbers were present on cotton, pepper, watermelon and tomato, showing the presence of *M. incognita* race 3. For the *M. arenaria* population, galls and nematode eggs were present on tobacco, pepper, watermelon, peanut, and tomato. This shows that the species present was *M. arenaria* race 1. Morphological measurements and features for adult males, females and juveniles were then taken of each of these species populations, and were found to fit the expected ranges for each relative species. *M. incognita* has