ABSTRACTS OF THE 54th ANNUAL MEETING OF THE ORGANIZATION OF NEMATOLOGISTS OF TROPICAL AMERICA

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EVALUATION OF NEMATICIDES FOR MANAGEMENT OF PLANT-PARASITIC NEMATODES IN SUGARCANE IN LOUISIANA [Avaliação de nematicidas para o manejo de nematoides parasitas de cana-de-açúcar em Louisiana]. **Aguilar, I. M.** and T. T. Watson. [1]Dept. of Plant Pathology & Crop Physiology, Louisiana State University Agricultural Center, Baton Rouge, LA, USA. iaguilar@agcenter.lsu.edu

Plant-parasitic nematodes (PPN) are an understudied threat in sugarcane production in the United States. Recent survey work has shown that *Tylenchorhynchus* (stunt nematode), *Pratylenchus* (lesion nematode), *Mesocriconema* (ring nematode), and *Helicotylenchus* (spiral nematode) are the primary PPN genera in sugarcane fields in Louisiana. Recently conducted greenhouse experiments suggest that PPN negatively influenced sugarcane growth, and that ethoprop and fluensulfone nematicides had potential to suppress PPN on sugarcane. Using a small-plot field experiment, this study aimed to evaluate the efficacy of various nematicide formulations and application frequencies on nematode population development and sugarcane yield in a newly planted sugarcane field. Six treatments were evaluated: (1) untreated control, (2) ethoprop applied at planting, (3) fluensulfone applied at planting, (4) fluensulfone applied at planting and spring, (5) Syngenta experimental compound applied at planting, and (6) Syngenta experimental compound applied at planting and spring. Nematode soil population densities were initially low at the time of planting (September 2022) but increased rapidly during the 2023 growing season. By harvest (November 2023), the Syngenta experimental compound reduced lesion nematode densities by 93% in soil and 87% in roots regardless of application frequency. Fluensulfone and the Syngenta compound applied twice also reduced stunt nematode soil population densities by 51% and 36%, respectively. No differences were observed in sugar yield or cane tonnage. In conclusion, this study showed that the efficacy of nematicides varied depending on nematode genera. No significant differences were observed in yield during the plant-cane year; however, differences may become more apparent in the following years as nematode population densities in untreated soil continue to increase in subsequent growing seasons.

A ATRATIVIDADE DE *Meloidogyne javanica* A DIFERENTES ISOLADOS DE ACTINOBACTÉRIAS [THE ATTRACTIVENESS OF THE *Meloidogyne javanica* TO DIFFERENT ISOLATES OF ACTINOBACTERIA]. **Andrade-Souza, L. F.**, W. C. Terra, E. Alves, C. Maximiniano, and D. De brum. Universidade Federal de Lavras, Lavras, MG, Brazil. larissaagr96@gmail.com

Os microrganismos do solo e os compostos que liberam podem influenciar a quimiotaxia de nematoides parasitas de plantas. Actinobactérias, conhecidas por produzir compostos com atividade nematicida, têm grande potencial como agentes de controle biológico. No entanto, o impacto dessas actinobactérias na quimiotaxia de nematoides é pouco estudado. Este estudo avaliou o efeito de 13 isolados de actinobactérias na quimiotaxia do segundo estádio juvenil (J2) de *Meloidogyne* *javanica*. As actinobactérias foram isoladas de solos cultivados com soja, em áreas infestadas com *Meloidogyne* spp. ou *Heterodera glycines*, e cultivadas em meio ISP2. No ensaio de quimiotaxia, placas de Petri foram divididas em três áreas: A) teste (50 µL da suspensão bacteriana); B) neutra (suspensão aquosa com 100 J2); e C) controle (nada ou ISP2). 24 horas após o início do teste, foi calculado o índice de quimiotaxia (IQ). Quatro isolados foram altamente atrativos: RS43 (0,71), RS3 (0,49), HS47 (0,64) e HT54 (0,2). Os isolados HT16 (0,11) e HS62 (0,12) foram atrativos. Já os isolados HS26 (-0,14) e T12 (-0,14) foram repelentes, e HS45 (-0,22) e HT73 (-0,32) altamente repelentes. Tratamentos como ISP2 (0,1), T14 (-0,05), HS60 (-0,07) e RS6 (0) foram neutros. Conclui-se que alguns isolados de actinobactérias têm a capacidade de repelir os J2 de *M. javanica.*

CARACTERIZACIÓN MORFOLÓGICA Y MOLECULAR DE NEMATODOS ANILLADOS (NEMATODA: CRICONEMATIDAE) DE COSTA RICA: DOS NUEVAS ESPECIES DESCRITAS [MORPHOLOGICAL AND MOLECULAR CHARACTERIZATION OF RING NEMATODES (NEMATODA: CRICONEMATIDAE) FROM COSTA RICA: TWO NEW SPECIES DESCRIBED]. Aráuz-Badilla, J.[1], R. Artavia-Carmona[1], I. Hilje-Rodríguez[1], P. Castillo[2], and **W. Peraza-Padilla**[1]. [1]Universidad Nacional de Costa Rica, Heredia, Costa Rica, [2]Instituto de Agricultura Sostenible (IAS), Córdoba, Spain. walter.peraza.padilla@una.cr

Plant-parasitic nematodes are organisms that cause significant economic impact on agricultural crops. Among these, the members of the Criconematidae family, ring nematodes, are considered as potential pests due to a strong stylet and worldwide distribution. In Costa Rica, there are several reports of ring nematodes associated with different plant species, however, there are no molecular studies of the species present in the country. The aim of this study was to identify nematodes of the Criconematidae family, using morphological and molecular methods. Soil samples were collected from cocoa, sugar cane, grass, and natural areas from five provinces in Costa Rica. A morphological study was conducted using a set of measurements, percentages, and ratios to differentiate the ring nematodes species. Molecular analysis included amplification of 28S D2D3 domain, 18S, ITS, and COI regions, which allowed for phylogenetic analysis between species identified in this study and those deposited in GenBank. Four species of ring nematodes were identified, including two new species which are described, herein, for the first time. *Mesocriconema onoense* and *Mesocriconema costarricense* n. sp. were identified in natural areas, *Mesocriconema paraonoense* n. sp. in cocoa and sugar cane plantations, and *Mesocriconema sphaerocephalum* in grass. This research reports the first morphological and molecular characterization of nematodes belonging to the Criconematidae in Costa Rica.

NOVEL BIPHASIC PRODUCTION OF *Steinernema rarum* [NOVA PRODUÇÃO BIFÁSICA DE *Steinernema rarum*]. **Chacon-Orozco, J. G.**, F. B. Baldo, and L. G. Leite. Instituto Biológico, Campinas, SP, Brazil. jchaconorozco@gmail.com.

Entomopathogenic nematodes (EPN) are common roundworms in the soil that present important advantages that make them promising agents for biological control, highlighted by the following characteristics: adaptability/ability to colonize the soil; search behavior to combat insect pests with terrestrial habits; high virulence; safe for vertebrates, plants and the environment; easy to apply using conventional equipment and; compatibility with chemical and biological inputs. The Biological Control Laboratory, at the Instituto Biologico, is currently the only institution that has the technology for the biphasic production of EPNs, which consists of their liquid fermentation, followed by fermentation on a solid substrate (phenolic sponge). *Steinernema rarum* requires at least 21 days of incubation on the sponge before being applied in the field and can reach a concentration of up to 250,000 infective juveniles/mL. Advantages of using phenolic foam to grow EPNs include: elimination of the need to extract/harvest and formulate the nematodes (because the foam serves as support for nematode growth as well as the final formulation); ability to store the nematodes with high stability on the shelf without contaminants, and; easy extraction of nematodes by crushing the sponge after the end of the production process, which allows direct application of the nematodes together with the foam debris/particles and secondary metabolites produced by the nematodes and their symbiotic bacteria, just after its extraction.

COMPARACIÓN MORFOLÓGICA ENTRE ALGUNAS ESPECIES MEXICANAS DE *Meloidodera* (NEMATODA: HETERODERIDAE) [MORPHOLOGICAL COMPARISONS OF MEXICAN SPECIES OF THE GENUS *Meloidodera* (NEMATODA: HETERODERIDAE)]. **Cid del Prado Vera, I.** Colegio de Postgraduados, Texcoco, Mexico. icid@colpos.mx

Five species of the genus *Meloidodera* have been described from Mexico: *M. mexicana, M. astonei, M. tecoacensis, M. Zacanensis, and M. ferrisi.* The host plants of these species are in the Solanaceae including *Capsicum annum* and *Solanum rostratum* (buffalo bur). Hosts also include some woody plant families, including the tejocote tree, *Crataegus mexicana* (Rosaceae) and an oak tree, *Quercus rugosa* (Fagaceae). Females have an endoparasitic habit, attached to secondary and tertiary roots. Females are spherical to pear-shaped, the cuticle is completely finely striated, and the body is covered with a capsule. The capsule material appears to be produced by the nematode in the case of *M. mexicana* and *M. ferrisi*, or by the host plant *S. rostratum* in both *M. astonei* and *M. tecoacensis.* The capsule is yellow in color and has a gelatinous appearance. In *M. ferrisi* and *M. zacanenesis,* parasitizing woody hosts, some females are completely covered with a thick layer of the capsule material while, in others, part of the body is visible. The distance of the vulva from the anterior is variable in all species, ranging from 70 to 260 µm. The males are characterized by an irregular rectangular-shaped cephalic annule, the completely-aerolated four incisures of the lateral field, and the absence of cloacal tubes. In the second-stage juvenile, the cephalic region is slightly separated from the body, the labial disc is oval, and the lateral field is areolated with four incisures. The phasmid is lens-shaped in *M. mexicana* and *M. ferrisi,* and pore-like in *M. tecoacensis, M astonei* and *M. zacanenesis*. All the *Meloidodera* species induce a uninuclete giant cell in the host tissues.

GÉNERO *Cactodera* (NEMATODA: HETERODERIDAE) CARACTERÍSTICAS MORFOLÓGICAS Y BIOLÓGICAS DE LAS ESPECIES DESCRITAS DE MÉXICO [THE GENUS *Cactodera* (NEMATODA: HETERODERIDAE) MORPHOLOGY AND BIOLOGY OF MEXICAN SPECIES]. **Cid del Prado Vera, I.** Colegio de Postgraduados, Texcoco, Mexico. icid@colpos.mx

The genus *Cactodera* has 16 species described from different parts of the world. Seven species have been described from Mexico: *C. galinsogae, C. rosae, C. evansi, C. torreyanae, C. salina, C. solani* and *C. herba*, representing 43.8% of the described species of the genus. The Mexican *Cactodera* species parasitize plants in different families: Poaceae, Chenopodiaceae, Solanaceae, and Caryophyllaceae. One group of the Mexican *Catodera* species form large cysts brown to dark brown in color, with a prominent vulval cone and oval body shape. This group includes: *C. rosae, C. Torreyanae,* and *C. amaranthi* which produce abundant cysts on *Hordeum vulgare* (Poaceae) and *Suaeda edulis* and *Amaranthus hybridus* (Chenopodiaceae). Another group consists of *Cactodera* species with small cycts light to brown in color, with a small vulval cone and spherical body shape. This group includes: *C. galinsogae, C. herba, C. salina, C. solani* and *C. evansi,* parasites of Poaceae, Chenopodiaceae, Solanaceae, and Caryophyllaceae. All the Mexican *Cactodera* species have egg shells with punctations except for *C. salina,* where the egg shell is smooth. Of the Mexican *Cactodera* species, *C. torreyanae* and *C. salina*, are found in saline soils. *Cactodera torreyanae* is found in alkaline soils with pH 8.6-10.1 and is the only species that does not develop inside the root; although the juvenile and adult stages are attached to the root, their development occurs outside the root. This species is considered a sessile ectoparasite of *Suaeda edulis* (Chenopodiaceae). All *Cactodera* species induce a multinucleate syncytium in the host root.

TECNOLOGÍA TYMIRIUM®: EFICACIA

SUPERIOR EN LA PROTECCIÓN DE CULTIVOS DE CEREALES CONTRA PLAGAS DE NEMATODOS EN LA REGIÓN DE ÁFRICA MEDIO ORIENTE [TYMIRIUM® TECHNOLOGY: SUPERIOR EFFICACY IN PROTECTING GRAIN CROPS AGAINST NEMATODE PESTS IN THE AFRICA MIDDLE EAST REGION]. **Fourie, D.**[1] and H. Monir[2]. [1]Syngenta Crop Protection, Centurion, Gauteng, South Africa, [2]Syngenta Crop Protection, Giza, Egypt. Driekie.Fourie@syngenta.com

Plant-parasitic nematodes such as root-knot (*Meloidogyne*), lesion (*Pratylenchus*) and cyst nematodes (*Heterodera*) are a serious threat to global grain production. These nematodes are highly pathogenic and infect a wide range of crop hosts in African cropping systems, making it challenging to mitigate yield and quality losses of grain crops. The problem is further complicated by complex interactions between nematodes and other microorganisms, and adverse climatic conditions. To combat nematode pests of maize, soybean and wheat, the seed-applied product VICTRATO® 500FS, containing TYMIRIUM® technology, has been developed. Field trials conducted in major grain producing areas in African countries (Egypt, South Africa and Zambia) showed efficacy rates of up to 94% for VICTRATO® 500FS in terms of reducing population densities of the major nematode pests (*Meloidogyne* and *Pratylenchus)*. Substantial yield increases were also recorded, up to 30% for maize, 20% for soybean, 17% for sunflower, and 14% for wheat. The effect of VICTRATO® 500FS against key soilborne fungal diseases is another benefit to be highlighted, with research and evaluations still in progress. Farmers in Zambia, where VICTRATO® 500FS has been registered in 2023, are using the product to control economically important nematode pests without negatively impacting soil health.

HISTOLOGICAL CHARACTERIZATION OF RESISTANCE TO *Meloidogyne enterolobii* AND *M. incognita* IN SELECTED SWEETPOTATO GENOTYPES. **Galo, D.**[1], J. Santos Rezende[1], D. R. Labonte[2], and T. T. Watson[1]. [1]Department of Plant Pathology and Crop Physiology, Louisiana State University Agricultural Center, Baton Rouge, LA, USA, [2]School of Plant, Environmental, and Soil Sciences, Baton Rouge, LA, USA. DGalo@agcenter.lsu.edu

Meloidogyne enterolobii (*Me*), an emerging nematode threat, and *M. incognita* (*Mi*) are major pests of sweetpotato. The ability of *Me* to cause symptoms and reproduce on nematode resistant sweetpotato cultivars represents a threat to the sweetpotato industry. In this project, we aimed to identify the mechanisms of sweetpotato resistance against *Me* and *Mi*. This study compared penetration and development of *Me* and *Mi* on the sweetpotato genotypes 'L14-31', 'L18-100', and 'L19-65'. The cultivars 'Beauregard' (susceptible to both species) and 'Jewel' (resistant to *Me* and intermediate resistant to *Mi*) were used as controls. Entire root systems were collected at 7, 9, 11, 13, 21, and 35 days post inoculation (DPI), stained with acid fuchsin, and nematodes were quantified under a microscope. *Meloidogyne enterolobii* developed in 'Beauregard' and 'L18-100' only, with nematodes reaching the third- and fourth juvenile (J3/J4) stages within the first 13 DPI and progressed into the female stage around 21 DPI. In the genotypes 'Jewel', 'L14-31', and 'L19-65', *Me* remained at the pre-parasitic second-stage juvenile (J2)-stage and were surrounded by necrotic tissues in response to *Me* penetration at an early stage of infection. For *Mi*, the defense response was primarily observed in 'L18-100'. Infective juveniles either died, matured as males, or experienced delayed development into adult females. Overall, results suggest that the mechanism of resistance to *Me* is associated with a hypersensitive response that prevents feeding site establishment. Whereas the delayed development of *Mi* in resistant genotypes suggests that resistance may be conferred by several different mechanisms.

USE OF SELECTED COVER CROPS AND BIONEMATICIDES IN THE MANAGEMENT OF PHYTOPARASITIC NEMATODES [USO DE CULTIVOS DE COBERTURA SELECCIONADOS Y BIONEMATICIDAS EN EL MANEJO DE NEMATODOS FITOPARÁSITOS]. **Gitonga, D.**[1], J. Desaeger[2], and A. Hajihassani[1]. [1]University of Florida, Davie, FL, USA, [2]University of Florida,

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Cover crops and bionematicides are integral components of sustainable agriculture, offering benefits such as soil conservation and management of plant-parasitic nematodes (PPNs). Two independent field trials were conducted in Florida to investigate the effects of integrating sunn hemp ‘Crescent sun’ and sorghum-sudangrass ‘Sweet Six BMR’ with three commercial bionematicides (AzaGuard, Promax, and EcoWorks) and one secondary metabolite of bacteria (XB; *Xenorhabdus bovienii*) associated with entomopathogenic nematode (*Steinernema* spp.) against PPNs in organic zucchini ‘Desert’ planted on plastic beds. A randomized complete block design with 12 treatments (Sunn hemp × Azaguard, Promax, EcoWorks, XB; sorghum-sudangrass × AzaGuard, Promax, EcoWorks, XB) was used with two fallows (with and without weeds) as controls. Nematode densities were assessed pre- and post-field trials; *Hoplolaimus* spp., *Meloidogyne* spp., and *Criconema* spp. were the most prevalent PPNs. Sorghum-sudangrass and sunn hemp with Promax and EcoWorks significantly decreased *Meloidogyne* spp. and *Hoplolaimus* spp population densities. However, sorghum-sudangrass alone increased the population density of *Criconema* spp. Fallow with weeds, sunn hemp, and sorghum-sudangrass with XB metabolite had the highest PPN population densities and galling indices. Results indicated that integrating sunn hemp or sorghum-sudangrass with bionematicides can effectively control PPNs especially *Meloidogyne* spp. in organic production systems than the use of cover crops alone. However, careful consideration is needed when choosing cover crops to avoid exacerbating certain PPNs.

COMPATIBILITY OF THE ENTOMOPATHOGENIC NEMATODE *Steinernema rarum* WITH BACTERIA AND CHEMICAL INSECTICIDES [COMPATIBILIDADE DO NEMATOIDE ENTOMOPATOGÊNICO *Steinernema rarum* COM BACTÉRIAS E INSETICIDAS QUÍMICOS]. **Gonçalves, C. R. A.**, J. G. Chacon-Orozco, F. B. Baldo, and L. G. Leite. Instituto Biológico, CAPSA, Campinas, São Paulo, Brazil. cauaneraema@hotmail.com

In Brazil, sugarcane is planted on more than 10.000.000 ha, facing several challenges related to its management, including the attack of insect pests such as *Sphenophorus levis* (the sugarcane billbug). Entomopathogenic nematodes control soil-dweling insect pests, with *Steinernema rarum* (a species native to Brazil) proven effective against *S. levis.* In order to improve the application technology and integrated pest management, this study aimed to assess the compatibility of *S. rarum* with 15 species of bacteria and 5 chemical insecticides applied to sugarcane. To evaluate compatibility with bacteria *(Azospirillum brasilense, Nitrospirillum amazonense, Rhizobium tropici, Bradyrhizobium elkani, Bradyrhizobium japonicum, Priestia megaterium, Priestia aryabhattai, Pseudomonas putida, Pseudomonas protegens, Chromobacterium subtsugae, Bacillus thuringiensis kurstaki, Bacillus licheniformis, Bacillus pumilus, Bacillus velezensis* and *Bacillus amyloliquefaciens)* and chemicals (Zeus, Conferin, Engeo Pleno, Altacor and Fipronil), infective juveniles were placed in contact with the treatments and evaluated at different time intervals to determine viability. *Steinernema rarum* was compatible with all bacteria and insecticides, except Zeus (23.2% mortality). Results suggest that *S. rarum* can be used in combination with these biological agents and chemical insecticides.

ROOT-KNOT NEMATODES ARE A GROWING PROBLEM IN TROPICAL FRUITS IN FLORIDA [AGALLADORES NEMATODOS SON UN PROBLEMA CRECIENTE EN FRUTAS TROPICALES EN FLORIDA]. **Hajihassani, A.**, and D. Gitonga. University of Florida, Davie, FL, USA. ahajihassani@ufl.edu

Florida is one of the leading producers of tropical fruits in the United States. Most commercial tropical fruit production is in South Florida where the soil is mostly Calcareous, while limited production also occurs in Central and North Florida where the soil is sandy. The last surveys conducted on nematodes in tropical fruit systems in South Florida are decades old. A state-wide survey conducted between 2022 and 2023 showed infestations with root-knot nematodes (*Meloidogyne* spp.) in different tropical fruit species. The nematode species causing damage were identified based on the morphometrics and morphological characteristics. DNA-based diagnostics using species-specific primers and sequencing based on the 28S and ITS of rDNA and mitochondrial region confirmed the nematode species identity. *Meloidogyne incognita* was found infecting passion fruit and papaya in North and Central Florida, respectively. Over 80% of guava groves in Miami-Dade County in South Florida were found highly infested with *M. enterolobii*. This nematode species was also detected parasitizing dragon fruit in the Homestead region in South Florida. The nematode issue in tropical fruits is likely to escalate in the next few years because of the lack of chemical nematicides for use in tropical fruits in Florida. Monitoring and surveillance of these plant health issues is crucial, and effective control approaches should be developed to mitigate the impact of nematodes on tropical fruits.

CARACTERIZAÇÃO DE NEMATÓIDES DAS GALHAS EM PLANTAÇÕES DE GOIABA DE TRÊS REGIÕES DA COLÔMBIA [CHARACTERIZATION OF ROOT-KNOT NEMATODES FROM GUAVA CROPS OF THREE REGIONS OF COLOMBIA]. **Holguin, C. M.**[1], J. Pinzón[2], L. Villalba[1], A. Jaramillo[3], L. Deantonio[4], and S. Marchant[2]. [1]C.I. La Suiza, AGROSAVIA, Santander, Columbia, [2]Universidad Industrial de Santander, Santander, Columbia, [3]C.I. Palmira, AGROSAVIA, Valle del Cauca, Columbia, [4]Sede CIMPA, AGROSAVIA, Santander, Columbia. cholguin@agrosavia.co

Root-knot nematodes (RKN, *Meloidogyne* spp.), are among the most damaging plant-parasitic nematodes globally, affecting both wild and cultivated plants. In Colombia, *M. incognita*, *M. arenaria*, and *M. javanica* have been identified as the primary species affecting guava based on morphological characters; however, no genetic information is available to confirm these identifications. In this study, we collected 165 root and soil samples from major guava-producing areas in Boyacá, Santander, and Valle del Cauca departments from Colombia. Species identification was performed by examining morphological characters and integrating molecular data from three gene regions (ITS rDNA, COI, and COII-16S mtDNA). Morphological and phylogenetic analyses allowed for the identification of a single species in 77 positive samples - *M. enterolobii*. This is the first confirmed report of *M. enterolobii* parasitizing guava in these regions. This highly polyphagous and aggressive species is known for its broad host range and ability to overcome resistance in many crop varieties. These findings highlight the limitations of relying solely on morphology for RKN identification and underscore the urgent need for further research to develop effective control strategies and implement measures to prevent the further spread of *M. enerolobii* in Colombia.

DIFERENCIAL GENE EXPRESSION IN SOYBEAN IN RESPONSE TO *Aphelenchoides besseyi sensu lato* INOCULATION [EXPRESSÃO GÊNICA DIFERENCIAL EM SOJA EM RESPOSTA À INOCULAÇÃO DE *Aphelenchoides besseyi* SENSU LATO]. **Honório, A. P.**, M. F. Silva, V. C. Holtman, C. E. Maldonado, S. H. Brommonschenkel, and D. S. Buonicontro. Universidade Federal de Viçosa, Viçosa/MG, Brazil. amanda.honorio@ufv.br

Green Stem and Leaf Retention Syndrome (SHVRF) in soybeans, caused by *Aphelenchoides besseyi sensu lato*, leads to crop yield losses. This study aimed to characterize the transcriptional profile of soybean plants (BRS284) infected by this nematode. For this purpose, buds were collected 48, 72, and 96 hours and 8 and 12 days after mock and nematode inoculation. Total RNA was sequenced (Illumina PE-150 reads, Novogene), resulting in 20-25 million reads per sample and around 750 million high-quality paired end-150 reads in total. Pairwise differential expression analysis, time series expression analysis, and gene set enrichment were conducted using *Glycine max* v. 4 as the reference genome. For this purpose, the 52,872 primary genes of the reference were also re-annotated using BlastX, InterProScan, and Gene Ontology (GO). Up and down regulated genes in pairwise comparisons and over time, as well as enriched gene sets according to GO terms, were identified at each time point and throughout the time series. We observed a high frequency of plant defense genes among the top 50 positively regulated genes, while the top 50 negatively

regulated genes were mainly involved in photosynthesis. The differential expression of the most significant differentially expressed genes will be validated by RT-qPCR. Functional studies will then be conducted to confirm the causative role of these genes in SHVRF.

PEPTÍDEOS DERIVADOS DA PROTEÍNA HARPIN (AMINOÁCIDOS EXCRETADOS DE BACTÉRIAS - 1,0 % (M/M)) PHC 949 WP - TEIKKO™ APLICADO NA MODALIDADE DE TRATAMENTO DE SEMENTES E SULCO DE PLANTIO NO CONTROLE DO NEMATOIDE-DAS-LEÕES (*Pratylenchus brachyurus*) EM SOJA [PEPTIDES DERIVED FROM THE HARPIN PROTEIN PHC 949 WP - TEIKKO™ (AMINO ACIDS EXCRETED FROM BACTERIA) - 1.0% (M/M)) APPLIED IN SEED AND FURROW TREATMENTS TO CONTROL ROOT LESION NEMATODE (*Pratylenchus brachyrus*) IN SOYBEAN]. **JULIATTI, B. C. M.**[1], F. C. Juliatti[1], A. E. Pereira[1], and S. L. Almeida[2]. [1]Juliagro, Uberlândia - Minas Gerais, Brazil, [2]Plant Health Care, Holly Springs, NC, USA. breno.juliatti@juliagro.com

Modern biological products derivate from enzymes excreted by microorganisms (low molecular weight metabolites), activate and elicit partial or total resistance mechanisms in plants. These environmentally compatible products can be important allies to producers' due to suppression or reduction of reproduction factors in plant-parastic nematodes. An experiment was conducted to validate a plant activator PHC 949 WP via seed and in-furrow treatments, to control the root lesion nematode (*Pratylenchus brachyurus*) in soybean. The trial was conducted in a natural infested field with *P. brachyurus* during 2023/2024 using the susceptible Brasmax Olimpo IPRO variety 'DBC' replicated six times. The following treatments were evaluated: 1) Control; 2) PHC 949 WP [60 µg/seed] and 3) PHC 949 WP [90 µg/seed] via seed treatment; 4) PHC 949 WP [60 µg/seed], 5) PHC 949 WP [90 µg/seed] and 6) PHC 949 WP [120 µg/seed] via furrow (MICRON). Agronomic traits, quantification of juveniles/adults/eggs in soil and roots were determined at 0, 40, and 70 DAE (days after emergence). Yield kg/ha was also determined at the end of the trial. PHC 949 WP at doses of 60 and 90 µg/seed via seed treatment and 60 to 120 µg/seed via furrow resulted in a reduction in the reproduction factor of juveniles and adults of *P. brachyurus* (RF < 1.0) and increased yield (> 500 kg/ha) in comparison with the control.

PHYTONEMATODES IN CITRUS TREES GRAFTED ON *Poncirus trifoliata* IN RIO GRANDE DO SUL, BRAZIL [FITONEMATOIDES EM ÁRVORES CÍTRICAS ENXERTADAS EM *Poncirus trifoliata* NO RIO GRANDE DO SUL, BRASIL]. **Ramos, E. K. K.**[1], M. R. Souza[2], and M. M. Inomoto[1]. [1]ESALQ, Piracicaba, SP, Brazil, [2]UFPEL, Pelotas, RS, Brazil. eduardakirsch@usp.br

Poncirus trifoliata is the principal citrus rootstock in Rio Grande do Sul (RS) due to winter dormancy and low susceptibility to *Tylenchulus semipenetrans* and *Pratylenchus jaehni*. This study investigated the occurrence of plant-parasitic nematodes in symptom-free trees grafted on *P. trifoliata* in RS. This research involved 15 citrus orchard sites with each sample composed of 5 sub-samples collected from randomly selected trees. Sample of 5 g of roots were macerated followed by sieving through 60, 200, and 500 mesh screens and extracted nematodes identified and counted. Plant-parasitic nematodes were detected in 10 out of 15 samples (about 67% of all samples). *Tylenchulus semipenetrans* was observed in five areas (ranging from 15 to 555 specimens g-1), while *Pratylenchus* sp. was also observed in five orchard (with 15 to 60 specimens g^{-1}). Additionally, *Helicotylenchus* sp. and *Mesocriconema* sp. were detected. The presence of *T. semipenetrans* and *Pratylenchus* in citrus orchards may be linked to the open-field production of seedlings in the state. This practice should be avoided, because, while *P. trifoliata* exhibits resistance to *T. semipenetrans*, it is not immune. Moreover, *T. semipenetrans* reproduces on persimmon and olive trees and grapevine, which are important crops in RS.

NEW TECHNOLOGIES FOR ASSESSING QUALITY CONTROL OF ENTOMOPATHOGENIC NEMATODES [NUEVAS TECNOLOGÍAS PARA ESTABLECER EL CONTROL DE CALIDAD DE NEMATODOS ENTOMOPATOGENOS].

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Quality control of entomopathogenic nematodes (EPNs) is crucial for effective biological pest control. Traditional methods for assessing EPN quality and persistence have been labor-intensive and often lacked accuracy. However, emerging technologies are enhancing the precision and efficiency of these assessments. Fourier Transformed Infrared (FTIR) spectroscopy, for example, has shown promise in predicting EPN performance by analyzing their biochemical composition. FTIR can identify key molecular markers related to nematode vitality and infectivity, enabling rapid, non-destructive quality assessments. This method provides a reliable means to predict the success of EPN applications in the field, thereby optimizing their use in integrated pest management programs. In addition to FTIR, Carbon Quantum Dots (CQDs) offer a novel approach to monitoring the persistence of EPNs after application to soil. C-dots can label nematodes, allowing researchers to track their movement, distribution, and longevity in the soil environment. This technique is a powerful tool for understanding EPN ecological dynamics and improving application strategies for sustained pest control. Bycombining FTIR spectroscopy for performance prediction and CQD labeling for persistence assessment, these new technologies significantly advance EPN quality control. These techologies will lead to more effective and sustainable pest management solutions, with the potential to revolutionize how EPNs are monitored and applied in agriculture.

DEVELOPMENT OF A BIONEMATICIDE BASED ON *Purpureocillium* sp. FOR THE CONTROL OF *Heterodera glycines* [DESENVOLVIMENTO DE BIONEMATICIDA À BASE DE *Purpureocillium* sp. NO CONTROLE DE *Heterodera glycines*]. Silva, J. O.[1], R. B. Lima[2], V. F. Guadagnini[1], and I. Delalibera Jr.[1]. [1]Escola Superior de Agricultura Luiz de Queiroz, Piracicaba, SP, Brazil, [2]Germinax, Análise e Certificação de Sementes, Formosa, GO, Brazil. julianadeos13@gmail.com

Products based on microorganisms are increasing in prominence among producers in the management of plant-parasitic nematodes. Therefore, it is important to have products with good efficiency for the control of nematodes. Thus, the aim of this study was to evaluate the efficiency of *Purpureocillium* sp. isolates in controlling *Heterodera glycines* in soybean. Productivity assays of the isolates in rice were conducted to determine the production of conidia/g of dry rice. After the productivity assays, in vitro tests were conducted to evaluate the reduction in hatching of *H. glycines* eggs in suspensions of *Purpureocillium* sp. Isolates. The top five isolates in the in vitro tests were selected for greenhouse tests. Greenhouse assays were conducted in a completely randomized design with eight replications, using pots containing 0.8 kg of soil:sand (3:2). The suspension of the isolates was applied to the soil at the time of sowing, at a concentration of 10^7 conidia/ml. Two thousand nematodes were inoculated five days after sowing. After 60 days, the fresh weight of the roots, number of nematodes per gram of root and reproduction factor were evaluated. *Purpureocillium i*solates P3, P4, P5, P8, and P9 were selected for their production and in vitro efficiency to be used in greenhouse tests. *Purpureocillium* isolates P3, P4 and P8 caused low reproduction of *H. glycines,* with reproduction factors < 1.

EFFECT OF INTEGRATED MANAGEMENT TOOL FOR *Pratylenchus brachyurus* ON SOIL HEALTH - Year 2019/2023 [EFEITO DO MANEJO INTEGRADO DE *PRATYLENCHUS BRACHYURUS* NA SAÚDE DO SOLO - ANO 2019/2023]. Silva, J. V. C. L., C. C. O. Guarnieri, C. Muller, P. E. Rampazzo, and O. Garcia. Corteva Agriscience do Brasil Ltda, Mogi Mirim, SP, Brazil. juliane.carneiro@corteva.com.

Integrated management tools for plant-parasitic nematodes in soybean are important to avoid yield losses. However, little is known about the effect of those tools on soil health. Thus, this study evaluated the effect of integrated management tools for *Pratylenchus brachyurus* in soybean using beneficial nematodes as bioindicators osf oil health. The experiment was conducted for four seasons using crotalaria 'Safrinha' in rotation after soybean 'M6410'. The following treatments were considered: T1 - Lumialza™ (*Bacillus amyloliquefaciens* strain PTA-4838) as a seed treatment; T2 - Reklemel™ (fluazaindolizine) applied in furrow; T3 - Lumialza™ + Reklemel™; and T4 - untreated (UTC). All treatments were applied during the summer season. Nematode population densites were measured at 70 DAE (days after emergence) in soybean by counting the number of *P. brachyurus* per root (g). Beneficial nematode analyses were carried out to assess total abundance, trophic structure, and metabolic activity of nematodes. All of the treatments except the UTC reduced population densities of *P. brachyurs* by 87% at 70 DAE. It was found that T3 resulted in an increase of 26% in the total abundance of beneficial nematodes, followed by T2 (>6%) compared to UTC. T1 reduced nematode abundance by 7%. T3 increased the abundance of bacteriovorus and omnivores-predators by 25% and 86%, respectively, compared to UTC. Furthermore, the contribution of beneficial nematodes to carbon cycling was increased by 73% in T3, followed by T1 (>55%) and T2 (>47%) compared to UTC. Assessment of the beneficial nematode community demonstrated that rotation with crotalaria and the application of Lumialza™ + Reklemel™ improved soil health.

A FRAMEWORK FOR NEMATICIDE MODE-OF-ACTION CLASSIFICATION AND LABELLING - WORK OF THE IRAC INTERNATIONAL NEMATODE WORKING GROUP [ESTRUTURA PARA CLASSIFICAÇÃO E DEFINIÇÃO DO MODO DE AÇÃO DE NEMATICIDAS - TRABALHO REALIZADO PELO IRAC INTERNATIONAL NEMATODE WORKING GROUP]. **Wiles, J. A.**[1]. B. Lovato[2], J. Huggins[3], T. C. Thoden[1], U. Collienne[4], R. Nauen[4], A. Crossthwaite[5], E. Riga[6], M. Gaberthueel[5], and R. Eldridge[7]. [1]Corteva Agriscience, USA, [2]Adama Agricultural Solutions, Israel, [3]BASF, Germany, [4]Bayer CropScience, Germany, [5]Syngenta AG, Switzerland, [6]FMC Corporation, USA, [7]Valent BioSciences, USA.

In Brazil, the need for various tools to manage plant-parasitic nematodes has increased and gained much attention over recent years. This paper describes the activities of the IRAC International Nematode Working Group [Nematodes Archives | IRAC (irac-online.org)]. This industry group, with a role in global outreach, has developed a MoA classification scheme for nematicides, like those for insecticides, fungicides (FRAC), and herbicides (HRAC). The 'Nematicide MoA Classification Scheme' incorporates a wide range of active ingredients, organisms, conventional chemical nematicides, fumigants, and agents of biological origin that have demonstrated nematicide activity. The letter N is used to denote 'nematicide/nematode control agent'. As with other MoA Classification schemes, when new information is submitted to the Working Group, the group evaluates and considers updating the nematicide MoA Classification scheme accordingly. The aim is to encourage companies and regulators around the world to use this classification code and associated icon on nematicide product labels to inform the grower as to what type of nematicide they are using. This presentation will provide an update on activities of the IRAC Nematode Working Group, including how novel nematicides and bionematicides are submitted and evaluated.

EFFECTS OF ENTOMOPATHOGENIC NEMATODES AND ENTOMOPATHOGENIC FUNGI ON NONTARGET SOIL SURFACE ARTHROPODS AND NEMATODES [EFECTOS DE NEMÁTODOS Y HONGOS ENTOMAPATOGÉNICOS SOBRE ARTRÓPODOS Y NEMÁTODOS EN EL OBJETIVO DE LA SUPERFICIE DEL SUELO]. **Wong, L. G. K.**[1], K. -H. Wang[1], B. S. Sipes[1], and R. Myers[2]. [1]Department of Plant and Environmental Protection Sciences, University of Hawaii, Honolulu, Hawaii, [2]USDA, Agricultural Research Service, Daniel K. Inouye U.S. Pacific Basin Agricultural Research Center, Hilo, Hawaii. Email: landonwo@hawaii.edu

Oscheius tipulae and *Beauveria bassiana* were evaluated for non-target effects on soil-surface arthropods and nematodes. An experiment was established in a sweetpotato field. *Oscheius tipulae* (125,000 nematodes/plot) and Botanigard® (at label rates) were applied monthly. Grower practice consisted of carbaryl applications. For arthropods, 17×17×5.5 cm pitfall traps filled with a 1% liquid detergent solution were placed in the middle of each plot. Traps were monitored weekly. To determine effects on the nematode community, soil samples were taken before sweetpotato planting and at crop harvest. A sifted 250 cm^3 soil sample was subjected to elutriation and centrifugation. Nematodes were identified to trophic level and counted. Ten arthropod orders were recorded over the 17-week period. Differences were observed in Isopoda between carbaryl and Botanigard treatments. *Oscheius tipulae* did not affect soil-surface arthropods. Isopod reduction indicated carbaryl and Botanigard had nontarget effects on the soil-surface arthropod community but *O. tipulae* did not. The isopods and the soil nematode community indicated a healthy soil.

MANAGEMENT OF *Cylas formicarius* USING ENTOMOPATHOGENIC NEMATODES [MANEJO DE *Cylas formicarius* UTILIZANDO NEMATÓDEOS ENTOMOPATÓGENOS]. **Wong, L. G. K.**[1], K. -H. Wang[1], R. Myer[2], and B. S. Sipes[1]. [1]University of Hawaii, Honolulu, Hawaii, USA, [2]United States Department of Agriculture, ARS, Hilo, Hawaii, USA. landonwo@hawaii.edu

Entomopathogenic nematodes (EPN) have the potential to manage *Cylas formicarius*, the sweetpotato weevil. Larval susceptibility to *Steinernema feltiae* MG-14, *Oscheius tipulae* OA-12, and *Heterorhabditis indica* OM-160 was evaluated. Larvae were exposed to 200 Infective Juveniles (IJs) of *S. feltiae* or *O. tipulae*. In other experiments, *C. formicarius* was exposed to *H. indica* or *S. feltiae* at 11, 42, and 105 IJ/larvae. Subsequently, efficacy of *S. feltiae* was tested at 0, 0.5, 1.0, and 2.5 billion IJ/ha in a sweetpotato field. Monthly applications of *O. tipulae* were also evaluated in the field. In the laboratory assays, *S. feltiae* caused an adjusted mortality of 50% to larvae. *O. tipulae* and *H. indica* caused an adjusted mortality of 30% and 25% to *C. formicarius* larvae, respectively. In the field experiment with *S. feltiae*, *C. formicarius* damage was minimal and insect population densities low (< 1 weevil/kg swollen root). The EPN population increased between planting and harvest, but EPN population density was not affected by EPN application rate ($P > 0.05$). A field experiment with *O. tipulae* experienced high *C. formicarius* population densities and subsequent damage. However, sweetpotato treated with *O. tipulae* suffered less damage and had lower *C. formicarius* population densities than plots not treated with EPN ($P < 0.05$). All three EPN species showed promise in the laboratory and both *S. feltiae* and *O. tipulae* demonstrated an ability to control weevils in the field.

ADDENDUM

USANDO CULTURAS DE COBERTURA DE INVERNO E PRODUTOS BIOLÓGICOS PARA MANEJAR *Meloidogyne incognita* E MELHORAR A SAÚDE DO SOLO NO CULTIVO DE. BATATA-DOCE Using winter cover crops and biological products to manage Meloidogyne incognita and enhance soil health in sweetpotato cultivation. **Schloemer, C.M.**[1]; B. R. Lawaju[1,] K. S. Lawrence[1], S. H. Graham[1], K. H. Wang[2], B. Sipes[2]. [1]Entomology and Plant Pathology Department, Auburn University, AL 36849, USA, [2]Department of Plant and Environmental Protection Science, University of Hawai'I at Manoa, Honolulu, HI 96822, USA. lawrekk@auburn.edu. Support: USDA NIFA OREI (HAW09705-G); Hatch project ALA015-214003 and ALA015-19117.

Organic production is increasing across the Southeast, yet there is a need to develop effective organic integrated nematode management practices for sweetpotatoes. To address this, field trials were conducted in a Benndale fine sandy loam soil and a Fairwiew cobbly sandy clay loam to determine the impact of selected winter cover crops and biological products on nematode and insect pest suppression. Sweetpotatoes were planted into the footprints of the chosen winter cover crops. Entomopathogenic nematodes (*Steinernema feltiae, S. carpocapsae*, and *Heterorhabditis bacteriophora*), fungi (*Beauveria bassiana*), and OMRI-approved Majestene bionematicide were applied to half of each plot to assess their combined pest suppression capabilities. In the sandy loam

soil, the cover crop mix of crimson clover, daikon radish, elbon rye, and wheat resulted in high marketable yields (+2000 lb/A increase over fallow), low insect damage, and reduced *M. incognita* populations. The combination of biological products numerically increased marketable yields at both locations and significantly reduced internal *M. incognita* damage in the sandy loam soil. Legume winter cover crops crimson clover and field peas supported higher *M. incognita* populations at sweet potato planting, with 97 to 368 J2/100 cm^3 soil, respectively, while other crops supported 1-78 J2/100 cm^3 soil. Throughout the season, total *M. incognita* populations increased to 454 J2/100 cm^3 soil on crimson clover and 863 J2/100 cm^3 soil on field peas, while the lowest population (354 J2/100 cm3 soil) was observed following daikon radish. In the sandy clay loam soil, populations at sweet potato planting ranged from 28 to 72 J2/100 cm^3 soil for fallow and crimson clover. Across the season, total *M. incognita* populations were significantly lower on elbon rye, wheat, and the cover crop mix compared with crimson clover. All cover crops in the sandy clay loam soil increased free-living nematodes compared to the fallow, with bacterivores being most numerous, followed by fungivores and predators. CO_2 respiration increased over the season, with Alabama recording the highest respiration near harvest, and the sandy clay loam soil observing the highest respiration in the cover crop mix and the lowest in the fallow. PLFA soil health values showed that total living microbial biomass ranged from 14,076 to 16,105 ng/g in the sandy clay loam soil but was lower in sandy loam soil, ranging from 2,925 to 3,495 ng/g, likely due to soil textural differences. Organic sweetpotato production is challenging, yet the cover crop mix was associated with higher yields, lower *M. incognita* populations, high CO^2 respiration, and higher total living microbial biomass. Overall, the biological control products significantly reduced internal *M. incognita* damage and numerically increased yields across both locations.