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ABSTRACTS

CURRENT STATUS OF THE BLOAT NEMATODE ON GARLIC IN NEW YORK. **Abawi[1], George S., K. Moktan[1], C. Stewart[2], R. Hadad[3], and C. Hoepting[4].** [1]Department of Plant Pathology and Plant-Microbe Biology, NYSAES, Cornell University, Geneva, NY 14456; [2]CCE, Troy, NY 12180; and [3]CCE, Lockport, NY 14094; [4]CCE, Albion, NY 14411.

A destructive outbreak of the stem and bulb (bloat) nematode (*Ditylenchus dipsaci*) on garlic was first observed in a commercial field in western New York in June 2010. A follow-up survey demonstrated the widespread occurrence of the bloat nematode on garlic grown throughout the state and it was recovered from samples received from 17 counties and at populations as high as 3,609/g garlic tissues. Since then, over 300 garlic samples were processed in our laboratory and the bloat nematode was recovered from approximately 30% of the samples. Damage by this outbreak had significantly impacted garlic production in New York; with 100% yield losses occurring in some cases. Severely infected plants exhibit stunting; yellowing and collapse of outer leaves, and such plants may eventually die. Individual cloves or the entire bulb of infected plants initially exhibit light discoloration, later become dark brown in color, shrunken, soft, light in weight, and at later stages show cracks in the basal plate. Decay symptoms are usually developed on such cloves and bulbs due to the involvement of various saprophytic soil organisms. During 2011 and 2012, five workshops on the biology and management of the bloat nematode and general garlic production were offered and attended by >200 growers. A new project by the Specialty Crop Program through the NYS Dept. of Agriculture and Markets will subsidize the bloat nematode diagnostics and outreach on appropriate garlic and soil sampling protocols, interpretation of the test results obtained, and the implementation of appropriate management options against this nematode for both conventional and organic garlic growers in New York. The latter include the use of nematode-free planting seeds, planting in bloat nematode-free or treated soil, use of appropriate crop rotations (out of *Allium* species and other known hosts to the garlic and onion race of *D. dipsaci*), use of effective bio-fumigant cover crops and others.

EFFECT OF SPACE-LIKE ENVIRONMENT ON THE BIOLOGY OF *CAENORHABDITIS ELEGANS*. **Abdel-Rahman, Fawzia, N.M. Alaniz, S. Heydari, and B.A. Wilson.** Department of Biology, Texas Southern University, Houston, TX 77004.

Different populations of the nematode *Caenorhabditis elegans* were exposed to simulated microgravity using the High Aspect Ratio Vessels (HARV) bioreactor which creates Low shear modeled microgravity (LSMM). *C. elegans* in liquid cultures (S medium seeded with *E. coli* OP50 as the food source), were exposed to simulated microgravity for different time intervals of 3, 6, 9, and 12 days, and 4, 8, 12, and 16 days. Control was kept in tissue culture vessels on a shaker. The bioreactor and the shaker were housed inside an incubator on 21 °C. After each exposure the total final population for each treatment and the control were determined and compared to the initial populations. All different developmental stages (eggs, L1, L2, L3, L4, and adults) were determined and counted in each treatment and the control. The survival and mortality were estimated. Several L3/L4 were selected from each treatment to study the brood size and the life span for each hermaphrodite. Individual L3/L4 was placed on NGM plate seeded with *E. coli,* once first egg was observed the adult was moved to a new and fresh plate of NGM seeded with *E. coli* to prevent overlapping of generations, and it was continued to be moved every two days until laying eggs was stopped, after that the adult was moved to a fresh plate and was observed daily until it died. All the eggs and hatched larvae were counted after each transfer to determine the brood size for each adult hermaphrodite. Eggs were extracted from gravid adult hermaphrodites (exposed and control) using alkaline bleach; eggs were placed on NGM plates seeded with *E. coli*, eggs were observed for development and hatching. Several adult hermaphrodites from each treatment and the control were processed to pure glycerin and mounted on glass slides to obtain measurements to determine their development. The molecular probe 4', 6-diamino-2-phenylindole di-hydrochloride (DAPI) which stains the DNA and fluoresce under the fluorescence microscope was used to determine the effect of modeled microgravity on the number of the germ cells (germline) in the gonads of the adult hermaphrodites in both treated and control. The survival of *C. elegans* was reduced and the mortality was increased with the extended exposure to simulated microgravity. Eggs took longer time to develop and to hatch, and hatching rate was much lower than the control. The brood size was reduced for the hermaphrodites which were exposed to the low shear modeled micro-gravity, and it took longer time for the adults to start laying eggs, they deposited fewer eggs and the eggs were deposited for a shorter time (days) comparing to the control. Locomotion of the exposed animals was greatly reduced. Microscopic studies revealed that some of the morphometrics values were smaller in the simulated microgravity exposed *C. elegans* than the control.

inoculation fresh weights of plant tops and roots were recorded and galls and nematodes were counted after roots were stained with acid fuchsin. Reported differences are significant at $P \leq 0.05$ with the exception of cucumber. Because of problems with *Pythium* contamination in cucumber pots these differences are shown at $P \leq 0.10$. The high rate of fluensulfone reduced nematode counts and galling in tomato roots by 58% and 46%, respectively, compared to the nontreated check. Oxamyl significantly reduced nematode counts in roots and galling on tomato by 74% and 73%, respectively, compared to the nontreated check. Neither nematicide demonstrated systemic suppression of nematode counts in roots or galling in the other crop species tested. The high rate of fluensulfone reduced plant vigor and height in eggplant by 68% and 33% respectively. A 15% reduction in vigor of tomato was observed for rates of 3 and 6 g a.i./l and 33% reduction in vigor at the 12 g a.i./l rate, however, root weights for the low rates of fluensulfone were higher than the root weights of the nontreated tomato plants. The high rate of fluensulfone reduced vigor in cucumber by 28%. Phytotoxicity was not observed in squash at any rate. Similarly, phytotoxicity was not observed in any crop for the oxamyl treatment. Fluensulfone has systemic activity when applied as a foliar spray in certain crops, such as tomato, but also can be phytotoxic to other crops, such as eggplant. Oxamyl only showed systemic activity in tomato in these experiments. Similarly to fluensulfone, systemic activity of oxamyl appears to be crop-dependent.

SOIL NEMATODE GENERA THAT PREDICT SPECIFIC TYPES OF DISTURBANCE. **Neher, Deborah A.[1], and Zhao, J.[1,2].** [1]Department of Plant & Soil Science, University of Vermont, 63 Carrigan Drive, Burlington, VT 05405; and [2]Key Laboratory of Vegetation Restoration and Management of Degraded Ecosystems, South China Botanical Garden, Chinese Academy of Sciences, Guangzhou 510650, PR China.

Nematode community indices would be more cost-effective and interpretable if ambiguous genera were removed and indices reduced to include genera with known sensitivity or response to specific types of disturbance. The objective of the present study was to perform a meta-analysis of existing datasets of high quality and enumerate the genera that response universally consistency to specific disturbance, treatment, or management worldwide. We collected 21 sources of original data primarily from farmland and secondarily from grassland, forest and orchard with manipulated treatments in cultivation, inorganic or organic fertilization and identified whether samples were collected in the spring, summer or autumn. Canonical correspondence analysis was used to determine the effect of disturbance type on the composition of soil nematode community composition. Genera that performed consistently in a single direction and across at least two seasons were identified. Briefly, cultivation reduced abundances of *Diphtherophora*, *Prismatolaimus* and *Tylenchorhynchus*. Application of synthetic chemical fertilizers reduced numbers of *Plectus*. Application of organic fertilizers resulted in increased numbers of *Cruznema, Mesorhabditus*, *Mesodorylaimus* and *Nygolaimus*. No genera met the criteria for responding positively to either tillage or inorganic fertilization or negatively to organic fertilization. The source of nutrients apparently affected nematode communities differently. These genera need to be verified by independent data to confirm that they generally reflect intensive cultivation or fertilization by synthetic or organic types. Once verified, this subset of genera will improve interpretation of index values and can be the initial targets for developing molecular probes that can be made accessible to non-specialists.

INTERACTIONS AMONG ENTOMOPATHOGENIC NEMATODES AND OTHER NEMATODE TROPHIC GROUPS AND PLANTS IN AGROECOSYSTEMS. **Nethi, Somasekhar[1], G.B. Jagdale[2] and P.S. Grewal[3].** [1]Directorate of Rice Research, Rajendranagar, Hyderabad, 500030, India; [2]Plant Pathology Dept., University of Georgia, Athens, GA 30602; and [3]Department of Entomology, Ohio State University, OARDC, Wooster, OH 44691.

Entomopathogenic nematodes together with their symbiotic bacteria represent an important biological control system. These nematodes are being increasingly used for the control of soil pests in many crops worldwide due to their positive attributes and exemption from registration requirements in many countries. Available information from field studies suggests that predictability of control, an important consideration in biological control programs can only be achieved with entomopathogenic nematodes by deploying right nematode species/isolate against right pest in the right ecosystem. This essentially requires precise knowledge of evolutionary relationships and multitrophic interactions of entomopathogenic nematodes in soil food webs. In this context, we have addressed interactions of entomopathogenic nematodes with other nematode trophic groups and plants in agroecosystems. Although, inundative field applications of entomopathogenic nematodes were shown to have no significant long-term adverse impact on non-target arthropods, improvements in plant growth were observed in fields treated with entomopathogenic nematodes in some areas. This plant growth improvement was attributed to the decrease in abundance of plant parasitic nematodes following application of entomopathogenic nematodes. Following this, there was a surge in reports on suppression of plant parasitic nematodes by entomopathogenic nematodes. The interaction between entomopathogenic nematodes and plant-parasitic nematodes has become a subject of intense study from both ecological and commercial perspective over the past two decades. While suppression of plant parasitic nematodes, though a non-target effect, is considered beneficial from the pest management perspective, concerns were raised about its mechanisms and the possible adverse impact of entomopathogenic nematodes on other nematode trophic groups in soil and ecosystem services they provide. Our efforts to address these key issues resulted in unravelling of a unique phenomenon of selective suppression of plant parasitic nematodes by entomopathogenic nematodes without any adverse impact on beneficial free-living trophic groups (bacterivores, fungivores, predators, omnivores) of nematodes in soil food webs. This effect was referred as a beneficial non-target effect of entomopathogenic nematodes. These findings gave further impetus to the studies on the mechanisms underlying suppression of plant parasitic nematodes by entomopathogenic nematodes. Recent studies have demonstrated that the entomopathogenic nematodes and their symbiotic bacteria can induce systemic resistance in plants which may act against plant parasitic nematodes. This gives an insight into how entomopathogenic nematodes could selectively suppress plant parasitic nematodes in soil ecosystem. Our current understanding of the interaction of entomopathogenic nematodes with other trophic groups of soil nematodes and plants, its ecological significance and consequences for their successful use in biological control programs are discussed in the light of recent developments in the field of entomopathogenic nematology.

ECOLOGY OF SOILS SUPPRESSIVE TO SOYBEAN CYST NEMATODE: III. ASSOCIATION OF NEMATODE AND MICROBIAL COMMUNITIES WITH SOIL SUPPRESSIVENESS. **Nishanthan, Tharshani[1], Deborah A. Neher[1], and Senyu Chen[2].** [1]Department of Plant & Soil Science, 63 Carrigan Drive, Burlington, VT 05405; and [2]University of Minnesota Southern Research and Outreach Center, 120th Street, Waseca, MN 56093, USA.

The long-term goal of this project is to develop ecologically-based, sustainable management of the soybean cyst nematode by characterizing the composition and function of suppressive soils and by understanding how production practices affect biological suppression of the soybean cyst nematode. The general working hypothesis is that certain production practices will alter soil community composition and function that create long-term suppression of soybean cyst nematode (*Heterodera glycines*, SCN) populations and/or manifestation of disease. A field experiment was designed as a split plot and replicated four times in two fields naturally suppressive to SCN in Waseca County, Minnesota. Main plots were cultivation (no till, conventional till) and subplots were five crop-biocide combinations. Treatments were chosen to identify management practices that disrupt natural suppression of SCN. Soil samples were collected three times per year (planting, mid-season, harvesting). Nematodes were enumerated and identified to genus. Activity of fourteen extracellular enzymes was quantified to assess function of the decomposer microbial community. Cultivation, application of biocides, and rotation to corn all reduced suppression of SCN and the impact increased progressively within the first three years of the four year experiment. There was a significant two-way interaction between cultivation and crop-biocide treatments. Abundance of plant-parasitic and fungivorous nematodes decreased and abundance of bacterivorous nematodes increased with cultivation. Among plant-parasitic nematodes, the proportion that was *Helicotylenchus* was correlated negatively with *Heterodera glycines.* When soybean was rotated to corn, the relative abundance of fungivorous nematodes (especially *Aphelenchoides*) increased. Naturally suppressive soils contained greater activity of chitinase than conducive soils. Preliminary pyro-sequencing analysis of bacterial communities suggests Verrucomicrobia were more abundant and Actinobacteria were sparse in suppressive soils. Values of ΣMI25 and trophic diversity indices were correlated positively with SCN suppressive soils. Based on these results, there appears to be some association between *Heterodera glycines* and *Helicotylenchus* in the rhizosphere, perhaps competing for space and/or nutrients. Mannase and arabinase seem to be related to crop rotation, reflecting different proportions of carbohydrate monomers in the cell wall of corn than soybean. Our results suggest that disease suppression appears to be more closely aligned with fungi than bacteria. Natural suppression of SCN appears to be associated with the microbial community fostered by a combination of no-till and soybean monoculture.

PREPLANT SOIL TREATMENTS TO MANAGE BLUEBERRY REPLANT DISEASE CAUSED BY M*ESOCRICONEMA ORNATUM*. **Noe, J.P., P.M. Brannen, W.T. Holladay, and G.B. Jagdale.** Plant Pathology Dept., University of Georgia, Athens, GA 30602.

Blueberry production in Georgia has a farm gate value in excess of $100 million and accounts for almost one-third of the total fruit and nut crop value for the state. A slow decline in plant vigor and an associated replant disease has been observed on a number of blueberry farms, which led to an investigation of possible causes. Soil assays showed that *Mesocriconema ornatum* was associated with the plant growth symptoms. After confirmation of pathogenicity in greenhouse and microplot experiments, a field study was undertaken to determine the efficacy of preplant soil treatments to manage *M. ornatum* on blueberry. Experimental plots were established on two blueberry farms located in two Georgia counties, Appling and Bacon, that were previously planted in blueberry and were naturally infested with *M. ornatum.* Treatments included preplant fumigation with broadcast equivalent rates of methyl bromide/chloropicrin (50:50) at 448 kg/ha, 1,3-dichloropropene at 91 and 273 liter/ha, preplant solarization of the soil under clear plastic for 77 days, and nontreated controls; 6 replicates of each treatment were administered at each site. Data were combined from both sites for analysis. Soil assays conducted immediately after plastic film was removed showed that soil treatment with solarization reduced population densities of *M. ornatum* by 64% compared with nontreated plots ($P \leq 0.05$). Preplant soil treatment with methyl bromide/chloropicrin, or 1,3-dichloropropene at 91 or 273 liter/ha reduced population densities to 3, 6, and 0 *M. ornatum*/ 100 cm^3 soil, respectively, compared with 203 *M. ornatum*/ 100 cm^3 soil in the nontreated plots ($P \leq 0.05$). In soil assays taken after fumigant treatments were applied and planting beds were formed, population densities in the solarized plots remained lower (140 *M. ornatum*/ 100 cm^3 soil) than the nontreated plots but were higher than all the soil fumigant treatments ($P \leq 0.05$). After planting,