

CURRICULUM VITAE
DAVID IAN SHAPIRO-ILAN
Research Entomologist and Lead Scientist (GS-15)
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Citizenship: USA

Education:

- 1994 Ph.D. Entomology, Iowa State University, Ames.
 - Dissertation: The Effects of Earthworms and Fertilizers on Entomopathogenic Nematodes.
- 1989 M.S. Entomology, Louisiana State University, Baton Rouge.
 - Thesis: Variation in DNA of Wild Isolates of *Spodoptera frugiperda* Nuclear Polyhedrosis Virus.
- 1984 B.S. Biology, University of Michigan, Ann Arbor.

Professional Experience:

- 2020 to Present: Supervisory Research Entomologist and Research Leader, USDA-ARS, Byron, GA (rank, GS-15 since 2012).
- 2000-2019: Research Entomologist and Lead Scientist, USDA-ARS, Byron, GA.
- 1999: Assistant in Entomology, Citrus Research and Education Center, University of Florida.
- 1996-1998: Research Insect Pathologist, Integrated BioControl Systems Inc., Indiana.
- 1994-1996: Fulbright Postdoctoral Researcher, Volcani Institute, Israel.
- 1993: Instructor in Insect Pathology, Iowa State University
- 1991-1994: Research Assistant, Iowa State University.
- 1990: Farm Apprentice, Viroqua, Wisconsin.
- 1987-1989: Research Assistant, Louisiana State University.
- 1985-1987: Peace Corps Agricultural Volunteer, Niger, West Africa.

Professional Honors & Awards:

- Fellow of the Entomological Society of America, 2022.
- Fellow of the Society of Nematologists, 2017.
- Highlight Paper of the Year Society of Invertebrate Pathology, Nematode Division, 2015, 2016, & 2019 and Microbial Control Division, 2018.
- Distinguished Alumni Forum, University of Florida, Citrus Research/Education Center, 2017.
- Federal Laboratory Consortium, Team Award: Technology Transfer (National Level), 2013.
- Award for Excellence in Integrated Pest Management (SE Branch, Entomological Society of America), 2012.
- Equal Employment Opportunity/Civil Rights Award, USDA-ARS, SAA, 2009.
- Appreciation of Service Award, Georgia Pecan Grower's Association, 2007.
- Outstanding Scholarship & Contributions, Research Day, Fort Valley State University, 2012.
- Gamma Sigma Delta Honor Society.
- Phi Kappa Phi Honor Society.
- Sigma XI Scientific Research Society.
- Fulbright Scholar, 1994-1996.

Professional Service:

- Editor-in-Chief: Journal of Invertebrate Pathology (2020-2023).
- Vice-President then President Georgia Entomological Society (2019-2023).
- Adjunct Professor: Dept. of Biology, Fort Valley State University (2010-Present).
- Adjunct Professor & Graduate Faculty Member: Department of Entomology, University of Georgia (2008-Present).
- Scientific Quality Review Officer: USDA-ARS (2018-2020).
- Editor-in-Chief: Journal of Nematology (2018-2021).
- Acting Research Leader: USDA-ARS, Byron. Three terms: January-April 2017, June-September 2018, and May-Aug 2019 (10 months total).
- Special Graduate Faculty: University of Guelph, School of Environmental Sciences, Ontario, Canada (2011-2016).
- Advisory Board: Central Georgia Technical College Biotech Program (2016-Present).
- Editor: Journal of Invertebrate Pathology (2010-2020).
- Editor: Journal of Nematology (for Entomopathogenic Nematology) (2009-present).
- Editor: Journal of Economic Entomology (Biological Control-Microbial) (2005-2009).
- Associate Editor: Environmental Entomology (2002-2018).
- Editorial Board: Biological Control (2004-Present).
- Editorial Board: Journal of Invertebrate Pathology (2007-2009).
- Editorial Board: Insects (2020-Present)
- Executive Member of the Governing Board: Society of Nematology (2010-2012).
- Vice Chair, Cobb Foundation Board: Society of Nematologists (2013-2016).
- Chair: Nematode Division, Society of Invertebrate Pathology (2006-2008 and 2015-2016).
- Chair: Entomophilic Nematode Committee, Society of Nematology (2001-2002).
- Chair: S-1024 Microbial Control Working Group (2010-2012).
- Chair: S293 Regional Project: Pecan Insect Pest Management (2003-2004).
- Panel Member: USDA-ARS Research Position Evaluation (RPES) (2009, 2012, 2014, 2016).
- Grant Panel Member: Puerto Rico Science, Technology & Research: Natural Sciences (2016).
- Grant Panel Member: USDA/NIFA/Small Business Innovation & Research (SBIR), Plant Production and Protection (2001, 2002, 2005, 2014).
- Grant Panel Member: USDA/CSREES/ NRI Biologically Based Pest Management (1997).
- Grant Panel Member: USDA/CSREES/NRI Grant Program, Biological Control (1996).
- Grant Ad-Hoc Reviewer: The Foundation for Food and Agriculture Research (FFAR), USDA-Sustainable Agriculture Research & Education (SARE), Gates Foundation (PEARL), South African NRF, Swiss NSF, US-Israel Binational Agricultural Research and Development Fund (BARD).
- President-Elect: Georgia Entomological Society, 2020 (will become President in 2021).
- Journal Peer Reviewer for Applied Soil Ecology, Applied Microbiology and Biotechnology, Biocontrol, Biocontrol Science and Technology, Biological Control, CAB Reviews, Canadian Entomologist, Crop Protection, Entomologia Experimentalis et Applicata, Environmental Entomology, Florida Entomologist, International Journal of Parasitology, Journal of Applied Ecology, Journal of Applied Microbiology, Journal of Entomological Science, Journal of Invertebrate Pathology, Journal of Nematology, Journal of Parasitology, Journal of Pest Science, Mycopathologia, Nature Biotechnology, Nematropica, Parasitology, Pest Management Science, Phytoparasitica, Phytopathology, PLoS ONE, PLoS Pathogens, Scientific Reports, Trends in Parasitology, Veterinary Parasitology, Veterinary Pathology.

Funded Cooperative Research and Development Agreements (CRADAs) with Industry (Shapiro-Ilan ADODR):

- 2002-2005: Mass *In Vivo* Rearing of Entomopathogenic Nematodes for Direct Application of Insect Cadavers to Sites of Target Insects. Partner = H&T Alternative Controls LLC.
- 2006-2011: Mechanization of *In Vivo* Production of Entomopathogenic Nematodes in *Tenebrio molitor*. Partner = Southeastern Insectaries, Inc.
- 2015-2020: The Enhancement of Entomopathogenic Nematode Efficacy for Improved Field Application. Partner = Pheronym, Inc.
- 2020-2025: Optimizing Nematode Pheromones and Their Production for Improved Sustainable Pest Management. Partner = Pheronym, Inc.

Competitive Grants Received, Authored or Co-Authored by David I. Shapiro-Ilan (> \$22 Million Total Funds):

- 1991-1994: Leopold Center for Sustainable Agriculture, grant for studying the effects of fertilizers on insect pathogens. (Shapiro [PI], Lewis, and Melvin) (\$69,000).
- 1993: Graduate Student Professional Advancement, grant to characterize a nuclear polyhedrosis virus isolated from *Agrotis ipsilon*. (Shapiro [PI])
- 1994-1996: Fulbright Foundation, grant to study genetic improvement of entomopathogenic nematodes. (Shapiro [PI]) (\$54,000).
- 1994-1996: Binational Agricultural Research Development (BARD), to study improvement of entomopathogenic nematodes as biological control agents. (Shapiro [PI]) (\$54,000).
- 1995: Trustees of Agricultural Research at the Volcani Center, grant to characterize novel biological control agents. (Shapiro [PI]) (\$6000).
- 1998: USDA Small Business Innovation Research (SBIR), to study using nematodes as biocontrol agents of mollusk pests (slugs). (Shapiro [PI], Wilson, and Gaugler) (\$64,000).
- 1999: Florida Citrus Production Research Council, grant to study biological and chemical methods of control of citrus rootweevil larvae. (McCoy and Shapiro) (\$41,000).
- 2000: USDA Small Business Innovation Research (SBIR), grant to study potential of applying entomopathogenic nematodes in their infected-host cadavers. (Teddors, Shapiro-Ilan and Lewis, primary author=Shapiro-Ilan) (\$69,000).
- 2000-2019: GA Agricultural Commodity Commission (Pecans), multiple annual grants to test microbial agents (entomopathogenic nematodes, fungi and bacteria) for control of the pecan pests. (Shapiro-Ilan [PI] et al) (\$157,000).
- 2001-2003: USDA PMAP, Grant to investigate biological controls for plum curculio in peaches. (Mizell, Shapiro & Horton) (ca. \$58,350).
- 2002-2005: USDA-CSREES [NIFA] National Research Initiative (NRI), Characterization and stabilization of trait loss in entomopathogenic nematodes. (Shapiro-Ilan [PI]) (\$299,000).
- 2002-2004: USDA Small Business Innovation Research, Phase II, grant to study potential of applying entomopathogenic nematodes in their infected-host cadavers. (L. Tedders, D. Shapiro-Ilan, & E. Lewis, primary author = Shapiro-Ilan) (\$299,000).
- 2003-2005: National Science Foundation, Host infection decisions by insect parasitic nematodes. (E. Lewis, J. Campbell, D. Shapiro-Ilan, and S. Ramaswamy). (\$200,000).
- 2003-2005: USDA Sustainable Agriculture Research and Education (SARE), Integrating Biological Control into Pecan Weevil Management: A Sustainable Approach. (Shapiro-Ilan [PI], Gardner, Cottrell, Hudson & Behle) (\$217,500).

- 2004 -2007: USDA-Risk Avoidance and Mitigation Program (RAMP), Advancing IPM and reducing pesticide risks in eastern peaches. (Scherm,...Shapiro-Ilan et al.) (\$1,034,722).
- 2006: USDA Small Business Innovation Research (SBIR) Phase I, Mechanized *in vivo* production of entomopathogenic nematodes: expanding biocontrol utility. (L. Tedders, D. Shapiro-Ilan, J. Morales, and G. Rojas, primary author = Shapiro-Ilan) (\$80,000).
- 2006-2008: USDA Pest Management Alternatives Program (PMAP), Entomopathogenic Nematodes as a Reduced Risk Alternative to Organophosphates for Control of Borers (Lepidoptera: Sesiidae) Attacking Peach. (Mizell, Cottrell, Shapiro-Ilan, Horton) (\$122,530).
- 2007-2009: USDA Small Business Innovation Research Phase II, Mechanized *in vivo* production of entomopathogenic nematodes: expanding biocontrol utility. (L. Tedders, D. Shapiro-Ilan, J. Morales, and G. Rojas, primary author = Shapiro-Ilan) (\$349,950).
- 2009-2013: USDA Specialty Crop Research Initiative (SCRI), Manipulating host and mate-finding behavior of the plum curculio: Development of a multi-life stage management strategy for a key fruit pests. (Leskey, Shapiro-Ilan et al.) (\$559,531).
- 2011-2015: USDA Sustainable Agriculture Research and Education (SARE), Enhancing Natural Enemy Systems: Biocontrol Implementation for Peachtree Borers. (Shapiro-Ilan [**PI**], Cottrell, Mizell, Horton, Lennon & Colson) (\$226,100).
- 2013-2017: USDA-NIFA-Organic Transitions Program, Improvement and Implementation of Organic Pecan Systems in the Southeastern US. (Mizell, Shapiro-Ilan et al.; Shapiro-Ilan was first author and listed as PI/PD on proposal, but grant had to be submitted by a University) (\$658,183).
- 2016-2018: USDA-NIFA-AFRI-CARE, IPM Package for the Management of *Pangaeus bilineatus* (Say), (Heteroptera: Cydnidae) using a combination of biological and chemical insecticides. (Mбата, Shapiro-Ilan, & Abney) (\$197,646.00).
- 2017: Norman E. Borlaug International Agricultural Science & Technology Fellowship Program (Shapiro-Ilan = Mentor) (\$40,000).
- 2017-2018: USDA-SBIR Phase I, Leveraging Nematode Signals to Enhance Entomopathogenic Nematode Efficacy for Pest Control. (Kaplan, Shapiro-Ilan, & Lewis) (\$100,000).
- 2018-2021: USDA-NIFA-Crop Protection and Pest Management (CPPM), Developing a multi life-stage management strategy for apple maggot, a persistent tree fruit pest in the Northeast, through the integration of attract-and-kill and biological control. (Pinero, Leskey, Shapiro-Ilan et al.) (\$324,942)
- 2018-2021: USDA-NIFA-CPPM, Leveraging pest behavior for implementation of biological control for plum curculio. (Nielsen, Leskey, Shapiro-Ilan et al.) (\$300,000).
- 2018-2021: USDA-NIFA-Agriculture and Food Research Initiative (AFRI) Foundational Program, Group behavior and chemical signaling as drivers for entomopathogenic nematode foraging and infection dynamics. (Shapiro-Ilan [**PI**] et al.) (\$499,837).
- 2018-2021: USDA-NIFA-SARE, Biocontrol with Benefits: Enhancing Sustainability by Adding Value. (Shapiro-Ilan [**PI**] et al.) (\$260,000).
- 2018-2019: Space Florida Israel Partnership Program, Enhancing biocontrol efficacy for agricultural pest control by leveraging nematode signals. (Kaplan, Shapiro-Ilan, Lewis & Yaacobi) (\$300,000).
- 2019-2022: BARD (Binational Agricultural Research & Development): Formulation for Biopesticides Based on Single Cell Encapsulation via Pickering Emulsions. (Mechrez, Shapiro-Ilan (**US PI**), & Ment) (\$309,000).

- 2020-2021: International Space Station, Microgravity effect on entomopathogenic nematodes' ability to find and kill insects. (Kaplan, Shapiro-Ilan & Sampson) (\$100,000).
- 2020: US-AID PEER (Partnerships for Enhanced Engagement in Research): Entomopathogenic nematodes and plant resistance for the control of sweet potato weevils (*Cylas* spp.) in Benin and in South Africa (Baimey, Ramakuwela, Shapiro-Ilan (US Advisor) (\$80,000).
- 2020-2023:USDA-SARE: Pecan Hedge-pruning: A Sustainable Management Option for the Southeastern US(Acebes, Shapiro-Ilan et al.) (\$299,893).
- 2020-2024: USDA-NIFA-SCRI: Flatheaded Borer Management in Specialty Crops. (Addesso,...Shapiro-Ilan et al...) (\$,6,058,955).
- 2020-2023: USDA-NIFA-ORG: Integrating biorational approaches to control plant parasitic nematodes and weeds in organic vegetable systems (Hajihassani, Shapiro-Ilan et al) (\$499,973).
- 2020-2022: NSF-SBIR: A scalable platform to produce nematode pheromones for crop protection (Kaplan and Shapiro-Ilan) (\$224,800).
- 2021-2025: NIFA-SCRI, Ecology and Integrated Management of Ambrosia Beetles in Eastern US Orchard and Ornamental Tree Crops (Ranger...Shapiro-Ilan et al) (\$7526949).
- 2022-2024: NIFA-AFRI, Chemical Cues from Beneficial Nematodes Enhance Plant Resistance and Strengthen Biological Control (Helms, Shapiro-Ilan, Kaplan) 680,000)
- 2022-2025: NIFA-MeBr, Development of Effective Economical Microbial Strategies To Combat Major Nematode And Fungal Pests In Turfgrass Systems (Hajihassani et al) (\$471,201).

Graduate Students, Postdocs & Visiting Scientists, Hosted and Mentored by David

I. Shapiro-Ilan:

- Muhammad Usman and Sehrish Gulzar, 10/2019-4/2020, two Ph.D. students from Pakistan, funded by the Higher Education Commission, Pakistan.
- Dr. Camila Hofman, 2018-2020, Postdoc, funded by USDA-NIFA and USDA-SARE grants.
- Dr. Shaohui Wu, 2018-Present, Postdoc, funded by Scientific Quality Review Officer allocation.
- Dr. Tshima Ramakuwela, 9/2017-12/2017, Visiting Scientist and Borlaug Fellow from South Africa, funded by Borlaug Fellowship Program (USDA-Foreign Agricultural Service).
- Dr. Barbara Caoili, 1/2017-7/2017, Visiting Professor and Fulbright Scholar from the University of Philippines, Los Banos, funded by Fulbright.
- Co-Major Advisor for Mr. Shahram Sharifi-Far, completed M.Sc. degree at University of Guelph, Ontario, Canada, April 2016.
- Dr. Luis G. Leite, 11/2014-11/2015, Visiting Scientist from Instituto Biológico, SP, Brazil, funded by São Paulo State Foundation for Research.
- Dr. Selcuk Hazir, 9/2014-9/2015, Visiting Professor from Adnan Menderes University, Turkey, funded by a sabbatical scholarship from the Technical and Scientific Research of Turkey.
- Dr. Weibin Ruan, 7/2015-10/2015 and 1/2017-4/2017, Visiting Professor from Nankai University, China, funded by the National Science Foundation of China.
- Dr. Brian Kunkel, 2004-2006, Postdoc (co-advised by Shapiro-Ilan and Cottrell), funded by NSF grant (Shapiro-Ilan) and in-house funds.
- Dr. Cheng Bai, 2002-2004, Postdoc, funded by USDA-NRI grant.

- Also served on graduate committees of Dr. Dana Blackburn (Ph.D. Brigham Young University, 11/2016) and Ramandeep Sandhi (University of Montana, 2019-2020), and served as the Outside Examiner for the Ph.D. dissertations of Dr. Tshima Ramakuwela (University of KwaZulu-Natal, South Africa, 2015), and Sonnica Albertyn (University of Rhodes, South Africa, 2017).

Some Selected Research Accomplishments:

***1. Accomplishment:** Shapiro-Ilan's research enhanced and expanded microbial biocontrol in orchards and other crops through discovery of numerous novel or improved microbial agent-target pest combinations (primarily with entomopathogenic nematodes but also entomopathogenic fungi and bacteria). Shapiro-Ilan was first to 1) discover high virulence of the nematode *Heterorhabditis indica* to citrus weevil, *Diaprepes abbreviatus*, and established that, compared with other nematodes, *Steinernema riobrave* possesses superior virulence, 2) discover new nematode strains of commercial significance i.e., various *S. riobrave* strains, *S. carpocapsae* Sal strain and *H. marelata* IN strain, 3) show outstanding nematode virulence to plum curculio larvae and discover exceptional efficacy to the peachtree borer, and 4) develop novel mechanisms to control pecan weevil using entomopathogenic nematodes, fungi and or bacteria (*Chromobacterium subtsugae*, Grandevo®). **Role:** Lead role in all research listed above. **Impact:** Overall, Shapiro-Ilan's discoveries under this accomplishment have resulted in more than \$5 million in commercial nematode sales in various orchard crops, ornamentals, turf, and others. 1) Based on Shapiro-Ilan's pioneering work on *H. indica*, more than 90,000 acres of citrus were treated, and sales of this strain continue in other commodities. 2) Sal and IN strains produced > \$1 million in commercial sales; newly discovered *S. riobrave* strains were licensed to a commercial and significant sales ensued. 3) Discovering high levels of biocontrol efficacy to plum curculio and peachtree borer also resulted in commercial application and extension publications. 4) New approaches to pecan weevil control (nematode and Grandevo application) have been adopted by organic growers. Commercial adoption based on Shapiro-Ilan's research extends to other commodities (outside of peach and pecan focus) and related pests, e.g., application of nematodes for peachtree borer in Michigan cherries, and control of chestnut weevil in New York. Shapiro-Ilan's novel research on control of orchard pests generated 52 invited talks (11 international) and 10 funded competitive grants in USDA national programs (SARE (3), PMAP (2), SCRI, RAMP, CPPM (2), Organic Transitions), an Annual Review article, and 4 authored/co-authored book chapters.

***2. Accomplishment:** Shapiro-Ilan elucidated fundamental aspects of entomopathogenic nematode foraging and signaling behavior. Foremost, Shapiro-Ilan was first to discover that nematode infected-host factors enhance nematode dispersal and infectivity; this behavior was later attributed to nematode pheromone signaling. Subsequently, Shapiro-Ilan et al. showed that the host factors/pheromones can be mixed with nematode suspensions to direct nematode behavior and enhance biocontrol efficacy. Also prominently, Shapiro-Ilan led research discovering entomopathogenic nematodes respond directionally to electromagnetic cues (implicating a novel mechanism in nematode navigation), and that the nematodes display aggregative movement behavior - they move through soil in groups like a pack of wolves seeking their prey. **Role:** Shapiro-Ilan was leader in all aspects of research on aggregative nematode movement, electromagnetic cues, and testing biocontrol efficacy of host exudates/pheromones in combination with nematodes, and partner on several other impactful foraging studies. **Impact:** Shapiro-Ilan's pioneering research and discoveries significantly expand knowledge of nematode foraging/host-finding behavior. Research results span broad fundamental interest as

evidenced by a funded NSF grant (co-PI) an AFRI grant on group behavior and signaling (Shapiro-Ilan=PI/PD), publications in parasitology journals, many citations, and invited talks (national and international). Broad interest in fundamental foraging behavior also led to a funded grant to explore nematode movement and infection dynamics under microgravity on the International Space Station (ISS) (coPI on grant from ISS National Lab). From a practical standpoint, elucidation of foraging dynamics (knowing what makes a nematode find a host and infect) enhances pest control efficacy through critical understanding of the nematode's basic biology and ecology. Application of host-exudates/nematode pheromones to enhance biocontrol efficacy is the basis for a CRADA and SBIR funding as well as a pending patent.

***3. Accomplishment:** Deterioration of beneficial traits (e.g., virulence, reproductive capacity) in biocontrol agents during laboratory or industrial production is detrimental to pest management efficacy. Shapiro-Ilan was first to document trait deterioration in entomopathogenic nematodes, and discovered the source of deterioration (genetic basis/inbreeding). Shapiro-Ilan's lab developed a method to deter deterioration through creation of selected inbred lines. Another cause of deterioration discovered was that too many nematodes inside the host leads to "cheaters" (those relying on virulence of others) due to lack of relatedness and therefore infection rates must be controlled **Role:** Led the first studies discovering trait deterioration, and was Project Director (PD/PI) and Team Leader on a funded NRI project encompassing most other research under this accomplishment (publications 2005 to 2009). Deterrence of trait loss via selected inbred lines conceived and designed by Shapiro-Ilan and then implemented under his direction. **Impact:** Accomplishment impacts both basic science and commercial industry: 1) The research provides fundamental understanding of a critical problem in biological control, i.e., trait loss during culture production. Research from the NRI project has impacted the fields of nematology, microbiology, parasitology and genomics/evolution as evidenced by 7 invited talks (5 international) by Shapiro-Ilan, citations, and follow up research in other laboratories in US, Canada, Germany, and South Africa. For example, 2 graduate students (Shapiro-Ilan was co-major advisor for one) conducted thesis/dissertation research based on the trait deterioration research, a Borlaug Fellow from South Africa (Dr. T. Ramakuwela) and a Fulbright Professor (Dr. B. Caoili) from Philippines came to Shapiro-Ilan's lab to conduct research on the topic. Furthermore, the selected inbred line technology developed by Shapiro-Ilan has been adopted by at least three commercial entomopathogenic nematode-producer companies (one was US CRADA partner).

***4. Accomplishment:** To improve biocontrol efficacy, Shapiro-Ilan has substantially enhanced entomopathogenic nematode production and application methods. Shapiro-Ilan et al. improved the efficiency of *in vivo* entomopathogenic nematode production by optimizing inoculation parameters and developing automated technology to reduce labor costs. Also developed novel improved media for *in vitro* culture of entomopathogenic nematodes. Toward novel application technology, Shapiro-Ilan developed methods for application of nematodes in infected hosts. Entomopathogenic nematodes, though typically applied in aqueous suspension, can also provide significant pest control when applied in infected host cadavers. Shapiro-Ilan et al. were first to discover advantages in applying nematode-infected cadavers and developed novel technology to facilitate application using a patented coating formulation (Shapiro-Ilan=lead inventor), use of hard-bodied insect hosts, or a method to automatically package infected. **Role:** Shapiro-Ilan was leader in all aspects of entomopathogenic nematology research. For *in vivo* production research, Shapiro-Ilan developed concepts for two CRADAs and was ADODR on one and co-ADODR on the other, and was primary author on two funded Phase I/Phase II

SBIR grants to support the projects. *In vitro* media optimization research was conducted by visiting scientist who came to Shapiro-Ilan's lab to pursue this research. **Impact:** Improved *in vitro* media is being used by a current CRADA partner (Pheronym Inc.) to produce nematode pheromones. Improved methods of *in vivo* production and cadaver application have resulted in 5 issued patents (lead inventor on 3) and all the technologies have been adopted by previous CRADA partner (Southeastern Insectaries, Inc.) resulting in significant sales of nematode products (300% increase in sales based on improved methodology). Basic and advanced *in vivo* production methods from Shapiro-Ilan's research were synthesized in an invited book chapter. Shapiro-Ilan has received invitations to present papers based on this accomplishment at 9 international and 4 national meetings or workshops. Research on protecting cadavers, was featured in several research or grower-based news publications, e.g., Nature Science Update (Nature's web magazine), Kiplinger's Ag Letter, eOrganic and CABI Biocontrol News. Based on Shapiro-Ilan's research, cadaver application has also been pursued (in research and commercial application) outside the US, e.g., in Brazil, India, and South Africa.

Selected Invited Papers/Presentations, etc.:

1. 1996: "Genetic Improvement of *Heterorhabditis bacteriophora* for heat tolerance". Presented to Department of Entomology Ames, IA. (Travel Expenses Paid).
2. 1999: "Entomopathogenic Nematodes as Biological Control Agents of Root Weevil Larvae". Presented at the 4th International Caribbean Conference on Entomology and the 82nd Florida Entomological Society Meeting, San Juan, Puerto Rico.
3. February 2001: "Research Toward Microbial Control of the Pecan Weevil". Presented at the Southeastern Pecan Growers Annual meeting, Orange Beach, AL.
4. July 2001: "Production Technology for entomopathogenic nematodes and their bacterial symbionts". Presented at the annual meeting of the Society of Industrial Microbiology, St. Louis, MO, as part of a symposium on Production Systems for Microbial Biopesticides.
5. December 2001: "Microbial Control of the Pecan Weevil". Presented at the annual meeting of the Entomological Society of America, San Diego, CA, as part of a symposium on pecan insect pest management.
6. January 2002: "In Vivo Production of Entomopathogenic Nematodes". Presented at Mideast Workshop on Biopesticides. Sharm El Sheik, Egypt. (Travel Expenses Paid).
7. March 2002: "Research toward microbial control of the pecan weevil". Presented at the 36th Annual Western Pecan Grower's Association Conference, Las Cruces, New Mexico, March 3-5.
8. March 2003: "Update on Research Toward Microbial Control of the Pecan Weevil". Presented at the Southeastern Pecan Growers Annual meeting, Panama City, FL.
9. July 2003: "Production of nematodes". Presented in the symposium: "Is Bigger Always Better? A Comparison of Industrial-Scale vs. Cottage Industry-scale Production of Microbial Pesticides" at the International Meeting of the Society for Invertebrate Pathology, Burlington, Vermont, from July 26 – 30.
10. November 2003: D. Shapiro-Ilan. Invited Talk "Use of Entomopathogenic Nematodes in North America", and Chair of Session "Production and Application, Industry Perspectives" held at "New Paradigms in Insecticidal Nematodes: Third International Workshop on Entomopathogenic Nematodes and their Bacterial Symbionts", Eilat Israel. (Travel Expenses Paid).

11. August 2004: “Potential for Application of Infected Hosts in Microbial Control”, Society of Invertebrate Pathology, Helsinki, Finland.
12. March 2005: “Biologically-Based Insecticides for Pecan Pest Management”, Western Pecan Growers Conference, March 6-8, 2005, Las Cruces, New Mexico.
13. August 2005: “Entomopathogenic nematode formulations and enhancing post-application survival”, Society of Invertebrate Pathology, Anchorage, Alaska.
14. August 2006: Symposium organizer and speaker “Emerging Target Pests for Entomopathogenic Nematodes”, at the Society of Invertebrate Pathology Meeting, Wuhan, China.
15. August 2006: “Improved Insect Control Using Entomopathogenic Nematodes in Orchard Systems”. Presented at the International Meeting of the Brazilian Congress of Entomology, Recife, Brazil. (Travel Expenses Paid).
16. June 2006: “Control of Pests in Pecan and Peach Using Entomopathogenic Nematodes: Challenges and Successes”. Presented at the annual meeting of the Society of Nematologists, Kauai, HI.
17. December 2006: “Entomopathogenic Nematodes and Infected Hosts: Implications in Microbial Ecology and Biological Control”. Presented at the annual meeting of the Entomological Society of America, Indianapolis, IN.
18. January 2007: “Entomopathogenic Nematodes for Control of Peach Pests”. Presented to the Fruit IPM School (Grower workshop) and the Michigan State University, Department of Entomology. (Travel Expenses Paid).
19. August 2007: Colloquium Organizer and Speaker. “Trait Modification in Entomopathogenic Nematodes” Society of Invertebrate Pathology, Quebec City, Canada.
20. July 2008: “Status and Future for Incorporation of Entomopathogenic Nematodes in Temperate Orchard IPM Systems”. Presented at the 5th International Congress of Nematology, held in Brisbane, Australia, July 13-18, 2008. Invited Speaker and Session Chair (“Current and Future Trends for Insect Control through Entomopathogenic Nematodes”).
21. July 2008: “Stability Issues: Maintenance of Beneficial Traits in Entomopathogenic Nematodes”. Presented at the 5th International Congress of Nematology, held in Brisbane, Australia, July 13-18, 2008.
22. October 2008: “Mass Production and Field Application of Entomopathogenic Nematodes”. Presented at the Meeting of the Association of Natural Biocontrol Producers, Greenville, MS, October 27-29, 2008.
23. January 2009: “Developing and Improving Microbial Control Programs for Insect Suppression” Presented at the Sigma Xi Seminar, University of Georgia, Tifton, GA, January 21, 2009.
24. February 2009: “Alternative Pest Control Research”, Meeting of the Southeastern Pecan Growers Association, Sandestin, FL, February 20-21, 2009.
25. March 2009: “Alternative Control of Orchard Pests in the Southeastern USA: Developing and Improving Microbial Control Programs for Insect Suppression”. Seminar presented to the Department of Nematology, University of California, Davis CA, March 2, 2009.
26. March 2009: “Alternative Approaches to Pecan Pest Management”, Mexican Pecan Grower’s Congress, Saltillo, Mexico, March 13-14, 2009. (Travel Expenses Paid).
27. March 2009: “Antifungal Agents Derived from the Symbiotic Bacteria *Photorhabdus* spp. and *Xenorhabdus* spp.”. Presented at the 237th National Meeting of the American Chemical Society, Salt Lake City, Utah, March 22-26, 2009.
28. April 2009: “Application Technology” International Symposium on the research and

- development of entomopathogenic nematodes, April 10-13, 2009, Sanya, China. (Travel Expenses Paid).
29. October 2009: "Persistence & Stability of EPN Beneficial Traits: Importance for Success in Biocontrol". Presented at the 2nd International Congress of Tropical Nematology, Maceio, Brazil, Oct. 4-9, 2009 (Full Travel Expenses Paid).
 30. December 2009: "Entomopathogenic Nematodes Versus Weevil Pests: It's what's for Dinner", Annual Meeting of the Entomological Society of America, Indianapolis, IN, December 13-16, 2009.
 31. January 2010: "Control of Peachtree Borer and Lesser Peachtree Borer with Beneficial Nematodes". Presented at the South Georgia/North Florida peach meeting, Quitman, GA, January 27, 2010.
 32. May 2010: "Entomopathogenic Nematodes: Successful Application Methodology and Future Directions" International Organization of Biological Control Meeting: Biological Control in the Americas: Past, Present & Future, Niagara Falls, Canada, May 10-14, 2010.
 33. July 2010: Invited Symposium Leader and Speaker: "Novel entomopathogenic nematode formulations and targets in North American Orchards". Presented in the symposium, "New Frontiers in Applied Entomopathogenic Nematology", Annual Meeting of the Society of Nematology Boise, ID, July 10-14, 2010.
 34. October 2010: "Advances in Entomopathogenic Nematode *In Vivo* Production and Application Methodology". Presented at the 12th Workshop of the IOBC Global Working Group on Arthropod Mass Rearing and Quality Control (in cooperation with the International Atomic Energy Agency), Vienna, Austria, October 19-22, 2010.
 35. March 2011: "The Impact of Clover on Beneficial Fungi for Pecan Weevil Suppression". Presented at the Georgia Pecan Grower's Association annual meeting, Perry, GA, March 29-30, 2011.
 36. March 2011: "Impact of Entomopathogens in Sustainable Orchard Pest Management Systems". Presented at the Southeast Branch Meeting of the Entomological Society of America, San Juan, Puerto Rico, March 18-21, 2011.
 37. June 2011: "The Use of Entomopathogenic Nematodes in the US and Issues Related to Genetic Degradation". Presented at the 13th European Meeting of the International Organization of Biological Control – "Insect Pathogens and Entomoparasitic Nematodes", Innsbruck_Austria, June 19-23, 2011. (Travel Expenses Paid).
 38. July 2011: "Application Technology for Entomopathogenic Nematodes". Presented at the 50th Annual Meeting of the Society of Nematologists, Corvallis, Oregon, July 17-20, 2011.
 39. August 2011: "Entomopathogenic nematodes as model systems for studying decision making and behavioral ecology". Annual Meeting of the Society of Invertebrate Pathology, Halifax, Canada. (Declined due to lack of travel funds).
 40. September 2011: (Invited for two talks): "Advances in production and application of entomopathogenic nematodes in North America" and "Entomopathogenic nematodes strain improvement and maintenance", International Entomopathogens and Microbial Control Symposium, Istanbul, Turkey (Full travel expenses offered, invitation declined due to scheduling conflicts).
 41. November 2011: Symposium speaker & co-organizer "Putting the worms to work: Application Technology for entomopathogenic nematodes". Presented at the Entomological Society of America, Reno, NV, November 13-16, 2011.

42. January 2012: "Impact of clover on *Beauveria bassiana* persistence and efficacy in suppressing pecan weevil". Presented at the SE Fruit and Vegetable Conference, January 5-8, 2012, Savannah, GA.
43. January 2012: "Nematodes: Biology and Use" Invited Lecture for a University of Georgia online course on Biological Control; a laboratory YouTube video was also created. January 31, 2012.
44. February 2012: "Controlling Insect Pests & Diseases in Organic Pecan and Peach Production". Presented at the Georgia Organics Annual Conference, Columbus, GA, February 24-25, 2012.
45. February 2012: "Using Beneficial Nematodes Effectively", Annual Industry Conference of the Nursery Growers Short Course, Guelph, Ontario, Canada, February 8, 2012. (Travel Expenses Paid).
46. February 2012: "Beneficial Trait Enhancement and Stabilization in Entomopathogenic Nematodes" Invited Departmental Seminar, University of Georgia, Department of Entomology, Athens, GA, February 27, 2012.
47. March 2012: "Microbial Control Agents for Suppression of Pecan Weevil". Presented at the SE Branch Meeting of the Entomological Society of America, Little Rock, Arkansas, March 3-8, 2012.
48. April 2012: "Undergraduate Research in Cooperation with Fort Valley State University" Presented at the Second Annual Research Day, Fort Valley State University, Fort Valley, GA, April 12, 2012.
49. April 2012: "Entomopathogenic Nematodes in Biological Control". Invited departmental seminar, University of Florida, Department of Entomology and Nematology, Gainesville, FL, April 16, 2012.
50. August 2012: "Entomopathogenic nematodes: Effects of the soil agroecosystem on biological control potential", Society of Nematologists, Annual Meeting, Savannah, GA, August 12-16, 2012.
51. August 2012: "Entomopathogenic Nematology in North America", International Congress of Entomology, Daegu, Republic of Korea, August 18-23, 2012.
52. November 2012: "Enhanced Persistence of Entomopathogenic Nematodes in Inundative BioControl Applications", National Meeting of the Entomological Society of America, Knoxville, TN, November 11-14, 2012.
53. January 2013: Webinar for eOrganic: "Organic Methods for Control of Insect Pests and Diseases of Pecan and Peach". <http://www.extension.org/pages/66504>
54. January 2013: "Biological Control of Insect Pests, with Emphasis on Microbial Agents and Tree Crops". Workshop/Field Day at Digging Roots Educational Farm.
55. February 2013: "Biorational Pesticides for Pecan Insect Pests" Southeastern Pecan Growers Association, February 22-23, 2013. Sandestin, FL.
56. February 2013: "Novel Management of Plum Curculio and Peach Borers". South Georgia/North Florida Peach Meeting. Quitman, GA.
57. February 2013: "Suppression of Plum Curculio with Nematodes, An Update". Middle Georgia Peach Update, Byron, GA.
58. August 2013: "Trait Stability and Improvement in Entomopathogenic Nematodes". Presented at the International Meeting of the Society for Invertebrate Pathology, Pittsburg, PA, August 10-15.
59. November 2013: "Mass Production of Entomopathogenic Nematodes", Presented at the Annual Meeting of the Entomological Society of America Meeting, Austin, TX, November 9-14, 2013.

60. November 2013: “Entomopathogenic Nematodes: Fascinating Model Organisms & Potent Natural Insecticides”. Presented as a Convocation Seminar at Wesleyan University, Macon, GA, November 21, 2013.
61. December 2013: “Entomopathogenic Nematology: Research and Application in the USA”. Presented in a Special Lecture on Biological Control, Haikou, China, December 8-13, 2013. (Travel Expenses Paid).
62. February 2014: “Enhancing the Efficacy of Entomopathogenic Nematodes for Control of Peachtree Borer and Lesser Peachtree Borer”. Presented at the Peach County Peach Update, Byron, GA, February 4, 2014.
63. April 2014: “Entomopathogenic Nematology: Research and Application”. Presented as a Special Lecture at Nankai University, Tianjin China, April 27-May 1, 2014. (Travel Expenses Paid).
64. May 2014: “Breeding a Super Nematode for Enhanced Insect Pest Suppression”. Presented at the International Congress of Nematology, Cape Town, South Africa, May 4-9, 2014.
65. August 2014: “The Road to Improving Biological Control using Entomopathogenic Nematodes”. Presented in the symposium “The Clayton McCoy Legacy: Impact on Citrus IPM and Invertebrate Pathology” at the Florida Entomological Society meeting, Jupiter, FL. August 3-6, 2014. (Travel Expenses Paid).
66. January 2015: “Control of Peachtree Borer and Lesser Peachtree Borer with Entomopathogenic Nematodes: Effects of Application Method and Formulation”, Peach County- Peach Update, January 22, 2015, Byron, GA.
67. March 2015: “Improving Microbial Control Efficacy of Entomopathogenic Nematodes in Orchard Systems”. Presented at the International IPM Symposium March 23-26, 2015, Salt Lake City Utah.
68. June 2015: “Enhancing the use of entomopathogenic nematodes in microbial control programs” Invited Seminar for the Department of Entomology, Iowa State University, Ames, IA, June 4, 2015.
69. June 2015: “Entomopathogenic Nematology” lecture presented as part of invited instructor engagement for entomopathogenic nematodes in an International Insect Pathology Short-Course held at Cornell University (Ithaca, NY) June 8-12, 2015. Course sponsored by Cornell University and the International Organization for Biological Control (IOBC). (Travel Expenses Paid).
70. June 2015: Invited to participate as delegate member of the audience at Sustainable Agriculture meeting, “Sustainable food chain – from field to table” Hosted by BASF, June 23-24 (Full Travel Expenses Offered). Declined.
71. August 2015: Invited Symposium Chair and Speaker: “Advances in entomopathogenic nematode dispersal and host-finding behavior” Annual meeting of the Society of Invertebrate Pathology, August 9-13, 2015, Vancouver, Canada.
72. September 2015: Invited to give a talk on entomopathogenic nematology at the 5th “Entomopathogens and Microbial Control Congress” held in Ankara, Turkey, September 9-11, 2015. (Travel expenses offered). (Declined due to time conflicts).
73. October 2015: Invited to provide a short course of two/three days to present research experiences and know-how in the applications of EPN and field efficacy. Universidad Autónoma del Estado de Hidalgo, Mexico (Travel Expenses Offered). (Declined due to time conflicts).

74. October 2015: Invited to provide two lectures at Stellenbosch University, South Africa “Dispersal and Host-Finding Behavior in Entomopathogenic Nematodes” and “Improving BioControl Control Efficacy with Entomopathogenic Nematodes” as well as to meet with faculty and graduate students for collaboration and mentoring. October 16-24, 2015. (Travel Expenses Paid).
75. November 2015: “Manipulating the Environment to Enhance Microbial Control in Orchard Systems”. Presented at the Annual Meeting of the Entomological Society of America Meeting, Minneapolis, Minnesota, November 15-18, 2015.
76. December 2015: Invited to speak at University of Missouri on “Enhancing the Use of Entomopathogenic Nematodes in Microbial Control Programs”. (Travel Expenses Paid).
77. December 2015: Invited to speak at Rutgers University on “Enhancing the Use of Entomopathogenic Nematodes in Microbial Control Programs”. (Travel Expenses Paid).
78. January 2016: “Beneficial Nematodes Are Effective Control Agents for Peachtree Borers”. Presented at the Southeastern Fruit and Vegetable Conference, Savannah GA, January 7-10, 2016.
79. February 2016: “Advances in Organic Insect Pest Management in Pecan”, Mid-Georgia Pecan update, Byron, GA, February 9, 2016;
80. February 2016: “Advances in Organic Insect Pest Management in Pecan”. Presented at the Southeastern Pecan Grower’s Association annual meeting, February 26-27, 2016.
81. March 2016: “Sustainable Agriculture & Alternative Pest Management” Rotary Club Byron GA, March 23, 2016. (NOTE had also presented at Rotary previously in Perry, GA, and Lions club in Macon, GA).
82. April 2016: “Sustainable Agriculture & Alternative Pest Management” Kiwanis Club Byron GA, April 14, 2016.
83. August 2016: “Enhancing the Use of Entomopathogenic Nematodes in Microbial Control Programs”. Presented in the 3rd Chilean Symposium on Biological Control, Chillán, Chile, August 30 –September 1, 2016. (Travel Expenses Paid).
84. September 2016: “Advancing Microbial Control in Temperate Orchard Systems”. Presented at the International Congress of Entomology, Orlando, Florida, September 24-30, 2016. Also was the Chair of an invited symposium (“Advances in the Behavioral Ecology of Entomopathogenic Nematodes”) in the same conference.
85. November 2016: “Biological Control of Insect Pests: Implementing and Enhancing Microbial Agents” Invited Special Lecture to the Agricultural Research Council, Bethlehem, South Africa, Nov 8-15, 2016. (Travel Expenses Paid).
86. January 2017: “Crop Protection Naturally: Emphasis on Microbial Methods for Control of Insect Pests in Pecan, Peach and Other Crops”. Presented at AgriEnergy Resources, Cordele, GA, January 5, 2017.
87. January 2017: “Advances in Biological Control Methods for Control of Key Orchard Pests in the Southeastern United States”. Presented at the Organic Agriculture Research Symposium, Lexington, KY, January 25-26, 2017.
88. February 2017: “Efficacy of Grandevo® for Control of Pecan Weevil and Aphids”. Presented at the Peach County Pecan Meeting, Fort Valley, GA, February 15, 2017.
89. February 2017: “New Bacterial Products for Control of Pecan Pests”. Presented at the Southeastern Pecan Grower’s Association Annual Meeting, Biloxi, MS, February 24-25, 2017.

90. March 2017: “Advancing the use of Microbial Agents for Control of Pecan Pests” and “Curculionid Pupal Cells Exhibit Antibiosis to Entomopathogenic Fungi”. Presented at the National Pecan Scientist’s Meeting, Ardmore, OK, March 21-24, 2017.
91. April 2017: “Invertebrate Pathology & Microbial Control” Invited Guest Lecture, Department of Biology, Fort Valley State University, Fort Valley, GA, April 20, 2017. (Actually, invited guest lecture was given annually with research updates from 2008-2017).
92. June 2017: "Improving the Efficacy of Entomopathogenic Nematodes in Microbial Control Programs". Presented at the 15° Simpósio de Controle Biológico (SICONBIOL), Ribeirão Preto, Brazil, June 3-8, 2017. (Travel Expenses Paid).
93. June 2017: “Entomopathogenic Nematology” lecture presented as part of invited instructor engagement in an International Insect Pathology Short-Course held at Cornell University (Ithaca, NY), June 18-24, 2017. Course sponsored by Cornell University and the International Organization for Biological Control (IOBC). (Travel Expenses Paid).
94. August 2017: “Microbial Control Approaches for Pests of Fruit and Nut trees” Presented at the Ag Innovations Conference, San Diego, CA, August 13, 2017.
95. August 2017: Invited Symposium Chair “Ecology of Invertebrate Pathogens” (Hajek & Shapiro-Ilan). Presented at the Annual Meeting of the Society of Invertebrate Pathology, San Diego, CA, USA, August 13-16, 2017.
96. August 2017: “Advancing application of entomopathogenic nematodes (EPNs) in orchard crops”. Annual Meeting, Society of Nematologists, Williamsburg, VA, August 13-17, 2017.
97. November 2017: “The use of *Photorhabdus* and *Xenorhabdus* metabolites for suppression of phytopathogens”. National meeting Entomological Society of America, Denver, CO, November 5-9, 2017, as part of a symposium “Leveraging Non-Traditional Uses of Microbial Control Agents for Broad Application” (co-chaired by Shapiro-Ilan).
98. November 2017: “Update on Production of Entomopathogenic Nematodes” Invited to present at the joint meeting of the International Organization for Biological Control MRQA (Mass Rearing and Quality Assurance) workgroup and Association of Natural BioControl Producers, November 14 - 17, 2017, Merida, Mexico. (Declined due to time conflict).
99. November 2017: “Enhancing the use of entomopathogenic nematodes (EPNs) for control of orchard crops”. Presented as part of the “Distinguished Alumni Forum” at the University of Florida, Citrus Research Center 100th year Anniversary. Lake Alfred, FL, November 30, 2017 (Travel Expenses Offered by Inviting Party).
100. December 2017: “Enhancing the use of entomopathogenic nematodes (EPNs) for biological control of insect pests”. Presented to USDA-Foreign Agricultural Service in recognition of mentorship for a Borlaug Fellow. Washington DC, December 7, 2017 (Travel Expenses Paid).
101. February 2018: “Beneficial Nematodes Are Effective Control Agents for Peachtree Borers”, Middle Georgia Peach Update, Byron, GA, February 21, 2018.
102. February 2018: “Efficacy of Grandevo® for Control of Pecan Weevil and Aphids” Middle Georgia Pecan Update, Reynolds, GA, February 28, 2018.
103. March 2018: “Novel Pest Management Strategies: Expanding the Use of Grandevo and Testing the Efficacy of a Fungal Endophyte” at the Georgia Commodity Commission for Pecans, Tifton, GA, March 5, 2018.
104. March 2018: “Microbial Control Approaches for Orchard Pests: Focus on Pecan and Peach Systems”. Presented at the International IPM Symposium, Baltimore, MD, March 19-21, 2018.

105. April 2018: “Enhancing Natural Enemy Systems: Biocontrol Implementation for Peachtree Borers” Invited Poster presented at the SARE/ Our Farms, Our Future Conference, St Louis, MO, April 2-5, 2018 (Travel Expenses Paid).
106. April 2018: “Enhancing the use of entomopathogenic nematodes in microbial control programs” Invited Lecture to the University of Philippines, Los Banos, April 11, 2018 (lecture provided remotely via Skype).
107. May 2018: “Research on Organic Pecan Management” at a Pecan Producer Meeting at Federal University of Santa Maria - Rio Grande do Sul, Brazil, May 3-5, 2018 (Travel Expenses Offered). (Declined due to time conflict).
108. May 2018: Invited as Borlaug Fellow Mentor’s Follow-Up visit (after having hosted and mentored a Borlaug Fellow in my lab) and Special Lectures on “Advances in Entomopathogenic Nematode Production Technology” and “A Young Researcher’s Guide to the Galaxy” at the Agricultural Research Council, Bethlehem, South Africa, May 14-20, 2018 (Travel Expenses Paid, by Fort Valley State University via Borlaug Fellow funds).
109. July 2018: “Variable Biotic and Abiotic Stress in Entomopathogenic Nematodes: Implications for Biocontrol”. Presented as Invited Speaker and Symposium Chair at the Annual meeting of the Society of Nematology, Albuquerque, New Mexico, July 22-26, 2018.
110. September 2018: “New Methods for Control of Key Pecan Pests” Sonora Pecan Growers Association, XIX Simposio Internacional de Nopal Pecanero in Hermosillo, Sonora, Mexico, September 6-7, 2018 (Travel Expenses Offered). (Declined due to time conflict).
111. November 2018: “Invertebrate Pathology and Microbial Control” Invited lecture in General Entomology class, University of Georgia, Tifton, GA, November 1, 2018.
112. December 2018: “Biocontrol with Benefits: Enhancing Sustainability by Adding Value”. Presented at the Texas Hispanic Farmers and Ranchers Conference, McAllen, TX, December 6-7, 2018 (Travel Expenses Paid).
113. December 2018: Invited to participate as Grant Review Panel Member for USDA-Agriculture and Food Systems Research Initiative (AFRI) 2018 Pests and Beneficial Species panel. Virtual Panel - December 3-7, 2018. (Declined due to time conflict).
114. February 2019: “New Biorational Approaches for Pecan Pest Control: A Friendly Fungus Living in the Tree?”. Presented at the Southeastern Pecan Growers Association annual meeting, Destin, FL, February 22-23, 2019.
115. April 2019: “Entomopathogenic Nematology and Microbial Control at International Congress of Entomology, Faisalabad, Pakistan, April 8-10, 2019. (Declined due to time conflicts).
116. April 2019: Invited to present talks, “Experience Using Entomopathogenic Nematodes” at two meetings Agrifood Summit meeting and at the IPM meeting for Blueberry meeting Temuco, Chile. April 23-25, 2019. (Declined due to time conflicts).
117. April 2018: “Enhancing the use of entomopathogenic nematodes in microbial control programs” Invited Lecture to the University of Philippines, Los Banos, April 30, 2019 (lecture provided remotely via Skype).
118. May 2019: “Enhancing the use of entomopathogenic nematodes in microbial control programs: Potential for Coffee Berry Borer?”. Presented at Coffee/Tea Pest Management Workshop, San Juan, May 27, 2019 (Travel Expenses Offered, presented remotely instead).
119. June 2019: “Entomopathogenic Nematology” lecture presented as part of invited instructor engagement for Entomopathogenic Nematodes and Microbial Control in an International Insect Pathology Short-Course held at Cornell University (Ithaca, NY) June 2-9, 2019. Course

- sponsored by Cornell University and the International Organization for Biological Control (IOBC) (Travel Expenses Paid).
120. July 2019: “Novel innovation in field of entomopathogenic nematodes and their application”, Biopesticide Summit 2019, Swansea, UK, July 2-3, 2019. (Travel Expenses Offered, Declined).
 121. July 2019: “Entomopathogens: Prior Knowledge and Potential for Borer Control”. Presented at the Flatheaded Borer Workshop, Tennessee State University, McMinnville, TN, July 1-2, 2019 (Travel Expenses Offered, but presented remotely instead).
 122. July 2019: “New and Expanded Opportunities with Entomopathogenic Nematodes”. Presented to BASF, Inc., Raleigh, NC, July 11, 2019.
 123. July 2019: “Aboveground applications of Entomopathogenic Nematodes”. Presented at the annual meeting of the Society of Invertebrate Pathology as part of a symposium “Nematode application, what, when, and how?”, Valencia, Spain, July 28- August 1, 2019.
 124. September 2019: “New Methods for Control of Key Pecan Pests” for presentation at the Sonora Pecan Growers Association, XIX Simposio Internacional de Nopal Pecanero in Hermosillo, Sonora, Mexico, September 5-6, 2018 (Travel Expenses Offered, but presented remotely instead).
 125. November 2019: “Entomopathogenic Nematode Research and Application Technology” to be presented as a Keynote address at the “Global Forum of Leaders for Agricultural Sciences and Technology”, Sichuan Academy of Agricultural Sciences, Chengdu, China, November 6-12, 2019 (Travel Expenses Paid).
 126. January 2020: “Using beneficial nematodes to control peachtree borer – What’s new?” presented at the SE Fruit and Vegetable Conference, Savannah, GA, January 10, 2020.
 127. May 2020. Invited Presentation at the Biopesticide Summit, Birmingham, UK. May 19-20. (Travel Expenses Offered). Declined due to time conflict.
 128. January 2021. “Biocontrol with Benefits: Control of Peachtree Borer with Entomopathogenic Nematodes” Middle Georgia Peach Update, presented remotely/virtually, January 11, 2021.
 129. March 2021: “Advances in the use of entomopathogenic nematodes” and Chair of symposium “Sustainable Insect Management in Fruit Cropping Systems”, Eastern Branch Entomological Society of America, Atlanta, GA, March 24, 2021.
 130. November 2021: “The use of pheromones to improve efficacy of entomopathogenic nematodes” presented as part of symposium (co-chaired by Shapiro-Ilan) at the National meeting of the Entomological Society of America, Denver CO October 31-November 3, 2021 (presented virtually).
 131. May 2022: “Advances in the use of entomopathogens to control orchard pests” to be presented at the World BioProtection Forum Symposium, Birmingham, UK.
 132. July 2022. Invited Presentation to the Volcani Center, Israel “Advances in Methodology to Improve Microbial Control of Insect Pests”. Volcani Center, Israel July 5, 2022.
 133. July 2022: Invited to co-Chair a symposium “Using entomopathogenic nematodes and their bacteria for biocontrol: Latest advances and a look into the future” and present a symposium talk “Use of pheromones and group behavior to improve EPN biocontrol” at the International Congress of Entomology to be held in Helsinki, Finland, July 17-22, 2022.

PUBLICATIONS: DAVID I. SHAPIRO-ILAN

Patents and Licenses:

1. Shapiro, D. I., Behle, R. McGuire, M. R., and Lewis, E. E. 2003. US Patent 6,524,601. Formulated Arthropod Cadavers for Pest Suppression. Issued 2/25/2003.
2. Shapiro-Ilan, D. I., Stuart, R. J., and McCoy, C. W. Biological Materials License No. 1326-002, Docket No. B 0005.05: Unique Nematode Strains.
3. Shapiro-Ilan, D. I. Gardner, W. A., Fuxa, J. R., and Wood B. W. 2007. US Patent 7,241,612. Materials and Methods for Control of Insects Such as Pecan Weevils. Issued 7/10/2007.
4. Shapiro-Ilan, D. I., Tedders, W. L., and Lewis, E. E. 2008. US Patent 7,374,773. Application of entomopathogenic nematode-infected cadavers from hard-bodied arthropods for insect suppression. Issued 5/20/2008.
5. Morales-Ramos, J. A., M. G. Rojas, D. I. Shapiro-Ilan, and W. L. Tedders. 2011. US Patent 8025027. Automated Insect Separation System. Issued 9-27-2011.
6. Morales-Ramos, J. A. M., W. L. Tedders, B. Dean, D. I. Shapiro-Ilan, and M. G. Rojas. 2013. US Patent 8,505,236 B1. Apparatus for packaging arthropods infected with entomopathogenic nematodes. Issued August 13, 2013.
7. Shapiro-Ilan, D. I., & Reilly, C. C. 2013. US Patent 8609083. Method for controlling fungal pathogen with bacterial metabolite. Issued December 17, 2013.
8. Shapiro-Ilan, D. I., W. L. Tedders, J. A. Morales-Ramos, and M. G. Rojas. 2014. US Patent 8,677,935. System and Method for Producing Beneficial Parasites. Issued March 25, 2014.
9. Shapiro-Ilan, D. I., Wu, S., Behle, R. W., Castrillo, L., Toews, M., 2023. Compositions and methods to reduce insect pests. Docket 0138.19. Filed: 04/16/2020, Application No. 16/850,516. Patent Issued 02/14/2023. US Patent No. 11,576,384 B2.
10. Shapiro-Ilan, D. I., and F. Kaplan “Methods for Increasing Infectivity of Entomopathogenic Nematodes” Docket 0138.18; 2020. Patent Pending. Filed 02/25/2020, Application No. 16/800,745.
11. Shapiro-Ilan, D.I., Kaplan F., 2021. Docket No. 0014.22; Optimizing Nematode Pheromones and their Production for Improved Sustainable Pest Management. Patent Pending. Filed 12-8-2021. Application No. 63/287,118.
12. Ment, D., Mechrez, M., Karaski, L., Ramakrishnan, J., Shapiro-Ilan, D., Wu, S. 2022. Pickering emulsion for coating entomopathogenic nematodes. Provisional Patent Pending, filed 7-6-2022; Application No. 63/358,387.

Books (5):

- Grewal, P. S., R-U Ehlers, and D. I. Shapiro-Ilan (Eds.). Nematodes as Biocontrol Agents. 2005. CABI Publishing, 505 pp.
- Morales-Ramos, J., M. G. Rojas, and D. I. Shapiro-Ilan (Eds.). 2014. Mass Production of Beneficial Organisms: Invertebrates and Entomopathogens. Elsevier, 742 pp.
- Hajek, A. E & D. I. Shapiro-Ilan (Eds.). 2018. Ecology of Invertebrate Diseases. Hoboken, NJ: John Wiley & Sons, 657 pp.
- Glazer, I., Shapiro-Ilan, D.I., Sternberg, P.W. (Eds). 2022. Nematodes as Model Organisms. CABI, Wallingford, UK, 374 pp. DOI: 10.1079/9781789248814.0000
- Morales-Ramos, J., M. G. Rojas, and D. I. Shapiro-Ilan (Eds.). 2022. Mass Production of

Beneficial Organisms: Invertebrates and Entomopathogens. Elsevier, 2nd Edition. 620 pp.

Book Chapters (27 Total):

1. McCoy, C. W., D. Shapiro, and L. Duncan. 2000. Application and evaluation of entomopathogens for citrus pest control. Pp. 577-596 in L. Lacey and H. K. Kaya (eds.) Field Manual of techniques in insect pathology. Kluwer Academic Publishers, Dordrecht.
2. Shapiro-Ilan, D.I., D. H. Gouge, and A. M. Koppenhofer. 2002. Factors affecting commercial success: case studies in cotton, turf, and citrus. Pp 333-355 in R. Gaugler, (ed.) Entomopathogenic nematology. New York, NY: CABI.
3. Shapiro-Ilan, D. I. 2004. Entomopathogenic nematodes and insect management. Pp. 781-784 in J. L. Capinera (ed.) Encyclopedia of Entomology (Volume 1). Kluwer Academic Publishers, Dordrecht.
4. Shapiro-Ilan, D. I., L. W. Duncan, L. A. Lacey, and R. Han. Orchard Crops. 2005. In P. Grewal, R-U Ehlers, and D. Shapiro-Ilan (eds.) Nematodes as Biological Control Agents, pp 215-230. CABI Publishing.
5. Ehlers, R-U and D. I. Shapiro-Ilan. Mass production. 2005. In P. Grewal, R-U Ehlers, and D. Shapiro-Ilan (eds.) Nematodes as Biological Control Agents, pp. 65-79. CABI Publishing.
6. Grewal, P. S. R-U Ehlers, and D. I. Shapiro-Ilan. 2005. Critical issues and research needs for expanding the use of nematodes in biocontrol. In: P. Grewal, R-U Ehlers, and D. Shapiro-Ilan (eds.) Nematodes as Biological Control Agents, pp. 479-489. CABI Publishing.
7. Lacey, L.A. and Shapiro-Ilan, D.I. Microbial Control of Insect and Mite Pests in Orchards: tools for integrated pest management and sustainable agriculture. In: R. Dris (ed.) Crops, Quality, and Biotechnology, Part I. pp. 1-24. 2005. (Book Chapter).
8. Shapiro-Ilan, D. I., L. A. Lacey, and J. P. Siegel. 2007. Microbial Control of Insect Pests of Stone Fruit and Nut Crops. In: L. Lacey and H. K. Kaya (eds.) Field Manual of techniques in insect pathology, Vol II, pp. 547-566. Springer: Dordrecht. (Book Chapter).
9. McCoy, C. W., R. Stuart, D. Shapiro-Ilan, and L. Duncan. 2007. Application and evaluation of entomopathogens for citrus pest control. In L. Lacey and H. K. Kaya (eds.) Field Manual of techniques in insect pathology, Vol II, pp. 567-582. Springer: Dordrecht. (Book Chapter).
10. Cottrell, T. E. and D. Shapiro-Ilan. 2008. Naturally-occurring pathogens and invasive arthropods. In: Use of Microbes for Control and Eradication of Invasive Arthropods, (Hajek, O'Callaghan & Glare, Eds.), Springer, pp. 19-32.
11. Shapiro-Ilan, D. I. and P. S. Grewal. 2008. Entomopathogenic nematodes and insect management. Pp. 1336-1340 in J. L. Capinera (ed.) Encyclopedia of Entomology (2nd Edition). Springer, Dordrecht.
12. Shapiro-Ilan, D. I., D. J. Bruck, and L. A. Lacey. 2012. Principles of Epizootiology and Microbial Control. Pp 29-72, In: F. E. Vega and H. K. Kaya (Eds.) Insect Pathology (2nd Edition), Elsevier, Amsterdam.
13. Shapiro-Ilan, Han, R., and Qiu, X. 2014. Production of entomopathogenic nematodes. Pp., 321-356, in: Morales-Ramos, J., Rojas, G., and Shapiro-Ilan, D.I (eds.). Mass Production of Beneficial Organisms: Invertebrates and Entomopathogens. Amsterdam: Academic Press.
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Refereed Journal Publications: 229 Total

ResearchGate H-index = 52

Google Scholar H-Index = 56

(If first author is in italics that indicates Shapiro-Ilan is corresponding author or co-corresponding due to the level of supervision Shapiro-Ilan provided, e.g., to student, postdoc or visiting scientist).

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