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EDUCATION AND TRAINING TO INCREASE ADOPTION OF IPM FOR WESTERN FLOWER THRIPS, *FRANKLINIELLA OCCIDENTALIS* (THYSANOPTERA: THRIPIDAE)

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ABSTRACT

The University of Florida, IFAS, IPM Florida and Southern Plant Diagnostic Network (SPDN) are cooperatively developing education and training to increase integrated pest management (IPM) of western flower thrips (WFT), *Frankliniella occidentalis* (Pergande). Management of WFT is exacerbated by difficulty in identifying thrips species and by their development of insecticide resistance. Education and training will emphasize workshops on identification of thrips; insecticide resistance management protocols; description of the effects of insecticides on natural enemies, i.e., *Orius* spp., and use of the "Grower's IPM Guide for Florida Tomato and Pepper Production". Thrips identification aids, such as a national field-based identification deck currently under development by the SPDN and the North Central IPM Center (NCIPMC), will be useful to Florida growers. This kind of information will be delivered through Extension programs, including workshops, in-service training, field days, and classroom education. A section of the IPM Florida website is devoted to thrips in several Florida crops (blueberry, cotton, greenhouse and nursery grown ornamentals, pepper, strawberry, tomato) and contains general information, such as (1) *F. occidentalis* biology and ecology, (2) management tactics incorporated into an IPM program that is crop and location specific, (3) identification of thrips and natural enemies, (4) practices that reduce damaging pest populations in space and time, (5) problems with managing *F. occidentalis* and other pests, (6) updated, crop and location specific information on population levels, and (7) resistance monitoring. Future needs for specific in-service or other educational programs, including advanced diagnostic training sessions, will be determined by clientele groups. Adoption of IPM for WFT will benefit growers by minimizing insecticide resistance and maximizing benefits of cultural practices and biological controls.

Key Words: western flower thrips, IPM, education, training, identification, extension.

RESUMEN

La Universidad de Florida, el programa de MIP de IFAS en Florida y la Red de Diagnostico de Plantas del Sur de los EEUU (SPDN) están desarrollándo cooperativamente un programa de educación y entrenamiento para aumentar el manejo integrado de plagas (MIP) sobre el trips occidental de flores (WFT), *Frankliniella occidentalis* (Pergande). El manejo de WFT es agravado por la dificultad en identificar especies de trips y por su desarrollo de resistencia hacia los insecticidas. La educación y entrenamiento enfatizara talleres sobre la identificación de trips; protocolos de manejo de resistencia de insecticidas; descripción de los efectos de los insecticidas sobre los enemigos naturales, i.e., *Orius* spp., y el uso de la "Guía de MIP de los Productores para la Producción de Tomate y Chile". Las ayudas para la identificación de los trips, como la baraca de cartas basada en la identificación de trips en el campo al nivel nacional que el SPDN y el Centro de MIP de Norte central de los EEUU (NCIPMC) están desarrollándose actualmente, serán muy útiles para los productores en la Florida. Esta clase de información será entregada por medio de programas de Extensión, incluyendo talleres, entremiento en servicio, días de campo y educación de aula. Una sección de la pagina web de MIP de Florida es dedicado a trips en varios cultivos en la Florida (arándano, algodón, ornamentales en los invernaderos y viveros, chile, fresa, tomate) y contiene información general, como (1) la biología y ecología de *F. occidentalis*, (2) tácticas de manejo incorporadas en programas de MIP que son especificas al cultivo y la localidad, (3) identificación de trips y enemigo naturales, (4) practicas para reducir las poblaciones dañinas de la plaga en espacio y tiempo, (5) problemas en el manejo de *F. occidentalis* y otras plagas, (6) información especifica y actualizada sobre el nivel de la población en diferentes cultivos y localidades, y el monitoreo de resistencia. Las necesidades en el futuro para programas en servio específicos y otros programas educativos, incluyendo sesiones avanzadas de entremiento

de diagnostico, será determinadas por los grupos de clientes. La adopción de MIP para WFT beneficiará a los productores en minimizar la resistencia hacia los insecticidas y maximizar los beneficios de prácticas culturales y de control biológico.

The development of sustainable approaches for managing western flower thrips (WFT), *Frankliniella occidentalis* (Pergande) (Thysanoptera: Thripidae), and the tospoviruses they vector, requires accurate species identification and understanding of the behavior and ecology of thrips (Funderburk 2002). WFT is the most efficient vector of *tomato spotted wilt virus* (TSWV). Although WFT is a common species in Florida and the U.S., specimens can be confused with other species in the field, partly due to the wide variation of color morphs. As Florida and the U.S. are constantly at risk from the potential introduction of non-indigenous species and limited taxonomic information is available for thrips, correct identification is a key component of any integrated pest management (IPM) program.

Knowledge of the geographic distribution and movement of thrips can be used to prevent outbreaks and minimize damage to crops. Due to trade and travel routes, storm patterns, and climate, Florida is highly suitable to establishment of exotic thrips. Many of the non-indigenous thrips detected in Florida within the last 20 years have become important pest species (Edwards 1995; Edwards 1996; Edwards 2000; Hamon & Edwards 1994). Of the 275 known species of thrips from Florida, 55 are not believed to be indigenous to North America (Diffie et al. 2008). Additionally, 10 non-indigenous species have been reported in Georgia but have not yet been detected in Florida. Unfortunately, the number of species occurring in Florida and North America is not completely known or described in the literature due to limited faunistic studies (Diffie et al. 2008).

A multi-tactic IPM program for thrips management is especially critical due to the potential development of insecticide resistant thrips populations. Resistance of WFT to pyrethroids in Florida has been reported by Leibee & Capinera (1995). As a consequence, information on resistance management has been included in our education and training programs. Insecticides for thrips control and the exclusive use of resistant crop varieties for management of plant pathogenic viruses do not have long-term sustainability (Funderburk 2002). These single tactic approaches, as well as other non-chemical management alternatives, can be useful components in an IPM program that incorporates a knowledge-base of thrips behavioral and ecological information for sustainable crop production (Momol et al. 2002).

Funderburk et al. (2000) described non-chemical management alternatives and documented the ability of the minute pirate bug, *Orius insidiosus* (Say), to suppress WFT under natural conditions of rapid colonization and population growth. These findings indicate that natural enemies play a more important role in regulating thrips populations than initially suspected. Funderburk (2002) reported that expansion of thrips populations can be suppressed by natural enemies other than the minute pirate bug. Adoption of IPM for WFT will benefit the growers by minimizing insecticide resistance and maximizing the use of cultural practices and biological controls. Thus, conservation of all natural enemies is an important aspect of this education and training program.

Several methods of information delivery have been developed or planned to educate Florida agricultural producers about available IPM strategies. Mayfield et al. (2003) stated that future thrips extension efforts in Florida should focus on educating clientele about various IPM techniques, including selection of appropriate cultivars, use of reflective mulch, and conservation of natural enemies. Several factors influence crop protection decisions in Florida. An education and training framework is being provided to assist Florida growers in determining the impact on overall crop health of the many aspects of production. Additionally, with training, the University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS), Distance Diagnostic and Identification System (DDIS) can be used by extension specialists and clientele groups to communicate pest information more rapidly via remote diagnostic technology.

Delivery of IPM information based on a foundation of thrips identification can be accomplished with several different venues to encompass the wide variety of clientele needs in Florida. Extension programs occur through in-service training workshops for extension faculty and several activities open to agricultural producers including workshops, field days, formal and informal classroom education, and advanced diagnostic training. Extension education for agricultural producers is the primary goal of this program and intensive diagnostic training for land grant university extension specialists, county educators, and researchers is a secondary objective.

Using predominantly UF/IFAS published material, we have collected the most up-to-date content for these educational programs. Some content for current and future traditional workshops with face to face training, includes information on the following: (1) life history and virus vector potential, (2) signs and symptoms of damage, (3)

sampling techniques, (4) field identification of thrips with a hand lens, (5) thrips slide-mounting techniques, (6) dissecting and/or compound microscope identification of thrips, (7) use of a dissecting and/or compound microscope with a camera attachment for digital sample submission, and (8) developing a thrips IPM plan. Specific content for individual workshops is adapted to the needs of different clientele groups.

Training sessions based on the outline above would usually include both laboratory and field-based hands-on components; educational material delivered would include 5 to 8 separate training exercises or sessions. The first session would typically cover life history and virus vector potential, including information on TSWV and *impatiens necrotic spot virus* because their vectors include WFT, Florida flower thrips (*F. bispinosa*), and tobacco thrips (*F. fusca*). Because symptoms vary depending on host species, cultivar, developmental stage, and environmental conditions, workshop participants are urged to base control recommendations on insects collected, not damage recorded. Signs and symptoms of suspect thrips damage are covered as the second topic during many training sessions, but it is emphasized that damage alone is not indicative of thrips feeding if the insects cannot be found. Scouting and sampling technique recommendations are covered in the fourth session of most workshops. Details on collection include either use of an aspirator or a white paint board. Field identification of WFT can be difficult due the small size of adults (~less than 1 mm) (Jensen 2000). Although field viewing of thrips is often inadequate to identify them at the species level, this topic is often covered during training. The identification component of training workshops in some instances focuses on common species that may be confused with WFT, as well as species currently not occurring in Florida.

Land grant university extension specialists as well as state and federal (USDA, APHIS, PPQ) identifiers are the primary target audience for advanced thrips training. These advanced diagnostic training sessions familiarize students with slide-mounting procedures for confirmatory diagnosis, more details in terms of thrips morphology, and the use of dichotomous and LUCID® keys (Moritz et al. 2004) for identification. Advanced diagnostic training often includes information regarding rapid screening for thrips species via a stereoscope, but the use of more detailed keys to identify thrips species is a major emphasis. Advanced diagnostic training requires hands-on interactions with instructors and cannot currently be conducted effectively through distance education.

Training increases the comfort level of the students with thrips identification, but confirmations may still be requested for identified specimens. Because of this, training on the use of a dissecting and/or compound microscope with a camera attachment often is included to prepare students for digital sample submission. The UF/IFAS Distance Diagnostic and Identification System (DDIS) is an excellent point source of identification communication. This online sample submission system (http://ddis.ifas.ufl.edu/ddisx/home.jsp) allows the user to receive assistance with identification. In training sessions, participants are taught how to take photographs of samples, login to DDIS, and upload images to the DDIS website. Specialists in thrips identification are notified by DDIS of the submitted sample. Specialists login to the DDIS system, and the submitter is notified once a sample has been reviewed. The time interval for the confirmation of identification may be within hours or days, depending upon specialist availability and image quality. In some cases, a physical sample will be requested by the specialists if the identification cannot be confirmed from the photo. Due to this occasional request, training is provided on preservation techniques for thrips specimens.

Hands-on training is not always convenient for clientele, so capability has been developed to deliver information electronically. The website on thrips in Florida crops includes information on several cropping systems impacted by WFT, including blueberry, cotton, greenhouse and nursery grown ornamentals, pepper, strawberry, and tomato. The site, called the Thrips Pest Management site, is located online at (http://ipm.ifas.ufl.edu/agriculture/vegetables/thrips/index.shtml). Plans for the Thrips Pest Management site of the IPM Florida website include the addition of new material that has been delivered in the hands-on training sessions. Thrips 101 is the first section on the Thrips Pest Management site, and it offers general information on the life cycle and habits of thrips species. Web-users also have links available to the Thrips Specialists Working Group (TSWG), a collection of Florida based thrips specialists who can help answer questions or assist with identification and management recommendations (Table 1). The site also lists the hands-on education and training activities available in Florida. These lists are updated often and usually include two or three upcoming training opportunities.

The Thrips Pest Management site has many links to thrips management and identification resources available for free. There is a direct link to the "Grower's IPM Guide for Florida Tomato and Pepper Production" (Gillett et al. 2006). This online production guide outlines several of the IPM techniques used to manage WFT. Additional links are available on the Thrips Pest Management site for quick access to information on other thrips species that may be of interest to agricultural producers. Material is being added as it is modified or

TABLE 1. THE THRIPS SPECIALISTS WORKING GROUP (TSWG) IS A COLLECTION OF FLORIDA-BASED SPECIALISTS WHO ARE WILLING TO ASSIST WITH THRIPS IDENTIFICATION, MANAGEMENT AND EDUCATIONAL PROGRAMMING. MEMBERS OF THE TSWG ARE DIVIDED BY PRIMARY AREA OF RESPONSIBILITY.

Primary area of responsibility	Number of specialists
Identification and Management	15
Extension	15
Industry Management	9
Education	3

developed to several sections on the Thrips Pest Management site. These include: scouting, identification of thrips, identification of natural enemies of thrips, general IPM practices that reduce thrips populations, thrips management in specific crops, challenges of thrips management, and tracking thrips resistance to insecticides. Most of the information being modified for these sections is currently available in the "Grower's IPM Guide for Florida Tomato and Pepper Production" and in UF/IFAS Electronic Data Information Source (EDIS) documents. Our goal is to make quick links to the most up-to-date information available to encourage its use by agricultural producers.

The educational goal of this program is to teach extension faculty members and agricultural producers how to design crop-specific IPM systems based on correct identification and multitactic management of WFT. The effort will build on four highly successful thrips identification and training courses that have been conducted in recent years, including chilli thrips Polycom training (Dec 2005), thrips identification and sampling training (Mar 2006), a Florida landscape and ornamental thrips workshop (Aug 2007), and a Polycom meeting of statewide thrips specialists (Jun 2008). At least 85 participants attended these thrips-related courses in Florida. Thrips identification, management, and regulatory expertise was provided by Joe Funderburk (UF/IFAS, North Florida Research and Education Center (REC)), Lance Osborne (UF/IFAS, Mid-Florida REC), Dak Seal (UF/IFAS Tropical REC), G.B. Edwards (Florida Department of Agriculture and Consumer Services, Division of Plant Industry), Stuart Reitz (USDA, Agricultural Research Service), Richard Clark (retired, formerly FDACS, DPI), and Scott Ludwig (Texas A&M AgriLife Extension). The chilli thrips Polycom training was designed specifically to provide rapid information about chilli thrips as a new pest to Florida. At the request of county Extension faculty, Joe Funderburk also conducted several informal thrips identification sessions during the last few years.

Additional training sessions conducted by the Southern Plant Diagnostic Network (SPDN) included an invasive arthropod meeting (May 2007) in Clemson, South Carolina that offered an optional advanced training session for thrips identification. Instructors for the course included Joe Funderburk and Stan Diffie (University of Georgia). The supplemental training at Clemson, along with the previous 3-day thrips workshop in Gainesville, Florida (Mar 2006), were the only 2 sessions that provided advanced diagnostics training for participants from Florida. Approximately 20 participants attended each session. For the advanced taxonomic training in Gainesville, Florida, most of the attendees represented laboratory staff, statewide extension specialists or researchers with UF or USDA, ARS. Some participation from Florida statewide extension specialists occurred at the 2007 SPDN regional training, but most of the audience included extension diagnosticians from other states or USDA, APHIS, PPQ identifiers.

The advanced diagnostic training for thrips, and other arthropods, continues to be a priority activity for entomologists in the National Plant Diagnostic Network (NPDN). Following advanced diagnostic training, participants are more capable to use keys for initial species-level identifications. Workshop participants often are in communication with instructors post-conference, for both initial identifications and final confirmations. Surveys were distributed to determine the effectiveness of this training and the responses were extremely favorable for 3 aspects of the training: instructors, learning environment, and workshop design. Many participants requested brief videoconference updates for new pest information.

Agricultural producers have special needs for education and training on thrips IPM. To meet these needs, educational materials have been or are being developed, including thrips identification aids, i.e., I.D. deck, and insecticide resistance management protocols. Product rotation is an important aspect of WFT management because this pest is resistant to almost all insecticides (Jensen 2000). Moreover, IPM can be difficult with multiple pests in a crop. For example, chemical control of pepper weevil, *Anthonomus eugenii*, and sweetpotato whitefly, *Bemisia tabaci*, can disrupt the natural enemy complex that naturally manages WFT (Funderburk et al. 2000; Gillett et al. 2006). Use of the "Grower's IPM Guide for Florida Tomato and Pepper Production" and other online resources, such as the Thrips Pest Management site, can help producers create a comprehensive crop management plan to maintain high populations of natural enemies and minimize pest problems. The Thrips Pest Management site was developed in the summer of 2008 and has already become a well-used resource. Web statistics collected from Jul to Nov 20, 2008 show the number of "hits" for these thrips specific resources (Table 2).

TABLE 2. NUMBER OF "HITS" FOR THE THRIPS PEST MANAGEMENT SITE ON THE IPM FLORIDA WEBSITE (JUL 1 TO NOV 20, 2008).

Sources of thrips educational information	Number of hits
Entire Thrips Website	5,016
Thrips Pest Management Home Page	1,192
Thrips Education and Training Activities	259
Thrips Specialists	206
Thrips Management in Specific Crops	221
Insecticides	209
News Releases	177
Links	173
Thrips Identification	192
Biology of Thrips	112
General IPM Practices	143
Scouting	143
Natural Enemies	138
Western Flower Thrips 8-29-08 Workshop	118

TABLE 3. NUMBER OF "HITS" FOR THRIPS IPM EDUCATIONAL INFORMATION IN THE ONLINE RESOURCE "GROWER'S IPM GUIDE FOR FLORIDA TOMATO AND PEPPER PRODUCTION" (JAN 1 TO NOV 20, 2008).

Sources of thrips educational information	Number of hits
Entire Guide	50,131
Chapter 4—Pest Management	2,284
Florida Flower Thrips	397
Tobacco Thrips	286
Melon Thrips	293
Western Flower Thrips	320
Chapter 8—Biological Control	452
Chapter 7—Cultural and Physical Controls	460
Mulches	240
Planting Dates and Times	174
Field Sanitation	184
Off-Season Management and Cover Crops	248
Off-Season Management and Double Cropping	162
Windbreaks	184
Chapter 9—Chemical Control	559
Biorational Insecticides	413
Pest Resistance	179
Restricted Use Pesticides	150
Appendix 8—Tospovirus	286

The "Grower's IPM Guide for Florida Tomato and Pepper Production" is based on IPM principles that emphasize pest prevention, rather than reaction, and up front planning to reduce the risks and costs of pest management. It presents options for tomato and pepper production in Florida, including management of soil nutrients, pests, diseases and weeds, as well as cultural, physical, biological, and chemical controls. The guide outlines several of the IPM techniques used to manage WFT and contains specific information about 4 thrips species in Florida and their management: Florida flower thrips, *F. bispinosa*; tobacco thrips, *F. fusca*; melon thrips, *Thrips palmi*; and WFT. Web statistics collected in the first 11 months of 2008 indicate the usefulness of this educational guide (Table 3). These statistics do not take into account the number of times the reference has been used offline, since 750 copies were distributed on CD and 60 as hard bound copies to key growers, scouts, and faculty members.

DISCUSSION

Demand will increase for WFT IPM training and associated materials as this pest spreads to new agricultural production areas in Florida. Consequently, plans are underway for more workshops on WFT identification and management. A "Thrips Identification Deck" is being developed by the SPDN and North Central IPM Center to assist scouts and growers who are learning how to distinguish between thrips species. Assistance will be provided by members of the TSWG to develop and implement crop and location specific insecticide resistance management programs. As a follow-up to these extension efforts, post training surveys of educational needs will be conducted. These surveys will assure that future efforts have the maximum benefit for Florida's agricultural community.

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References Cited

Diffie, S., Edwards, G. B., and Mound, L. A. 2008. Thysanoptera of Southeastern U.S.A: A checklist for Florida and Georgia. Zootaxa. 1787: 45-62.

Edwards, G. B. 1995. Thrips (Thysanoptera) New to Florida: II. Thripidae: Thripinae (*Psydrothrips, Asprothrips*). Fla. Dept. Agric. Consumer Serv., Div. Plant Indus. Entomol. Circ. 371: 1-2.

Edwards, G. B. 1996. Thrips (Thysanoptera) New to Florida: III. Thripidae: Thripinae (*Chaetanaphothrips, Danothrips*). Fla. Dept. Agric. Consumer Serv., Div. Plant Indus. Entomol. Circ. 377: 1-2.

Edwards, G. B. 2000. Thrips (Thysanoptera) New to Florida: IV. Thripidae: Thripinae (*Baileyothrips, Bolacothrips*). Fla. Dept. Agric. Consumer Serv., Div. Plant Indus. Entomol. Circ. 398: 1-2.

Funderburk, J. E. 2002. Ecology of thrips. Thrips and Tospoviruses, pp. 121-128 *In* R. Marullo and L. A. Mound [eds.], Proc. 7th Intl. Symp. on Thysanoptera, July 2-7,. Reggio Calabria, Italy.

Funderburk, J. E., Stavisky, J., and Olsen, S. 2000. Predation of *Frankliniella occidentalis* (Thysanoptera: Thripidae) in field peppers by *Orius insidiosus* (Hemiptera: Anthocoridae). Environ. Entomol. 29: 376–382.

Gillett, J. L., HansPetersen, H. N., Leppla, N. C., and Thomas, D. D. [Eds.]. 2006. Grower's IPM Guide for Florida Tomato and Pepper Production. University of Florida Extension Bulletin 1500. 256 p. http://ipm.ifas.ufl.edu/resources/success_stories/T&PGuide/index.shtml (Last accessed September 10, 2008).

Hamon, A. B., and Edwards, G. B. 1994. Thrips (Thysanoptera) New to Florida: I. Thripidae: Panchaetothripinae. Fla. Dept. Agric. Consumer Serv., Div. Plant Indus. Entomol. Circ. 365: 1-2.

Jensen, S. E. 2000. Insecticide resistance in the western flower thrips, *Frankliniella occidentalis*. Integr. Pest Manage. Rev. 5: 131-146.

Leibee, G. L., and Capinera, J. L. 1995. Pesticide resistance in Florida insects limits management options. Florida Entomol. 78: 386-399.

Mayfield, J. L., Hudgins, J. L., and Smith, J. L. 2003. Integrated management of thrips and tomato spotted wilt virus in field-grown fresh market tomatoes. Proc. Florida State Hort. Soc. 116: 161-164.

Momol, M. T., Funderburk, J. E., Olsen, S., and Stavisky, J. 2002. Management of TSWV on tomatoes with UV-reflective mulch and acibenzolar-S-methyl, pp. 111-116 *In* R. Marullo and L. A. Mound [eds.], Proc. 7th Intl. Symp. on Thysanoptera, July 2-7, Reggio Calabria, Italy.

Moritz, G., Mound, L. A., Morris, D. C., and Goldarazena, A. 2004. Pest Thrips of the World. Lucid-CSIRO publishing, Collingwood, Australia. http://www.cbit.uq.edu.au/software/pestthrips/default.htm (Last accessed September 18, 2008).