Scirtothrips dorsalis – IPM-PIPE

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Executive Summary

The plant pest *Scirtothrips dorsalis* Hood, commonly known as chilli thrips, was detected and determined to be established in Florida's landscape in 2005. Subsequent to its detection, it has become a pest of increasing significance for landscape managers, and presents a potential threat to vegetables and other agronomic commodities. Due to its widespread distribution in Florida, it is likely to spread via trade and travel pathways to other states across the southern U.S. Chilli thrips has been detected at retail stores in Texas, but its establishment in that state has not been confirmed.

Although chilli thrips has not yet been reported in vegetable crops in the U.S., its potential for damage can be easily projected on the basis of its worldwide impact on a variety of important hosts. An appropriate response to this new pest should include: an immediate effort to detect and monitor the pest population; effective communication among appropriate specialists; and increased outreach to commodity groups. These actions could significantly reduce major crop loss due to pest outbreaks, and promote proper management strategies in order to prolong the effectiveness of chemical controls currently used to manage thrips. If proper education and management strategies are not implemented, the development of pesticide resistance is possible in both this and other thrips species. An urgent, coordinated effort is needed to protect ornamental as well as agronomic industries, and to prolong the effectiveness of chemical controls currently used to manage thrips.

Proper field and lab-based diagnostic training is also an essential component of this proposed concept. The IPM-PIPE platform provides the ideal interface for implementing this important effort and protecting our plant resources. We propose implementing a coordinated detection survey in the ornamentals industry. Once *S. dorsalis* is detected on ornamental plants in an area, additional surveys will be initiated on susceptible crops. Ornamental specialists will then communicate with specialists in other commodities.

Justification

Thrips (insects in the order Thysanoptera) are excellent invaders due to their small size, cryptic habits, and propensity for hitchhiking on plants or plant products through global trade patterns. An average of at least 1000 thrips samples are intercepted annually in plant shipments arriving in the U.S. (Morse and Hoddle 2005).

Thrips may feed on leaves, flowers, or new growth terminals, and primarily damage host plant tissue by direct injury. Damaged foliage may become silvery or curled, and eventually dies. Flower buds that have suffered thrips damage may not open, or may drop prematurely. Scarring, flecking, or feeding damage may also occur on the host fruit. Thrips are also known to threaten crops through virus transmission, but there is some species-specific variability in their abilities to serve as efficient vectors.

Proper communication between specialists and producers is essential for thrips management in order to avoid the development of pesticide resistant populations. During the mid-1980s, the western flower thrips, *Frankilinella occidentalis* (Pergande) was introduced from the southwest into the southeastern U.S. It quickly became a major pest of vegetable and ornamental crops due to the development of pesticide resistant populations. The economic impact of two invasive, closely related *Scirtothrips* species has also been documented in the U.S. *Scirtothrips perseae* Nakahara was introduced into California in 1996. Within two years, it had spread throughout California's avocado-growing region, causing a 12 percent reduction in grower revenues of $8.7 million per year (Crop Prot. 22:485–93). *Scirtothrips citri* Moulton is a pest of California citrus that can cause surface scaring of fruit. This damage has been shown to have no impact on fruit quality. However, growers still treat for this pest, spending more than $11 million per year (J. Appl. Entomol. 111:28–32, Calif. Grower 18:1619–26).

An established population of *Scirtothrips dorsalis* Hood, the chilli thrips, was detected in Florida's landscape on ornamental rose, *Rosa* spp. during 2005. Prior to this detection, there were two suspected interceptions of *S. dorsalis* in retail garden centers in the early 1990s, although Cooperative Agricultural Pest Survey (CAPS) commodity surveys focusing primarily on tomato and pepper during 2004 and early 2005 did not detect *S. dorsalis* (Silaygi, A.J. and W.N. Dixon 2006). Less than a year after the 2005 detection in the landscape, chilli thrips was confirmed in 24 of Florida's 67 counties and considered established. *Scirtothrips dorsalis* has also been detected in retail garden centers in Texas, but its distribution in the environment has not been determined. *Scirtothrips dorsalis* originated from South Asia, but has expanded its range to tropical, subtropical, and temperate regions around the world. It was first recorded as established in the Western Hemisphere on St. Vincent in 2003. *Scirtothrips dorsalis* has since been documented in the Republic of Suriname, St. Lucia, Barbados, Trinidad, and Tobago, in addition to the previously mentioned detections in Florida and Texas.

As a polyphagous species recorded on more than 100 hosts from about 40 different families, *S. dorsalis* has a high pest potential. Severe infestations of *S. dorsalis* can result in total defoliation and potentially heavy crop loss. Some of the crops which have been severely impacted in tropical and sub-tropical regions include: vegetable, ornamental, and fruit crops in southern and eastern Asia; strawberries in Australia; tea in Taiwan; citrus in Japan and Taiwan; cotton in the Ivory Coast; soybeans in Indonesia; and peanuts, chillies, and castor bean in India. Damage has also been reported on cashew, cotton, tomato, mango, tamarind, and grape. As its range continues to expand in the U.S., additional crops will likely be added to its host list.

According to analyses by the USDA-APHIS-PPQ during 2004, $3 billion in losses would result if there was only 5 percent crop loss on 28 susceptible hosts (Spears, B.M. NPAG, USDA-APHIS-PPQ-CPHST, March 3, 2006 report; Garrett 2004).

Also, the potential exists for pesticide resistant populations; and producers, extension specialists, and effected industries need to work closely to promote management strategies that will prolong the effective use of chemical controls currently used in thrips management.

The IPM-PIPE platform provides a necessary and immediate interface for monitoring, outreach and education, and communication between researchers, extension specialists, and the private sector in order to avoid major outbreaks of thrips (similar to the 1980s incidences of western flower thrips) in ornamental and agronomic crops. Another key component of thrips management is proper identification, and the IPM-PIPE platform, in partnership with the National Plant Diagnostic Network (NPDN), provides an important framework for distributing important information, streamlining our response, and properly identifying *S. dorsalis.*

Implementation Process

Even though *S. dorsalis* is clearly a threat to a number of cropping systems, pest movement through retail trade associated with the vegetable transplants or ornamental plant industries will likely be its point of introduction. As such, we propose to use ornamental plants as sentinel sites for pest monitoring. The primary group of ornamental hosts to be surveyed will be limited, initially, to 5-10 key hosts. These will be determined by an ornamental entomology working group, in consultation with PIPE information technology specialists. However, additional ornamental host sampling and random agronomic crop sampling may be added to the plan, pending additional finds of *S. dorsalis*. Sampling is likely to be biweekly, with the sampling season determined by local climate. The working group leading the overall effort will determine the sampling protocol.

The project's Co-Director, Dr. Scott Ludwig, will coordinate the activities of the ornamental entomology working group. The group will include key extension specialists and researchers concerned with thrips management. At least one extension specialist perstate (more if needed) will be responsible for providing their state's extension commentary for the public view of the PIPE portal. Proposed states/U.S. territories for implementation include: Florida, Texas, California, Arizona, Nevada, New Mexico, Georgia, Alabama, Louisiana, Puerto Rico South Carolina, and Mississippi. The extension entomology contacts will also be responsible for initially providing a connection and communication channel to vegetable and other commodity groups within their state who may be at risk to *S. dorsalis* introduction. Due to the known occurrence of *S. dorsalis* in Florida, its detection in Texas, and the risk to California as a high-volume trade state, a more extension survey should be conducted in Florida, Texas, and California in order to initially establish the
S. dorsalis IPM-PIPE.

The ornamental entomology working group will work closely with industry to ensure that their interests and concerns are addressed. For example, although there may be more detailed information available on the password protected side of the PIPE interface (to be determined by the working group), the public side of the PIPE interface is likely to include only county level information regarding *S. dorsalis* detections. Project Co-Director, Dr. Lance Osborne, will serve as the primary liaison between the PIPE project and effected industries. Dr. Osborne will coordinate conference calls or industry-specific working groups as needed. Currently, a *S. dorsalis* task force is being formed by USDA-APHIS-PPQ and facilitated Bill Grefenstette.

Dr. Osborne will work through the task force's Industry Group to ensure clear communication with effected industries.

An extensive amount of diagnostic coordination is also necessary for quick and rapid detection of *S. dorsalis.* Project Director, Dr. Amanda Hodges, will coordinate the diagnostic lab segment of the IPM-PIPE on behalf of the National Plant Diagnostic Network (NPDN). Project Co-Director, Dr. Joe Funderburk, will provide the primary scientific expertise for thrips identification. Dr. Funderburk will present information on thrips identification at the upcoming May 2007 Southern Plant Diagnostic Network's (SPDNs) Invasive Arthropod Conference in Clemson, South Carolina. Drs. Funderburk, Osborne, and Hodges are also in the process of planning an intensive multi-day regional/national *S. dorsalis* training session later this summer (2007). Field and lab identification information will be included.

In order to address the need for enhanced diagnostic resources, we are also proposing that Dr. Joe Funderburk be provided funding for final development and publishing of an intensive, LUCID®-based thrips identification key. Dr. Funderburk and his collaborators have spent significant time and effort in photographing slide-mounted specimens, collecting thrips for host plant and species range records, and developing the LUCID® key. The majority of the work has been accomplished through existing funds and resources, available through the University of Florida and the University of Georgia, with Mr. Stan Diffee as a key collaborative. Dr. Funderburk and Mr. Diffee are also in close communication and consultation with worldwide thrips expert, Dr. Lawrence Mound, for final product development. The key will be an invaluable resource for thrips identification in diagnostic labs throughout the U.S.

General outreach and awareness will also be a critical component of the *S. dorsalis* IPM-PIPE. Currently, a national pest alert, produced by the North Central IPM Center collaboration with the NPDN, APHIS, and ARS is under development and will be available during 2007. Drs. Ludwig and Osborne were involved in its development, with coordination assistance from Dr. Amanda Hodges on behalf of the SPDN. We propose working with Dr. Susan Ratcliffe of the North Central IPM Center to conduct national teleconference training sessions. We also propose working with Dr. Ratcliffe to develop an identification deck for thrips surveys. Dr. Scott Ludwig will develop additional commodity-specific outreach efforts.

The *S. dorsalis* IPM-PIPE will be introducing a new group of learners to the PIPE platform, as well as a new pest and host range to the existing framework. In the *S. dorsalis* IPM-PIPE, we propose utilizing the existing Pennsylvania State University team led by Dr. Scott Isard (i.e. by providing funds to this team from the *S. dorsalis* IPM-PIPE) for developmental adaptations for the interface. We anticipate that many of the information technology changes will be somewhat minor, but there will be some specific needs for the *S. dorsalis* IPM-PIPE working group (to be determined by the group). At least one meeting of specialists and PIPE information technology experts will be scheduled to discuss the *S. dorsalis* IPM-PIPE interface. This meeting will be facilitated by Dr. Amanda Hodges.

List of Important Implementers and Stakeholders

- Project Directors will be primarily responsible for implementation and overall coordination.
- Bill Grefenstette, facilitator for USDA-APHIS-PPQ *S. dorsalis* task force
- Extension specialists and NPDN diagnosticians from Alabama, Arizona, California, Florida, Georgia, Louisiana, Mississippi, Nevada, New Mexico, South Carolina, Texas, and Puerto Rico
- State extension specialists will serve as primary contacts for county extension agents who will be the primary implementers of sentinel plot work in most cases
- Society of American Floriculture (SAF)
- American Nursery and Lanscape Association (ANLA)
- Various Local, Regional, and National Fruit and Vegetable Commodity Groups
- PIPE IT coordination, Dr. Scott Isard, Pennsylvania State University
- Outreach assistance, Dr. Susan Ratcliffe, North Central IPM Center

Budget

Proposed Budget-$1,000,000 for 2 Years
University of Florida-Indirect Costs
Indirect Costs: $100,000 at a 10% limitation

Coordination expenses-Dr. Amanda Hodges	$75,000
Final development of Thrips LUCID® key and thrips management research coordination-Dr. Joe Funderburk	$80,000
Website coordination and industry liaison-Dr. Lance Osborne	$30,000
Sentinel Plot implementation in Florida and Texas	$200,000
Coordination of ornamental working group and development of commodity based outreach material, Dr. Scott Ludwig	$70,000
National teleconference training and thrips ID Deck-Dr. Susan Ratcliffe	$40,000
PIPE IT interface-Dr. Scott Isard	$50,000
Thrips Diagnostic funding	$100,000
Sentinel sites in other states during Year 2*	$255,000

*Note: Pending needs of commodity groups, implementation in other states will occur in Year 1. Urgency of need will determine whether a phased or national effort is implemented during Year 1.