Chilli thrips, *Scirtothrips dorsalis*: A potential threat to cotton production in the USA

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Abstract

Studies involving host preference, age specific abundance, within plant distribution and seasonal abundance of *S. dorsalis* were conducted to evaluate its pest status on cotton. Cotton was found to be the most preferred host plant among the three hosts (cotton, peanut and pepper) evaluated. Highest abundance of *S. dorsalis* was reported on 1-5 week old cotton plants with a maximum damage rating of 3.8 out of 5. Studies to determine within plant distribution of *S. dorsalis* showed abundance of *S. dorsalis* was significantly higher on upper young leaves of cotton compared to middle and basal leaves. Significantly high abundance of *S. dorsalis* larvae and adults were reported in the months of July and August. Our results indicate that if given the opportunity, this pest could be a threat to cotton production in the United States.

Introduction

Chilli thrips, *Scirtothrips dorsalis* Hood have been a serious problem across the globe. It is an economic pest of various vegetable crops, cotton, citrus and other fruit and ornamental crops in its principal range of southern and eastern Asia, Africa, and Oceania. Detection of *S. dorsalis* larvae and adults in fresh vegetation is difficult due to their thigmotactic behavior and tiny stature (< 2mm in length). Eggs are deposited within plant tissues and may take a week for larval emergence. Consequently, chances of transportation of *S. dorsalis* through state, regional and international trade of plant materials for all life stages are high. Within five years of its introduction into the United States, *S. dorsalis* has become established in 30 Florida counties, 8 counties in Texas with several positive reports of interception in New York, Alabama, Georgia, Louisiana and California. Thus, with the aim to asses its pest potential in this region, a preliminary study was conducted using cotton as a host. Results from these studies will help growers and extension personnel in understanding the abundance and distribution of *S. dorsalis* in the cotton field, which are important components required in developing a sound management program.

Objective

In order to validate pest status of *S. dorsalis* the following studies were conducted with cotton as the host:

1. Host preference of *S. dorsalis* among three important crops
2. Vertical distribution of *S. dorsalis*
3. Within plant distribution of *S. dorsalis* on cotton
4. Age specific abundance of *S. dorsalis* on cotton
5. Seasonal variation in abundance of *S. dorsalis*

Materials & Methods

In the Fall of 2008, experiments were initiated and different parts of the study were continued for three years at the Tropical Research and Education Center, University of Florida (TREC-UF), Homestead, (25.28N, 80.28W). Studies were conducted in an unairconditioned well-ventilated greenhouse, using host plants grown into Pro-mix medium (Fafard, Agawam, MA) in 10.1 cm plastic pots. In all the following studies wherever required, treatments were arranged in randomized complete block design with four or more replications. Data were collected every wk for 6-10 wk except in the seasonal abundance study where abundance of *S. dorsalis* was recorded biweekly.

Study 1. Host preference of *S. dorsalis* was studied using potted plants of three hosts in the Fall 2008 and 2009. Choice and no-choice host preference tests of *S. dorsalis* were conducted on three crops i.e., "Jalapeño" pepper, "Bollgard" cotton and "Virginia" peanut.

Study 2. Vertical distribution of *S. dorsalis* was studied in the Fall of 2009 and 2011 using potted plants at four different heights 45.7 (H1), 91.4 (H2), 137.1 (H3), and 182.8 (H4) cm approximately, using three-host plants: cotton, pepper and peanut at different times.

Study 3. Within plant distribution of *S. dorsalis* was conducted in both laboratory and greenhouse conditions. For lab experiments, apical, middle and basal leaves were collected from a healthy, young, vigorous, pest free cotton plant and were subjected to oviposition by *S. dorsalis*. In the greenhouse study, young cotton plants (5 wk) were selected and divided into three substratum: upper leaf, middle leaf and lower leaf and were subjected to feeding and oviposition by *S. dorsalis*.

Study 4. In order to determine the host age group which is most susceptible to *S. dorsalis* attack, age specific host preference of *S. dorsalis* was studied on 1-9 week old cotton plants.

Study 5. Seasonal abundance of *S. dorsalis* was studied on cotton in a well-ventilated greenhouse for two years between September 2009 and August 2011 (2nd yr data not shown).

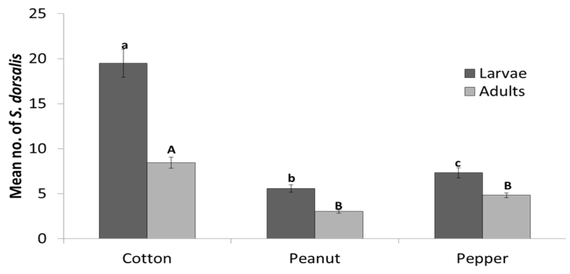
Preliminary Results

Study 1.

Table 1. Mean SEM number of *S. dorsalis* larvae that emerged per host plant in no choice and choice tests under laboratory conditions.

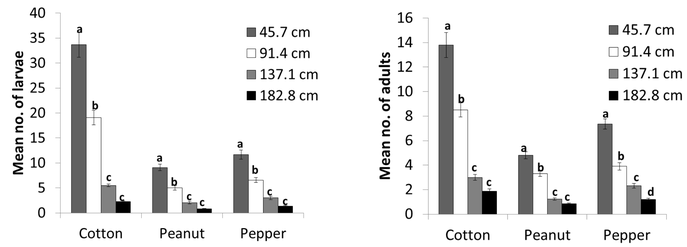
Test	Cotton	Peanut	Pepper	Statistical analysis
No choice test	3.58 ± 0.056a	0.77 ± 0.45b	1.94 ± 0.21b	$F = 10.36$; df = 2, 105; $P < 0.0001$
Choice test	5.79 ± 0.64a	1.31 ± 0.19b	2.35 ± 0.31b	$F = 13.04$; df = 2, 141; $P < 0.0001$

Fig.1. Mean number of *S. dorsalis*/cotton plant recorded every week in choice test during second season under greenhouse conditions.



Study 2.

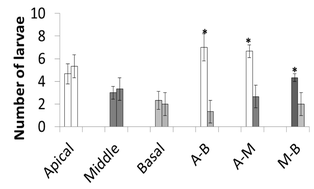
Fig.2. Vertical distribution of *S. dorsalis*; (a) abundance of *S. dorsalis* larvae, (b) adults on three hosts at four different heights.



Study 3.

Table 2./Fig.3. Mean number of *S. dorsalis* on cotton leaves from different positions relative to plant apex under greenhouse and laboratory conditions.

Growth stage	Apical	Middle	Basal
Larvae	8.64 ± 0.73a	3.05 ± 0.28b	2.13 ± 0.29b
Adults	6.31 ± 0.41a	2.43 ± 0.25b	1.37 ± 0.15c



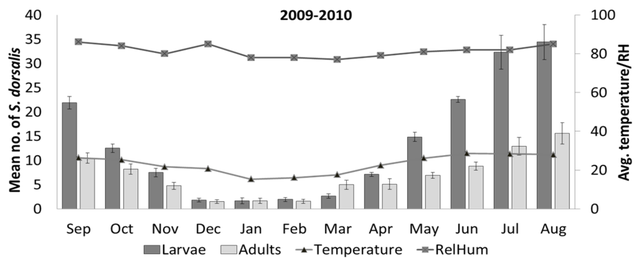
Study 4.

Table 3. Percentage difference in plant growth (plant height and leaf count) and damage rating of different aged group cotton plants after 8 weeks of study.

Plant age group	% difference in height		% difference in leaf count		Damage rating
	Infested with *S. dorsalis*	Insecticide Control	Infested with *S. dorsalis*	Insecticide Control	
Week 1	244.3	596.3*	-70.3	414.8**	3.8a
Week 2	125.7	307.9*	-45.3	256.4**	3.4ab
Week 3	103.2	193.6*	-29.0	100.7**	3.2abc
Week 4	83.5	149.7*	1.80	83.7**	2.7bc
Week 5	70.5	101.3	11.5	66.5**	2.6bcd
Week 6	27.2	42.3	23.2	55.4	2.3cd
Week 7	17.5	25.4	27.2	38.5	1.6d
Week 8	10.4	14.2	22.6	28.7	0.1e
Week 9	7.5	9.4	18.5	20.5	0.0e

Study 5.

Fig.4. Seasonal abundance of *S. dorsalis* on potted cotton in 2009 to 2010.



Conclusions

Based on these studies and our previous experiments (Kumar et al. 2012), it can be concluded that cotton is an important feeding and reproductive host of *S. dorsalis* and is capable of posing a serious threat to cotton production in this region.