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VARIATION IN CC TRAP CATCHES OF THRIPS ASSOCIATED WITH DIFFERENT COLORS WITH AND WITHOUT DICHLORVOS CUBES

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Abstract

The fact that different thrips species are attracted to different shades of blue in the field is well documented. This was verified for western flower thrips (WFT), *Frankliniella occidentalis* (Pergande), in a cotton field in our studies with different shades of blue sticky card traps. Continuing studies are being conducted to improve the efficacy of CC traps for detecting and monitoring thrips populations. Addition of Hot Shot® No-Pest Strip as a killing agent in the traps increased the WFT catches compared with standard CC traps without the killing agent. The increased catches are attributed to increased mortality and retention of thrips that entered the trap as opposed to increased attractiveness.

Introduction

Thrips species are worldwide polyphagous pests. In 2003 in the United States it was estimated that 11.5 million cotton acres were thrips infested causing economic losses of 2.81 million dollars (Williams 2004). The CC trap designed and validated for monitoring sweetpotato whitefly (SPW), *Bemisia tabaci* (Gennadius) B-biotype, populations was based on the SPW color attraction, flight patterns approaching plants and landing behavior (Chu et al. 1995, Chu and Henneberry 1998, Chu et al. 2000). The CC traps with white bases caught more chilie thrips (ChT), *Scirtothrips dorsalis* (Hood), and melon thrips (MT), *Thrips palmi* (Karny) in a peanut field in India in 1996 compared with yellow base trap catches (Chu et al. 2000). To extend the usefulness of the CC traps for monitoring thrips, we are studying different methods to increase trap efficacy. We report here the results of key studies in 2004 on the improvement of CC trap catches of WFT.

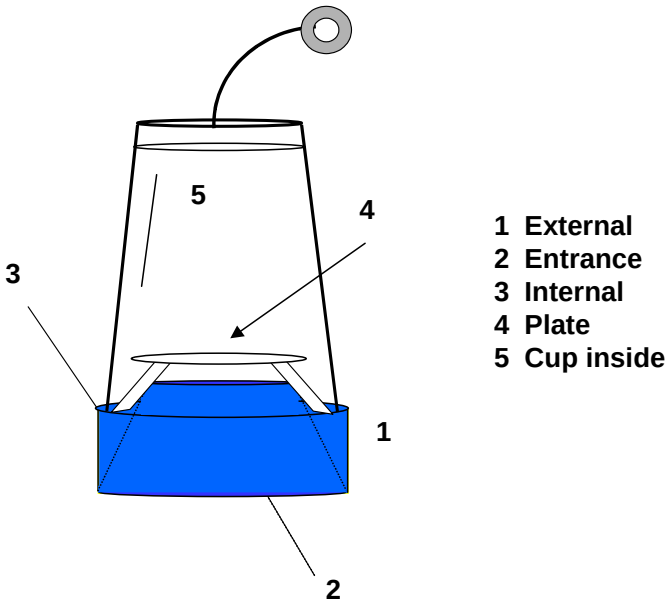
Materials and Methods

CC trap base colors The experiment was conducted in a commercial cv. Cebola alfalfa field at Maricopa, AZ. Standard agronomic practices were followed. The experiment was conducted in a randomized complete block (RCB) design with five replicates. Treatment colors were: white, yellow, and blue. Thrips caught in traps were counted every three days and traps were cleaned and reset for the following 3-day sampling period. The experiment was conducted from 9 to 15 August 2004.

Sticky card trap colors The experiment was conducted in a cotton field at Maricopa, AZ in a RCB design with eight replicates. Each block (= a variety) was eight rows wide and 12.2-m long. Rows were spaced 1-m apart. There were two unplanted rows between replicates and 6-m wide alleys between blocks. Seeds were planted and watered for germination on 8 April 2004. Plants emerged two weeks later and were watered at 10-20 d intervals during the growing seasons. Plots were not treated with any pesticides.

Blue sticky card trap treatments were: Sensor® blue cards (Whitemire Micro-Gen Research Laboratories, Inc., St. Louis, MO), blue Bug-Scan® (IVOG® -Systems, Biobest n.v.® Biological Systems™, Westerlo, Belgium), and blue Takitrap® (Oecos Ltd., Kimpton, Hertfordshire, England). The light reflectance of the blue sticky cards measured with a spectrometer (Full Range model, Analytical Spectral Devices, Boulder, CO) was 444 nm, 446 nm, and 458 nm for Sensor®, Bug-Scan®, and Takitrap® blue cards, respectively. Traps were placed 8-cm above plant canopy tops and spaced 1-m apart. Traps were recovered and replaced with new traps weekly from 22 June to 13 July 2004. Trapped WFT were counted with aid of stereoscopes in the laboratory.

WFT capture sites on CC traps The experiment was conducted in a commercial cv. Mecca II alfalfa field at Maricopa, AZ using a RCB design with five replicates. Standard agronomic practices were followed. Treatments were different CC trap parts coated with Tanglefoot® (figure at right) (Tanglefoot ®Co., Grand Rapids, MI). CC traps without Tanglefoot® were controls. Trap catches of WFT were counted in the field and traps were replaced in the same position for the experimental period from 25 June to 2 July 2004.



CC traps with killing agent modification The experiment was conducted in a commercial cv. Cebola alfalfa field at Maricopa, AZ using a RCB design with fifteen replicates. Hot Shot® No-Pest Strip (United Industries Corp., St. Louis, Mo) cubes (1 cm^2 x 0.5 cm) were inserted, one cube in each trap, in the hollow cone base to kill and retain the thrips that entered the trap. Trap catches were counted daily and traps were cleaned (see comment above) for the next sampling day. The same No-Pest Strip cubes were used during the entire experimental period, from 15 to 21 July 2004.

Data analyses Numbers of thrips caught were averaged over experimental sampling periods. Data were analyzed using ANOVA and means were separated using Tukey's HSD or *t*-test when appropriate.

Results and Discussion

CC trap base colors More WFT were caught in white or blue base color CC traps compared with yellow base traps (Table 1). The findings agree with our earlier WFT, ChT, and MT studies (Chu et al. 2000).

Table 1. Mean numbers of *Frankliniella occidentalis* (Pergrande) caught in different color base CC traps in an alfalfa field, Maricopa, AZ, 2004.

	No. thrips/trap/3-day		
Base color	8/9	8/12	8/15
White	154 a[a]	108 ab	209 a
Yellow	16 b	31 b	59 c
Blue	129 a	157 a	170 b

[a]Mean trap catches in a column not followed by the same letter are significantly different by Tukey's HSD, $P = 0.05$.

Sticky card trap colors WFT catches were highest in sticky card traps with peak wavelengths of 458 nm, except during week one (Table 2). Mateus and Mexia (1995) reported that 353 nm reflectance (dark blue) traps were more attractive to WFT compared with traps with 326 nm reflectance traps (bright blue), while 308 nm reflectance traps (translucent blue) caught the fewest.

WFT capture sites on CC traps Sixty to 92% of the total WFT catches occurred on the external surfaces of the CC trap bases (Table 3). Few WFT were caught on other surfaces coated with Tanglefoot®. The total number of WFT caught in CC traps without Tanglefoot® was only a fraction of the total number caught on the coated sticky base of the traps. The cumulative numbers of thrips in CC traps without Tanglefoot® for June 28 to July 2 were less than for June 2 catches indicating escapes of some thrips that entered the traps. Dislodgement of thrips from internal trap bases and/or deflector plates might also have occurred following the counts on June 25.

Table 2. Mean numbers of *Frankliniella occidentalis* (Pergrande) caught on blue sticky card traps with different peak wavelength reflectances in a cotton field, Maricopa, AZ, 2004.

Wavelength	No. thrips/trap on week			
Reflectance (nm)	1	2	3	4
444	53 b[a]	63 b	31 c	15 b
446	616 a	190 b	157 b	126 b
458	369 b	499 a	286 a	533 a

[a]Mean trap catches in a column not followed by the same letter are significantly different by Tukey's HSD, P = 0.05.

Table 3. Mean numbers of *Frankliniella occidentalis* (Pergrande) caught in an alfalfa field on different parts of blue based CC traps coated with Tanglefoot, Maricopa, AZ, 2004.

Tanglefoot	Cumulative no. thrips/trap			
coating	6/25	6/28	6/30	7/02
None	1.5 b[a]	0.5 b	0.8 b	0.5 b
External base	14.4 a	85.8 a	97.3 a	113.8 a
Entrance of base	1.3 b	1.3 b	6.5 b	11.3 b
Internal base	1.5 b	0.3 b	1.0 b	3.0 b
Deflector plate	2.8 b	4.0 b	2.5 b	2.0 b
Cup inside	0.5 b	1.0 b	4.8 b	8.5 b
Total	22.0	92.9	112.9	139.1

[a]Means in a column not followed by the same letter are significantly different by Tukey's HSD, P = 0.05.

CC traps with killing agent modification Adding a Hot Shot® No-Pest Strip cube to the trap base increased the trap catches of WFT by 5 X indicating that most of the thrips entering the traps escape compared to traps with the killing agents.

Table 4. Mean numbers of *Frankliniella occidentalis* (Pergrande) caught in an alfalfa field in blue base CC traps with and without a Dichlorvos killing agent, Maricopa, AZ, 2004.

No-Pest Strip	7/15	7/16	7/19	7/20	7/21	Mean
No	2.1 b	1.2 b	15.8 b	9.4 b	16.2 b	8.9 b
Yes	15.8 a	19.6 a	70.1 a	46.1 a	56.2 a	41.6 a

[a]Means in column of the counts for the three trap base colors not followed by the same letters are significantly different by *t*- test.

Large numbers of WFT are apparently attracted to blue color CC trap base but do not enter the trap. Further studies to improve the CC trap for use in monitoring will include behavioral studies and attractant combinations.

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