2005 Beltwide Cotton Conferences, New Orleans, Louisiana - January 4 - 7, 2005

ATTRACTION OF FRANKLINIELLA OCCIDENTALIS TO PARTI-COLORED LAMP ARRAY UNDER DARKROOM CONDITIONS

Tian-Ye Chen, Chang-chi Chu, Glenn Fitzgerald, Shaun Tuck, Patrick Alexander and Thomas Henneberry
Phoenix, AZ

Abstract

Spectral responses of adult western flower thrips (WFT) *Frankliniella occidentalis* (Pergande) were determined using a parti-colored light array (PLA) system under darkroom conditions. The PLA system consisted of thirty different light source boxes arranged in six boxes (in two columns of three each) per replicate of five replicates. The highest numbers of released WFT adults were attracted to ultraviolet (UV) (peak wavelength 369 nm) compared with blue (460 nm), green (512 nm), yellow (545 nm), red (650 nm), and non-colored white light. Distances from the point of WFT release to the PLA affected the number of WFT caught independent of color.

Introduction

Western flower thrips (WFT) *Frankliniella occidentalis* (Pergande) are one of the important pests attacking cotton grown in the Western United States (Leigh et al. 1996). Sampling and population monitoring methods are urgently needed in WFT management programs. We are evaluating different colored light sources to determine the most attractive light wavelengths to WFT. Our goal is to develop a trap for monitoring and potential control in greenhouse culture. This report is a description of our methodology and experimental results of studies conducted in a dark room using a parti-colored lamp array (PLA).

Materials and Methods

Darkroom All tests were conducted in a 7.9 x 5.2 x 2.7 m (L x W x H) darkroom at 28-30°C and R.H. of 20%-30%.

Light Sources The PLA system was arranged in three rows of ten juxtapositional spaced light source boxes that were stacked vertically against a wall. Light source treatments boxes were randomized within two columns of three boxes each. There were five replicates. Each light source was installed in a 25 x 25 x 11 cm (L x W x D) plastic box. The inside of each light source box was inlaid with aluminum foil. The front of the box was covered with black cloth with a 9.5 x 9.5 cm (L x W) window area of clear plastic. Each light source box contained one compact white fluorescent light bulb (15 watt, 120 V, 60Hz, 750 lumens, Phillips Lighting Co., Somerset, NJ), except for boxes with one ultraviolet (UV) light bulb (fluorescent black light, BPESL15T, 15W, 120V, 50-60Hz, 200mA, Pico Rivera, CA). Front windows of each light source box were covered with one of five randomly assigned color transparency per replication. The color transparencies obtained from Rosco Roscolux (Stamford, CT) were: #26 Light Red, #10 Medium Yellow, #88 Light Green, #85 Deep Blue, and #00 Clear (used for both white and UV light bulbs). Each transparency (9.5 x 9.5 cm) was coated with Tanglefoot® Insect Trap Coating (Grand Rapids, MI). Released – recaptured WFT were counted on the 8 x 8 cm center area of each transparency. Transparencies were held in position on the cover of each light box using magnetic strips on the outside edges of the transparent windows. Color transparency light spectrums were measured with a spectrometer (Full Range model, Analytical Spectral Devices, Boulder, CO). Peak wavelength measurements were made by placing transparencies in front of a spectrometer sensor. The sensor and light (halogen light bulb) were both directed at the instruments 99% spectralon panel. The peak wavelengths for the transparencies were: 545 nm for #10 Medium Yellow, 650 nm for #26 Light Red, 460 nm for #85 Deep Blue, and 512 nm for #88 Light Green. The peak wavelength for the blacklight (UV) was 369 nm. The PLA was powered continuously during experimental.

Test Insects WFT were collected in sweep nets in an alfalfa field at Maricopa, AZ. WFT were transferred from the nets to vials using an aspirator. Vials contained 100, 200, or 300 WFT per vial. Numbers of WFT released were 1000, 2000 or 3000 as one of the experimental variables. The second treatment variable was light source color. The WFT were released in the darkroom and after 24 hour, the numbers caught on each Tanglefoot® coated transparency were counted.

Data Analysis The numbers of WFT caught were analyzed using the general linear model (PROC GLM, SAS Institute 1999). The means were separated using the Tukey's test at $P = 0.05$.

Results and Discussion

When 1000, 2000 or 3000 WFT were released 82.6 cm distant from the PLA, 83, 148 and 221 WFT, respectively, were caught on the UV light source (Table 1). Catches at UV light sources ranged from 21 to 111 times more than the WFT numbers caught at any other light source. When 1000, 2000 and 3000 WFT were released 165.1 cm distant from the PLA, 9, 33 and 41 thrips were caught, respectively, on the Tanglefoot® coated transparencies overlaid on the UV light sources. Numbers caught were 6 to 464 times more than were caught on transparencies overlaid on blue, green, yellow, red and clear light sources, respectively (Table 2). Increasing the distance from the point of WFT releases to the PLA resulted in decreased numbers of WFT caught independent of the light sources.

Table 1. Western flower thrips caught per colored light source when releases occurred 82.6 cm distant from the lights.

	No. of WFT caught at light sources when numbers released were		
Light color	1000	2000	3000
UV	82.6a[1]	148.0a	221.4a
Blue	1.8b	4.8b	5.2b
Green	1.8b	2.0b	3.4b
Yellow	1.2b	1.4b	1.8b
Red	1.2b	2.0b	2.0b
Clear	4.0b	3.6b	6.6b

[1]Means in the same column followed by the different letters are different significantly different at $P = 0.05$ (Tukey's test).

Table 2. Western flower thrips caught per colored light source when releases occurred 165.1 cm distant from the lights.

	No. of WFT caught at light sources when numbers released were		
Light color	1000	2000	3000
UV	9.2a[1]	32.8a	40.8a
Blue	0.8b	0.8b	0.4b
Green	0.2b	0.8b	1.0b
Yellow	0.2b	0.2b	0.8b
Red	0.2b	1.6b	1.2b
Clear	0.8b	1.8b	6.4b

[1]Means in the same column followed by the different letters are different significantly different at $P = 0.05$ (Tukey's test).

References

Leigh, T.F., H.R. Steven, and T.F. Watson, 1996. Biology and ecology of important insect and mite pests of cotton. pp. 17-86. *In* King, E.G., J.R. Phillips, and R.J. Coleman (eds.) Cotton insects and mites: Characterization and management. The Cotton Foundation, Memphis, TN.

SAS Institute, 1999. SAS/STAT user's guide. SAS Institute, Cary NC.