DEVELOPMENT OF TRAPPING SYSTEMS TO TRAP GLASSY-WINGED SHARPSHOOTER (*HOMALODISCA COAGULATA*) ADULTS AND NYMPHS IN GRAPE

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INTRODUCTION

The glassy-winged sharpshooter (GWSS) *Homalodisca coagulata* is native to the southeastern United States (Young 1958) where it is a known vector of various strains of the bacterium *Xylella fastidiosa.* Since its introduction into California, it has become established in large numbers in certain areas. Pierce's disease (PD) has been a problem in California for more than 100 years, but the GWSS is a more efficient vector of *X. fastidiosa* because it is a stronger flier than native California sharpshooters, and it can feed on the xylem of seemingly dormant woody stems.

The wine industry in Temecula, California has been seriously impacted by PD losing about 30% of its vineyards to date. The combination of PD and GWSS in California poses a serious threat to the grape industries. About 98,000 acres of table grapes are currently cultivated in California with 11,000 acres of table grapes in the Coachella Valley (Riverside County). The Coachella Valley has a history of PD and there is currently a high population of glassy-winged sharpshooters. The combination of the bacterium and new vector creates a serious disease threat to grape in the area. A similar situation has occurred in Kern County, California as well.

One of the crucial components and cornerstones of integrated pest management is the monitoring for the presence and density of a pest. Proper detection methods allow for optimum integration of biological, cultural, physical, chemical and regulatory measures to manage a pest. Yellow sticky traps have been used extensively in the southeastern U.S. for monitoring leafhoppers including GWSS in peach (Ball 1979) and citrus (Timmer et al. 1982). However, the reliability of these methods to detect the GWSS in California is questionable, and traps specifically designed for GWSS do not currently exist. To compound the situation, current methods are not standardized. For example, different sizes and shades of yellow sticky traps are being used in monitoring programs. The AM designation on certain traps actually refers to the apple maggot for which the trap was designed. Furthermore, the relationship of trap catches to actual populations of GWSS in grape or citrus are currently unknown.

Trap designs based on the behavior and biology of the insect in question have a much higher chance of success than relying on trial and error of traps designed to monitor other insects. Female GWSS secrete and deposit brochosomes on the forewings just prior to egg laying (Hix 2001). These spots are then scraped off during egg lying. Furthermore, white spots are secreted before each egg mass is laid, and female GWSS can only produce rod shaped brochosomes after mating. It is therefore feasible to relate preovipositional females with white spots and residues to egg masses in associated vegetation analysis. The white spots are very visible on females caught in traps (Hix 2001). Many leafhopper species produce brochosomes, but only females are known to produce the rod shaped brochosomes (Rakitov 2000). As reported here in 2001, data from the intercept traps and colored plates clearly indicated that GWSS are attracted to yellow as well as orange. Attraction to these colors was statistically significant and demonstrated that even though the AM type trap may have a reliability issue, it is clearly not a "blunder trap."

OBJECTIVES

This research addresses:

1. Which hue of yellow is the most attractive to GWSS;
2. What is the field longevity of a trap before weather and photo degradation impact trap reliability;
3. How does trap catch relate to populations of GWSS in citrus and grape;
4. GWSS spectral sensitivity;
5. How does temperature affect trap catch;
6. The feasibility of using certain wavelengths of light to enhance trap catch of GWSS in vineyards and associated orchards;
7. Develop and evaluate sticky barriers to trap and detect GWSS nymphs within a vine or tree canopy.

RESULTS AND CONCLUSIONS

Ten trap colors were field tested in 2002 to repeat tests from 2001. Colored Solo® plates and Seabright™ yellow panel traps (a Pherocon® AM clone) were deployed in citrus groves with known high GWSS populations. Traps were checked weekly and visual count of egg masses, nymphs, and adults were made. The yellow and orange Solo plates were very successful in catching adult GWSS. Yellow plates caught statistically more GWSS than Seabright yellow panel traps while orange traps usually caught more than the Seabright yellow panel traps (Figure 1). The interesting thing is that the yellow plates were more reliable at catching GWSS at low population levels than the Seabright yellow panel traps. Square and circle traps were made using the same yellow material and glue (Stickem Special™ Hold Fast formulation) to test GWSS response to 2-dimensional shapes to determine if that is why plate routinely catches more GWSS. On 1 August 2003 the square trap mean was 139.9 (± 33.8 SEM) compared to the circle trap mean 151.3 (± 22.8 SEM). Since the difference wasn't due to shape, two glue types (Stickem Special Regular and Stickem Special Hold Fast formulations) were tested on Seabright yellow panel traps and Solo yellow plates. The Solo yellow plates caught significantly more GWSS than the Seabright yellow panel regardless of glue type (Figure 2). In addition, four trap sizes made from the same material and glue were evaluated. The larger traps caught more GWSS than traps of smaller area (Fig.ure3), but the 499 cm^2 trap caught more GWSS per cm^2 than the larger and smaller traps. In summary, size and color are the two most important factors in sticky trap design as long as a suitable glue is used. The two stickiest glues available were used in the study. Stickem Special Regular and Stickem Special Hold Fast formulation glues are currently in use in the GWSS monitoring components of the various areawide management programs in California. Apparently, an attribute of color other than hue-angle is responsible for the differences in trap catches for the Solo yellow plate, the Seabright yellow panel traps, or Pherocon AM traps.

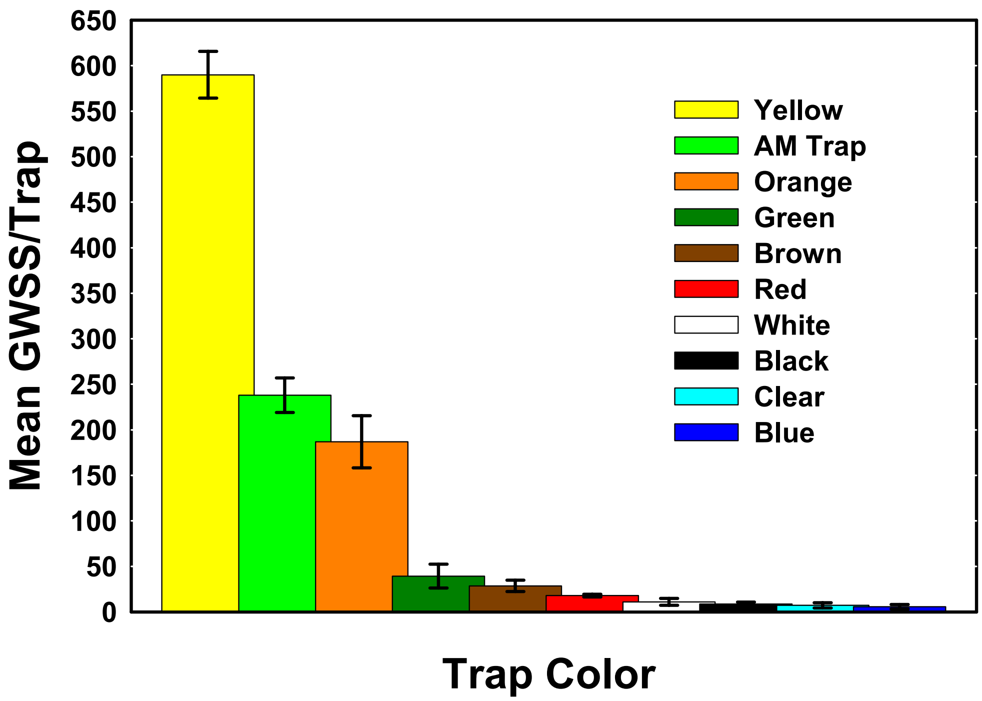

Figure 1. Mean Number (± SEM) of GWSS Trapped on Colored Solo® Plate Traps (one side of plate) at the Peak Trap date of 17 Aug 2002. . There were 5 of each trap color.

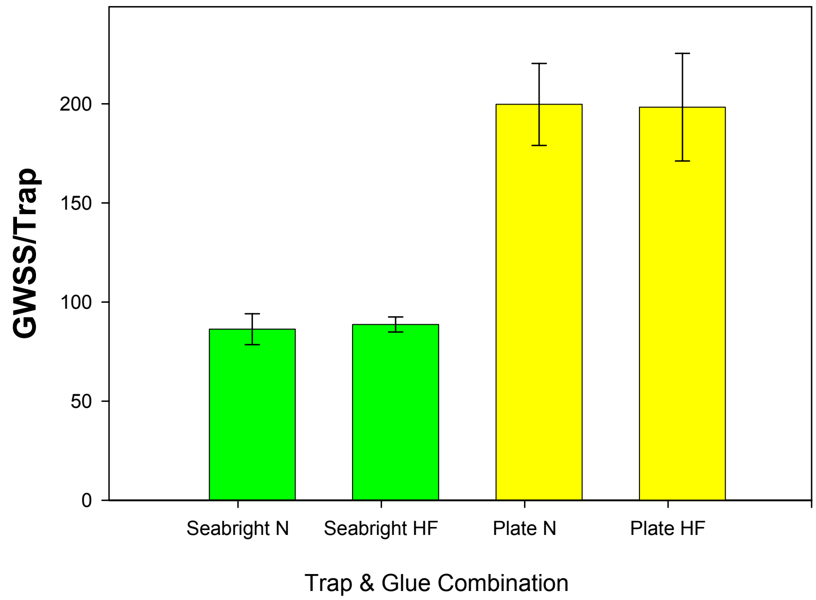

Figure 2. Means (± SEM) for Seabright yellow panel traps and Solo yellow plates (one side only) with Stickem Special™ Regular (N) and Stickem Special Hold Fast (HF) formulations. Reps = 5.

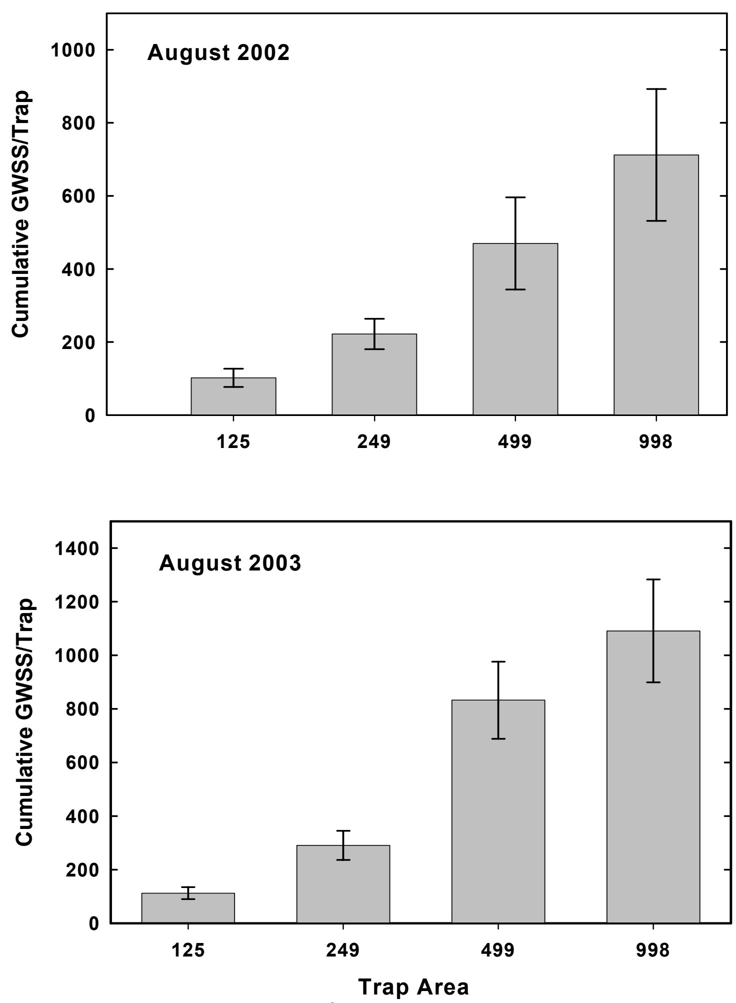

Figure 3. Comparison of trap sizes in cm^2. Cumulative means for a 4 week period in August. N = 5 ± SEM.

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