AGE DETERMINATION AND THE RED PIGMENT IN THE WINGS OF THE GLASSY-WINGED SHARPSHOOTER

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ABSTRACT
The glassy-winged sharpshooter, *Homalodisca vitripennis,* has a red pigment that is found in its wings during the final immature stage of its life. Over the course of the sharpshooter's lifespan, the red pigment darkens with maturation and eventually becomes a brown/black color. These pigments are unidentified but believed to be pheomelanin and eumelanin, respectively. The age of the sharpshooter can be determined by analyzing the amount of red pigment found in the wings. In this study, we attempted to identify the red pigment and quantify the amount of red pigment contained in wings via chemical analysis. Ultimately, we found that it was more practical to determine the amount of red pigment compared to brown/black pigment using an image analyzing software (ImageJ) to compare the ratios of each color present.

INTRODUCTION
In area-wide management studies in California and Texas, glassy-winged sharpshooters (GWSS; *Homalodisca vitripennis*) are collected using yellow sticky cards such as the Trécé Inc. adhesive trap T3306 (Trécé, Inc., Adair, OK). This method works very well for monitoring population numbers and identifying species that occur in the field. However, determining the age of sharpshooter off of traps can be difficult due to the degradation of internal tissues. However, the GWSS's wing color changes from red to black based on its age and this is a static change that is not altered postmortem. This compound is proposed to be pheomelanin which is red-brown and can be converted in to eumelanin (a dark brown/black pigment) (Wakamatsu 2002, Tran 2006).

MATERIALS AND METHODS
Determination of red and brown/black pigment. Age determination was done by scanning the wings using a Hewlett Packard Scanjet 3500c scanner (**Figure 1**). These images were labeled properly and then analyzed by ImageJ software. A color histogram was obtained along with the area of selection in square pixels, and the mean gray value. A numerical value was calculated for each wing (x=(R-((G+B)/2))*mean/area). These values were used to set up a standard scale using known ages.

Figure 1. *Development of Standards and Age Determination for field-collected insects.* GWSS were reared from eggs at the Texas Agrilife Research facility in Fredricksburg, TX. Each day, newly molted adults were collected and transferred to separate cages. These insects were allowed to survive 3, 6, 9, and 15 days. At that time the insects were sacrificed and analyzed for the ratio of red pigment to brown/black pigment as described above. From the yellow sticky traps, GWSS wings were collected and analyzed.

RESULTS AND DISCUSSION
GWSS collected on different days had significantly different levels of red pigment in their wings (**Figure 2**). We tested a large group of field-collected GWSS and where able to determine the relative age of the insects. However, many of the tested insects were determined to be older than 21 days. Therefore, we need to refine the system and set standards at the max age of the insects.

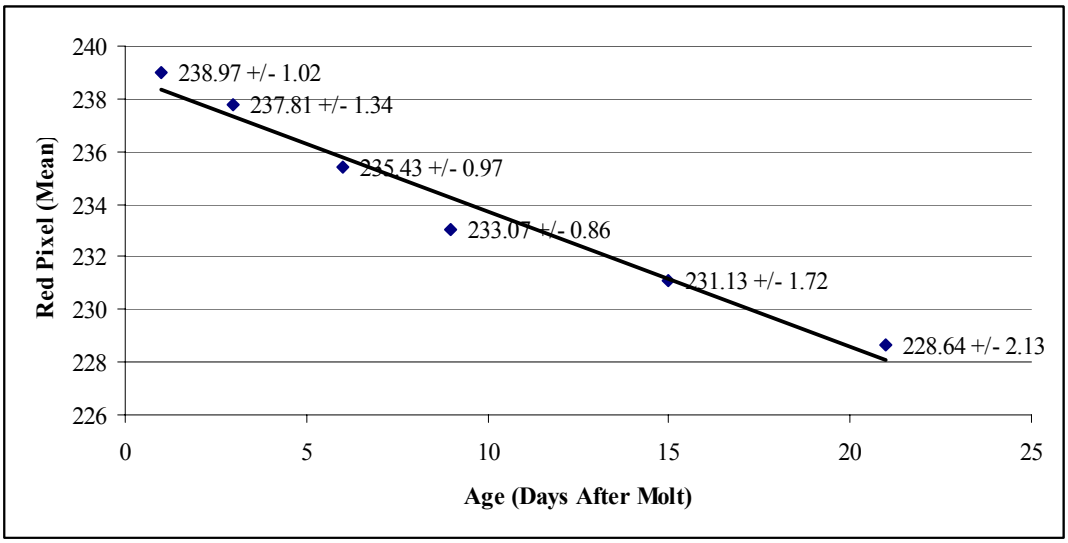

Figure 2. Decreasing levels of red pigment found in GWSS wings over time.

CONCLUSIONS

The unknown pigment in the sharpshooter wings is believed to be pheomelanin. The other proposed pigments of xanthomattin and erythropterin absorbance spectra are similar in shape to that of other organic pigments unlike the unknown compound. Pheomelanin is commonly found in nature and can be easily converted to eumelanin which is a darker, almost black hue. Pheomelanin (red) can be converted to eumalanin (black) if the solution is lacking a high concentration of sulfur compounds. Therefore if cysteine (sulfur containing) concentration is low, the pheomelanin will readily convert into eumelanin. In the sharpshooter this lack of cysteine would most likely come from a change in diet. Further research is needed to verify that the pigment is in fact pheomelanin.

The age of the sharpshooters can be determined by ImageJ. In an area-wide management program, it is important to understand as many biological factors as possible. Age may have a direct correlation to the vectoral capacity of the insects.

REFERENCES CITED

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