

Effects of Bulb Degradation on Fly Attraction to Insect Light Traps

Final Report to the Pest Management Foundation

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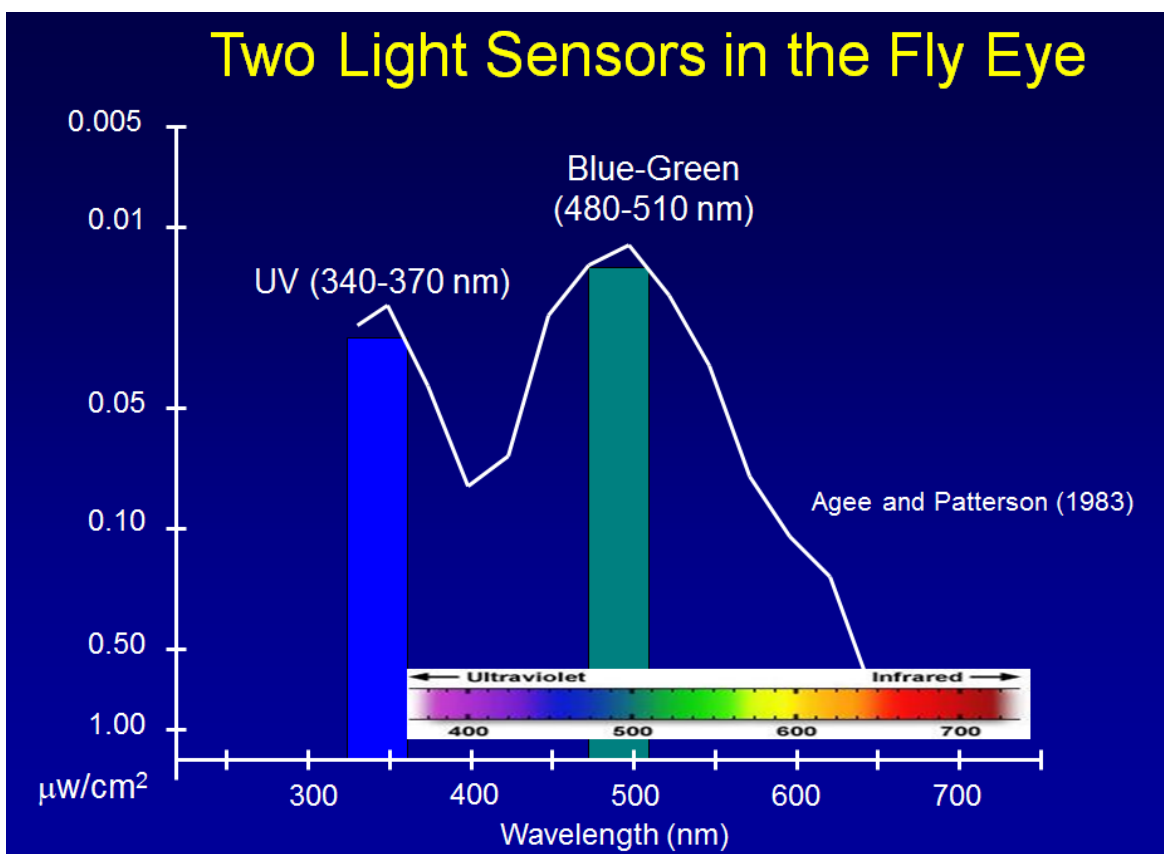
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Table of Contents

Table of Contents	2
Introduction	3
Procedures	3
Conclusions	9

Introduction

Insect Light Traps have been a critical part of fly control programs for many years. They rely on a light source to generate light at a wavelength that is attractive to flies (Graph 1). This light draws the flies in and catches them on a sticky trap housed behind the light source. Insect light traps must be checked frequently (monthly) to ensure the sticky trap is still functional for fly control. The manufacturers of the lights themselves recommend that the bulbs be changed on an annual basis to ensure the correct wavelength and output from the bulbs is maintained for greatest fly catch. One major question about bulb replacement that has not been answered is how does the age of the bulb effect fly catch? We investigated the response of flies to Insect Light Traps with new bulbs vs. those with bulbs that were aged.



Graph 1. Flies are attracted to two specific ranges of light UV (340-370 nm) and Blue-Green (480-510). Agee and Patterson (1983)

Procedures

6 test facilities have been up and running since October 2012. These facilities include 3 Bar/Grills, 2 Restaurants and 1 Brewery. One of the facilities elected to have the ILT's removed in September of 2013 leaving 5 currently in place. Each facility has 4 Insect Light Traps strategically placed inside. Each location was checked approximately once per month.

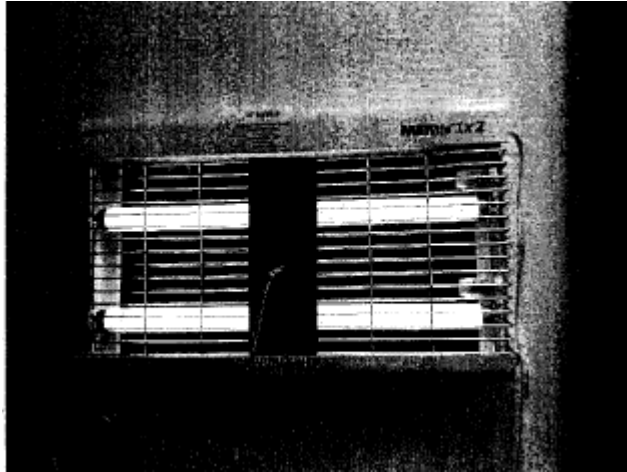
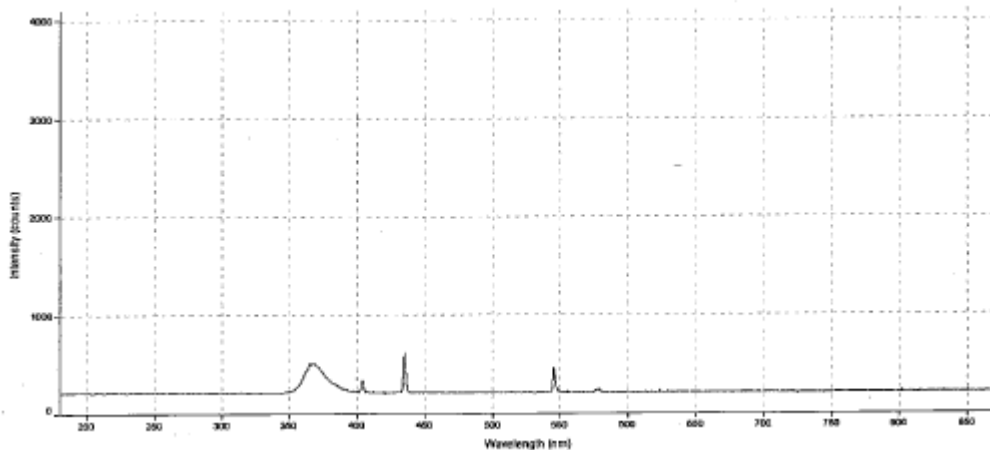


Figure 1. Setup showing Mantis 1x2 on wall in restaurant. Spectrometer is being used to analyze light source.

Data on light emission from the Insect Light Traps was collected monthly. The light was measured using an Ocean Optics USB 2000 Spectrometer (Figure 1).



Graph 2. Graph showing Wavelength and Intensity of Insect Light Trap Output.

The Light emitted from the ILT is quantified using the Ocean Optics Spectra Suite software. The wavelength is measured in nanometers and plotted against the corresponding intensity measured in counts (Graph 2).

Glue boards from the Insect Light Traps were also collected on each visit. These glue boards were used to determine the number of flies captured in specific time periods throughout a fly season (Figure 2).

Real World: Restaurant ILTs over time

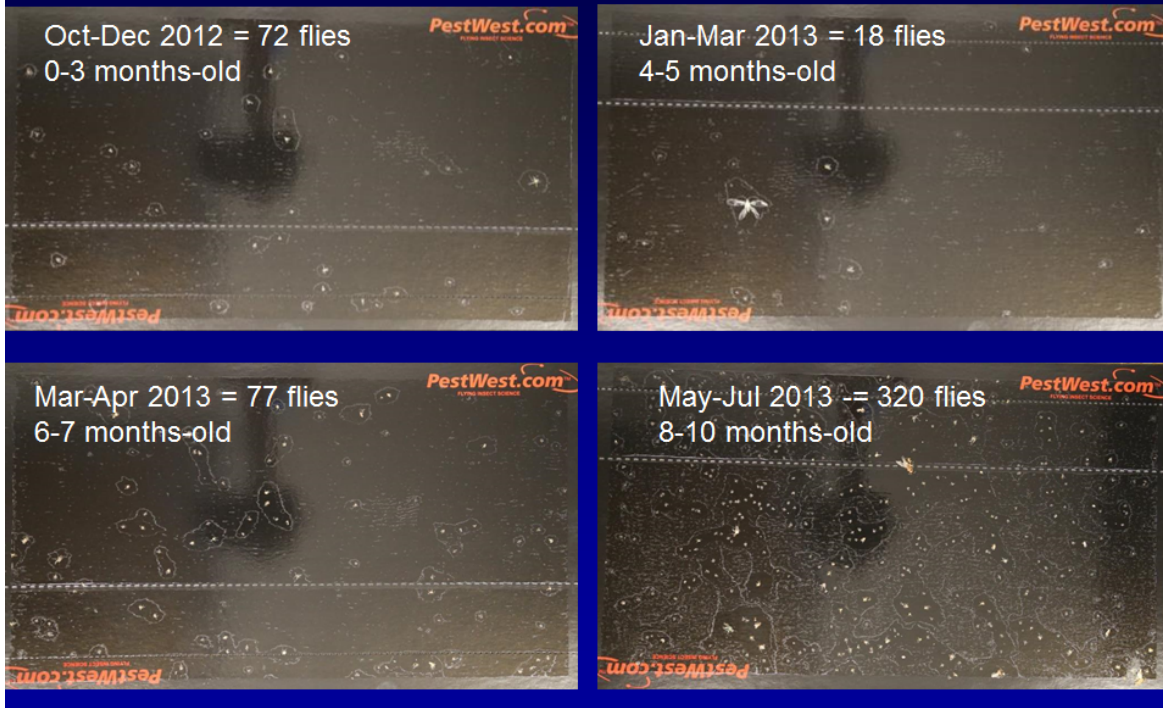
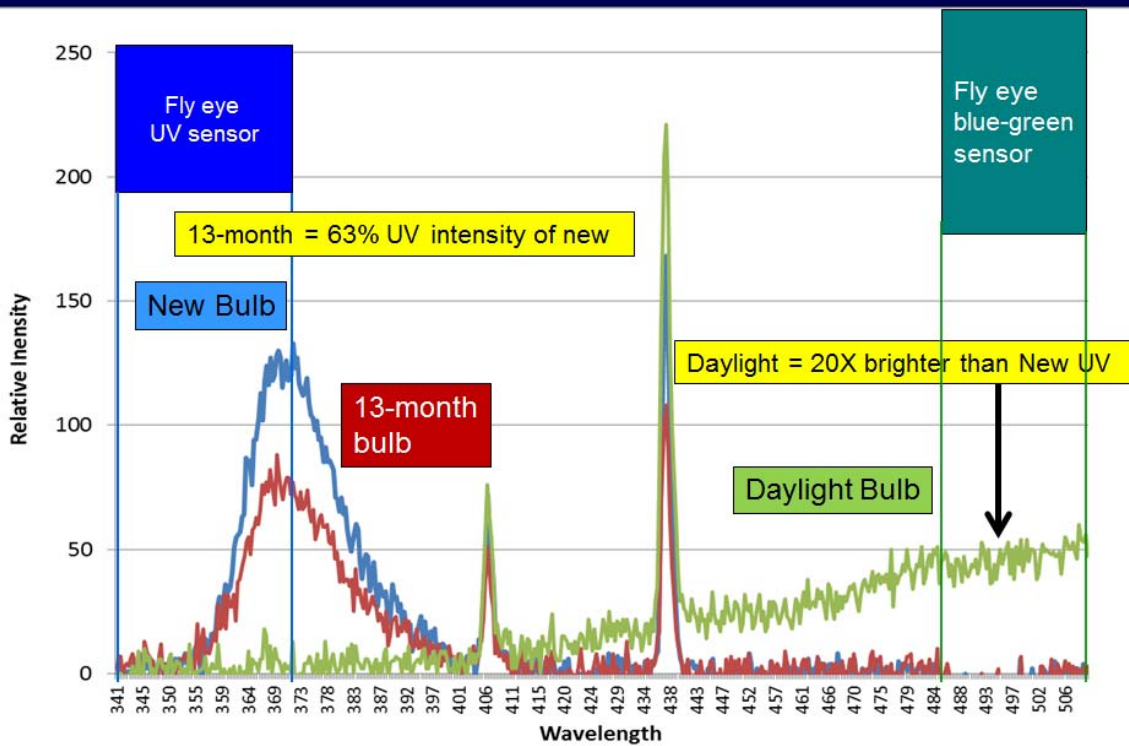


Figure 2. Glue Boards from field sites.

To do a direct comparison of aged bulbs to new bulbs, bulbs with a known age of 13 months were taken from the field to use in the lab. In the lab comparisons were made of the 13 month old UV bulbs, new UV bulbs and Day light bulbs. When spectrometer readings of each of these bulbs were taken the following was found(Graph 3):

1. 13 month old bulbs had 63% of the UV intensity of new UV bulbs.
2. Daylight bulbs were 20 times brighter in the blue-green spectrum than new UV bulbs.

Fluorescent Bulb Light Intensities



Graph 3. Graph showing Wavelength and Intensity of New UV, Old UV and Day light bulbs.

Testing was also done using a cage to determine the attractance of flies to the day light bulb, 13 month old UV bulb and new UV bulb. The cage measured 30' wide x 30' deep x 36' high (Figure 3). An ILT was placed in the cage and fitted with the specific bulb being tested. 100 flies were released in the cage and a count of flies captured was taken after 1 hour.

Cage (30 x 30 x 36 inches) Experiment

100 flies released

1 hour trap catch

Bulbs

Daylight
New UV
13-month UV



Figure 3. Cage Test

When compared against each other the following was found:

1. New UV bulbs caught 62% when compared to no bulbs caught 1%
2. New UV bulbs caught 54% when compared to Daylight bulbs 58%
3. New UV bulbs caught 66% when compared to Old UV bulbs caught 72%

These cage tests only allowed the flies' one option in the cage. In order to test a true preference for each of the different light sources a Two Sided Light Tunnel Test was used (Figure 4). In this test, white styrofoam coolers were used to hold an Insect Light Trap. Two coolers were connected by a black tube. Flies were released into the center of the tube and had the option to go right or left based on their preference for the light source.

Two sided light tunnel (TSLT) True Preference Test



Figure 4. Two Sided Light Tunnel Test.

In this test, the effect of white vs. black glue boards and the effect of a black box interior vs. white box interior were also investigated. In each of these tests, 150 flies were released and one hour elapsed before counts were taken. Results from the tests were as follows:

1. When comparing white vs. black glue boards, both fitted with new UV bulbs, 38% were caught in the black glue board and 36% were caught in the white glue board. No significant difference.
2. When comparing a black box to a white box, both fitted with ILT's containing new UV bulbs and black glue boards, 43% were caught in the glue on the black box side and 31% were caught in the glue on the white box side. Significant difference.
3. When comparing black box to black box with new UV bulb to 13 month old UV bulb, 63% were in new UV side vs. 36% in 13month old UV side. From these sides 39% were in the glue on the new UV side vs. 22% in the glue on the 13 month UV side. Significant difference.

A room test was also conducted. This test was designed to test the effects of the different bulbs in real world situations. In this test an Insect Light Trap was placed in an empty bedroom (Figure 5). The bedroom had an ILT on one end of the bedroom and two daylight fluorescent lights on the other end. The room also contained water and sugar water sources. 150 flies were released in the room and the count of flies caught by the ILT was

taken after two hours. 3 identical rooms were used and different bulbs were rotated through the different rooms as repetitions. In this test, the ILT with new UV bulbs captured 59% of the flies released. The ILT with the 13 month old bulbs captured 50% of the released flies.

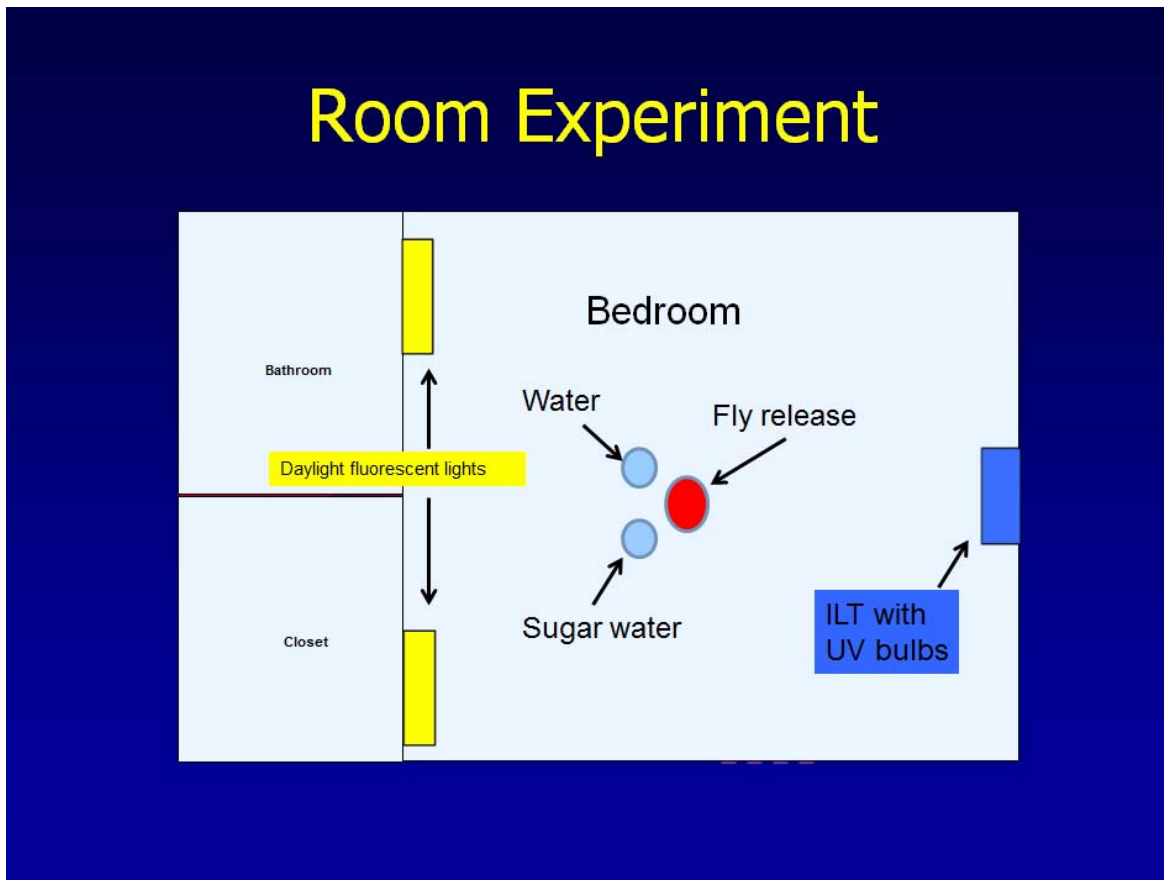


Figure 5. ILTs in room test.

In this test, the ILT with new UV bulbs captured 59% of the flies released. The ILT with the 13 month old bulbs captured 50% of the released flies.

Conclusions

Flies are attracted to ILT's when the bulbs are activated. When given only one option, day light bulbs are just as attractive to flies as UV bulbs and new UV bulbs are just as attractive to flies as old UV bulbs. When given an option, old UV bulbs are 63% as attractive to flies as new UV bulbs. The color of the box in which an ILT is placed in a choice test effects the preference. Flies had a preference for the ILT in a black box over that of one in a white box at a rate of ~1.8X. Color of the glue boards does not affect fly catch. 13-24% of flies that are attracted to a light in a preference test are not actually caught on the glue boards. In a room test, Old UV bulbs catch 80-90% as many flies as new UV bulbs.