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# Infrared Lighting Does Not Suppress Catch of Codling Moth (Lepidoptera: Tortricidae) in Pheromone-Baited Monitoring Traps

C. G. Adams[1,*], P. S. McGhee[1], and J. R. Miller[1]


## Abstract

Video cameras are increasingly being used to record insect behaviors in the field over prolonged intervals. A nagging question about crepuscular and nocturnal recordings is whether or not infrared light emitted by such cameras to illuminate the scene influences the behaviors of the subjects or study outcomes. Here we quantified catches of male codling moths, *Cydia pomonella* (L.), responding to sex pheromone-baited monitoring traps illuminated with infrared, red, white, or no light. No statistically significant differences were found between any of these treatments.


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Remotely deployed video cameras are increasingly being used to record insect behaviors in the field over prolonged intervals (Grieshop et al. 2012, and references therein). Such cameras usually come equipped with infrared lighting for nocturnal recording. For example, Cardé et al. (1998) used such a camera to record and interpret nocturnal visits of pink bollworm, *Pectinophora gossypiella (Saunders),* males to sex pheromone-baited monitoring traps in cotton fields under mating disruption. Measures such as number of moth visits to the trap, timing of visits, number of insects captured, and elapsed time spent in trap interactions or arrestment near a trap can thus be conveniently captured and quantified.

A question that has repeatedly surfaced among researchers employing such equipment is: does the illumination enabling nighttime videography influence male moth behavior at a monitoring trap? It could be postulated that the additional illumination might suppress behaviors, possibly due to a heat or static electric field effect (Newland et al. 2008), if not by the light itself (Herms 1932). Alternatively, some researchers have wondered if added light might enhance behavioral responsiveness when it is focused on sources of sensory cues. The usual speculation is that there should be no effect because it has been shown that the visual pigments of some insects are insensitive to long wavelengths of visible light or to infrared light (Wigglesworth 1972, Menzel 1979). Some authors (Callahan 1965, Traill 2005) have cautioned that the assumption of no response to infrared light by insects might be an over-reach. Some bark beetles are reported to be highly sensitive and responsive to the infrared emissions associated with forest fires (Evens 1966).

Here we report results of a small but definitive field test on whether administering infrared light from a video camera, red light from a head lamp, or white light from a headlamp to sex pheromone-baited monitoring traps for the codling moth, *Cydia pomonella*, had any influence on captures.

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## Materials and Methods

This test was performed within the 20 × 20 × 3 m field cages, each covering 12 standard-sized apple trees, described by Miller et al. (2010). We used codling moth (CM) purchased from the Okanagan-Kootenay Sterile Insect Release (SIR) rearing facility (Summerville, British Columbia, Canada) or Benzon Research (Carlisle, PA). For each of three replicate blocks of this experiment, 100 2-3 day-old male CM were handled and released as per Miller et al. (2010) uniformly within one cage in the early afternoon of each run. One Pherocon VI insect trap (Trécé Inc., Adair, OK) baited with a grey rubber septum loaded with 0.1 mg codlemone was hung 1.5 – 2.0 m above the ground in each of 5 trees per cage so that traps were uniformly distributed and approximately equidistant from one another. Thus, each cage had a full set of the 5 treatments randomly applied to traps for each experimental run.

The five treatments were designed to test whether infrared light, white light, red light or other operating features of our digital video cameras (Q-See model QOCDC36 Digital Peripheral Solutions Inc., Anaheim CA) affected numbers of moths captured. For each treatment a single camera, at the same elevation as the trap and 60 cm away, was aimed directly at the trap. The five treatments were: 1) an energized camera with infrared lamp activated (800-1400 nm, <10 lx); 2) an energized camera with black construction paper completely blocking the infrared lamp; 3) an energized camera with blocked infrared lamps and an Energizer 3 LED Trail Finder Head Lamp (model MPN: HD33A20DE, Energizer, Inc., St. Louis, MO) placed adjacent to the camera's lamp and operating in the red light mode (650-680 nm, 60 lx); 4) an energized camera with blocked infrared lamps and an Energizer 3 LED Trail Finder Head Lamp (model MPN: HD33A20DE Energizer, Inc., St. Louis, MO) placed adjacent to the camera's lamp and operating in white light mode (400-700 nm, 250 lx); and 5) a powered off camera with no light. Batteries to power the cameras were configured in a manner consistent with Grieshop et al. (2012).

Traps were checked and the CM counted each morning for 5 days following each experimental run. The overall experimental design was randomized complete block with treatments randomized for each run. The three blocks were accumulated across three weeks during the summer of 2009 using different cages deployed across the 8 ha orchard. Moth capture data were analyzed by 2-way ANOVA (SAS Institute 2012).

## Results and Discussion

Mean male CM catch per trap (Fig. 1) was not significantly influenced by any of the treatments ($F = 0.399$; df = 4,10; $P = 0.804$). Illumination of traps by video cameras with active night vision using infrared light (800-1400 nm, <10 lx) did not suppress codling moth trap capture. This outcome supports the widely held assumption that this form of passive observation does not interfere with the pheromone-mediated behaviors of this crepuscular and night-active moth species. No evidence was found that IR light or the electromagnetic emanations from a video camera operating in very close proximity to traps had any influence on catch in a monitoring trap. Here is one example that can now be cited confirming that the infrared lighting and electromagnetic fields typically emitted by video cameras did not influence the behavioral outcome of capture of a tortricid moth in a pheromone baited trap. However, before a sweeping generalization can be made to that effect, further studies with other animal taxa need to be performed, perhaps using the simple experimental design employed here.


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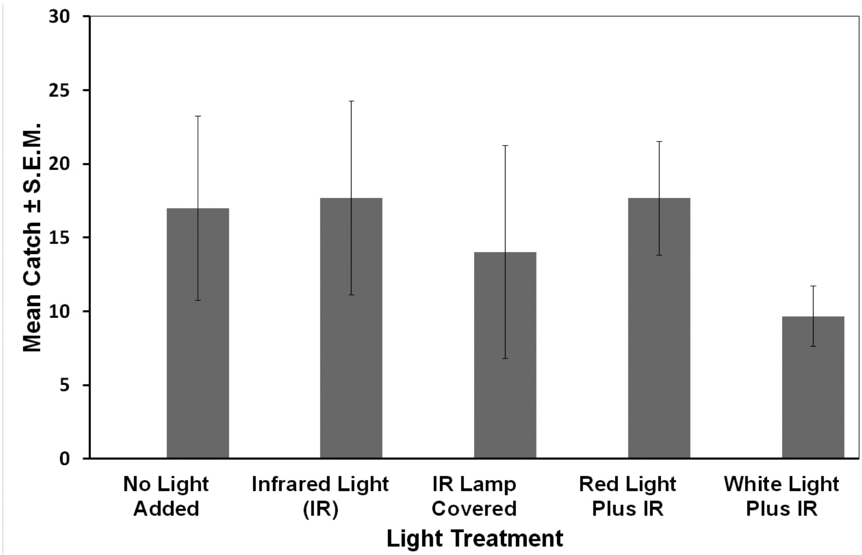


**Figure 1.** Catch of codling moth males per single pheromone-baited monitoring trap as influenced by the type of illumination bombarding the trap. No significant differences were detected among treatments ($F = 0.399$; df = 4, 10; $P = 0.812$).

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