A Novel Non-Invasive Method to Detect Pebrine Disease in Sericulture by Using Phototaxis of Hatched Silkworm (Bombyx mori)

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Pebrine disease caused by Nosema bombycis is the most dreaded infectious disease in sericulture practice, accounting for 30% yield loss of silkworm with estimated economic loss of 10 million USD annually. Until now, there is no cure to treat this disease. Thus, the incarnation of silkworms in a crop is only the solution. Disease detection is necessary to prevent further dissemination. However, the disease is asymptomatic during the early stage. The conventional microscopic examination of N. bombycis spores can be used to detect Pebrine in larvae. But this invasive method is the sampling method, and it requires silkworms from a specific stage (i.e., 7 – 10 days). The method also requires experts and a laboratory. Our project aims to develop a novel non-invasive method to detect Pebrine disease in sericulture using phototaxis of hatched silkworms. From previous observations, hatched larvae of silkworms showed phototaxis and the green light had more percentage of phototactic than blue, yellow, red and purple light, respectively. Infected Pebrine larvae do not exhibit this behavior. The patterns of phototaxis were used to develop detection tools and increase the efficiency of detection by developing a machine learning algorithm as a model for differentiating free and infected silkworms. This novel method is highly effective for Pebrine disease screening (97.6% accuracy), and it did not kill the worm in the test. Moreover, all larvae were screened, and farmers can use it by themselves.

Awards Won:

Second Award of $2,000