**A study on the effect of diapause length on the digestive efficiency of the European corn borer**

**Abstract**

The objective of this project is to measure the effect diapause length has on the digestive efficiency of the European corn borer. In this study we will use two strains of the ECB (European corn borer larvae) and artificially manipulate the photoperiods of the environment. This will allow us to recreate summer and winter days using photoperiod chambers. To measure the digestive efficiency of the ECB, artificial diet will be placed with the larvae in the chambers. At the end of the fifth instar, the larvae will be separated from the diet and their container. The weight of the diet will be measured before and after consumption giving the mass of the diet consumed. This mass of the diet consumed will be measured against the mass of the collected frass from the larvae. Using those figures, we will calculate the digestive efficiency of the European corn borer.

**Hypothesis**

The ECB that experience longer summer-like photoperiods are expected to have a higher digestive efficiency than the ECB reared in winter-like photoperiods. The reasoning behind this is because the digestive track slows down while asleep, so it is believed that the more daylight the larvae experience the more diet they fully digest. Testing the digestive efficiency over the two photoperiods will allow insight if this theory proves accurate.

**Material and Methods**

For this experiment, we will be using two strains of larvae from [insert company name], [strain names]. The larvae will be placed into trays at the beginning of the fifth instar, each larva will be reared in its own well. Pre-weighed artificial diet will be added to into each well of the tray with the larvae. The trays will be placed into environment control chambers, where one chamber will be set to a summer mimicking photoperiod and the other will be set to a photoperiod mimicking winter. At the end of the fifth instar the larvae will be taken out of the trays and the diet will be dried out. Taking the dehydrated diet, we will insert them into pre-weighed viles filled with peptone water. Vortexing the viles on a low level will allow the frass to be easily removed from the diet’s surface. The diet will then be removed from the viles carefully and dried in the oven at 60 degrees Celsius. The peptone water and frass will then be dried out in the speed vac. Taking the difference in the weight of the viles before and after use will give the mass of the frass, while the difference in the diet before and after consumption will give the mass of the diet consumed by the ECB. The sum of the frass produced will be divided by the sum of the diet consumed to obtain the digestive efficiency of each strain and photoperiod.

∑ Frass\_\_\_\_

= Digestive Efficiency

∑ Consumed diet

Peptone water recipe

1. Make peptone water solution.
   1. Weigh out 1.0g of peptone into a weigh boat.
   2. Weigh out 0.5g of sodium chloride into a separate weigh boat.
   3. Add 100 mL deionized water to glass storage jar.
   4. Dissolve peptone and sodium chloride into deionized water by swirling.
      1. Homogenized solution should be light yellow/beige.

**Discussion**

This project will benefit the insect control industry by providing information that has not been studied before. With the potential of different consumption and digestion patterns farmers will be able to efficiently deal with the European corn borer who would otherwise be destroying crops or be killed by overuse of pesticide. This data will help farmers decide how much pesticide they need when, with very little waste. This in turn saves the farmer money and prevents unnecessary pesticide runoff.