

Parker Denny
Research Project
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Capstone Summary: Evaluating the Toxicity of Corn Seed Treatment Components to Honey Bees

The goal of this research project was oriented around the hypothesis that drifting talc powder from seed hoppers planting in a field causes honey bee mortality. It is known that seed treatment manufacturers are required to examine the toxicity of the individual components but are not required to examine the toxicity of the cocktail that makes up the entire seed treatment. We hypothesized that the seed treatment cocktail that the talc powder within the seed hopper would be more toxic overall than talc powder mixed with a single neonicotinoid (clothianidin). Our project took that idea and compared this used talc powder from a seed hopper (analyzed into individual components) and compared it to talc powder mixed with a single neonicotinoid pesticide. These components were diluted (10x, 1x, 0.5x, 0.1x, 0.01x) and mixed with sugar water. The dilutions are based on the LD50 of the single neonicotinoid pesticide where the LD50 concentration makes up the 1x dilution. The control group was fed pure talc powder mixed with sugar water to determine the effects of pure talc powder on the insects. The honey bees were then placed in cages with sugar water and pollen patties and observed over the next 36 hours.

These treatments were compared based on the total mortality and the mortality over time of the insects. The mortality of the bees (see figure 1) was very similar in the highest concentration (10x) and the two lowest concentrations (0.1x and 0.01x). The 0.5x and 1x dilutions fed to the honey bees resulted in roughly double the overall mortality in the seed treatment group over the single neonicotinoid pesticide. The effect of the different seed treatment group dilutions was also notable. Where there was significantly lower mortality in each dilution lower than the first. In the single neonicotinoid group, the 10x and 1x dilutions had noticeable casualties where the 0.5x, 0.1x, and 0.01x dilutions tended to cluster around the low mortality of the control. Over time, trends showed that these treatments tended to kill the insects within a few hours after feeding (see figures 2 and 3).

Overall the results seem to suggest that there is a significant difference among the 1x and 0.5x groups between the two treatment based on a chi squared test. With a larger experiment (more bees), a very significant trend line may demonstrate an extremely significant difference between the seed treatment drifting talc and the single neonicotinoid treatment. Additionally, placing the honey bees in larger cages in a controlled environment may also reduce cage stress and mortality among the control groups. If this experiment were to take place on a more massive scale, we may be able to observe trends that may change the way we look at and examine seed treatments.

Treatment Comparison

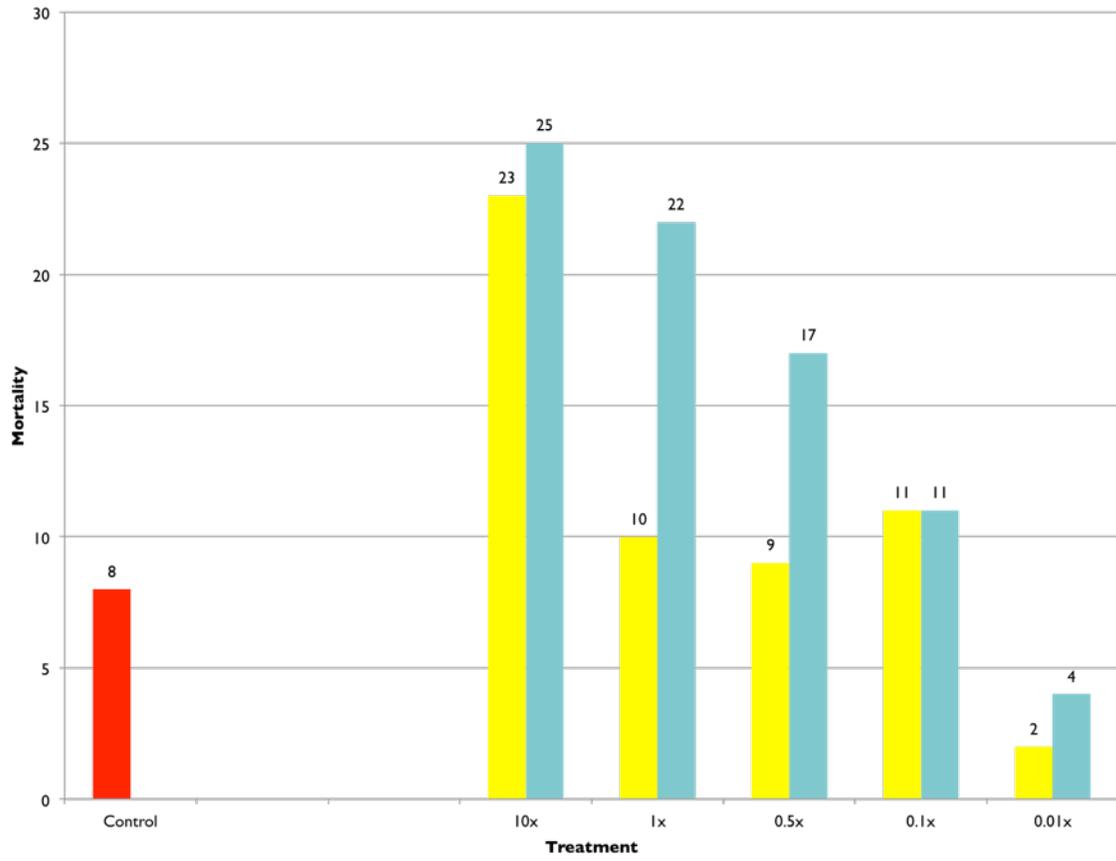


Figure 1

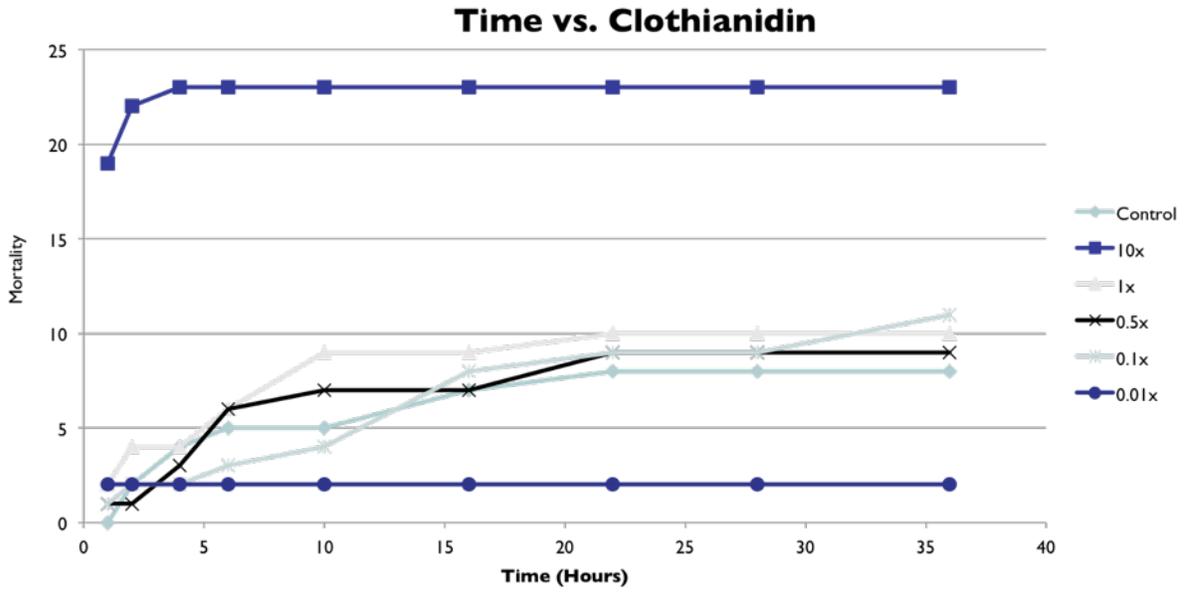


Figure 2

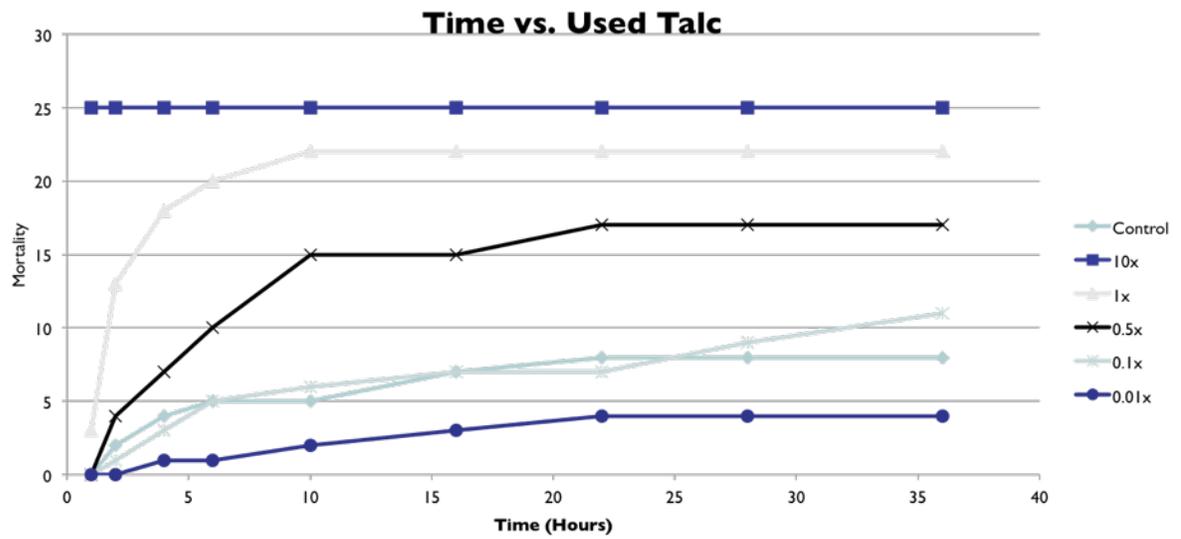


Figure 3