Using Response Surface Methods to Optimize a Repellant for the Invasive Sri Lankan Weevil, Myllocerus undecimpustulatus undatus Marshall (Coleoptera: Curculionidae: Entiminae)

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The Sri Lankan weevil, or Myllocerus undecimpustulatus undatus Marshall, is a destructive and invasive pest with a host range of >150 different plant species. In the adult and larval stages, it inflicts severe damage to plants' foliage and root systems. Because of this, there is a dire need to find appropriate and sustainable control methods for this weevil. The objective of this study was to find the optimal component blend that could be utilized as an attractant or repellant of the Sri Lankan weevil using modeling and statistical processes known as Response Surface Methods. Using RSM, 14 component blends, each containing differing amounts of (Z)-ocimene, (Z)-3-hexen-1-ol, and 2-Ethylhexanol (determined to be individual attractants in previous experimentation) were selected to test. A Y-tube olfactometer was used to evaluate the Sri Lankan weevil's behavioral response to the selected component blends. The number of Sri Lankan weevils entering the treatment arm, control arm, or remaining in the release port area was recorded after 1 minute, 5 minutes, and 10 minutes. Using Design Expert Software, the data were inputted and fitted onto the model. A one-way ANOVA analysis was then performed. The response surface model for the percent of weevils that moved into the control arm after 10 minutes was highly significant ($p = 0.0047$). This model indicated that component blends 1 and 10 (both composed of 50% (Z)-b-ocimene and 50% (Z)-3-hexen-1-ol) were optimal repellants . This optimal repellant blend offers an environmentally friendly alternative to pesticides that has the potential to be used widely in the management of this pest. The results of this study prove to be novel and very valuable to the agricultural industry.

Awards Won:

Third Award of $1,000