Developing a Monomolecular Model To Describe the Disease Progress Curve for Early Blight in Tomato (Solanum lycopersicum), Potato (Solanum tuberosum), and Bell Pepper (Capsicum annuum), Treated With Novel Microbial Formulations

Patel, Shloke (School: Hillsborough High School)

Early blight, a fungal disease, leads to annual crop losses of up to 70-78% in tomato, potato, and bell pepper crops. Current treatment requires repeated application of chemical fungicides, resulting in fungicidal resistance. Previous studies have identified microorganisms that enhance plant growth or prevent the growth of early blight spores. This study aims to produce a biological fungicide with a multi-site mode of action that can be used in fungicide rotation or in a tank mix. Eight microorganisms and fungi were multiplied for two weeks on their respective media to develop the three microbial formulations and fungal inoculum. The fungal inoculum was sprayed on the 90 plants (tomato, potato, and bell pepper) until runoff. Five treatments: untreated control, three microbial formulations, and industry-standard were replicated six times. After 24 hours, formulations were sprayed, and the disease severity was recorded weekly for 28 days. The average area under disease progress curve (AUDPC) values were calculated to measure the disease progression: for tomato, formulation 2 had an AUDPC value of 189.58 (p-value 1.98E-05), in potato, formulation 1 had an AUDPC value of 175 (p-value 6.40E-10), and in bell pepper, formulation 3 had an AUDPC value of 115.17 (p-value 1.91E-08). A monomolecular model was used to describe the disease progression of non-linear data. A paired t-test was conducted to validate the significance of the data (p-value ≤ 0.05): it showed that the formulations performed close to industry-standard, indicating that the formulations can be commercially developed.

Awards Won:

Second Award of $2,000

University of Arizona: Renewal Tuition Scholarship