ML 2014, Chapter 312, Article 12, Section 8 Project Abstract
For the Period Ending December 30, 2019

PROJECT TITLE: MITPPC Sub-project #1 Novel Diagnostic Tools for Rapid and Early Detection of Oak Wilt
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FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: ML 2014, Chapter 312, Article 12, Section 8

APPROPRIATION AMOUNT: $271,911
AMOUNT SPENT: $271,911
AMOUNT REMAINING: $0

Sound bite of Project Outcomes and Results

This project developed a novel, patented Nanoparticles Enhanced Chemiluminescence assay for the rapid detection of the fungus *Bretziella fagacearum* that causes oak wilt disease. Early detection of invasive forest pathogens is expected to have a significant economic impact by preventing the spread of diseases and the conservation of natural resources.

Overall Project Outcome and Results

Oak trees (*Quercus* spp.) play a significant role in the ecosystem and are considered economically important for several reasons. They are prone to oak wilt disease, caused by the fungus, *Bretziella fagacearum*, which is of huge concern due to the reduced profitability in their production. Affected trees cannot be cured and so, early, and rapid identification of the infection is necessary to prevent spreading. The objectives of this study include the development of cell separation method of woodchips and DNA extraction method, followed by the development of a rapid detection assay in combination with a handheld system. Infected and healthy red oak wood chip samples were collected from different parts of Minnesota followed by DNA extraction and testing using the chemiluminescence-based chemical assay. In phases I and II of this project, we developed a novel Nanoparticles Enhanced Chemiluminescence (NEC) assay. The major accomplishments include: **(1)** Combination of the DNA extraction protocol with NEC assay detection. **(2)** Application of the NEC assay on real-world samples (wood chips from healthy and infected red oak trees) and determination of the sensitivity (88.8 %) and specificity (73%) of the NEC assay. **(3)** Optimization of the reaction conditions. Additionally, MITPPC phase III proposal has been approved to expand the NEC assay to various invasive forest pathogens of high priority to Minnesota and conduct third party validation of the technology. The major impact of this project will be the improvement of diagnostic capabilities of plant diagnostic clinics and laboratories by offering a highly sensitive and cost-effective tool for rapid identification of oak wilt. The spread of the disease can be stopped at an early stage by administering treatments and implementing preventative measures. The proposed technology will help protect Minnesota natural resources and reduce the financial burden of oak tree removal.

Project Results Use and Dissemination

Description: The research findings were disseminated through regular updates to the Minnesota Invasive Terrestrial Plants and Pests Center, non-peer reviewed outlets (e.g., newsletters or websites), and peer-reviewed publications. This project was also discussed through formal and informal presentations to stakeholder groups and scientific societies.