

Treating White Leaf Disease in Sugarcane Cuttings Using Solution Plasma

Janjira Sroykaew¹, Komgrit Leksakul^{1*},
Dheerawan Boonyawan² and Angsana Akarapisan³

¹Faculty of Engineering, Chiang Mai University, Chiang Mai 50200, Thailand

²Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

³Faculty of Agriculture, Chiang Mai University, Chiang Mai 50200, Thailand

*Corresponding author. E-mail: komgrit@eng.cmu.ac.th

<https://doi.org.10.12982/CMUJNS.2018.0006>

ABSTRACT

Sugarcane, an important agricultural crop, is susceptible to white leaf disease, which can severely damage the crop and income. The disease is caused by phytoplasma, a prokaryote in the class mollicutes. This study investigated the efficacy of treating the disease by sterilization with solution plasma technology, including wire-to-wire, plasma jet, and gliding arc systems. Nested PCR and a scanning electron microscope were used to examine the phytoplasma disease and evaluate the effectiveness of the various solution plasma treatments. The most effective treatments, in terms of balancing plant growth and disease reduction, were the wire-to-wire system, with infected specimens immersed during discharge for 2 min with discharge repeated every 2 min, for 120 min (Exp 13); and the plasma jet system, with infected specimens immersed during discharge for 30 min and then continuously immersed for 180 min (Exp 18). The wire-to-wire treatment yielded 50% disease-free sugarcane specimens with 80% growth; the plasma jet system yielded fewer disease-free sugarcane specimens (40%), but more growth (90%). Additionally, SEM results showed that the solution plasma treatments as a group reduced disease incidence by about one third compared to the controls.

Keywords: White leaf disease, Sugarcane, Phytoplasma, Solution plasma

INTRODUCTION

Sugarcane, an important agricultural crop, is susceptible to white leaf disease, which can severely damage the crop and income. White leaf disease in sugarcane is caused by phytoplasma parasites that destroy the plant's chlorophyll, which is responsible for photosynthesis and the green color of the leaves. Phytoplasma are bacterial parasites classified as prokaryotes of the mollicutes class (Pagliari et al., 2016). They have no cell wall and are of an uncertain shape of 400-900 nm. They live in the sieve tubes of the sugarcane, scattering to all parts of the plant. White leaf disease cannot be cultured in synthetic food (Om-Hashem et al., 2015).