"Research and Innovation towards Sustainable Food System"

THE 4th POSTGRADUATE SYMPOSIUM

9 December 2021

**Faculty of Agro-Based Industry,
Universiti Malaysia Kelantan,
Jeli Campus, Kelantan,
Malaysia**

The 4ᵗʰ Postgraduate Symposium
"Research and Innovation towards Sustainable Food System"
eISBN 987-967-2912-88-0

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Organized by
Faculty of Agro-based Industry (FIAT)
Universiti Malaysia Kelantan

in collaboration with
Guru Ghasidas University, University Gadjah Mada, Vikrama Simhapuri University, Princess of Naradhiwas University & Yogi Vemana University

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Internet of Things (IoT) Approach to Detect and Modelling Fusarium Wilt Disease on Banana

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ABSTRACT

The continuing development of Internet of Things (IoT) is becoming progressively important in agriculture activities including plant disease identification. Consequently, the IoT technology will act as a game-changer in plant disease identification from manual to automated detecting plant disease. In ancient farming, most plant diseases identification were conducted manually based on the external symptoms which only can be done by experienced people and require more manpower to monitor the farms. Thus, this scenario brings difficulty for young or inexperienced farmers to identify the plant disease. This paper describes the development of IoT technology for detecting Fusarium wilt disease in bananas at the early stage of disease infestation under the greenhouse environment. Sensors will be equipped inside the greenhouse with microcontrollers, communication networks, and suitable protocols to capture soil parameters such as soil moisture content, pH, electrical conductivity (EC), and temperature. Then, all the measured data will be stored and managed properly using Thingspeak. To better understand the association of soil parameters with Fusarium wilt disease, a mathematical modelling will be done to simulate the disease progression using output data. As a result, this study will give insightful real-time data monitoring using IoT technology to determine the threshold of favourable soil conditions for Fusarium wilt disease occurrence.

Keywords: Environmental monitoring, fusarium, Internet of Things (IoT), sensors, smart agriculture

INTRODUCTION

As with other technologies, the Internet of Things (IoT) is rapidly being explored in the agriculture industry in Malaysia. From an agriculture perspective, IoT technology promises farmers to monitor their crops growth and field conditions through intelligent devices anywhere and anytime (Antony et al. 2020). Over the years, banana farming has faced significant global constraints in production. To date, Fusarium wilt disease or also known as Panama disease caused by *Fusarium oxysporum* f. sp. *cubense* (Foc) remains a critical threat to banana production loss for most banana cultivars globally (Olivares et al., 2021). Worries have been highlighted that banana production would be unable to serve the increasing global population, including Malaysia. By 2050, United Nations (UN) predicted the world population could reach up to 10 billion (Alexandratos & Bruinsma, 2012). This would put pressure in the food production industry to fulfil the demand of the population.