Thesis Title	Development for Boron Analysis Method in Soil Using a Fluorescence Sensor
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ABSTRACT

Boron is an essential soil micronutrient critical for plant physiology, supporting fruit development, cellular growth, and cell wall integrity. Both boron deficiency and excess are highly detrimental to plant health, causing stunted growth, fruit abnormalities, or toxicity symptoms, respectively. Therefore, accurate determination of soil boron concentrations is crucial for maintaining optimal nutrient levels to enhance crop productivity and ensure overall plant health. In this work, a homemade fluorescence spectrometer consisting of an LDR sensor and 365 nm light source was developed for effective boron detection in soil samples. N-(9-Anthrylmethyl)diethanolamine was synthesized and utilized as a fluorescent reagent specifically for boron ion detection. The fluorescent reagent volume, pH conditions, and incubation time parameters were systematically studied and optimized. Under these optimized experimental conditions, the analytical system demonstrated excellent linear correlation (R^2 = 0.9983) over a working concentration range of 5.7×10^{-7} to 5.7×10^{-3} M. Method validation was conducted at the 95% confidence level using soil samples (n = 7), with the developed sensor results statistically compared to those obtained by the standard ICP-MS method. The results showed no statistically significant difference between the developed sensor and ICP-MS methods, with the calculated *t*-value (1.343) being less than the critical *t*-value (2.447). The method achieved lower detection limits with reagent stability successfully maintained for 30 days. The developed sensor provides a viable, cost-effective alternative to ICP-MS for routine boron analysis in agricultural applications.

Keywords: Fluorescence Sensor, Light Dependent Resistor (LDR) Sensor, Boron