

ABSTRACT

Indonesia stands as a leading agricultural nation in Southeast Asia, where the agricultural sector serves as a cornerstone of the national economy. Among its key commodities, durian contributes substantially to fruit production with an annual yield of about 1.85 million tons. Durian shells contain cellulose, lignin, and hemicellulose which can be utilized as a precursor for carbon-based materials. This study aims to synthesize CQDs derived from durian shells through a hydrothermal method, determine its characteristics, and evaluate its potential activity as a nanofertilizer to enhance the growth of bok choy (*Brassica rapa*) under a hydroponic cultivation system. The synthesis of CQDs in this study was carried out using a hydrothermal method with variations in reaction time under 120°C. Characterization revealed that the optimal CQDs product was obtained from synthesis at 120 °C for 6 h, showed by maximum emission peak at 413 nm. FTIR analysis confirmed the presence of functional groups included hydroxyl, alkene, carbonyl, and hydrocarbon groups, which are typical of carbon-based materials. In addition, CQDs demonstrated an average hydrodynamic diameter of 6.58 nm, while the resulted zeta potential is -13.63 mV. Biological activity assays demonstrated that nanofertilizer CQDs variation of KD020 enhanced the growth of bok choy based on ANOVA and DMRT analyses, including number of leaves, leaf length, and leaf width over 3-6 week after planting.

Keywords: Carbon Quantum Dots (CQDs), durian shell, hydrothermal, nanofertilizer, bok choy (*Brassica rapa*).