

## **ABSTRACT**

*Indonesia, as a tropical country, generates a large amount of fruit peel waste every year, which poses a potential environmental threat. This study aimed to synthesize and characterize Carbon Quantum Dots (CQDs) derived from banana, papaya, orange, pineapple, and dragon fruit peels using the hydrothermal method, and to evaluate their application as a supplementary fertilizer for pakcoy (*Brassica rapa L.*) cultivated in a wick hydroponic system. The synthesis was carried out at 200 °C for 1–5 hours, and the CQDs were characterized using PL, QY, FTIR, and PSA. The optimal result was obtained at 5 hours (CQ205), exhibiting an excitation peak at 349.07 nm, an emission wavelength of 430 nm, a fluorescence intensity of 380.74, a QY of 70%, functional groups –OH, –COOH, and C=O, and an average particle size of 17.39 nm. The bioactivity test revealed that the CQ20AB treatment (0.2 mg/mL + AB mix) significantly enhanced the morphological growth and chlorophyll content of pakcoy based on ANOVA and DMRT analyses. The improvements were observed in leaf number, leaf length, leaf width, and chlorophyll content, with respective values of 9.58, 11.16, 7.59, and 0.0034.*

**Keywords:** *Bok choy, Carbon Quantum Dots (CQDs), hydroponics, hydrothermal, and nanofertilize*