

Application of Pulsed Electric Field-Based Calcium Oxalate Reduction Technology as an Effort to Optimize Processing and Increase Production of Malang Porang MSMEs

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ABSTRACT

Porang tuber is a high-value commercial product widely cultivated in Indonesia, targeted to reach a production of 600,000 tons from 100,000 hectares by 2024, according to the Ministry of Industry. Despite its economic potential, porang tubers contain calcium oxalate, a compound that can cause health issues such as rheumatic diseases and kidney stones. Traditional decontamination methods often damage the tuber's quality or require lengthy processing times. In contrast, Pulsed Electric Field (PEF) technology offers a promising alternative by extracting unwanted compounds through electroporation and electropermeabilization without damaging the tuber's quality. This study utilizes the ADDIE method, incorporating both qualitative and quantitative approaches, and involves nine treatment samples and one control sample. Two key variables were tested: voltage strength (5, 10, and 15 kV) and PEF exposure time (30, 60, and 90 seconds). The findings reveal that (1) PEF treatment at 15 kV for 90 seconds resulted in the lowest calcium oxalate content (1.91 mg/100 g), which is below the SNI 7939:2020 threshold. (2) The PEF process did not harm the physicochemical properties of the porang tubers. The viscosity remained unaffected, water content decreased to 7.63%, meeting SNI standards, and starch carbohydrates were preserved. Additionally, functional group peaks confirmed the presence of high glucomannan content in the samples. (3) The highest drying rate (1.81 g/hour) was achieved by sample W3V3, treated with 15 kV for 90 seconds. For future research, it is recommended to test additional variations and apply this method to other agricultural commodities to further validate its potential.

Keywords: *PEF, Porang, CaC₂O₄, Reduction*