Thesis Title	Productions and Modifications of Avocado and Jackfruit Seed Starches
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ABSTRACT

This research examines the physicochemical and functional characteristics of starch derived from avocado and jackfruit seeds, which are currently underutilized in industrial applications. Starch was extracted from both seeds using wet and dry milling methods and initially characterized. To enhance their properties, citric acid esterification and hydrothermal treatments, namely annealing and heat-moisture treatment were employed. The impacts of these modifications were assessed to evaluate their industrial potential. Three experimental setups were conducted to achieve these objectives.

In Experiment 1, avocado and jackfruit seeds were processed into flour using dry and wet milling techniques, followed by starch isolation through alkaline steeping. The native flours and starches were then evaluated for proximate composition, amylose content, color, morphology (SEM), crystallinity (XRD), pasting behavior (RVA), thermal properties (DSC), and textural profiles. The results demonstrated that dry milling yielded higher levels of protein, fat, and ash, whereas wet milling combined with alkaline steeping produced starches with higher purity, lightness, and well-defined granules. Avocado starch exhibited B-type crystallinity, while jackfruit starch displayed A-type, with both showing differences in thermal behavior and paste viscosity depending on the processing method.

In Experiment 2, the isolated starches were chemically modified via citric acid esterification at three concentrations (5%, 10%, and 15%). The resulting starch citrates were examined for degree of substitution (DS), changes in color and morphology, FTIR profiles, XRD patterns, and alterations in functional performance including viscosity,

thermal transitions, and gel texture. The 5% citric acid treatment improved gel-forming capacity and increased relative crystallinity in avocado starch, whereas higher concentrations (10% and 15%) caused significant granule damage, reduced paste viscosity, and poor gel formation in both starches.

In Experiment 3, physical modifications, annealing (ANN) and heat moisture treatment (HMT) were applied individually and in combination with 5% citric acid to assess their synergistic effects. The modified starches were characterized using similar techniques. ANN and ANN with 5% citric acid treatments enhanced the structural integrity and crystallinity of starch granules, while HMT and HMT with 5% citric acid treatments led to decreased paste viscosity and greater disruption of gelatinization properties. These results suggest a strong interaction between the applied physical and chemical modifications on starch behavior.

In conclusion, both avocado and jackfruit seed starches showed promise as functional food ingredients. The most favorable modifications in terms of performance were observed in samples treated with 5% citric acid, particularly when combined with ANN. This strategy minimized chemical usage while enhancing thermal stability, gel texture, and overall functionality, supporting their potential application in some food processing systems.

Keywords: Avocado Seed, Jackfruit Seed, Wet Milling and Dry Milling, Citric Acid Treatment, Annealing, Heat Moisture Treatment