

Rancang Bangun Mesin Reduksi Kadar Air Berbasis Elektroosmosis Non Termal Dewatering Untuk Meningkatkan Kualitas Industri Produk Selai Apel *Food Grade*

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ABSTRAK

Produksi selai apel lokal masih banyak yang melebihi standar SNI, yaitu sebesar sebesar 36,98% - 42,62%. Untuk mengatasi masalah tersebut, metode reduksi kadar air konvensional menyebabkan nutrisi dan tekstur pada selai apel rusak karena penggunaan suhu berlebih. Berdasarkan uraian tersebut, peneliti memanfaatkan prinsip *electroosmosis dewatering* untuk mengurangi kadar air secara non-thermal. *electroosmosis dewatering* mampu menurunkan kadar air pada makanan, melalui perpindahan partikel air dengan bantuan arus listrik. Tujuan dari penelitian ini adalah untuk (1) menjelaskan prinsip dan mekanisme kerja, (2) menguji kelayakan teknis, serta (3) potensi inovasi dibandingkan dengan teknologi sejenis. Penelitian ini menggunakan metode ADDIE (*Analysis, Design, Development, Implementation, and Evaluation*) dengan susunan yang sistematis. Uji kelayakan teknis pada penelitian ini yakni penurunan persentase kadar air (%), perhitungan konsumsi listrik (W), pengujian Tegangan (V), Arus listrik (A), perhitungan emisi karbon sebesar (Kg CO₂), *energy of dewatering* (Jmol), dan uji organoleptik. Hasil pengujian menunjukkan bahwa inovasi bekerja secara otomatis yang memiliki prinsip dan mekanisme kerja sebagai penurun kadar air berbasis *non-thermal electroosmosis dewatering*. Kation mengikat molekul air dan ditarik menuju katoda setelah diberi medan listrik. Berdasarkan hasil uji kelayakan teknis, variasi 48V dengan waktu 180 menit mengkonsumsi daya sebesar 145,7W dan mampu menurunkan kadar air dari 70,31% hingga 33,9, serta, inovasi ini mampu menghasilkan *energy of dewatering* hingga 429,39 Jmol dengan emisi karbon sebesar 0,5 Kg CO₂. Tes organoleptik menunjukkan bahwa inovasi ini mampu menurunkan kadar air tanpa mengubah sifat aslinya. Jika dibandingkan dengan 9 Inovasi sebelumnya, dari segi keefektifan, efisiensi, *food grade*, otomatis, dan *non-thermal*. Inovasi ini berpotensi untuk menurunkan kadar air hingga 12,1%/jam dengan harga pembuatan inovasi sebesar Rp.1.160.000,00 dan biaya konsumsi listrik yang lebih murah hanya sebesar Rp.5056,-/Hari.

Kata Kunci: *Electroosmosis dewatering, Kadar Air, Non-thermal, Selai apel*

ABSTRACT

Local apple jam production still exceeds the SNI standard by 36.98% - 42.62%. To overcome this problem, conventional water content reduction methods cause nutrients and texture in apple jam to be damaged due to the use of excessive temperatures. Based on this description, researchers utilized the principle of electroosmosis dewatering to reduce moisture content non-thermally. Electroosmosis dewatering is able to reduce moisture content in food, through the transfer of water particles with the help of electric current. The objectives of this study were to (1) explain the principle and mechanism of action, (2) test the technical feasibility, and (3) the potential for innovation compared to similar technologies. This research uses the ADDIE method (*Analysis, Design, Development, Implementation, and Evaluation*) with a systematic arrangement. The technical feasibility test in this study is a decrease in the percentage of water content (%), calculation of electricity consumption (W), testing Voltage (V), Electric current (A), calculation of carbon emissions by (Kg CO₂), *energy of dewatering* (Jmol), and organoleptic test. The test results show that the innovation works automatically which has the principle and mechanism of work as a water reducer based on non-thermal electroosmosis dewatering. Cations bind to water molecules and are drawn towards the cathode after being given an electric field. Based on the results of the technical feasibility test, the 48V variation with a time of 180 minutes consumes 145.7W of power and is able to reduce the water content from 70.31% to 33.9, and, this innovation is able to produce energy of dewatering up to 429.39 Jmol with carbon emissions of 0.5 Kg CO₂. Organoleptic tests showed that this innovation was able to reduce moisture content without changing its original properties. When compared to the previous 9 Innovations, in terms of effectiveness, efficiency, food grade, automatic, and non-thermal. This innovation has the potential to reduce water content up to 12.1% / hour with an innovation manufacturing price of Rp.1,160,000, 00 and cheaper electricity consumption costs of only Rp.5056, - / day.

Keywords: *Apple jam, Moisture Content, Non-thermal, Electroosmosis dewatering*