

Pengaruh Ultrafiltrasi Menggunakan Membran *Polyethersulfone* Terhadap Karakteristik Fisik, Kimia, dan Antioksidan Air Kelapa (*Cocos nucifera* L.)

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ABSTRAK

Air kelapa merupakan minuman yang diperoleh dari dalam buah kelapa. Ukuran buah yang besar menyebabkan sulitnya distribusi air kelapa dalam buah, sehingga air kelapa siap minum menjadi pilihan pada industri pangan. Umumnya, air kelapa muda dikonsumsi dalam keadaan segar. Sedangkan air kelapa tua dibuang sebagai *by-product* pada pengolahan santan dan minyak goreng. Namun, beberapa penelitian menunjukkan bahwa air kelapa tua masih memiliki sifat fungsional yang baik seperti aktivitas antioksidan, total fenolik, serta mineral yang cukup tinggi. Pengolahan yang tepat diharapkan mampu meningkatkan pemanfaatan air kelapa agar mempertahankan kesegaran, flavor, serta sifat fungsional air kelapa muda dan tua. Tantangan pengolahan air kelapa pada industri pangan adalah kerusakannya yang cepat. Hal ini disebabkan oleh enzim polifenol oksidase dan peroksidase yang terdapat secara alami pada air kelapa. Salah satu pengolahan yang dapat diterapkan pada bahan baku liquid seperti air kelapa adalah ultrafiltrasi. Prinsip teknologi ini adalah memisahkan padatan dan larutan berdasarkan berat molekulnya. Tujuan dari penelitian ini adalah untuk (i) mengetahui karakteristik fisik, kimia, dan antioksidan air kelapa muda dan tua, (ii) Mengevaluasi pengaruh *molecular weight cut off* (MWCO) membran ultrafiltrasi menggunakan *polyethersulfone* (PES) dalam menghasilkan air kelapa siap minum yang bebas dari enzim dan tetap memiliki karakteristik alami air kelapa segar, ditinjau dari karakteristik fisik, kimia, dan antioksidan, (iii) Mendapatkan *molecular weight cut off* (MWCO) terbaik yang mampu menghilangkan enzim PPO dan POD serta tetap mempertahankan karakteristik air kelapa segar. Karakterisasi dilakukan pada air kelapa muda (buah berusia 7 bulan) dan air kelapa tua (buah berusia 11 bulan). Ultrafiltrasi dilakukan menggunakan membran *polyethersulfone* dengan *molecular weight cut off* sebesar 30 kDa dan 50 kDa pada air kelapa muda dan tua serta digunakan proses thermal 90°C selama 10 menit sebagai pembanding. Hasil penelitian menunjukkan kadar abu, protein, lemak, pH, kalium, natrium, aktivitas antioksidan dan total phenolic content yang lebih tinggi pada air kelapa tua. Sedangkan, volume, kejernihan, total gula, dan TSS yang lebih tinggi pada air kelapa muda. Ultrafiltrasi dapat menurunkan aktivitas enzim pada kedua tingkat kematangan, meningkatkan kejernihan, dan mempertahankan karakteristik kimia. Namun, penurunan TPC serta %RSA terjadi selama proses. *Molecular weight cut off* 30 kDa menunjukkan permeate flux dan penahanan enzim yang lebih baik dibandingkan dengan 50 kDa.

Kata kunci: air kelapa, ultrafiltrasi, polifenol oksidase, peroksidase, *polyethersulfone*

The Effect of Ultrafiltration Using Polyethersulfone Membranes on Physical, Chemical, and Antioxidant Characteristics of Coconut (*Cocos nucifera* L.) Water

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ABSTRACT

Coconut water is a beverage that is obtained from the coconut fruit. The large size of the fruit makes it difficult to distribute coconut water commercially, so ready-to-drink coconut water has become an option in the food industry. Generally, tender coconut water is consumed fresh. Meanwhile, mature coconut water is discarded as a by-product in coconut milk and cooking oil processing. However, several studies have shown that mature coconut water still has good functional properties such as high antioxidant activity, total phenolics, and minerals. Proper processing is expected to increase the utilization of coconut water in order to maintain the freshness, flavor, and functional properties of tender and mature coconut water. The challenge for coconut water processing in the food industry is its rapid deterioration. This is caused by the polyphenol oxidase and peroxidase enzymes that occur naturally in coconut water. One of the process that can be applied to liquid raw materials such as coconut water is ultrafiltration. The principle of this technology is to separate solids and solutions based on their molecular weight. The objectives of this study were to (i) determine the physical, chemical, and antioxidant characteristics of tender and mature coconut water, (ii) evaluate the effect of molecular weight cut off (MWCO) of ultrafiltration membranes of polyethersulfone (PES) in producing ready-to-drink coconut water that is free from enzymes and still has natural characteristics of fresh coconut water, in terms of physical, chemical, and antioxidant characteristics, (iii) Obtaining the best molecular weight cut off (MWCO) which is able to eliminate PPO and POD enzymes and still maintains the characteristics of fresh coconut water. Characterization was carried out on tender coconut water (7 months old fruit) and mature coconut water (11 months old fruit). Ultrafiltration was carried out using a polyethersulfone membrane with a molecular weight cut off of 30 kDa and 50 kDa in young and old coconut water and a 90°C thermal process for 10 minutes was used as a comparison. The results showed that the levels of ash, protein, fat, pH, potassium, sodium, antioxidant activity and total phenolic content were higher in mature coconut water. Meanwhile, volume, clarity, total sugar, and TSS were higher in tender coconut water. Ultrafiltration can decrease enzyme activity at both maturity levels, increase clarity, and maintain chemical characteristics. However, a decrease in TPC as well as % RSA occurs during the process. The 30 kDa molecular weight cut off showed better permeate flux and enzyme retention compared to 50 kDa.

Key words: coconut water, ultrafiltration, polyphenol oxidase, peroxidase, polyethersulfone