

QUALITY ATTRIBUTES, ANTIOXIDANT ACTIVITIES, AND PROBIOTIC STABILITY OF SESAME MEAL MILK ADDED WITH JACKFRUIT RAG-ENCAPSULATED SYNBIOTIC POWDER DURING STORAGE

ABSTRACT

By:

NADYA VALENTINA PUTRI
21/479330/TP/13222

Sesame (*Sesamum indicum* L.) meal, a protein-rich byproduct of oil extraction containing approximately 50% plant-based protein, holds high potential as a protein source in plant-based milk. Currently, the combination of probiotics and prebiotics in plant-based milk has garnered particular interest in the food market due to its synbiotic effect on gut microbiota. The trend of adding synbiotic powder in easy-to-use dosage packs, designed to be mixed into beverages immediately before consumption, has become popular. Among the various combinations of probiotics and prebiotics, *Lactobacillus acidophilus* TISTR 1338 and jackfruit (*Artocarpus heterophyllus*) rags powder could serve as a potential synbiotic pair, as it is made from jackfruit waste and its synergistic effect could add value to the product.

Plant-based milk was produced by mixing pea protein isolate, sesame protein extract, λ -carrageenan, distilled monoglycerides, rice bran oil, sugar, and water in high-speed blender at 15.330 rpm for 2 minutes. The mixture was then homogenized using a high-pressure homogenizer at 22,000 psi, pasteurized at 75-80°C for 15 minutes, and stored in refrigerator at $4 \pm 2^\circ\text{C}$ for further analysis during storage time evaluation. The synbiotic powder was prepared in two main steps: culturing *Lactobacillus acidophilus* and encapsulating the probiotic with the prebiotic (jackfruit rags powder) using a freeze-dryer.

This study aims to evaluate how storage affects the quality attributes (pH, color, viscosity, particle size distribution, sedimentation, total plate count), antioxidant activity, and probiotic stability of plant-based milk from sesame meal, both before and after the addition of encapsulated synbiotic powder from jackfruit rags, to ensure product stability and quality. The results showed that over the 20-day period of storage, the pH, color L*, color a*, color b*, viscosity, sedimentation, and total plate count remained stable. In contrast, the particle size distribution and antioxidant activity fluctuated. Probiotic stability showed that the samples maintained viable probiotic cell counts above $6 \log_{10}$ CFU/mL.

Keywords: antioxidant, plant-based milk, sesame meal, storage studies, synbiotic

ATRIBUT KUALITAS, AKTIVITAS ANTIOKSIDAN, DAN STABILITAS PROBIOTIK SUSU BUNGKIL WIJEN DENGAN PENAMBAHAN BUBUK SINBIOTIK TERENKAPSULASI DAMI NANGKA SELAMA PENYIMPANAN

INTISARI

Oleh:

NADYA VALENTINA PUTRI
21/479330/TP/13222

Sesame (*Sesamum indicum* L.) meal, produk sampingan kaya protein dari ekstraksi minyak yang mengandung sekitar 50% protein nabati, memiliki potensi tinggi sebagai sumber protein dalam susu nabati. Saat ini, kombinasi probiotik dan prebiotik dalam susu nabati telah menarik perhatian khusus di pasar makanan karena efek sinbiotiknya pada mikrobiota usus. Tren penambahan bubuk sinbiotik dalam kemasan dosis yang mudah digunakan, yang dirancang untuk dicampur ke dalam minuman segera sebelum dikonsumsi, telah menjadi populer. Di antara berbagai kombinasi probiotik dan prebiotik, *Lactobacillus acidophilus* TISTR 1338 dan bubuk serat nangka (*Artocarpus heterophyllus*) dapat menjadi pasangan sinbiotik yang potensial, karena terbuat dari limbah nangka dan efek sinergisnya dapat menambah nilai pada produk.

Susu nabati diproduksi dengan mencampurkan isolat protein kacang polong, ekstrak protein wijen, λ -karagenan, minyak bekatul, gula, dan air dalam blender berkecepatan tinggi pada 15.330 rpm selama 2 menit. Campuran tersebut kemudian dihomogenisasi menggunakan homogenizer bertekanan tinggi pada 22.000 psi, dipasteurisasi pada 75-80°C selama 15 menit, dan disimpan dalam lemari pendingin pada $4 \pm 2^\circ\text{C}$ untuk analisis lebih lanjut selama evaluasi waktu penyimpanan. Bubuk sinbiotik disiapkan dalam dua langkah: kultivasi *Lactobacillus acidophilus* dan enkapsulasi probiotik dengan prebiotik (bubuk dami nangka) menggunakan freeze-dryer.

Penelitian ini bertujuan untuk mengevaluasi bagaimana penyimpanan memengaruhi atribut kualitas (pH, warna, viskositas, distribusi ukuran partikel, sedimentasi, jumlah total bakteri), aktivitas antioksidan, dan stabilitas probiotik susu nabati dari tepung wijen, baik sebelum maupun sesudah penambahan bubuk sinbiotik terenkapsulasi dari serat nangka, untuk memastikan stabilitas dan kualitas produk. Hasil penelitian menunjukkan bahwa selama periode penyimpanan 20 hari, pH, warna L^* , warna a^* , warna b^* , viskositas, sedimentasi, dan jumlah total bakteri tetap stabil. Sebaliknya, distribusi ukuran partikel dan aktivitas antioksidan berfluktuasi. Stabilitas probiotik menunjukkan bahwa sampel mempertahankan jumlah sel probiotik yang layak di atas $6 \log_{10}$ CFU/mL.

Kata kunci: antioksidan, bungkil wijen, sinbiotik, studi penyimpanan, susu nabati