

QUALITY ANALYSIS OF PHYSICOCHEMICAL, MICROBIAL, AND ACCEPTANCE OF PLANT- BASED PROTEIN BEVERAGE POWDER

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ABSTRAK

ELKE PALUPI ARIANA. Analisis Kualitas Fisikokimia, Mikroba, dan Keberterimaan Minuman Bubuk Nabati Berprotein. Dibimbing oleh **RATIH DEWANTI-HARIYADI.**

Meningkatnya permintaan terhadap produk pangan berbasis nabati diakibatkan oleh tren konsumen di Asia yang menunjukkan kepedulian terhadap gaya hidup lebih sehat. Namun, produk minuman berbasis nabati yang umumnya dijumpai hanya terbuat dari satu jenis bahan dasar yang disajikan dalam bentuk siap minum. Penelitian ini berupaya mengembangkan minuman bubuk nabati berprotein sebagai alternatif susu sapi sejalan dengan tren diet fungsional. Sampel minuman ekstrak biji-bijian cair terbuat dari berbagai sereal/kacang-kacangan dan air (biji-bijian: air = 1:5(w/v)) dengan persentase beragam menjadi lima sampel: P1 (50% kedelai, 0% oat, 50% beras), P2 (37,5% kedelai, 12,5% oat, 50% beras), P3 (25% kedelai, 25% oat, 50% beras), P4 (12,5% kedelai, 37,5% oat, 50% beras), dan P5 (0% kedelai, 50% oat, 50% beras). Kadar protein pada kelima sampel tersebut dianalisis untuk memilih sampel yang berprotein tinggi meliputi seluruh sereal/biji pilihan, di mana sampel P2 dipilih berdasarkan kadar protein yang meliputi semua sereal/biji-bijian. Untuk meningkatkan kadar protein, minuman ekstrak almond cair ditambahkan untuk meningkatkan kadar protein pada sampel minuman ekstrak biji-bijian cair, dengan rasio 1:3 (P2V1), 1:4 (P2V2), dan 1:5 (P2V3) (sampel ekstrak biji-bijian cair yang terpilih: minuman ekstrak almond cair), dengan penambahan 108 g sukrosa dan bahan tambahan pangan. Campuran tersebut dikeringkan dengan pengering semprot pada suhu 180°C untuk mencapai setidaknya 15% hasil bubuk dari 3-liter minuman ekstrak biji-bijian cair. Analisis kimia (proksimat dan serat kasar), fisik (warna dan densitas kamba), mikroba (TPC dan kapang/khamir), dan analisis penerimaan (menggunakan 5 skala JAR) dilakukan untuk menentukan karakteristik minuman bubuk nabati berprotein. Hasil penelitian menunjukkan, sampel P2V1 mendapat nilai kesukaan tertinggi dari panelis (3.11 ± 0.145), dengan skor tertinggi untuk warna (2.91 ± 0.205), didukung oleh warna yang berada pada nilai 80.33 ± 0.53 (L*), 3.96 ± 0.08 (a*), dan 20.36 ± 0.32 (b*). Sampel ini juga memiliki kerapatan kamba tertinggi (0.6909 ± 0.001). Analisis mikroba menunjukkan semua sampel, termasuk P2V1, memenuhi batas maksimum cemaran kapang dan khamir, meskipun hasil TPC melebihi standar. Analisis proksimat menunjukkan P2V1 mengandung 13.42% lemak, $2.92 \pm 0.23\%$ serat kasar, $4.09 \pm 0.03\%$ air, dan $2.85 \pm 0.24\%$ abu. Namun, kandungan protein dalam semua sampel rendah, dengan P2V1 memiliki kandungan tertinggi yaitu hanya 9.35%, tidak cukup untuk memenuhi syarat sebagai minuman bubuk nabati berprotein.

Kata kunci: ekstrak nabati, fisikokimia, pengering semprot, pengujian mikroba, tingkat penerimaan

ABSTRACT

ELKE PALUPI ARIANA. Quality Analysis of Physicochemical, Microbial, and Acceptance of Plant-Based Protein Beverage Powder. Supervised by **RATIH DEWANTI-HARIYADI.**

The increasing demand for plant-based product is due to the Asian consumer trends showing concerns for consuming health-conscious foods/beverages. However, the plant-based beverage products (generally) found are limited to one ingredient and served in a ready-to-drink form. This research sought to develop a plant-based protein beverage powder, as an alternative to dairy milk aligning with the trend toward functional diet. Liquid Grain Extract Beverage (LGEB) samples made from various cereal/beans and water (cereal/beans: water = 1:5 (w/v)) with varying percentages into five samples: P1 (50% soybeans, 0% oats, 50% rice), P2 (37.5% soybeans, 12.5% oats, 50% rice), P3 (25%, 25% oats, 50% rice), P4 (12.5% soybeans, 37.5% oats, 50% rice), and P5 (0% soybeans, 50% oats, 50% rice). The protein content in five samples were analyzed to select sample of highest protein content covering all selected cereal/beans, in which sample P2 is selected in respect to protein content and involvement of all cereal/beans. To increase the protein content, liquid almond extract beverage was added to the liquid grain extract beverage (LGEB), with a ratio of 1:3 (P2V1), 1:4 (P2V2), and 1:5 (P2V3), with the addition of 108 g of sucrose and food additives. The LGEB were dried using spray dryer at 180°C to achieve at least 15% of yield powder from 3 litres of liquid grain extract beverage (LGEB). Chemical (proximate and crude fiber), physical (color and bulk density), microbial (TPC and mold/yeast), and acceptance (using 5 JAR scale) analysis were conducted to determine the characteristics of plant-based protein beverage powder. As the result, sample P2V1 received the highest overall liking from panelists (3.11 ± 0.145), with the highest score for color (2.91 ± 0.205), supported by its color values (80.33 ± 0.53 L*, 3.96 ± 0.08 a*, 20.36 ± 0.32 b*). It also had the highest bulk density (0.6909 ± 0.001). Microbial analysis showed all samples, P2V1 met mold and yeast maximum contamination limit, though TPC results exceeded the standard. Proximate analysis revealed P2V1 contained 13.42% fat, $2.92 \pm 0.23\%$ crude fiber, $4.09 \pm 0.03\%$ moisture, and $2.85 \pm 0.24\%$ ash. However, protein content in all samples was low, with P2V1 having the highest at only 9.35%, insufficient to qualify as a plant-based protein beverage powder.

Keywords: acceptance, microbial assay, physicochemical, plant-based extract, spray drying

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ELKE PALUPI ARIANA

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Submitted as one of the requirements for obtaining a
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FOREWORD

The author would like to express his gratitude to Allah Subhanaahu Wa Ta'ala for all His gifts in completion for this undergraduate thesis. The theme chosen in the research conducted from September 2023 to June 2025 was the development of plant-based beverage powder products, with the title "Quality Analysis of Physicochemical, Microbial, and Acceptance of Plant-Based Protein Beverage Powder"

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Hopefully this research is useful for the advancement of science and provides positive contributions to product development, especially in the field of plant-based. The author expresses his deepest apologies for possible shortcomings in the preparation of this research.

Bogor, Juni 2025

Elke Palupi Ariana

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