

Pengaruh Suhu Penyimpanan Terhadap Stabilitas Mikrobiologi, Aktivitas Air, dan Umur Simpan *Emergency Bar Ampas Sari Tempe* Dengan Metode *Accelerated Shelf-Life Testing (ASLT)*

Bernardus Vedo Nandawardhana¹, Siti Helmyati², Farah Faza

INTISARI

Latar Belakang: Bencana menyebabkan distribusi bahan makanan terganggu sehingga meningkatkan risiko pengungsi mengalami kekurangan gizi. Produk pangan darurat seperti *Soy-based Bar* dapat menjadi alternatif dalam menyediakan gizi bagi pengungsi. Akan tetapi, kondisi penyimpanan pada tempat pengungsian yang terbatas dapat mempersingkat umur simpan produk karena stabilitas mikrobiologi dan aktivitas air yang terganggu.

Tujuan: Mengetahui umur simpan *Soy-based Bar* menggunakan metode Accelerated Shelf Life Testing (ASLT) melalui pendekatan Arrhenius.

Metode: Produk *Soy-based Bar* berbahan dasar tepung ampas sari tempe, tepung ubi oranye, tepung jagung, tepung terigu, kacang mete panggang, dan gula aren disimpan pada inkubator dengan suhu penyimpanan 25, 35, dan 45 °C selama 4 minggu. Parameter mutu yang terdiri dari Angka Lempeng Total (ALT), Angka Kapang Khamir (AKK), dan Aktivitas Air (Aw) diuji pada produk saat minggu ke-0, ke-1, ke-2, ke-3, dan ke-4. Pengaruh suhu dan waktu penyimpanan terhadap parameter mutu diketahui melalui pengujian *one-way* Anova atau Kruskal-Walis dan dilanjutkan dengan uji bivariat *Generalized Linear Model (GLM)* untuk mengetahui interaksi antar variabel independen. Umur simpan produk diketahui melalui perhitungan ASLT dengan pendekatan model Arrhenius.

Hasil Penelitian: Suhu penyimpanan 35 dan 45°C menunjukkan perbedaan yang signifikan terhadap Aw produk, terutama pada minggu ke-2 hingga ke-4 ($p < 0,05$). Pada parameter ALT, suhu penyimpanan 25 dan 35 °C menunjukkan efek signifikan pada minggu ke-2 dan ke-4 ($p < 0,05$), sedangkan pada parameter AKK suhu penyimpanan tidak menunjukkan pengaruh signifikan terhadap produk ($p > 0,05$). Hasil analisis ASLT model Arrhenius memprediksi umur simpan produk selama 11, 14, dan 19 hari pada suhu penyimpanan 25, 35, dan 45 °C secara berurutan.

Kesimpulan: Terdapat pengaruh suhu penyimpanan yang signifikan terhadap Aw dan ALT, tetapi tidak signifikan terhadap AKK produk. Produk *Soy-based Bar* memiliki umur simpan 11 hingga 19 hari.

Kata Kunci: Suhu Penyimpanan; Angka Lempeng Total; Angka Kapang Khamir; Aktivitas Air; Umur Simpan

¹Mahasiswa Program Studi Gizi Kesehatan FK-KMK UGM

²Dosen Program Studi Gizi Kesehatan FK-KMK UGM

The Effect of Storage Temperature on the Microbiological Stability, Water Activity, and Shelf Life of a Tempe Pulp-Based Emergency Bar Using the Accelerated Shelf-Life Testing (ASLT) Method

Bernardus Vedo Nandawardhana¹, Siti Helmyati², Farah Faza

ABSTRACT

Background: Disasters disrupt food distribution, increasing the risk of malnutrition among refugees. Emergency food products, such as soy-based bars, can serve as an alternative source of nutrition for displaced populations. However, limited storage conditions in evacuation shelters may shorten the product's shelf life due to compromised microbiological stability and water activity.

Objective: To determine the shelf life of the soy-based bar using the Accelerated Shelf-Life Testing (ASLT) method through the Arrhenius approach.

Methods: The soy-based bar product, made from tempe pulp flour, orange sweet potato flour, corn flour, wheat flour, roasted cashew nuts, and palm sugar, was stored in an incubator at temperatures of 25°C, 35°C, and 45°C for four weeks. Quality parameters, including Total Plate Count (TPC), Yeast and Mold Count (YMC), and Water Activity (Aw), were measured at weeks 0, 1, 2, 3, and 4. The effects of storage temperature and time on these quality parameters were analyzed using one-way ANOVA or Kruskal-Wallis tests, followed by a bivariate Generalized Linear Model (GLM) analysis to examine interactions among independent variables. The product's shelf life was determined using the Accelerated Shelf-Life Testing (ASLT) method with the Arrhenius model approach.

Results: Storage temperatures of 35°C and 45°C showed significant differences in the product's Aw, particularly from weeks 2 to 4 ($p < 0.05$). For the TPC parameter, storage temperatures of 25°C and 35°C had significant effects at weeks 2 and 4 ($p < 0.05$), while for the YMC, storage temperature showed no significant effect on the product ($p > 0.05$). The ASLT analysis using the Arrhenius model predicted the product's shelf life to be 11, 14, and 19 days at storage temperatures of 25°C, 35°C, and 45°C, respectively.

Conclusions: There was a significant effect of storage temperature on the Aw and TPC, but not on the YMC of the product. The soy-based bar had a shelf life ranging from 11 to 19 days.

Keywords: Shelf Temperature; Total Plate Count; Yeast and Mold Count; Water Activity; Shelf-life

¹Student of Nutrition and Health Department, Faculty of Medical, Public Health, and Nursing, Gadjah Mada University

²Lecturer of Nutrition and Health Department, Faculty of Medical, Public Health, and Nursing, Gadjah Mada University