

PENENTUAN UMUR SIMPAN PRODUK SUPLEMEN PROBIOTIK

***Lactiplantibacillus plantarum* subsp. *plantarum* Dad-13 MENGGUNAKAN**

METODE ACCELERATED SHELF-LIFE TESTING

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Suplemen probiotik harus mempertahankan jumlah sel hidup minimal 10^6 – 10^7 CFU/g hingga akhir masa simpan agar tetap memberikan manfaat kesehatan. Viabilitas probiotik dipengaruhi oleh faktor formulasi dan suhu penyimpanan. Penelitian ini bertujuan (1) mengetahui pengaruh penambahan monosodium glutamat (MSG) sebesar 1%, 2%, dan 3% pada medium fermentasi terhadap viabilitas awal dan stabilitas penyimpanan *Lactiplantibacillus plantarum* subsp. *plantarum* Dad-13 dalam kapsul probiotik, serta (2) menentukan umur simpan produk menggunakan metode *Accelerated Shelf-Life Testing* (ASLT). Kapsul probiotik hasil *freeze-drying* disimpan pada suhu 4°C, 10°C, 20°C, 30°C, dan 40°C. Viabilitas dianalisis secara berkala menggunakan metode *total plate count* dan dimodelkan menggunakan pendekatan *Arrhenius*. Penambahan MSG berpengaruh signifikan terhadap viabilitas awal dan stabilitas selama penyimpanan. MSG meningkatkan viabilitas awal sekitar 1 log cycle, dengan nilai tertinggi diperoleh pada konsentrasi 2% sebesar $8,95 \times 10^{12}$ CFU/g. Namun, stabilitas terbaik selama penyimpanan diperoleh pada konsentrasi 1%, dengan laju penurunan viabilitas paling rendah ($-0,022$ log CFU/hari). Konsentrasi yang memaksimalkan pertumbuhan awal tidak sepenuhnya sejalan dengan konsentrasi yang paling efektif dalam mempertahankan kestabilan selama penyimpanan. Umur simpan kapsul probiotik pada MSG 0%; 1%; 2%; dan 3% berturut-turut adalah 4; 7; 6; dan 6 bulan berdasarkan batas minimal 10^7 CFU/g. Hasil ini menunjukkan bahwa penambahan MSG mempengaruhi viabilitas awal dan stabilitas penyimpanan, serta metode ASLT efektif dalam memprediksi umur simpan produk probiotik.

Kata kunci: kapsul probiotik, penambahan MSG, umur simpan, ASLT, model *Arrhenius*, stabilitas viabilitas

**DETERMINING THE SHELF LIFE OF PROBIOTIC SUPPLEMENT
PRODUCTS *Lactiplantibacillus plantarum* subsp. *plantarum* Dad-13 USING
THE ACCELERATED SHELF-LIFE TESTING METHOD**

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Probiotic supplements must maintain a minimum viable count of 10^6 – 10^7 CFU/g throughout storage to ensure functional efficacy. However, probiotic viability is influenced by formulation factors and storage temperature. This study aimed (1) to know the effect of monosodium glutamate (MSG) supplementation at 1%, 2%, and 3% during fermentation on the initial viability and storage stability of *Lactiplantibacillus plantarum* subsp. *plantarum* Dad-13 in probiotic capsules, and (2) to determine product shelf life using the Accelerated Shelf-Life Testing (ASLT) method. Freeze-dried probiotic capsules were stored at 4°C, 10°C, 20°C, 30°C, and 40°C. Viability was periodically determined using the total plate count method and analyzed using kinetic modeling with the Arrhenius approach. MSG supplementation significantly affected both initial viability and stability during storage. The addition of MSG increased initial viability by approximately 1 log cycle, with the highest count observed at 2% MSG (8.95×10^{12} CFU/g). However, the most stable storage profile was observed at 1% MSG, which showed the lowest degradation rate (-0.022 log CFU/day). These findings indicate that the MSG concentration maximizing initial growth does not necessarily correspond to the concentration providing optimal storage stability. The predicted shelf life of probiotic capsules with MSG concentrations of 0%, 1%, 2%, and 3% was 4, 7, 6, and 6 months, based on the minimum threshold of 10^7 CFU/g. These findings indicate that MSG supplementation influences both initial viability and storage stability, and ASLT provides a reliable approach for predicting probiotic shelf life.

Keywords: probiotic capsule, MSG supplementation, shelf life, ASLT, Arrhenius model, viability stability