OPTIMIZATION OF α-AMYLASE SYNTHESIS BY *BACILLUS VELEZENSIS* USING TAGUCHI EXPERIMENTAL DESIGN

Sasidhar Bhimana[a]* and Saravanan Ravindran[b]

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ABSTRACT

This research employs the Taguchi experimental design to optimize the production of α-amylase, a versatile enzyme with diverse industrial applications, using *Bacillus velezensis*. Thirteen key parameters, including pH, temperature, agitation, inoculum size, aeration and various carbon and nitrogen sources, were systematically investigated using the Taguchi L27 (313) orthogonal array. Initial screening of six seed media formulations identified SM6 (0.5% peptone, 0.5% yeast extract, 0.1% K_2HPO_4) as the optimal medium, producing 2.8 U mL^{-1} of α-amylase. Further optimization under the Taguchi framework yielded a maximum α-amylase activity of 1097.31 U mL^{-1} and total protein of 1230 mg mL^{-1} at pH 5, 34°C, 4% moong husk as carbon source, and 2% soybean cake as nitrogen source. Two-factor interaction analysis revealed that a temperature of 34°C with 2% soybean cake, and 4% moong husk with 2% soybean cake, provided the best results. Validation experiments confirmed a 31.2% enhancement in α-amylase production under the optimized conditions. This study highlights the efficacy of the Taguchi design in systematically optimizing complex bioprocesses, paving the way for improved α-amylase synthesis with *B. velezensis*.