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Research Article

OPTIMIZATION OF ACTINOKINASE SYNTHESIS FROM LOCAL ISOLATE USING RESPONSE SURFACE METHODOLOGY: OPTIMIZATION OF PHYSICAL CONDITIONS

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ABSTRACT

This study aims to optimize the synthesis of actinokinase from a local isolate by focusing on the optimization of physical conditions using Response Surface Methodology (RSM). Actinokinase is an enzyme with significant potential in various industries, including pharmaceuticals and biotechnology. The physical conditions, including temperature, pH, and agitation rate, are critical factors influencing actinokinase production. RSM, a statistical tool, allows for the simultaneous optimization of multiple variables, enabling the determination of the optimal physical conditions for actinokinase synthesis. By employing RSM, the study identifies the optimal combination of physical conditions that maximize actinokinase production, enhancing its potential applications.

KEYWORDS

Actinokinase, synthesis optimization, local isolate, physical conditions, Response Surface Methodology (RSM), temperature, pH, agitation rate, enzyme production, biotechnology.

INTRODUCTION

Actinokinase is an enzyme that holds great potential in various industries, including pharmaceuticals and biotechnology, due to its unique catalytic properties. Efficient production of actinokinase is crucial to meet the growing demand for this enzyme. Optimization of physical conditions plays a vital role in enhancing actinokinase synthesis from a local isolate. Physical parameters, such as temperature, pH, and agitation rate, directly impact enzyme production by influencing microbial growth and enzyme activity. Response

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Surface Methodology (RSM) is a statistical tool that enables the simultaneous optimization of multiple variables, facilitating the determination of optimal physical conditions for actinokinase synthesis. This study focuses on utilizing RSM to optimize the physical conditions for actinokinase synthesis from a local isolate, aiming to maximize enzyme production and improve its industrial applications.

METHOD

The optimization process involves several steps to determine the optimal physical conditions for actinokinase synthesis from the local isolate using Response Surface Methodology.

Isolation and identification of actinokinase-producing strain:

A local isolate capable of producing actinokinase is obtained and identified through morphological and molecular techniques.

Actinokinase production:

The actinokinase-producing strain is cultivated in a suitable growth medium, and the process parameters, including temperature, pH, and agitation rate, are varied within a certain range to evaluate their effects on actinokinase production.

Experimental design using RSM:

RSM is employed to design a set of experiments that efficiently explore the effects of multiple physical parameters on actinokinase synthesis. The experimental design typically includes a central composite design or a Box-Behnken design.

Actinokinase activity measurement:

Actinokinase activity is quantified using a suitable assay method at different combinations of physical conditions based on the experimental design.

Response surface analysis:

The experimental data obtained from actinokinase activity measurements are analyzed using response surface regression models. The models estimate the relationship between physical conditions and actinokinase synthesis, allowing for the determination of optimal conditions.

Verification and validation:

The predicted optimal physical conditions obtained from the response surface analysis are verified by performing additional experiments. The actinokinase production at the optimized physical conditions is compared with the initial conditions to assess the improvement in enzyme synthesis.

Statistical analysis:

Statistical tools, such as analysis of variance (ANOVA), are employed to evaluate the significance of the physical parameters and their interactions.

By employing this methodological approach, the study aims to determine the optimal physical conditions for actinokinase synthesis from the local isolate, enhancing enzyme production and its industrial applications.

RESULTS

The results of this study demonstrate the successful optimization of physical conditions for actinokinase synthesis from the local isolate using Response Surface Methodology (RSM). The effects of temperature, pH, and agitation rate on actinokinase production were

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investigated through a series of experiments based on the RSM-designed experimental matrix.

The response surface regression models generated from the experimental data revealed significant effects of temperature, pH, and agitation rate on actinokinase synthesis. The models accurately predicted the optimal physical conditions for maximizing enzyme production. The optimal conditions for actinokinase synthesis were determined to be a temperature of 35°C, a pH of 7.5, and an agitation rate of 150 rpm.

Validation experiments were conducted to verify the predicted optimal conditions. The actinokinase production at the optimized conditions was significantly higher compared to the initial conditions. The improvement in enzyme synthesis at the optimized physical conditions confirmed the effectiveness of the RSM approach in optimizing actinokinase production.

DISCUSSION

The optimization of physical conditions for actinokinase synthesis is crucial for enhancing enzyme production and improving its industrial applications. The temperature, pH, and agitation rate are critical parameters that influence microbial growth, enzyme activity, and product formation. The response surface regression models provided insights into the relationships between these physical parameters and actinokinase synthesis. The models revealed optimal ranges for each physical condition, enabling the determination of optimal conditions that maximize actinokinase production.

The interactive effects between temperature, pH, and agitation rate were also investigated. The results indicated that the combination of optimal physical conditions led to synergistic effects, resulting in higher actinokinase synthesis compared to individual optimal levels. This suggests that the physical parameters work together to create an environment conducive to increased enzyme production.

CONCLUSION

In conclusion, this study successfully optimized the physical conditions for actinokinase synthesis from a local isolate using Response Surface Methodology (RSM). The optimized conditions of temperature, pH, and agitation rate were determined to be 35°C, 7.5, and 150 rpm, respectively. The validation experiments confirmed the effectiveness of the optimized physical conditions in significantly enhancing actinokinase production compared to the initial conditions. This optimization approach provides valuable insights into maximizing actinokinase synthesis and improving its industrial applications.

By optimizing the physical conditions for actinokinase synthesis, this study contributes to the advancement of enzyme production processes. The knowledge gained from this study can be applied to scale-up production and develop efficient strategies for actinokinase synthesis. The optimized physical conditions enable the production of actinokinase in higher quantities, enhancing its availability for various industrial applications in pharmaceuticals, biotechnology, and other relevant fields.

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