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Fabrication of Infectious Amylase Using Biotechnological Techniques

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Abstract

Amylase is an enzyme that catalyzes the hydrolysis of starch into simpler sugars. Biotechnological methods have been widely employed for the production of amylase due to their efficiency and cost-effectiveness. In this study, we explore the use of infectious techniques for the production of amylase. Specifically, we use genetic engineering to incorporate the amylase gene into a virus that can infect bacterial cells. The infected bacteria then produce large quantities of amylase, which can be harvested and purified for commercial applications. Our results demonstrate the feasibility and potential of this approach for the production of amylase using biotechnological methods. This research could pave the way for the development of new and innovative biotechnological strategies for enzyme production.

Keywords: Fabrication• Enzyme production• Biotechnological techniques• Amylase

Introduction

Based on the reactions they catalyze, the International Enzyme Commission has divided enzymes into six different classes. Biochemically active enzymes can be made by plants, animals, and microbes. Microbial enzymes are typically preferred because they are simple to isolate in high quantities, can be produced at a low cost in a short amount of time, are stable under a variety of harsh conditions, and their cocompounds are also safer and easier to control. Microbes' environment-secreted enzymes are incredibly dependable for use in industrial processes and applications. Furthermore, the creation and expression of recombinant enzymes is made simpler by using microorganisms as the host cell. These enzymes have uses in chemical synthesis, bioconversion (biocatalyst), and bioremediation [1].

Amylases can be generically categorised into and subtypes, with the first two receiving the majority of attention. Amylase has a faster rate of action than amylase. Amylases act on glycosidic bonds, making them glycoside hydrolases. The first amylase was discovered in 1833 by Anselme Payen. Amylases have particular substrates and are present in all living systems. The extensive availability of amylase substrates from inexpensive plant sources increases the viability of the enzyme's prospective applications. Endoamylases and exoamylases are the two categories of amylases. Endoamylases randomly catalyse the hydrolysis of the starch molecule. This results in the synthesis of oligosaccharides of varied chain lengths, both linear and branched [2].

Most applications for microbial amylases generated from bacteria, fungus, and yeast have been in the industrial and academic fields. Even within the same genus, species, and strain, different microorganisms produce different amounts of the enzyme amylase. Additionally, the amount of amylase produced varies based on the microbe's place of origin, with strains isolated from environments rich in starch or amylose naturally producing more enzymes. In particular during fermentation operations, the PH, temperature, and sources of carbon and nitrogen all have a significant impact on the pace of amylase production. Microorganisms can be genetically modified to produce more amylase, which allows for strain improvement. Additionally, microbes can be modified to create effective amylases that are stable at high temperatures and in harsh environments. It is necessary to isolate prospective and effective bacterial or fungal strains before screening for the production of enzymes of interest. Microbes can be found everywhere and come from a variety of sources, as was previously mentioned. Contrarily, the most effective strains are typically isolated from environments rich in substrates, where the bacteria can be modified to utilise a particular substrate. Serial dilution is the most popular technique for strain separation since it lowers the number of colonies and facilitates selection. Substrate selection is a different technique in which effective strains are chosen based on their affinity for a particular substrate. These techniques have been used to identify and examine various bacteria and fungi for the production of amylase [3,4].

Literature Review

To improve amylase output, basic optimisation studies should be carried out. This can be done empirically or with the use of experiment design, with further support coming from the proposed experiments. Numerous approaches have been put forth, and with the development of software, they are now capable of producing more accurate forecasts. Implemented a Box-Menken design with three variables (incubation duration, pH, and starch as the substrate) to optimise the amylase production by the fungus A. vesicular. With a correlation coefficient of 0.9798 confirming the higher output, the laboratory trials and DOE predictions were in excellent agreement. The researchers adjusted the conditions for covalently immobilising amylase by using glutaraldehyde as a crosslinker on graphene sheets. This study made use of the Box-Behnken-designed response surface methodology [4,5].

Approximately 25% of the world's enzyme market is made up by amylase. It is utilised by the food, detergent, pharmaceutical, paper, and textile sectors. It is used in the food industry to make juices, maize syrups, maltose syrups, glucose syrups, as well as for baking and alcohol fermentation. It has been employed in the manufacture of detergents as well as as a food ingredient. The creation of beer and alcoholic beverages from sugars (based on starch) requires the use of amylases. Alcohol is created during this fermentation process by yeast eating carbohydrates. Fermentation is excellent for the synthesis of microbial amylase when there are adequate moisture and growth conditions. Both submerged fermentation and solid-state fermentation have been employed as fermentation techniques [6].

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Discussion

The fabrication of infectious amylase using biotechnological techniques represents an innovative approach for enzyme production. Traditional methods for producing amylase involve the use of purified enzymes or fermentation of microbial cells. However, these methods are limited by their low yields and high costs. In contrast, infectious amylase fabrication has the potential to be more cost-effective and efficient, as large quantities of amylase can be produced by infected bacterial cells. Furthermore, biotechnological techniques such as genetic engineering allow for the optimization of amylase production through the manipulation of the genetic makeup of the virus and bacterial cells.

One of the key advantages of infectious amylase fabrication is the ability to tailor the properties of the amylase to specific applications. For example, by incorporating the amylase gene into a virus that infects a specific type of bacterial cell, it is possible to produce amylase with specific enzymatic properties. This could have applications in industries such as food and beverage, where amylase is used to modify the texture and taste of food products. The ability to produce tailored amylase enzymes could also have applications in the pharmaceutical industry, where amylase is used in the production of drugs [7].

However, there are also potential risks associated with the use of infectious amylase fabrication. For example, there is a risk of unintended consequences due to the genetic manipulation of viruses and bacterial cells. Additionally, there is a risk of contamination of the environment or food supply by the infectious agents used in the production process. Therefore, it is important to carefully assess the potential risks and benefits of infectious amylase fabrication and to implement appropriate safety measures to mitigate any potential risks.

The fabrication of infectious amylase using biotechnological techniques is an innovative approach for enzyme production that has the potential to be more efficient and cost-effective than traditional methods. However, it is important to carefully consider the potential risks and benefits associated with this approach and to implement appropriate safety measures to mitigate any potential risks. With further research and development, infectious amylase fabrication could become an important tool for enzyme production in a variety of industries.

Conclusion

Amylase is a versatile enzyme with potential applications in various industries. The use of modern technologies, including white biotechnology, pinch technology, and green technology, can enhance large-scale production. Screening methods such as solid-based or solution-based techniques can be used to select appropriate microbial species for amylase production. Efficient microbial species, genetic engineering, and high-throughput screening can all increase amylase production for industrial and medicinal purposes.

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Not applicable.

Conflict of Interest

There is no conflict of interest by author.

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