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Short Communication

Environmental Sources of Amylase-Producing Bacteria and their Industrial Applications

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DESCRIPTION

Amylase enzymes play a pivotal role in starch hydrolysis, facilitating various industrial processes, including food, textile and pharmaceutical production. Bacteria from diverse environments are significant sources of amylase, particularly due to their high production efficiency and adaptability. This study explores various sources of amylase-producing bacteria, including soil, aquatic ecosystems, plant surfaces and extreme environments. A better understanding of these sources and the properties of isolated bacteria can lead to the development of optimized bacterial strains with specific industrial applications [1].

Amylases are enzymes that catalyze the hydrolysis of starch into sugars, supporting numerous industrial processes. Although amylases can be derived from plants, fungi and bacteria, bacterial amylases are particularly attractive due to their high yield and adaptability. Isolating amylase-producing bacteria from diverse sources can lead to the discovery of enzymes with properties tailored for specific applications, such as temperature and pH tolerance [2].

Sources of amylase-producing bacteria

Soil is a primary reservoir for amylase-producing bacteria, especially species from the genus *Bacillus*. Soils rich in organic matter, including agricultural soil and compost, provide nutrients that encourage microbial amylase production. The ease of isolating bacterial strains from soil makes it one of the most accessible sources for industrial amylase [3].

Freshwater and marine environments are known to harbor diverse bacteria with amylolytic activity. Marine bacteria, such as *Pseudomonas* and *Vibrio* species, exhibit amylase production with unique properties like salt tolerance, beneficial for industries operating in high-salinity conditions. Freshwater sources, including rivers and lakes, are also analyzed for bacterial strains with efficient starch-hydrolyzing capabilities [4].

Bacteria residing on plant surfaces or within the rhizosphere often produce amylase to utilize plant-derived starches. Rhizobacteria, like certain *Pseudomonas* and *Azospirillum* species, aid in nutrient cycling and show promise for industrial amylase production. Plant-associated bacteria offer an untapped potential for enzymes with properties adapted to moderate temperatures and specific pH ranges [5].

Bacteria from extreme environments such as hot springs, deserts and saline lakes produce amylases with high stability under extreme conditions. Thermophilic bacteria from hot springs, such as *Thermus* and *Geobacillus* species, produce thermostable amylases valuable for high-temperature applications in textile, food and biofuel industries. Similarly, halophilic bacteria from saline lakes offer salt-resistant amylase, suitable for industries with harsh conditions [6].

Isolation of amylase-producing bacteria involves collecting samples from targeted environments and culturing them on starch-containing media. Positive colonies can be identified through clear halos around colonies in starch-iodine assays. Selected strains undergo further analysis to optimize amylase production using parameters such as temperature, pH and nutrient concentration [7-9].

Amylase-producing bacteria are central to industries requiring rapid starch degradation. Thermostable amylases from thermophilic bacteria are used in the textile and biofuel industries due to their resilience at high temperatures. Marine-derived amylases are favorable for food and pharmaceutical applications where salt tolerance is important. Advances in genetic engineering and fermentation technology continue to expand the utility of bacterial amylases, enhancing their production efficiency and industrial suitability [10].

CONCLUSION

The diverse environmental sources of amylase-producing bacteria provide access to enzymes with various properties suitable for

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industrial processes. Isolation efforts focused on soil, aquatic, plant-associated and extreme environments offer valuable enzymes that can meet the demands of temperature, pH and salinity tolerance. Further exploration of these sources may yield novel bacterial strains with unique amylase properties, benefiting multiple industries.

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