Immobilization of CGTase from *Bacillus licheniformis* on pineapple waste for production of cyclodextrin

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PRODUCT BACKGROUND

- CD is a nonreducing maltooligosaccharides with a hydrophobic inside and hydrophilic surface outside.
- CD able to form inclusion complexes with many hydrophobic molecules, changing their physical and chemical properties.
- Ability to reduce of unwanted taste and odour in food and pharmaceutical.
- CD also approved by Generally Recognized As Safe (GRAS) and Food and Drug Administration (FDA) in food application.

MOTIVATION

- CD has many benefits that can be used in industries.
- Shortage of CD supply is due to low production of CD by free enzyme.
- Enzyme immobilization technique is quite simple and may have a higher commercial potential due to its simplicity, low cost and retaining high enzyme activity.
- Agricultural unwanted leftovers such as pineapple peels are one of the potential biocarrier for enzyme immobilization.

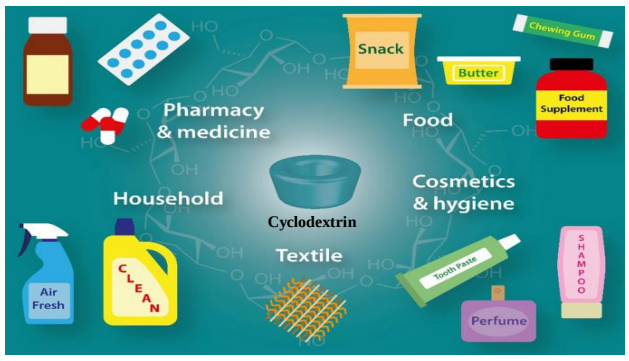
NOVELTY

1. Used of pineapple peels as a material support for enzyme immobilization.
2. Determination of the best operating conditions of immobilization of CGTase which increased the CD production.

ADVANTAGES

- Significantly increased the CD production versus free enzyme system.
- The reusability of immobilized enzymes will reduce production costs.
- Decreasing costs of production would benefit to the customers.

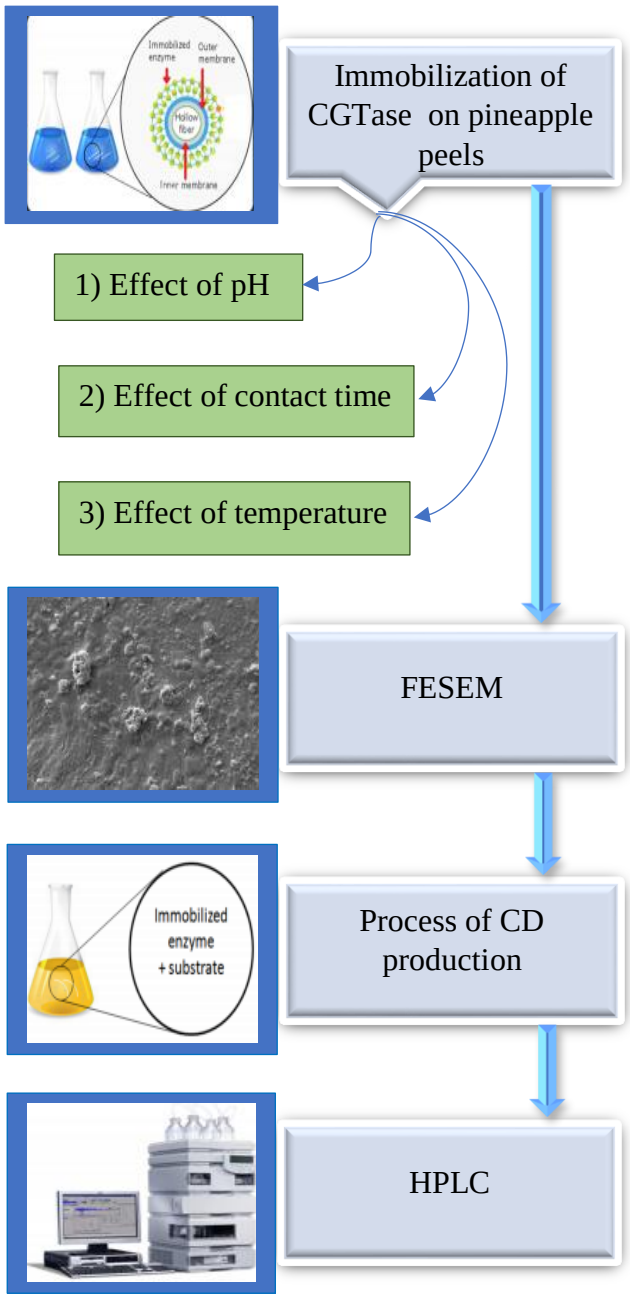
APPLICATIONS OF CD



MARKETABILITY

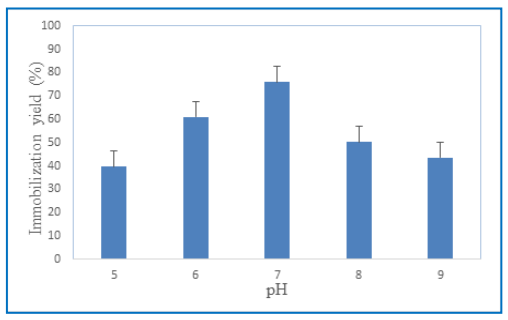
- Global "Cyclodextrin Market" size is projected to reach USD 245.8 million by 2026, from USD 201.1 million in 2020, at a CAGR of 3.4% during 2021-2026.(WICZ-TV,2020)

METHODOLOGY



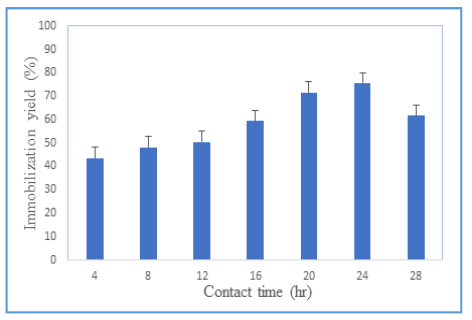
RESULT

1 EFFECT OF pH ON CGTASE IMMOBILIZATION



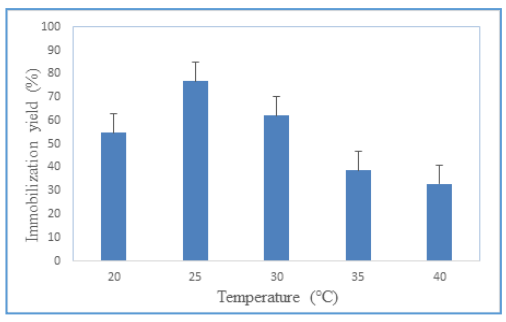
✓ The optimum attachment of the CGTase on the pineapple peel was achieved at pH 7 with 75.97% immobilization yield.

2 EFFECT OF CONTACT TIME ON CGTASE IMMOBILIZATION



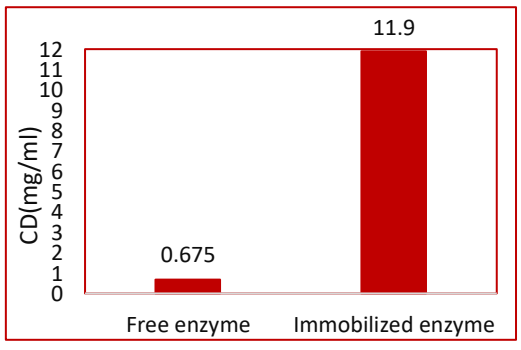
✓ The maximum immobilization yield of 75.53% was detected at 24 hr.

3 EFFECT OF TEMPERATURE ON CGTASE IMMOBILIZATION



✓ The optimum temperature of enzyme immobilization was defined at 25 °C with the highest immobilization yield of 76.8%.

PRODUCTION OF CD USING IMMOBILIZED CGTASE AND FREE ENZYME



✓ The ammount of CD from immobiized CGTase was 17-fold higher compared to free enzyme.