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Technical Brief

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Novel low-cost process for the manufacturing of high quality α-Arbutin

Technology Summary

A novel low-cost process for the biosynthesis of alpha- arbutin, from hydroquinone, using inexpensive feedstock and a novel metagenomic amylosucrase, Asmet, as the biocatalyst.

Background

Arbutin is a biomolecule of pharmaceutical and cosmetic significance, and is found in the species of various plant families. It acts by inhibiting tyrosinase activity and melanosome maturation, and has been used in the treatment of many hyperpigmentation disorders. **α**-arbutin is much more efficient in inhibiting tyrosinase activity than the naturally occurring **β**-arbutin. However, **α**-arbutin does not occur naturally. Commercially, **α**-arbutin is synthesized by using an enzyme that catalyzes an alpha-anomer selective transglycosylation reaction between a glucosyl donor and hydroquinone as an acceptor.

Technology Description

A novel amylosucrase, Asmet, identified from a thermal spring metagenome, was used to catalyze the transglucosylation of hydroquinone to arbutin, using sucrose as the glycosyl donor. Arbutin production was also demonstrated using low-cost feedstock, table sugar, muscovado, and sweet sorghum stalk extract, as a replacement for sucrose. Various parameters such as acceptor and donor ratio, temperature, and pH, and effect of metal ions were studied to optimize the reaction. The maximum hydroquinone to arbutin conversion of 70% was obtained in 24 h of Asmet led catalysis, at 30 °C and pH 6.0. In addition, Asmet expressing whole-cells, without involving protein extraction and purification steps, were used to produce arbutin, with about 50% yield..

Market Potential

The skin lightening market was valued at USD 4.74 Billion in 2020 and is projected to reach USD 7.68 Billion by 2028, growing at a CAGR of 6.23% from 2021 to 2028. Arbutin is considered a safer alternative to compounds such as , and is liely to drive the rise in demand for natural ingredients in cosmetic products

Value Proposition

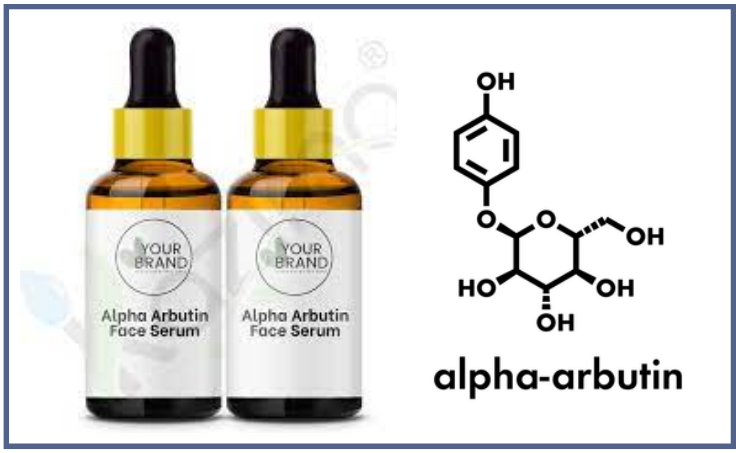
- Different low-cost feedstock, e.g., table sugar, muscovado, and sweet sorghum juice (SSJ), were examined for their potential to be used in the place of sucrose for arbutin production.
- Whole-cell catalysis for arbutin production
- To further validate the industrial importance of the metagenomic amylosucrase, Asmet, arbutin production was demonstrated to be produced using whole recombinant cells as a biocatalyst in the reaction. The use of whole cells avoids the process of protein extraction and purification steps in the bioprocess. The arbutin yield of about 50% was
- The cold-active property of Asmet is an essential aspect for industrial production of arbutin, since it offers a relatively less investment of energy for executing catalytic reaction

Applications

Alpha-arbutin reduces skin tanning after UV exposure. In addition, it aids in lightening skin tone by minimizing dark spots. Arbutin finds application in BB/CC creams, age spot treatment, skin lightening products, and skin tone care products.

Technology Status

- Demonstrated at 50 L static fermentative conditions scale (samples available)
- Patent protected
- Seeking interested industry partners



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