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THE REVIEW ON EXTRACTION OF GLYCOLIC ACID

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ABSTRACT
Glycolic acid (GA) is a widely used alpha hydroxy acid (AHA) renowned for its applications in cosmetic and pharmaceutical industries.mostly taken from natural sources, including sugarcane,glycolic acid has garnereddue to its exfoliating qualities and capacity to enhance the texture of the skin. This review aims to discuss various extraction methods, the properties of glycolic acid,its applications, and the challenges associated with its extraction. A thorough understanding of these aspects is crucial for optimizing the extraction processes and enhancing the yield and purity of glycolic acide
KEYWORDS: *Acid hydrolysis , Enzymatic hydrolysis, alkaline hydrolysis, fermentation, membrane separation*

INTRODUCTION
The chemical molecule known as glycollic acid (GA) has the formula $C_2H_4O_3$ and is colourless and odourless. It is the simplest alpha hydroxy acid (AHA) and has gained prominence in dermatology and cosmetic formulations due to its effectiveness in exfoliation, hydration, and skin rejuvenatio. Its extraction from natural sources, such as sugarcane, pineapple, and papaya,has been extensively studied, as these sources contain high concentrations of GA . This review provides an overview of the extraction methods for glycolic acid, discussing their efficiencies,advantages, and limitations.

PROPERTIES OF GLYCOLIC ACID
Glycolic acid has unique chemical and physical properties that make it suitable for various
Applications. Some key properties include:

1. Chemical Structure: Glycolic acid is characterized by its small molecular size, allowing for Easy penetration into the skin .
2. Solubility: GA is highly soluble in water, which enhances its applicability in aqueous Formulations .
3. pH Level: It has a low pH (around 3.0), which contributes to its exfoliating effects and ability topromote collagen production.

EXTRACTION METHOD
The extraction of glycolic acid from natural sources can be accomplished through various methods, each with its benefits and challenges.

1.Chemical Hydrolysis
Chemical hydrolysis involves breaking down larger molecules into glycolic acid through the use of acids or bases. This method is efficient in extracting GA from plant sources.

Acid Hydrolysis
Acid hydrolysis typically uses strong acids such as sulfuric acid to facilitate the conversion of polysaccharides and glycosides into glycolic acid .

ADVANTAGES
High yield of glycolic acid.
Rapid process.

DISADVANTAGES
Potential degradation of glycolic acid at high temperatures.

Alkaline Hydrolysis
In alkaline hydrolysis, sodium hydroxide is commonly employed to hydrolyze plant materials, releasing glycolic acid.

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ADVANTAGES
Mild conditions can be maintained, reducing degradation.

DISADVANTAGES
Lower yields compared to acid hydrolysis.

2.Enzymatic Hydrolysis
Enzymatic hydrolysis utilizes specific enzymes, such as cellulase or amylase,to break down plant materials, releasing glycolic acid.

ADVANTAGES
- Selective reaction leads to higher purity.
- Lower environmental impact .

DISADVANTAGES
- Higher costs associated with enzyme production.
- Longer processing time.

3.Fermentation
Fermentation is a biotechnological approach where microorganisms convert sugars into glycolic acid.

ADVANTAGES
- Sustainable and eco-friendly process.
- Potential for large-scale production.

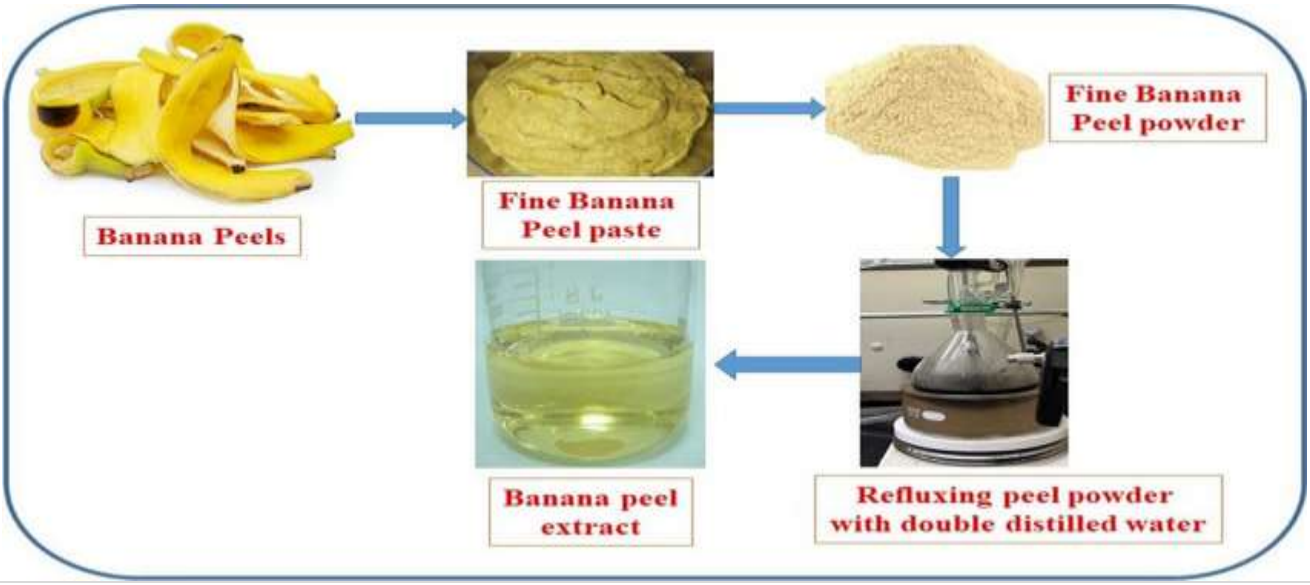
DISADVANTAGES
- Strict control over fermentation conditions is required.

4.Extraction with Solvents
Solvent extraction involves using organic solvents such as ethanol or methanol to extract glycolic acid from plant sources.

ADVANTAGES
- Simple and straightforward method.

DISADVANTAGES
- Solvent residues may affect product purity.

5.Membrane Separation



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Membrane separation techniques, such as ultrafiltration and nanofiltration, can be employed to concentrate glycolic acid from aqueous solutions.

ADVANTAGES
Efficient separation and concentration.
Minimal thermal degradation.

DISADVANTAGES
High equipment costs.

APPLICATION OF GLYCOLIC ACID
Glycolic acid has diverse applications, particularly in the cosmetic and pharmaceutical industries. Some of its key uses include:
1. Skin Care: GA is widely used in topical formulations for exfoliation, acne treatment, and anti-aging products .
2. Chemical Peels: Glycolic acid is commonly employed in chemical peel formulations to enhance skin texture and appearance.
3. Pharmaceuticals: GA is used in the formulation of drug delivery systems and as an excipient due to its pH-modulating properties.

CHALLENGES IN GLYCOLIC ACID EXTRACTION
Despite its beneficial properties, the extraction of glycolic acid faces several challenges:
1.Yield and Purity: Achieving high yields and purity levels can be difficult, especially with methods involving chemical hydrolysis or solvent extraction.
2.Environmental Concerns: Chemical methods may generate hazardous waste, necessitating the development of more sustainable extraction methods.
3.Cost-Effectiveness: The production costs associated with enzymatic hydrolysis and fermentation methods can be high, limiting their commercial viability.

CONCLUSION
Glycolic acid is a valuable compound with numerous applications in the cosmetic and pharmaceutical industries. Various extraction methods exist, each with distinct advantages and disadvantages. To optimize the extraction processes, a deeper understanding of the mechanisms involved and advancements in technology are essential. Future research should focus on enhancing yield, purity, and sustainability, ensuring that glycolic acid remains a key ingredient in skincare formulations.

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