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Development and Validation of RP-HPLC Method for Simultaneous Estimation of Curcumin and Glycyrrhizic Acid from Polyherbal Formulation

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Abstract: ***Polyherbal formulations have gained significant attention due to their synergistic therapeutic effects and improved safety profiles. Curcumin and Glycyrrhizic acid are two bioactive compounds widely recognized for their anti-inflammatory, antioxidant, and hepatoprotective properties. This review consolidates pharmacological insights and analytical strategies for simultaneous estimation of these compounds, emphasizing RP-HPLC as a robust technique. Challenges in standardization, method validation parameters, and future perspectives for quality assurance in herbal medicine are discussed.***
Keywords: Curcumin, Glycyrrhizic acid, RP-HPLC, Polyherbal formulations, Analytical method validation

I. INTRODUCTION

Polyherbal formulations represent a cornerstone of traditional medicine and are increasingly integrated into modern therapeutic regimens. Curcumin, derived from Curcuma longa, and Glycyrrhizic acid, obtained from Glycyrrhiza glabra, exhibit diverse pharmacological activities including anti-inflammatory, antioxidant, and antimicrobial effects. Despite their therapeutic potential, analytical standardization remains challenging due to complex matrices and variability in phytochemical composition. This review aims to summarize pharmacological profiles and analytical techniques for simultaneous estimation of these compounds.

A. Drug Profile Of Curcumin

IUPAC Name - (1E,6E)-1,7-bis (4-hydroxy- 3-methoxyphenyl) -1,6- heptadiene-3,5-dione
Molecular Formula - $C_{21}H_{20}O_6$
Molar Mass - 368.38 g/mol
Category - Anti-inflammatory, an Antifungal agent, a flavouring agent.
Description- A yellowish crystalline or odorless powder
Solubility- Poorly soluble in water, petroleum ether and benzene, soluble in ethyl alcohol, glacial acetic acid and in propylene glycol; very soluble in acetone and ethyl ether
Melting Point - 183 °C
Boiling Point - 591.4 °C

B. Drug Profile Of Glycyrrhizic Acid

IUPAC Name - (2S,3S,4S,5R,6R)-6-[(2S,3R,4S,5S,6S)-2 [[(3S,4aR,6aR,6bS,8aS,11S,12aR,14aR,14bS)-11-carboxy-4,4,6a,6b,8a,11,14b-heptamethyl-14-oxo-2,3,4a,5,6,7,8,9,10,12,12a,14a-dodecahydro-1H-picen-3-yl]oxy]-6-carboxy-4,5-dihydroxyoxan-3-yl]oxy-3,4,5-trihydroxyoxane-2-carboxylic acid
Molecular Formula - $C_{21}H_{20}O_6$
Molar Mass - 822.9 gm/mol
Category - Flavouring agent, Anti-diabetic and Anti-oxidant
Description - Colour yellowish brown, Odour is faint and Taste is sweet
Solubility - Solubility in water 1–10 mg/ml. Freely soluble in hot water, alcohol; practically insoluble in ether.
Melting point - 200.00 °C.
Boiling point - 970.00 °C.

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II. LITERATURE REVIEW SUMMARY

Curcumin has been extensively analyzed using various techniques, with 12 HPLC methods, 5 UV spectrophotometric methods, and limited TLC (2), HPTLC (1), and LC-MS/MS (2) approaches. Glycyrrhizic acid shows fewer reported methods, primarily HPLC (2) and HPTLC (1). Notably, no simultaneous estimation methods for Curcumin and Glycyrrhizic acid were found in the literature, highlighting a significant research gap and the need for developing a validated RP-HPLC method for polyherbal formulations.

A. Pharmacological Overview

Curcumin is a polyphenolic compound known for its anti-inflammatory, antioxidant, and anticancer properties. It is commonly used in capsules, tablets, and topical formulations. Glycyrrhizic acid, a triterpenoid saponin, exhibits hepatoprotective, anti-inflammatory, and immunomodulatory effects and is widely used in cough syrups and Ayurvedic preparations.

B. Analytical Techniques for Estimation

High-Performance Liquid Chromatography (HPLC) remains the gold standard for phytochemical analysis due to its precision, reproducibility, and ability to handle complex mixtures. Reverse Phase HPLC (RP-HPLC) is particularly suitable for simultaneous estimation of Curcumin and Glycyrrhizic acid. Validation parameters such as accuracy, precision, linearity, specificity, and robustness are critical for method reliability.

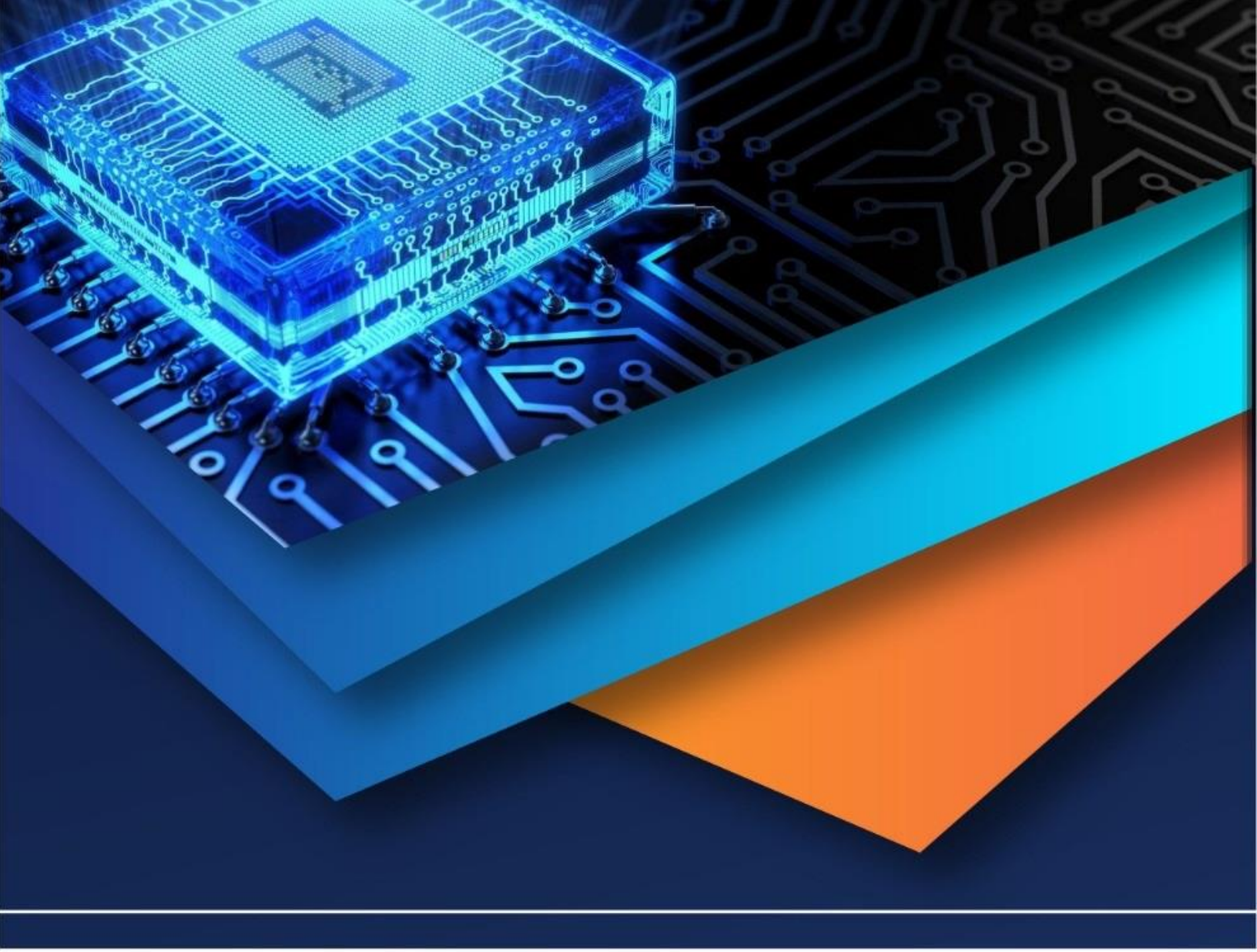
III. CONCLUSION

Simultaneous estimation of Curcumin and Glycyrrhizic acid is essential for quality assurance in polyherbal formulations. RP-HPLC offers a robust platform for achieving accurate and reproducible results. Standardization and validation as per ICH guidelines will ensure therapeutic reliability and regulatory acceptance.

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