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Identification and Estimation of Curcuminoids

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ABSTRACT:

Turmeric roots were used to get the extracted curcumin, a chemical which is responsible for the anti-inflammatory activity. It has a greater significance in different sectors because of its variety of uses. By using the technique of solvent extraction method curcuminoids were extracted and analyzed. Ethyl acetate was used as solvent for the extraction procedure. Efficient extraction, purification, recrystallization, and analytical methods like TLC and HPLC, expected to meet the standards of green chemistry that includes the safety measures, environment friendliness, and financial requirements.

Keywords: Turmeric, Curcumin, Solvent Extraction, HPLC

INTRODUCTION:

Curcumin is also known as “Indian Saffron” is a bright yellow-orange spice that comes from the root of the *Curcuma longa* plant, which belongs to the ginger family. It is a polyphenolic compound and has several benefits. Turmeric contains curcumin, demethoxycurcumin, and bisdemethoxycurcumin, which are all curcuminoids. Turmeric is also termed as “Golden Spice” because of its several compelling reasons and its uses for not only humans but also for animals. Its vibrant golden-yellow color is unmistakable and has made it prized not just for cooking but also as a natural dye for fabrics, cosmetics, and religious ceremonies.

Curcumin is also known as diferuloymethane, which is popular to be extracted from turmeric but beyond this it can also be extracted from the species like *Curcuma longa*, *Curcuma amada*, *Curcuma zedoaria*, *Curcuma aromatic*, *Curcuma raktakanta*. Being a spice it is used as a food additive having E number as E100. It has supported several pharmacological activities such as anti-inflammatory, anti-oxidant, anti-neoplastic, antidiabetic activity, anti-microbial activities and also supports neuroprotective effects, cardiovascular protection and hepatoprotective action. The diverse pharmacological profile of curcumin largely stems from its ability to interact with multiple cellular targets, making it a promising compound for various therapeutic applications, though challenges with its bioavailability continue to be addressed through formulation innovations.

The pigment is so potent that it can stain hands, utensils, and countertops. In Indian culture, turmeric symbolizes purity, prosperity, and fertility. Used in Hindu wedding ceremonies where turmeric paste is applied to the bride and groom's skin (Haldi ceremony). Considered auspicious and sacred in many South Asian traditions. Traded along the Silk Road for centuries, sometimes fetching prices comparable to gold. Mentioned in historical texts dating back thousands of years. Used by ancient civilizations not just as food but as medicine and in spiritual rituals. Medically, turmeric that contains curcumin has been used directly in several traditional ancient ayurvedic and Chinese medicines and contains several healing energies in it. This multifaceted spice continues to be valued across cultures not just for its color, but for its rich cultural history and potential benefits, truly earning its status as a "golden" ingredient.

Apart from this there is still a drawback with the curcumin, being an active compound in turmeric, has notoriously poor bioavailability, meaning it's difficult for the body to absorb and utilize. This is due to several factors, including low water solubility, rapid metabolism, and poor intestinal absorption. Despite its numerous potential health benefits, these bioavailability challenges can limit its effectiveness.

This research provides the extraction technique by using Soxhlet Apparatus used to extract the curcumin from turmeric followed by identification and estimation using the techniques like TLC and HPLC.

Curcumin is a lipophilic compound thus has poor water solubility (around 0.6 µg/mL) presents a challenge for HPLC analysis, but it is soluble in organic solvents like methanol, ethanol, and acetone, acetonitrile which are commonly used as mobile phases in HPLC.

Materials and Instrumentation

Chemicals and reagents:

Curcumin was obtained from country delight company for the curcumin analysis along with other components. Solvents like methanol and acetonitrile of HPLC grade and distilled water was obtained from ABIPER, Bangalore for TLC and HPLC.

Instrumentation

A HPLC system consisting of Younglin (S.K) Gradient System, Column C18 (250 x 4.6mm i.d), and size packing of 5 mm, detector UV 730 D, software-Autochro-3000, and pump SP930 D were used for the method development, data analysis, and interpretation. For TLC, the plates were made in the laboratory of Department of Pharmaceutical Analysis lab, ABIPER, Bangalore. The excitation and emission wavelengths for estimation of curcumin were set at 425 and 426 nm. Curcumin was estimated using HPLC system (Schimadzu) from ABIPER, Bangalore.

Experimentation:

Methodology:

30g of turmeric powder was soaked in 100 ml acetone in a beaker, and it was kept a side for 72 hours with occasional shaking. Further to prevent the vaporization of acetone the beaker was closed from the top with the help of aluminium foil. It was then filtered, concentrated and n-hexane was added to remove the resinous matter. The solution was filtered and 0.1N NaOH was added and acidified with dilute HCl, filtered and filtrate collected in separating funnel and acetone layer was separated from it. Lastly, it was recrystallized with ethanol.

Determination of curcuminoids by Thin Layer Chromatography (TLC):

Dissolve extracted samples and separately using ethanol as a solvent in the beaker. TLC chamber saturated with chloroform and methanol (8:2) as a mobile phase. Pre coated silica gel TLC plates were activated and further used for the identification. Spots were identified on the TLC plate and chromatogram was developed.

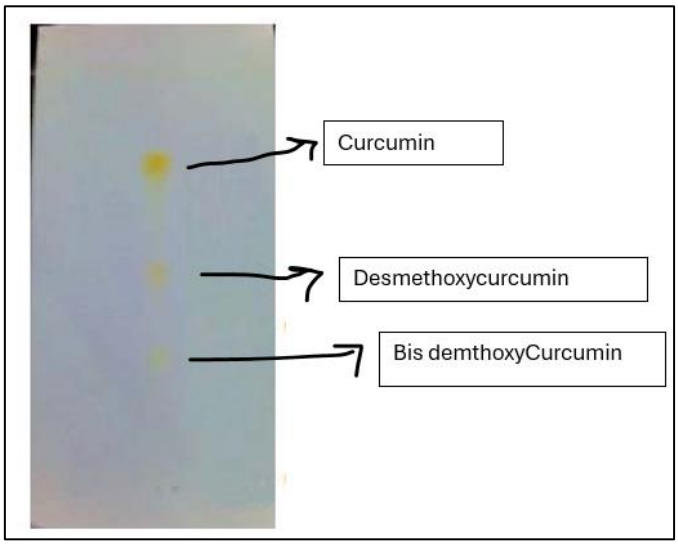

Figure 1: Curcuminoid chromatogram

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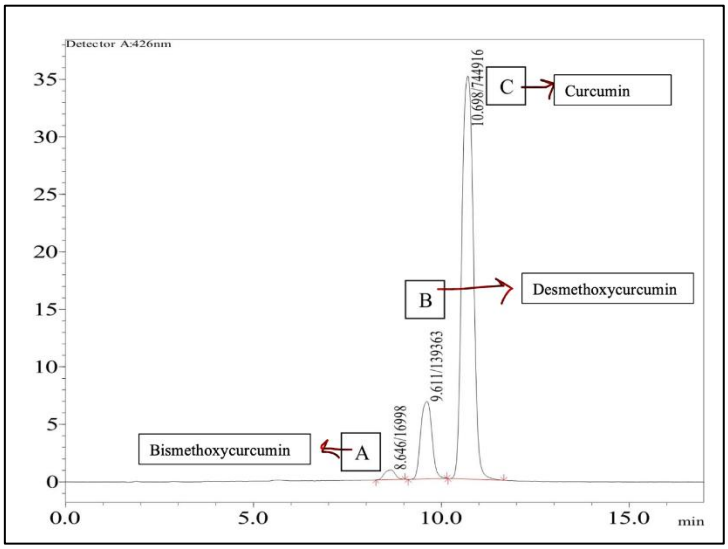
Determination of wavelength using HPLC technique:

Dissolve approx. 250mg of curcumin in ethanol, UV-Visible spectra was taken from 400-500nm wave length range and determine the maximum absorbance (λmax). Stock solution which was made with acetonitrile and acetic acid in the proportion of 40:20 with a concentration of 0.1%. The relative λmax was obtained at 426nm and the retention time was 20minutes.



Results and Discussion

In these experimental studies, while performing TLC, acetone was used as a solvent as curcumin was completely solubilized in it. N-hexane, 0.1N NaOH and dilute HCl used to separate the resinous matter. Further, it gives three major spots of three different chemicals having Rf value at 0.87, 0.78, and 0.70.

While performing HPLC, received 3 peaks at 10.698 which was reported as curcumin, 9.611 as desmethoxycurcumin and 8.646 as bismethoxycurcumin. Additionally, the maximum absorption was reported at 426nm.

Conclusion:

From the ancient times till now it has been proved that turmeric also known as “golden spice” has shown excellent activity towards inflammation, cancer, tumors, anti-fungal, etc. Since, the author has used the Country Delight brand turmeric to evaluate the purity and content of curcumin which has given the satisfactory results in the research. The estimation of curcuminoids was estimated by performing TLC which gave the Rf values at three spots and HPLC where the maximum absorption was at 426nm.

Author’s Contribution

The corresponding author has done the identification, estimation, and written the manuscript.

Conflict of Interest

There is no conflict of interest. All the authors have agreed to publish the research in IJPPR.

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