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Research Article

MICROWAVE ASSISTED EXTRACTION OF MANGIFERIN FROM *MANGIFERA INDICA* L.

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ABSTRACT

The aim of this work is to compare the extraction efficiencies of microwave and conventional isolation of mangiferin from *Mangifera indica* L. The parameters studied, which might affect the extraction efficiency were extraction time, solvent composition and microwave power. The conventional heating 21 h provided 5.23 % yield of mangiferin and by microwave heating at 210 W for 56 min, the yield was 6.868 %. Hence microwave assisted extraction has shown as the most effective technique for the isolation of mangiferin. The isolated compounds were found to be same as evidence by UV, IR, HPTLC, and ¹H NMR studies.

KEY WORDS- Microwave assisted extraction, mangiferin, *Mangifera indica* L, UV, HPTLC, ¹H NMR

INTRODUCTION

In recent years, new extraction techniques have been developed to reduce the volume of solvent needed for extraction (or to eliminate its use entirely), to reduce extraction and extract clean-up times and to improve the reproducibility of compound recovery. These recent extraction techniques include accelerated solvent extraction (ASE), supercritical fluid extraction (SFE), solid-phase micro extraction (SPME), extraction with supercritical or subcritical water, and microwave-assisted extraction (MAE). Most of these methods have similarity regard to solvent volume, extraction time and extraction efficiency. The use of SFE or ASE, however, requires greater financial investment, and the presence of water in samples can cause blockages in both techniques¹⁻³. Microwave-assisted extraction gains increasing interest as an advantageous method for the extraction of natural products. MAE has been employed for the extraction of pollutants such as polynuclear aromatic hydrocarbons⁴, phenols in soil samples⁵, and natural products such as silymarin from milk thistle seeds⁶, essential oils from plant materials⁷, ginsenosides from ginseng root⁸, and saponins from chickpea⁹.

Mangiferin, a xanthone glucoside, is an active phytochemical present in various plants including *Mangifera indica* L., *Anemarrhena asphodeloides* Bunge rhizome. Mangiferin is the major component (10 %) of *Mangifera indica* L. (mango) which belongs to the family Anacardiaceae, which grows in tropical and subtropical regions and widely used in folk medicine for various therapeutic indications [10]. Mangiferin has been reported to possess antioxidant¹¹, antitumor, immunomodulatory, antiHIV¹², antiviral¹³, inhibit bowel

carcinogenesis¹⁴, anti diabetic¹⁵, vascular modulatory activity¹⁶, anti-bone resorption¹⁷, arthritis, hepatitis, mental disorders¹⁸, cardioprotective¹⁹, hypolipidemic²⁰, chemopreventive²¹, and anti-inflammatory²².

In the present paper we report the feasibility of MAE for the isolation of mangiferin from *Mangifera indica* with a short duration providing its excellent yield when compared to conventional extraction technique.

MATERIALS & METHODS

Plant Materials

The leaves of *Mangifera indica* L. were collected from Nilgiri, Tamil nadu and authenticated by Dr. S. Rajan, Medicinal Plants Survey and Collection Unit, Government Arts College, Ootacamund, Tamil Nadu, India, where a voucher specimen was preserved for further reference.

Equipments

Catalyst Scientific Microwave Oven with variable power output ranging between 140 W and 700 W; Soxhlet apparatus, and Buchi Rotovapor.

Conventional Extraction Technique

The shade dried and powdered plant material of *Mangifera indica* leaves were defatted with petroleum ether (60-80°C). Defatted powdered leaves (10 g) were extracted by Soxhlet with 50 ml of ethanol for 21 h and concentrated under reduced pressure to yield semisolid mass⁷. The semisolid mass was defatted repeatedly and finally dissolved in ethanol at room temperature. It yields an amorphous white powder and after repeated recrystallization of the powder in ethyl acetate, pale yellow needle –shaped crystals of mangiferin were obtained. The crystals were completely dried and weighed. The TLC, HPTLC, melting point, UV, IR and ¹H NMR were determined.

Microwave Assisted Extraction

Defatted powdered leaves of *Mangifera indica* (10 g) were also extracted with a 50 ml of ethanol using microwave power at 210 W intensity for 56 min. The semisolid mass was defatted repeatedly and finally dissolved in ethanol at room temperature. It yields an amorphous white powder and after repeated recrystallization of the powder in ethyl acetate, pale yellow needle –shaped crystals of mangiferin were obtained. The crystals were completely dried and weighed. The TLC, HPTLC, melting point, UV, IR and ¹H NMR were determined.

RESULTS & DISCUSSION

The conventional isolation of mangiferin from *Mangifera indica* involves 21 h of Soxhlet extraction using ethanol. Using the same amount of ethanol a microwave extraction method was developed. A satisfactory isolation was possible at 140 to 210 W intensities. However yields higher than the conventional method were obtained only at 210 W intensity and heating for a duration of 45 to 65 min. At 210 W intensity and 56 min heating the highest yield of 6.868 % was obtained hence, saving of around 20 h and increase in the yield of 31.3 % was obtained by following the microwave method when compared to conventional extraction.

The melting point of conventional and microwave isolated compounds ranges between 292-295⁰ C. The UV spectrum of standard solution of mangiferin obtained by conventional procedure showed $\lambda_{\max}$ of 365, 314, 267, 241 nm with absorbance 0.496, 0.635, 1.008, 1.079 and by microwave method the same solution showed $\lambda_{\max}$ of 365, 315, 257, 240 nm with absorbance 0.536, 0.685, 1.393, and 1.190 respectively. Under the same conditions HPTLC separation of mangiferin for both conventional and microwave method yields a single spot of R_f value 0.62 and 0.63 respectively. The IR and ¹H NMR data's of mangiferin isolated by both methods are shown in table-1

CONCLUSION

The present demonstrates the feasibility of microwave assisted extraction (MAE) for isolation of mangiferin from *Mangifera indica*. The data and comparison results illustrate that the microwave extraction is a rapid

method, with less solvent consumption, good recovery, and easy to be controlled automatically in comparison with the Soxhlet extraction.

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Table- 1: IR And ¹H-NMR of Mangiferin

Spectral and chromatographic data	Conventional method	Microwave method
IR (cm⁻¹)	3365 (OH), 2916 (CH), 1651 (C=O), 1253 (C-OH)	3355 (OH), 2916 (CH), 1651 (C=O), 1253 (C-OH)
¹H-NMR (500 MHz, CDCl₃)	13.76 (s, 1H, 1-OH), 10.55 (s, 2H, 6, 7-OH), 9.86 (s, 1H, 3-OH), 7.38 (s, 1H, 8H), 6.37 (s, 1H, 4H).	13.74 (s, 1H, 1-OH), 10.56 (s, 2H, 6, 7-OH), 9.89 (s, 1H, 3-OH), 7.36 (s, 1H, 8H), 6.35 (s, 1H, 4H).

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