



PREPARATION AND ANALYSIS OF ALOE EMODIN: A REVIEW

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ABSTRACT

Aloe emodin is found in the gel, sap or leaves of different species of aloes, the bark of Frangula and cascara sagrada, the leaves of Senna, and the rhizome of rhubarb. Chemically, Aloe emodin is 1,8-dihydroxy-3-(hydroxymethyl)anthraquinone. It is used as anti-aging, anti-inflammatory, antioxidant, anti-cancer, laxative and antitumor agents. The present review was aimed at collection and compilation of the information related to Aloe emodin which will be helpful to the researchers for qualitative and quantitative analysis.

Keywords – Aloe-emodin, TLC, Isolation, Identification, HPLC Analysis

1. INTRODUCTION

Anthraquinones are natural phenolic compounds, which are reported to act as anti-aging, anti-inflammatory, antioxidant, anti-cancer, laxative and antitumor agents¹⁻⁴. They are found in plants usually in minute amounts, especially in family of Polygonaceae, Fabaceae, and Liliaceae. Aloe emodin is found in the gel, sap or leaves of aloe vera, the socotrine aloe, Barbados aloe, and Zanzibar aloes, the bark of Frangula (*Rhamnus frangula*) and cascara sagrada (*Rhamnus purshiana*), the leaves of Senna (*Cassia angustifolia*), and the rhizome of rhubarb (*Rheum rhaponticum*)⁵. Literature survey revealed numerous studies, which have been carried out on the quantitative estimation of aloe emodin and emodin individually by HPTLC, GC/MS and in combination by HPLC⁶⁻¹⁰. They have gained considerable interest because of the increasing use of herbal drugs as alternatives to modern medicine and their potential beneficial effects on human health. Animal studies reveal that aloe emodin and emodin show anti-proliferative activity by producing cytotoxic effects, cell cycle arrest and apoptosis in human tongue and breast cancer cells. There are many marketed formulations, which contain aloe emodin and emodin as constituents¹¹. The objective of the present review was to collect and compile the information related to a phytoconstituent Aloe emodin which will be helpful to the researchers for qualitative and quantitative analysis.

2. PHYSICOCHEMICAL PROPERTIES

Chemically, Aloe emodin is 1,8-dihydroxy-3-(hydroxymethyl) anthraquinone¹². Its empirical formula is C₁₅H₁₀O₅ and molecular weight is 270.24 g/mol. Melting point of aloe emodin is 223 to 224°C. It is yellow /orange to brown in colour. It is freely soluble in hot alcohol, toluene, ether, benzene with yellow colour, ammonia water and sulphuric acid with crimson colour, insoluble in water¹³.

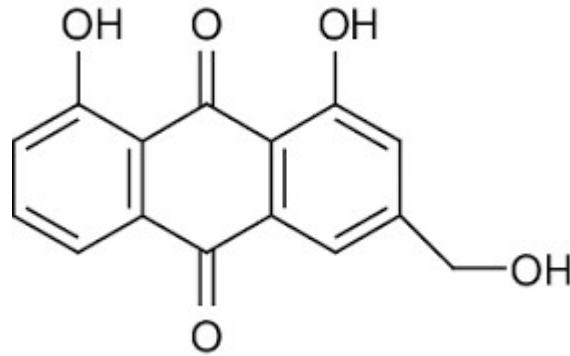


Fig. 1: Chemical structure of Aloe emodin¹⁴

3. PREPARATION OF ALOE EMODIN

It is obtained from barbaloin (Aloin) through oxidative hydrolysis. *Rajesh S. Gavit* and *K.S.Laddha* carried out oxidative hydrolysis of barbaloin using ferric chloride and hydrochloric acid. The detailed procedure followed is described below:

About 10 g of barbaloin was added to an acidic solution comprising of a mixture of 250 ml of concentrated hydrochloric acid with 750 ml of water. 500 ml of a 20 % aqueous solution of ferric chloride solution was added to the above acidic solution and the resulting mixture was transferred to a round bottom flask. Toluene, about 300 ml of was added to the above solution and the biphasic mixture refluxed for 8 h at $100 \pm 10^\circ\text{C}$. At the end of 8 h the reaction mixture was allowed to cool to about 90°C and the organic layer was separated, collected and kept overnight at $8 \pm 2^\circ\text{C}$ to yield crystals of aloe-emodin¹⁵.

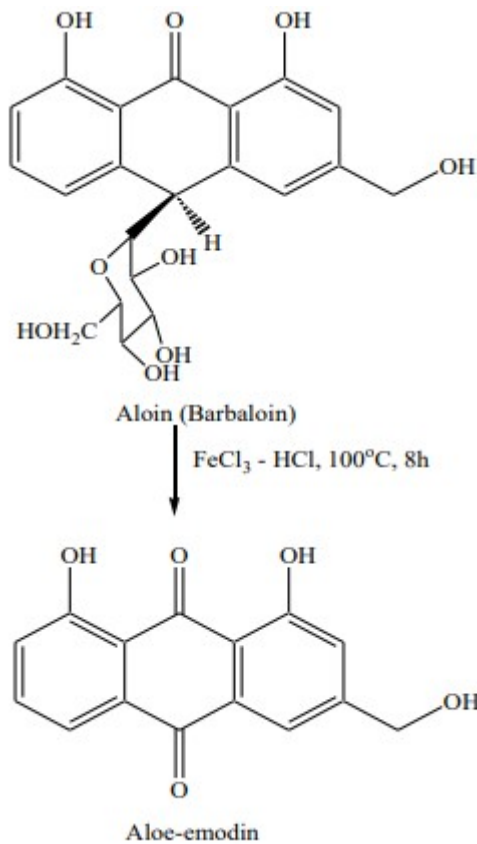


Fig. 2: Chemical conversion of Aloin to Aloe-emodin

3. ANALYSIS OF ALOE EMODIN

Various analytical methods have been reported in previously published literatures for qualitative and quantitative analysis of Aloe emodin. Two simple methods are discussed below:

4.1 TLC Analysis

Kumar, S., Yadav, M., Yadav, A. et al. have carried out TLC analysis of Aloe emodin. The detailed procedure reported in literature is as discussed below:

The TLC plate (10 × 10 cm) was pre-activated on TLC plate heater at 60 °C for 30 min. 10 µl of sample solution of aqueous extract along with the standard was applied on a TLC plate and the plate was developed in Ethyl acetate, methanol and water in the ratio of 10:2:1 (v/v/v) solvent system to a distance of 8 cm. The plates were dried at 120 °C temperature for 5 min using TLC plate heater. The plate was then kept inside TLC visualizer for resolving the colored bands and for plate photo documentation. The Retardation factor (Rf) values and colour of the resolved bands were noted. The Rf value of aloe-emodin was found to be 0.83 confirming the presence aloe-emodin in plant extracts ¹⁶.

4.2 HPLC Analysis

Mandrioli, Roberto, et al. reported the HPLC analysis of Aloe emodin. The reported procedure is described below:

A HPLC method with tandem UV absorption and fluorimetric detection, was developed and validated for the analysis of aloe emodin in products obtained from Aloe leaves, such as capsules, tablets, dried extracts and mother tinctures. The stationary phase was a C18 reversed-phase column and the mobile phase was composed of water and methanol (30/70, v/v). Satisfactory linearity was obtained over the 10.0–1000.0ng/mL range for photodiode array detection (limit of detection: 3ng/mL) and over the 2.5–1000.0ng/mL range for fluorimetric detection (limit of detection: 0.8ng/mL). Aloe emodin levels were determined in *Aloe vera* extracts and commercial formulations by both detection means, with good precision (R.S.D. 85%) and consistent results ¹⁷.

5. CONCLUSION

Aloe emodin gained considerable interest because of the increasing use of herbal drugs as alternatives to modern medicine and their potential beneficial effects on human health. Aloe emodin exhibits good biopotential. It is reported to exhibit laxative, anticancer, anti-inflammatory, anti-aging, antioxidant and antitumor activities There are many marketed formulations, which contain aloe emodin as an active ingredient / phytoconstituent. The compiled information will be helpful to the research scientist for preparation as well as qualitative and quantitative estimation of aloe emodin.

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