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# THE EXTRACTION AND PURIFICATION OF GALLIC ACID FROM THE *SONGORIA CYNOMORIUM*

This study describes the biochemical ingredients and biological active compounds of *Songoria Cynomorium*. The dried and powdered root of *Songoria Cynomorium* was extracted with 60 % ethanol and purified by using recrystallization techniques. Quantitative determination of compounds performed by High Performance Liquid Chromatography (HPLC). The following compounds were identified from the precipitates of crude extract. They are as follows: quercetin, catechine and gallic acid. The purified compound was then identified and justified as a gallic acid.

**Key words:** *Songoria Cynomorium*, Gallic acid, HPLC, recrystallization.

## Introduction

*Cynomorium* plants have long been used for medicinal purposes. Based on the signature theory, the plant was attributed to a phallic shape to help treat sexual problems. This property, together with its extraordinary rarity, made it highly valued [1]. The plant was also used to treat stomach problems, dysentery, diarrhoea, hemorrhoids and as an aphrodisiac.

*C. coccineum* and *C. songaricum* contain many bioactive compounds [2]. More than 30 compounds including 8 triterpenoids, 6 flavonoids, 8 phenolic acids, 4 fatty acids, and others have been detected and identified in *Cynomorium coccineum* [3].

In recent years, phenolic compounds have been a hot research topic due to their relevant properties in the health and nutrition fields [4]. Some natural substances may be used directly others serve as precursors for the production of other semi-synthetic bioactive substances. Also interesting is the possibility of using the known chemical structure of a natural substance as an inspiration in the development of new drugs [5].

Gallic acid is commonly used in the pharmaceutical industry [6]. Gallic acid can also be used as a starting material in the synthesis of the psychedelic alkaloid mescaline [7]. Gallic acid seems to have anti-fungal and anti-viral properties. Gallic acid acts as an antioxidant and helps to protect human cells against oxidative damage. Gallic acid was found to show cytotoxicity against cancer cells, without harming healthy cells. Gallic acid is used as a remote astringent in cases of internal haemorrhage. Gallic acid is also used to treat albuminuria and diabetes [8].

## Materials and methods

### *Plant materials*

Plant materials, whole plants were collected in the region of Umnugovi aimag. The fresh root of *Songoria Cynomorium* collected and washing with under tap water to remove any impurities and then drying at room temperature 25°C without light, the sample put in grinder transfer it to powder.

### *Extraction, separation and identification procedure*

We weighed 100g of powder and put it in round bottom with solution content ethanol : water 40:60. The flask was heated at 60°C for 60 minutes. The solution was filtered to obtain crude extract then solution is kept overnight at refrigerator 4°C to precipitate.

Biologically active compounds such as tannins, flavonoids and saponins were identified in plant samples using spectrophotometric and volumetric methods.

The separation and identification of gallic acid was performed by HPLC using Water-Alliance 2690-LC-system's type High performance Liquid Chromatography C18 (150mm×4.6mm, 5µm particle) was used for the analysis. The mobile phase was a mixture of 0.1% acetic acid : methanol (95:5 v/v) delivered at a flow rate of 1.0 mL min<sup>-1</sup>. Peak of gallic acid, catechine and quercetin in sample were identified by comparison with retention time of standard compounds.

The crystal was then characterized by FTIR spectroscopy and by comparison with literature data and authentic sample and determined its structure to be gallic acid.

## Result and discussion

The results of Table 1 show that *Songoria Cynomorium* has the highest content of vitamin C, tannins and saponins in the roots, at 8.80 %, 4.37 % and 2.02 % respectively. Mongolian *Songoria Cynomorium* contains 5.47% non-starchy carbohydrates as dietary fiber – cellulose. Representative chromatograms for the analysis of the precipitated powder from crude extraction of *Songoria Cynomorium*. The method employed offered base line separations of gallic acid, quercetin and catechine.

The content of biochemical and biological active compounds of *Songoria Cynomorium* in Mongolia

№	Biochemical ingredients, (%)		Biological active compounds, (%)		
	1	Moisture	8.94±0.90	Tannins	Hydrolysable
2	Ash	6.29±0.26	Condensed		2.55±0.65
3	Oil	0.15±0.39	Saponins		2.02±0.52
4	Protein	5.68±0.35	Flavonoids		0.23±0.25
5	Sucrose	7.06±0.06	Pectin		0.01±0.13
6	Non-starch polysaccharides	5.47±0.62	Vitamin C		8.80±0.50
7	Starch	1.97±0.23			

HPLC analysis of the powder precipitated from the raw extract of the *Songoria Cynomorium* plant showed that Rt 2.708 quercetin, Rt 3.364 catechins, and Rt 2.854 gallic acid were compared with the standard compounds.

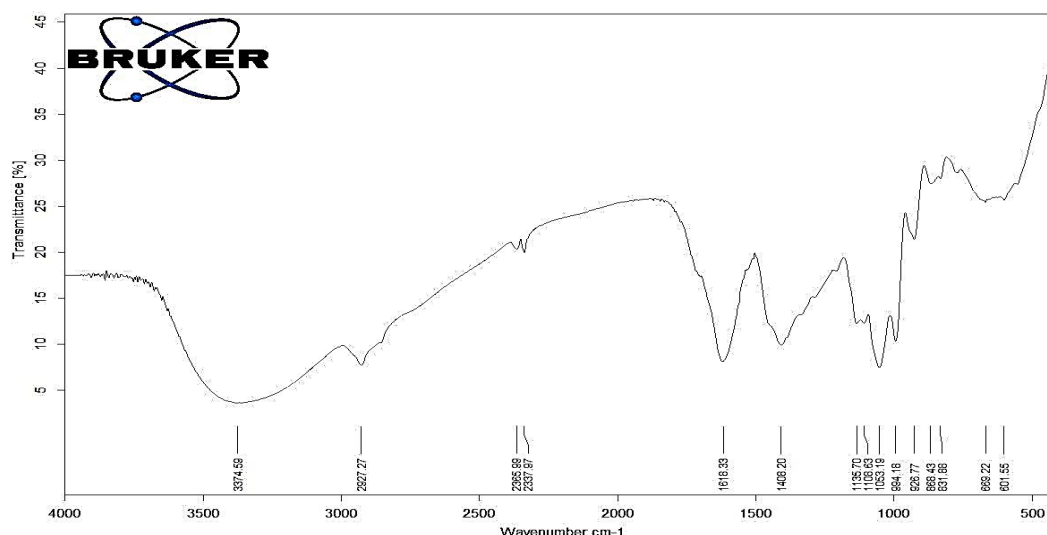


Figure 1. FT-IR spectra of gallic acid sample

The IR spectrum of the isolated compound displayed absorption bands broadly at 3374 cm<sup>-1</sup> and at 1618 cm<sup>-1</sup> indicating hydroxyl and carbonyl groups, respectively. The absorption band 1408 cm<sup>-1</sup> and 1135, 1108 and 1053 cm<sup>-1</sup> indicated the presence of benzene ring system and three –O– aryls directly attached to the benzene ring, respectively. The last absorption band at 669 cm<sup>-1</sup> showed substituted benzene (Figure 1).

**Conclusion**

On this work, according to biochemical studies, the total non-starchy carbohydrate content was high. These results suggest that, *Songoria Cynomorium* can be used as a source of dietary fiber.

This study proved that HPLC is a time-saving and sensitive method for distinguishing and purifying gallic acid from *Songoria Cynomorium*. The approaches described in this work can be useful in the evaluation of gallic acid from raw materials such as plants, up to the final products which used plant matr

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### ЭКСТРАКЦИЯ И ОЧИСТКА ГАЛЛОВОЙ КИСЛОТЫ ИЗ *SONGORIA CYNOMORIUM*

В этом исследовании описаны биохимические ингредиенты и биологически активные соединения *Songaria Cynomorium*. Высушенный и измельченный в порошок корень *Songaria Cynomorium* экстрагировали 60 %-ным этанолом и очищали с использованием методов перекристаллизации. Количественное определение соединений проводят методом высокоэффективной жидкостной хроматографии (ВЭЖХ). Следующие соединения были идентифицированы из осадков сырого экстракта. Это кверцетин, катехины и галловая кислота. Затем очищенное соединение было идентифицировано и подтверждено как галловая кислота.

**Ключевые слова:** *Songaria Cynomorium*, галловая кислота, ВЭЖХ, перекристаллизация.