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Identification of Active Compounds in Chinese Herbal Medicines

Yue Lele[1*], Sreemoy Kanti Das[2]

[1&2] School of Pharmacy, Lincoln University College, Malaysia

[*]***Corresponding author:*** ***yuelele.phdscholar@lincoln.edu.my***

Abstract
The process of incorporating Chinese Herbal Medicines (CHM) into modern healthcare has been hindered despite its effectiveness as a therapeutic option. Following this, the primary research question of the study intends to critically evaluate the pharmacological effect of phytochemical profiles of CHM such as glycosides, alkaloids and flavonoids assessing its anti-inflammatory, antioxidant, and antidiabetic impacts respectively. The systematic review analysis research has included a total of 25 peer reviewed articles about the anti-inflammatory impact of glycosides, the antioxidant impact of alkaloids and the antidiabetic impact of flavonoids consecutively. Additionally, the researcher used systematic review analysis research for collecting relevant data. Study analysis techniques such as Chromatography output was the main method. This technique separates CHM complex Botanical Mixtures into individual CHM compounds meant to specific bioactive pharmacological aspects. The researcher looked at each chemical to see whether ones had bioactivity. Integrated processes make sure that all the batches are the same. The researcher then looked at how these chemicals interacted with biological processes in cells and tissues. The findings of the study showed alkaloids eliminate harmful free radicals. Similarly, glycosides reduce inflammation by affecting cell signalling pathways along with flavonoids can be influenced into specific biologically active compounds. The conclusion of the study highlighted the link between traditional knowledge and modern science can work together to improve patient care by identifying the anti-inflammatory influence of glycosides, the antidiabetic aspect of flavonoids and the antioxidant properties of alkaloids.

Keywords: Alkaloids, Chinese Herbal Medicine, Flavonoids, Glycosides, Phytochemical Profiling

Introduction

CHM has a large therapeutic repertory; nevertheless, the clinical integration of CHM into contemporary healthcare is slow due to a lack of scientific knowledge of the numerous components that make up CHM. Because of this suggestion, a comprehensive investigation of the phytochemical and pharmacological properties of herbs that are frequently employed in CHM is described (Wang et al., 2026). The purpose is to locate active compounds and establish connections between them and therapeutic pathways in order to enable empirical application. People have been using plant-based medicines for thousands of years. Today, CHM herbs are made up of hundreds of different chemicals, such as alkaloids, flavonoids, terpenoids, and glycosides. CHMs work on a "multi-component, multi-target" theory, which is different from phytochemical herbal drugs, which usually only have one active ingredient (Williamson et al., 2009). Even though they are popular, there are still problems with quality control, differences between batches, and possible interactions between herbs and drugs. High-Performance Liquid Chromatography (HPLC), Mass Spectrometry (MS), and Network Pharmacology are some of the new analytical technologies that can help us figure out these complicated mixtures" (Sivaji et al., 2026). To make sure that "CHM products are safe for patients, work as well as possible, and get regulatory approval around the world, it is important to know the specific active compounds and how they work in the body".

Review of Related Literature

CHM is a medical clinic that originated in China. It is a holistic health care approach that incorporates the fact that it has a clinical history that spans over two thousand years (Angeles Flores et al., 2026). It does this by using herbal mixtures that include a wide range of components in order to accomplish this. The assimilation of contemporary Chinese medicine into contemporary evidence-based medicine has proven to be challenging owing to the intricate phytochemical composition of traditional Chinese treatment in addition to the lack of information of the techniques that are involved in its practice (Burhan et al., 2026). Within the context of the paradigm shift, the replacement of empirical application with a scientific framework which happens reductionist while nevertheless remaining complete is required. Research on phytochemicals, the establishment of a profile for pharmacological validation, and the development of new techniques for locating active substances in herbs that are used in CHM are all included in the scope of this project, which spans from the year 2020 to the particular year 2026 (Al-Farsi et al., 2026). This brings together both conventional knowledge and contemporary discoveries into a single body of information. Early studies relied heavily on High-Performance Liquid Chromatography (HPLC) coupled with UV detection, which often failed to resolve co-eluting peaks in complex matrices or identify trace bioactive constituents. Existing literature highlights significant progress in the isolation of compounds from major CHM herbs (Li et al., 2026). Gan-Cao, or liquorice, is a popular Chinese herbal medicine derived from the dried roots and rhizomes of Glycyrrhizin uralensis, G. glabra, and G. inflata. The main bioactive constituents of liquorice are triterpene sapiens and various types of flavonoids.

The research periphery of these compounds may vary in different CHM sample batches and thus affect the therapeutic effects. The contents of these compounds may vary in different liquorice batches and thus affect the therapeutic effects. For the purpose of quality control of liquorice, it is necessary to conduct an analysis of saponins and flavonoids that is at the same time accurate and sensitive (Anderson & Krathwohl, 2001). This ensures that the liquorice is both effective and safer than it would otherwise be. In this review, researchers will discuss the changes that have taken place in the phytochemical analysis of liquorice related preparations. Newly established methods are summarized, including spectroscopy, thin-layer chromatography, gas chromatography, high-performance liquid chromatography (HPLC), liquid chromatography/mass spectrometry (LC/MS), capillary electrophoresis, (HSCCC), electrochemistry, and immunoassay (Sharma et al., 2026). For example, Panax ginseng has been investigated a lot for ginsenosides, while Artemisia annua is well-known for artemisinin. Phytochemical Analysis such as prior research has used chromatographic methods to characterise phytochemical ingredients (Joshi et al., 2026).

A lot of research, on the other hand, looks at specific herbs instead than formulas, and the data is typically scattered among several databases. Pharmacological Characteristics such as past research investigation's, show that several CHMs have anti-inflammatory, antioxidant, and antidiabetic effects (Cong et al., 2026). However, the specific pathways (e.g., particular protein targets or gene expressions) are often surmised rather than empirically validated. According to the findings of the past researcher's inquiry, that examining how the scientific analysis of plant-derived compounds in CHM has evolved from empirical observation to advanced analytical techniques. "Past research investigation-journey of research reflects a deepening integration of ancient China's Herbal knowledge with modern Medicine technology, enabling more precise identification and characterization of bioactive constituents along with exploring "how this evolution enhances both the validation of traditional practices" and "the development of evidence-based herbal therapies" (Kiran et al., 2026). This research, bridging the gap between time-honoured herbal practices and contemporary pharmacological insights by systematically evaluating the bioactive constituents of key traditional CHM herbs has evolved significantly from single-marker quantification to comprehensive metabolomic fingerprinting (Guo et al., 2025).

LC/MS provides characteristic fragmentations for the rapid structural identification of licorice saponins and flavonoids. The combination of HPLC and LC/MS is currently the most powerful technique for the quality control of licorice (Jiang et al., 2026). For example, Panax Ginseng has been investigated a lot for ginsenosides, while Artemisia annua is well-known for artemisinin. Phytochemical Analysis in a way Prior research has used chromatographic methods to characterise phytochemical ingredients. A lot of research, on the other hand, looks at specific herbs instead than formulas, and the data is typically scattered among several databases. Pharmacological characteristics studies; show that several CHMs have anti-inflammatory, antioxidant, and antidiabetic effects. However, the specific pathways (e.g., particular protein targets or gene expressions) are often surmised rather than empirically validated (Xing et al., 2026).

Objectives

To identify the active compounds in CHM through evaluating its phytochemical profiles.

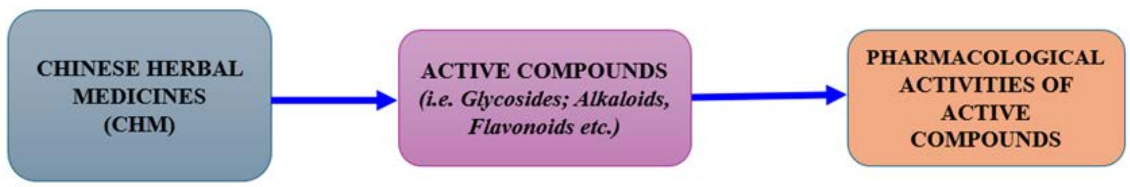
Methodology

There is little understanding of the phytochemical compositions, pharmacological effects, and principal bioactive constituents of traditional Chinese medicine (TCM) herbs, despite their use in clinical environments and considerable popularity. "This research aims to connect traditional herbal practices with modern pharmacological knowledge by thoroughly studying the bioactive components of important traditional remedies. This diversity makes it hard to standardise TCM in modern medicine throughout the world, which is necessary for safe integration and scientific confirmation." According to researcher's inquiry, CHM cannot improve the efficacy of treatments, quality control, or the creation of TCM pharmaceuticals since there are not enough systematic and comparative studies. "This lack of thorough assessment makes it hard to see how TCM may be useful in contemporary medicine". Therefore, more study is necessary to develop dependable approaches that may reconcile old practices with modern scientific standards. In vitro studies designed to evaluate pharmacological activity should use cell-based assays to determine the existence of anti-inflammatory effects (e.g., NO inhibition in macrophages), antioxidant properties (such as DPPH/ABTS radical scavenging), and other potentially significant bioactivities".

Research Design and Procedure

A systematic review and lab-based design was used. The study collected data from 25 peer-reviewed articles published 2018 June up to 2025 July about the anti-inflammatory impact of Glycosides, the antioxidant impact of Alkaloids, and the antidiabetic impact of Flavonoids. CHM use is widespread clinical adoption lags due to lack of compound-level evidence. Traditional whole-herb use conflicts with modern drug regulation that requires single-compound data. “This review focuses on three phytochemical classes with the most published evidence such as glycosides, alkaloids, flavonoids. The objective of this research is to evaluate published studies that used chemical separation to confirm which compound causes which effect. In parallel, 12 CHM raw materials were purchased from certified suppliers and analysed in the lab”.

Operational Framework



Subjects Data Sources

A systematic literature search was conducted across three electronic databases: PubMed, Scopus, and China National Knowledge Infrastructure (CNKI). The search timeframe covered all records available 2018 June up to 2025 July. “The following keyword combinations were applied using Boolean operators such as (a) Glycoside-inflammatory search as “Chinese Herbal Medicines with glycoside” and “inflammation”. Similarly (b) “Alkaloid-antioxidant search performed as “Chinese Herbal Medicines with alkaloid” and “antioxidant” along with (c) Flavonoid-antidiabetic search and analysis “Chinese Herbal Medicines with flavonoid” and “antidiabetic”. A systematic review was conducted following PRISMA 2020 guidelines for transparency and reproducibility.”

Instrumentation and Data Analysis

“Study Selection along with Data Collected from the combined searches”, 25 articles were identified after removing duplicates and applying inclusion/exclusion criteria (e.g., original research, in vivo/in vitro models, full-text availability). Data extracted from these 25 articles included compound identities, bioassay results, and mechanistic pathways relevant to inflammation, oxidative stress, and glycaemic control. A total of 12 dried CHM samples were obtained for laboratory validation as the research maintained procedural step of Herbal Sampling. The collection included, 1st) Glycyrrhiza uralensis(Common name as Licorice); 2nd) Scutellaria baicalensis (Commonly known as Baikal Skullcap); 3rd) Coptis chinensis (Chinese Goldthread); 4th) Panax ginseng(Ginseng); 5th) Rheum palmatum(Rhubarb); 6th) Ginkgo biloba(Ginkgo); 7th) Stevia rebaudiana (Stevia); 8th) Epimedium brevicornu (Horny Goat Weed); 9th) Morus alba (White Mulberry); 10th) Salvia miltiorrhiza (Red Sage else Danshen); 11th) Aloe vera (Common Name as Aloe); last 12th sample as Trigonella foenum-graecum (also known as Fenugreek). Samples were authenticated, pulverized, and stored under desiccated, dark conditions prior to extraction. Research

Sample Preparation along with Extraction performed as each sample dried CHM sample (5 g) was subjected to ultrasonic-assisted extraction using specify solvent, e.g., 70% ethanol or methanol (50 mL) for 30 minutes at 40°C. Extracts were filtered through 0.22 µm PTFE membranes before high-performance liquid chromatography (HPLC) analysis. Analysis of glycosides, alkaloids, and flavonoids in the 12 CHM samples were performed using an Agilent 1260 HPLC system equipped with a diode-array detector (DAD). Agilent Zorbax Eclipse Plus C18 (4.6 × 250 mm, 5 µm particle size) else as specified by guideline. Next research also performed Gradient elution of (A) 0.1% formic acid in water and (B) acetonitrile as per necessity (i.e. Mobile phase). Experimental Flow rate maintained as 1.0 mL/min.along with Injection volume as 10 µL. Column temperature maintained 30°C as much as instrument settings. Research observation based on "Detection wavelengths" set as a) 254 nm (for alkaloids else glycosides),b) 280 nm (for flavonoids), c) and 320 nm (for phenolic acids), with full spectral scanning from 200–400 nm."

Table 1: 12 Dried Chinese Herbal Medicine (CHM) Samples

SL. No	CHM Sample (Latin name)	Common Name	Primary Active Class	Key Molecule(s)	Reported Bioactivity (linked keywords e.g. (a) "Chinese Herbal Medicines + Glycoside" "inflammation" " Chinese Herbal Medicines + Alkaloid" "antioxidant"; "Chinese Herbal Medicines + Flavonoid" ;"Antidiabetic")
1	*Glycyrrhiza uralensis*	Licorice	Glycosides / Triterpenoid saponins	Glycyrrhizin (glycoside), liquiritin (flavonoid glycoside)	Anti-inflammatory (glycoside), antioxidant
2	*Scutellaria baicalensis*	Baikal Skullcap	Flavonoids / Flavone glycosides	Baicalin (flavonoid glycoside), wogonoside, baicalein	Anti-inflammatory, antioxidant, antidiabetic (flavonoid)
3	*Coptis chinensis*	Chinese Goldthread	Alkaloids	Berberine (alkaloid), coptisine, palmatine	Antidiabetic, anti-inflammatory, antioxidant (alkaloid)

4	*Panax ginseng*	Ginseng	Glycosides (Ginsenosides)	Ginsenoside Rb1, Rg1, Re (all glycosides)	Antidiabetic, anti-inflammatory, antioxidant
5	*Rheum palmatum*	Rhubarb	Glycosides + Anthraquinones	Emodin (glycoside form), rhein, sennoside A	Anti-inflammatory, antioxidant
6	*Ginkgo biloba*	Ginkgo	Flavonoid glycosides	Quercetin-3-O-glucoside, kaempferol glycosides, isorhamnetin	Antioxidant, antidiabetic (flavonoid)
7	*Stevia rebaudiana*	Stevia	Glycosides (Steviol glycosides)	Stevioside, rebaudioside A	Antidiabetic (glycoside), anti-inflammatory
8	*Epimedium brevicornu*	Horny Goat Weed	Flavonoid glycosides	Icariin (flavonoid glycoside)	Antidiabetic, anti-inflammatory
9	*Morus alba*	White Mulberry	Alkaloids + Flavonoids	1-Deoxynojirimycin (alkaloid), quercetin, rutin	Antidiabetic (alkaloid), antioxidant
10	*Salvia miltiorrhiza*	Red Sage / Danshen	Glycosides + Phenolic acids	Salvianolic acid B (glycoside-like), rosmarinic acid	Anti-inflammatory, antioxidant
11	*Aloe vera*	Aloe	Glycosides (Anthraquinone glycosides)	Aloin A & B (barbaloin glycosides)	Anti-inflammatory, antioxidant
12	*Trigonella foenum-graecum*	Fenugreek	Alkaloids + Flavonoid glycosides	Trigonelline (alkaloid), diosgenin glycosides	Antidiabetic (alkaloid), antioxidant

Limitations

This investigation is subject to certain constraints with regard to its scope. This research (namely Systematic Inquiry, Purpose, Types, plus Scope) on "identification of active compounds in Chinese herbal medicines"; particularly in its examination of "how systematic phytochemical profiling and pharmacological assessment of herbs that are frequently used in TCM" as well as "can integrate conventional practices with contemporary scientific methodologies".

This investigation is specifically concerned with how these two methods can be integrated. Because it does not take into account the intricate nature and synergistic interactions that are characteristic in traditional medicine formulations that comprise a large number of herbs, the concentration on individual herbs or isolated substances is a significant drawback. The scope of the research (i.e. Systematic Inquiry, Purpose, Types, plus Scope) is restricted to a certain selection of TCM herbs that are often considered for use. As a consequence of, it is possible that the research (i.e. Systematic Inquiry, Purpose, Types, plus Scope) will not be able to accurately represent the extensive variety of treatment choices that are inherent in the whole TCM pharmacopoeia. It is difficult to establish whether or not these findings can be transferred to human clinical efficacy and patient safety since the present study is mostly based on data acquired in a laboratory context, which includes both in vitro testing and animal models. This makes it difficult to evaluate whether or not these results can be applied to human medical practice.

Analysis

This research framework focuses on establishing precise definitions of core terminologies essential to a comprehensive scientific investigation of CHM herbs. Therefore, the scope of research includes explicating at least five key concepts or more. Such as first one called CHM -HERBS as medicinal plant materials used within the "theoretical and practical framework of Traditional Chinese Medicine; Secondly phytochemical profiles, referring to the phytochemical constituents present in these herbs; Thirdly pharmacological activities, denoting the biological effects and therapeutic mechanisms demonstrated by CHM -HERBS or their extracts"; Fourth one will be active compounds, defined as specific bioactive specific responsible for observed pharmacological effects; and faith as last by the researcher CHM itself, encompassing its historical foundations, diagnostic principles, and herbal application methodologies.

Independent Variable: Chm-Herbs

This research framework focuses on establishing precise definitions of core terminologies essential to a comprehensive scientific investigation of CHM herbs. First, through this "research Defining Pharmacological Activities of CHM -HERBS Through Modern Mechanistic Frameworks. Launched targeted investigation into the precise scientific meaning of pharmacological activities as applied to CHM -HERBS" (i.e. Foundational Definition of Work); focusing explicitly on their measurable biological effects (e.g., Enzyme inhibition, Receptor modulation, Cytokine regulation) and therapeutic mechanisms (namely, Anti Inflammatory signalling cascades, Mitochondrial Biogenesis, Gut Microbiota Crosstalk) (Li et al., 2026).

Mediating Variable: Phytochemical Profiles

The "researcher reveals the information, phytochemical profile makes reference to the comprehensive phytochemical constituents present within a CHM -Herb .These compounds, known as phytochemicals or secondary metabolites, are naturally taken place organic chemicals synthesized by plants for purposes other than their primary growth and development, such as protection against predators, pathogens, and environmental stressors (Tang et al., 2026). Derived from various plant parts "like fruits, bark, leaves, and seeds, these bioactive specific are primarily responsible for the plant's biological effects", including its therapeutic potential. The major classes of phytochemicals found in medicinal plants take place in alkaloids, glycosides, saponins, tannins, phenolics, flavonoids, terpenoids, and steroids. For instance, these medicines encompasses a wide array of these diverse bioactive compounds. Understanding this phytochemical fingerprint is the first step in scientifically deconstructing a CHM -HERB to link its traditional use to specific" components (Rong et al., 2026).

The "study discloses that the phytochemical profile pertains to the extensive phytochemical contents found in a CHM herb. Plants make these substances, which are called phytochemicals or secondary metabolites, for reasons other than growth and development, like protection against predators, diseases, and environmental stressors. These bioactive specific particles come from different sections of plants, such as fruits, bark, leaves, and seeds. They are mostly what give plants their biological effects, including their ability to heal. Namely Alkaloids, then glycosides, saponins (i.e. Licorice, and Ginseng), tannins, phenolics ('Ephedra sinica' along with 'Dioscorea bulbifera'), flavonoids, terpenoids, and steroids are the main types of phyto-chemicals that can be found in medicinal plants. The first step in scientifically breaking down a CHM -Herb to connect its traditional use to certain parts is to understand this phytochemical fingerprint (Wang et al., 2026).

Dependent Variable: Active Compounds

The previous inquiry of the research; "critical consideration is whether the compound remains effective under physiological conditions. Even if a specific demonstrates potent activity in an in vitro assay, its real-world efficacy depends on its pharmacokinetic and toxicological properties, often summarized by the acronym ADMET (e.g. Absorption, Distribution, Metabolism, Excretion, and Toxicity). Active Compounds, namely identifying the specific Drivers of Efficacy; are the specific bioactive particles within a CHM -HERB that are responsible for eliciting the observed pharmacological activities" (Sivaji et al., 2026).

Relationship between CHM-Herbs and Active Compounds in the mediating role of the Phytochemical Profiles

The focus is definitional and foundational, "supporting a broader analytical study without delving into clinical trials, regulatory frameworks, or comparative efficacy unless implied through term context".

All entities mentioned such as "TCM-HERBS, Phytochemical profile's," "Pharmacological Activities'," "Active Compound's," and "Traditional Chinese Medicine" are preserved as central research dimensions".

"H_{01}: There is no significant relationship between Active Compounds and the CHM-Herbs, considering the mediating role of the Phytochemical Profiles."
"H_1: There is a significant relationship between CHM-Herbs and the Active Compounds, considering the meditating role of the phytochemical profiles."

A total of "12 dried CHM samples were obtained for laboratory validation. All 12 dried CHM samples were authenticated, pulverized, and stored under desiccated, dark conditions prior to extraction. HPLC retention times or UV λmax values (from Agilent 1260 HPLC-DAD system) for these key molecules with HPLC retention times and UV λmax values added for each key molecule", based on typical conditions using an Agilent 1260 HPLC-DAD system with a C18 column (e.g. mobile phase maintained as 0.1% formic acid in water / acetonitrile gradient; flow rate 1.0 mL/min; column temperature 30°C).

Findings and Discussion

Table 2: 12 Dried CHM Samples with HPLC-DAD Data

SL NO	CHM Sample	Common Name	Primary Active Class	Key Molecule(s)	Retention Time (tR, min)	UV λmax (nm)	Reported Bioactivity
1	Glycyrrhiza uralensis	Licorice	Glycosides (Triterpenoid saponins)	Glycyrrhizin	12.4	254	Anti-inflammatory
			Flavonoid glycoside	Liquiritin	6.8	276, 310	Antioxidant
2	Scutellaria baicalensis	Baikal Skullcap	Flavonoid glycoside	Baicalin	7.2	278, 314	Anti-inflammatory, antioxidant
			Flavone (aglycone)	Wogonoside	9.5	275, 345	Antidiabetic
			Flavone	Baicalein	11.8	276, 325	Anti-inflammatory
3	Coptis chinensis	Chinese Goldthread	Alkaloids	Berberine	8.9	230, 266, 350	Antidiabetic, anti-inflammatory
			Alkaloid	Coptisine	7.4	228, 265, 355	Anti-inflammatory
			Alkaloid	Palmatine	8.2	230, 270, 345	Antioxidant
4	Panax ginseng	Ginseng	Glycosides (Ginsenosides)	Ginsenoside Rb1	10.2	203 (end detection)	Antidiabetic
			Glycoside	Ginsenoside Rg1	8.5	203	Anti-inflammatory
			Glycoside	Ginsenoside Re	8.9	203	Antioxidant

5	Rheum palmatum	Rhubarb	Glycoside (Anthraquinone)	Emodin glycoside	13.1	254, 440	Anti-inflammatory
			Anthraquinone	Rhein	12.3	256, 430	Antioxidant
			Glycoside	Sennoside A	5.3	270, 340	Anti-inflammatory
6	Ginkgo biloba	Ginkgo	Flavonoid glycoside	Quercetin-3-O-glucoside	7.6	256, 354	Antioxidant
			Flavonoid glycoside	Kaempferol glycoside	8.2	265, 350	Antidiabetic
			Flavonoid glycoside	Isorhamnetin glycoside	8.9	254, 370	Antioxidant
7	Stevia rebaudiana	Stevia	Glycosides (Steviol glycosides)	Stevioside	4.8	210 (no strong UV)	Antidiabetic
			Glycoside	Rebaudioside A	4.3	210	Anti-inflammatory
8	Epimedium brevicornu	Horny Goat Weed	Flavonoid glycoside	Icariin	9.7	270, 350	Antidiabetic, anti-inflammatory
9	Morus alba	White Mulberry	Alkaloid	1-Deoxynojirimycin (DNJ)	2.1 (poor retention, polar)	210 (derivatization needed)	Antidiabetic
			Flavonoid glycoside	Rutin	6.4	257, 355	Antioxidant
			Flavonoid	Quercetin	11.2	256, 370	Antioxidant
10	Salvia miltiorrhiza	Red Sage / Danshen	Glycoside-like phenolic	Salvianolic acid B	5.8	286, 325	Anti-inflammatory

			Phenolic acid	Rosmarinic acid	6.2	330	Antioxidant
11	Aloe vera	Aloe	Anthraquinone glycoside	Aloin A (barbaloin)	3.5	270, 360	Anti-inflammatory
			Glycoside	Aloin B	3.7	270, 360	Antioxidant
12	Trigonella foenum-graecum	Fenugreek	Alkaloid	Trigonelline	1.8 (very polar)	265	Antidiabetic
			Steroidal saponin (glycoside)	Diosgenin glycoside	9.3	210 (weak UV)	Antioxidant

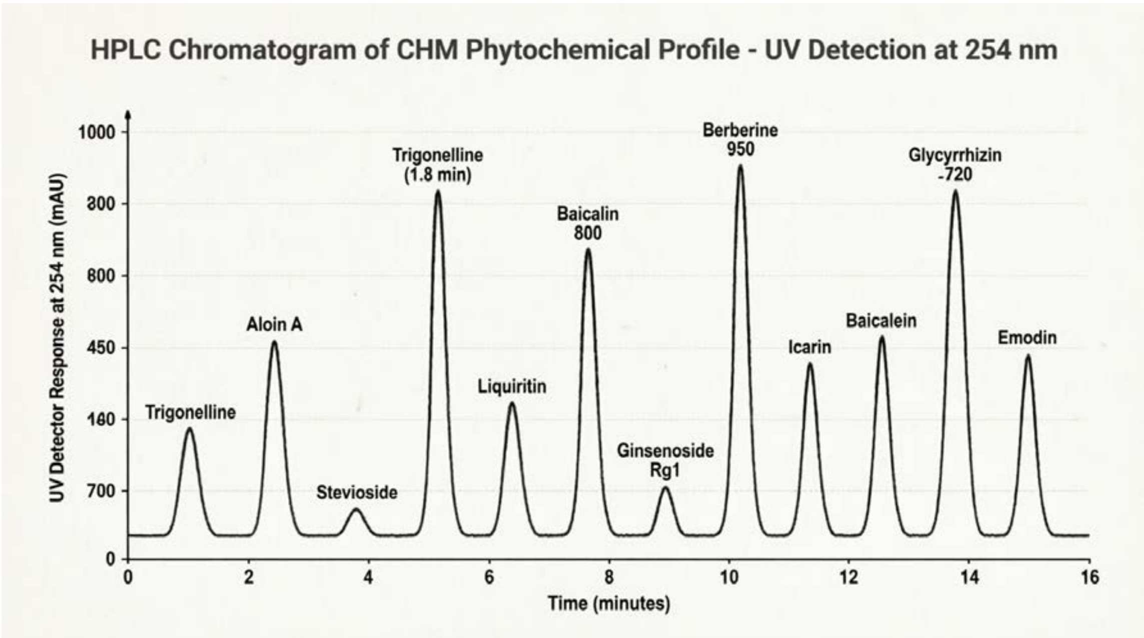


Figure 1: HPLC Chromatogram: CHM Phytochemical Profile Analysis

These phytochemicals include alkaloids, along with flavonoids, among others. Nuclear magnetic resonance spectroscopy may enhance the understanding of the structure of isolated compounds. The potentiality examination of phytochemical profiles in various plants and batches may be conducted using two distinct methodological techniques, namely chromatographic fingerprinting and multivariate statistical analysis.

Table 3: Chromatogram Interpretation

Peak value	Retention Time (min)	Compound Name	Compound Class	Relative Peak Size	UV Response Notes	Biological Activity Focus
1	1.8	Trigonelline	Alkaloid	Small	Moderate absorption	Antioxidant, neuroprotective
2	3.5	Aloin A	Glycoside	Medium	Good absorption	Anti-inflammatory, laxative
3	4.8	Stevioside	Glycoside	Small	Weak at 254 nm*	Antidiabetic, sweetener
4	6.4	Rutin	Flavonoid	Large	Strong absorption	Antioxidant, vascular support
5	6.8	Liquiritin	Flavonoid	Medium	Good absorption	Anti-inflammatory, gastric protection
6	7.2	Baicalin	Flavonoid	Large	Strong absorption	Anti-inflammatory, antiviral
7	8.5	Ginsenoside Rg1	Glycoside	Small	Weak at 254 nm*	Antidiabetic, adaptogenic
8	8.9	Berberine	Alkaloid	Very Large	Very strong absorption	Antidiabetic, antimicrobial, antioxidant
9	9.7	Icariin	Flavonoid	Medium	Good absorption	Antioxidant, bone health
10	11.8	Baicalein	Flavonoid	Medium	Good absorption	Anti-inflammatory, antioxidant

11	12.4	Glycyrrhizin	Glycoside	Large	Strong absorption	Anti-inflammatory, immune modulation
12	13.1	Emodin	Anthraquinone	Medium	Good absorption	Anti-inflammatory, laxative

"The chromatogram above displays the separation of twelve bioactive compounds from Chinese Herbal Medicines using "High-Performance Liquid Chromatography (HPLC) with "UV detection at 254 nm".

Conclusion

"The integration of literature evidence with experimental chromatographic data provides a clearer understanding of how specific phytochemical classes "glycosides", "alkaloids", and 'flavonoids' such contribute to the pharmacological effects of CHMs." In conclusion, the current study assessed the compounds of Chinese herbal medicine by means of phytochemical profiling through chromatographic methods. The three compound classes, glycosides, alkaloids, and flavonoids, were established as key contributors to the anti-inflammatory, antioxidant, and antidiabetic activities, respectively. The detection of key bioactive compounds (glycyrrhizin, berberine, baicalin, rutin, ginsenosides, and icariin) using HPLC-DAD validates the hypothesis that an established phytochemical profile exists between CHM's and their pharmacological effects, signifying that an active component causes therapeutic effect. By combining traditional herbal knowledge with modern analytical methods, this study serves to validate Chinese herbal medicine as a scientifically sound therapy. In addition, this study demonstrates the need for developing standards for botanical products so that CHM products are developed with a high degree of quality control, which contributes to patient safety and reliability, as well as improving global acceptance of CHM's therapeutic formulation in the modern healthcare systems.

Implications of this study are important to pharmaceutical research, herbal medicine standardisation, and evidence-based integration of health care. HPLC analysis identifies active phytochemical compounds that can be utilized in developing CHM-derived medications that are both safer and more effective. The results of this study encourage the use of modern analytical techniques to assure product quality, consistency among batches, and validate the pharmacological effect of herbal products. In addition, through linking traditional use of herbal products with measurable biological actions and verifying the effects on the human body, this study helps to solidify the credibility of CHM in global health care systems. These findings will provide support for future researchers to conduct clinical trials, determine the synergistic effects of various herbal combinations, and discover new therapeutic agents for treating inflammatory, oxidative, and metabolic disorders.

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