# Characteristic Features of the Top 100 Cited Studies on Herbal Medicine: A Bibliometric Analysis

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## Abstract

***Background:*** *Plants play vital role in human life. Herbal plants have been used for the treatment of several ailments over the years. The aim of the study is to provide an overview and research trend of 100 top-cited studies on herbal plants.*
***Methods:*** *A comprehensive search of publications on herbal plants was conducted in the Web of Science Core Collection database on April 05, 2021. HistCite™ and VOSviewer software were used for citations and visualization mapping respectively.*
***Results:*** *The top 100 studies authored by 453 authors and published in 70 journals were included in the final analysis. Majority of the retrieved documents were based on articles (56%). The most dominant authors were Ernst E (n=8, 8%) and Chan K (5%). The most active institute was University of Exeter (8%). The top leading Journal in herbal medicines was Journal of Ethnopharmacology (11%). Most hotspot words used in our study was Herbal (100%) and Medicine (52%). Moreover, visualization mapping represents that herbal medicine was the most co-occurrence (15 occurrences) author keyword. The most productive country was People's Republic of China (31%).*
***Conclusion:*** *This study provides basic information about the published literature on herbal plants. Most of the herbal medicines have been used in developing countries. But now this trend is shifting towards developed nations.*
***Keywords*:** Herbal medicines, Bibliometric analysis, VOSviewer, HistCite™.

## Introduction

The term 'medicinal/herbal plant' shows the presence of medicinal properties in some specific plants like *Citrullus colocynths*, *Thyme* and *Turmeric*. These herbal plants contain various bioactive compounds that are beneficial for the synthesis of drugs (Rasool, 2012). These bioactive compounds include steroids, reducing sugar, saponins,

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terpenoids, tannins, anthraquinones, phlobatannins and cardiac glycosides. These bioactive compounds of plants are metabolic products, that acts similar for both human and animals (Da-silva et al., 2016). The World health Organization (WHO) defines the term herbal plants as natural plant materials that are used locally without industrial process for the treatment of disorders (Tilburt and Kaptchuk, 2008).

Herbal plants have medicinal properties in their all parts and these agents left their therapeutic effects. All the constituents of plants may have interaction with each other that help to diagnose the diseases like cancer that is hard to treat. Some active ingredients of vincristine, taxol and morphine isolated from periwinkle, yew, foxglove, and opium poppy, respectively can be used to treat cancer (Rasool, 2012). Plant materials also have the capability to control the onset of any disease. Due to the harmful effects of allopathic medicines people are moving to the use of these herbal drugs rather than chemical drugs usage (Jamshidi-Kia et al., 2018). Ethnomedicinal plants are used by many tribes in India to cure the cuts and wounds (Bhardwaj and Gakhar, 2005). Medicinal plants have some beneficial properties like side effects neutralization and synergistic properties that develop keen interest in these plants (Gilani, 2005; Shinwari, 2010). All parts of a plant can be used for drugs production process including roots, branches, fruits, above all whole plant is beneficial. But the most commonly used plant parts are leaves that is 92% and then sap/juice is 77% (Hassan-Abdallah et al., 2013).

Decades ago, people were in search of natural treatment for diseases. At that time, the use of herbal plants was common and there were specific plants for the treatment of specific diseases (Petrovska, 2012). These plants have a lot of importance in poor communities worldwide. Only 10% of flowering plants are used for medicinal purpose among thousands of species of plants (Shinwari, 2011).

Medicinal plants are beneficial for their remarkable properties. They are high in demand due to their good effects on living organisms as well as on ecosystem. In ancient times, herbal plants were the only source of diseases treatment. Now a days, plant species are also in use for the manufacturing of pharmaceuticals and cosmetics (Jamshidi-Kia et al., 2018).

Zoo-pharmacognosy, represent the usage of herbal plants by animals as well as human beings for their disorder's treatment (Shinwari and Qaisar, 2011). Herbal medicines have their uses in both developed and developing countries due to the presence of lesser complications in these drugs (Jamshidi-Kia et al, 2018; Wichtl, 2004). Many cultures in world used herbal plants as a safe therapeutic drug due to their specific capabilities (Khan, 2014). Herbal plants induce a keen interest in their

usage in developed countries and about 80% of developing countries use them as their first therapeutic medicine. A large part of the world's population used medicinal herbs as natural healers of their complications (Sánchez et al., 2020). These herbs are used by families and some consultants also prescribed such medicines as a home remedy to treat diseases (d'Avigdor et al., 2014).

Before the discovery of allopathic medicines, man rely on the natural herbs for their diagnosis. This is due to the ancient belief that plants were created for food, medical treatment, and other beneficent effects. In WHO survey, it is said that about 80% of the developing world population is mostly dependent on the traditional herbs for their primary health care. It is believed that these herbs are the 'backbone' of traditional medicines in less developed countries as evident from their usage on regular basis (Ahvazi et al., 2012).

Population has a strong belief on the medicinal herbs as they are natural and not of synthetic origin., The consumption of such medicinal herbs is safer than the synthetic drugs. Herbal plants after their discovery and conventional usage become the part of healthy lifestyle hence replaced western medicines. It is also mentioned in a study that herbal drugs and all their components have advantageous effects on health and can also be used efficiently in the treatment of human disorders (Srivastava, 2018).

## Methods

*Study design*

A retrospective bibliometric type of study was designed.

*Database and searching keywords*

On April 05, 2021, the Web of Science Core Collection database was searched for the relevant studies on herbal medicine. The search terms "herbal medicine" was used in the title field and limited to 1900-2019. The top 100 cited studies were selected based on number of total citations in descending order.

*Data collection and analysis*

The retrieved data were downloaded in CSV and plaintext format. A number of attributes including study title, author name, year of publication, journal, institution, country, and number of citations were extracted. The required graphs or charts were generated using OriginPro 2018. The data in plaintext were exported in to HistCite™ for citation analysis both local and global citations of the included studies. Furthermore, the obtained data were plotted for co-authorship countries,

all keywords, citations and source, and bibliographic coupling source using VOSviewer software version 1.6.16 for windows.

*Ethical approval*
This study required no ethical approval.

## Results

Many studies have been conducted on herbal medicines, but we retrieve top 100 articles. These studies were documented by 453 authors and published in 70 journals with cited references and 462 keywords. In this study the dominant authors were Ernst E (8%) and Chan K (5%) as it is described in Figure 1. Documents on herbal medicines that were retrieved consisted of articles, reviews and proceedings as shown in Figure 2. Institutes that were most active in research on herbal medicines include Univ Exeter (8%), China Acad Chinese Med Sci (5%) and Cent S Univ (4%) shown in Figure 3.

Many journals publish documents on herbal medicines. Maximum publications in journals include *Journal of Ethnopharmacology* (11%), followed by *Journal of Chromatography A* (7%) and *Evidence-based Complementary and Alternative Medicine* (4%) presented in Figure 4. Among all the countries only 30 countries publish documents on herbal medicines in which Peoples R China was the most productive country with (31%) published documents, followed by USA (25%) and UK (15%) as described in Figure 5.

### Co-authorship countries network visualization

Among all countries Peoples R China was the leading country with 31 publications (6237 citations, and TLS 20), followed by USA (4987 citation score, 25 publications and TLS 20) and UK (2818 citation, 11 publications and TLS 20). Co-authorship country visualization network mapping is presented in Figure 6

### Co-occurrence all keywords network visualization

Minimum number of occurrences of a keyword was set at 2. Of the 831 keywords, only 123 meet the threshold. Herbal medicine (15 occurrences), ginkgo-biloba (10 occurrences) and inhibition (10 occurrences) were the most frequently used keywords. Co-occurrence of all keywords is presented in Figure 7.

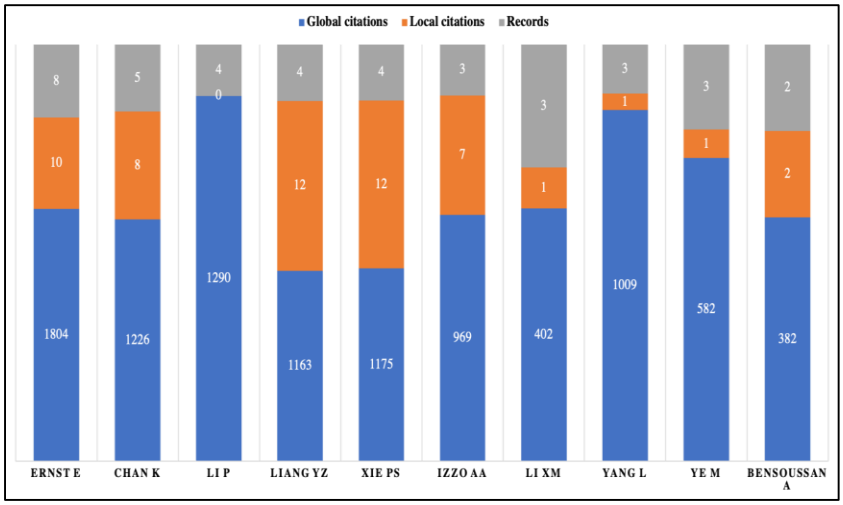


**Figure 1.** Authors with at least 2 publications

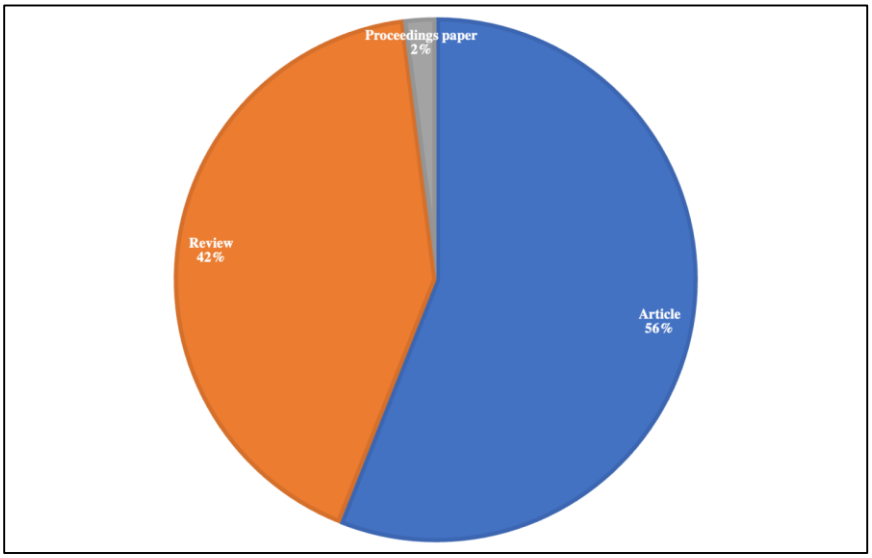


**Figure 2**. Publications by document types

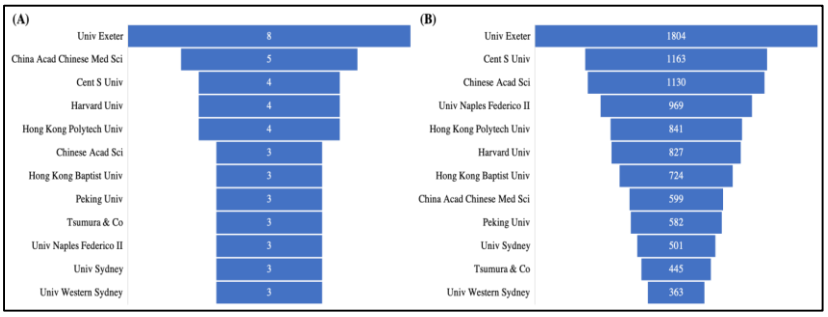


**Figure 3.** Institutions with at least 3 publications.

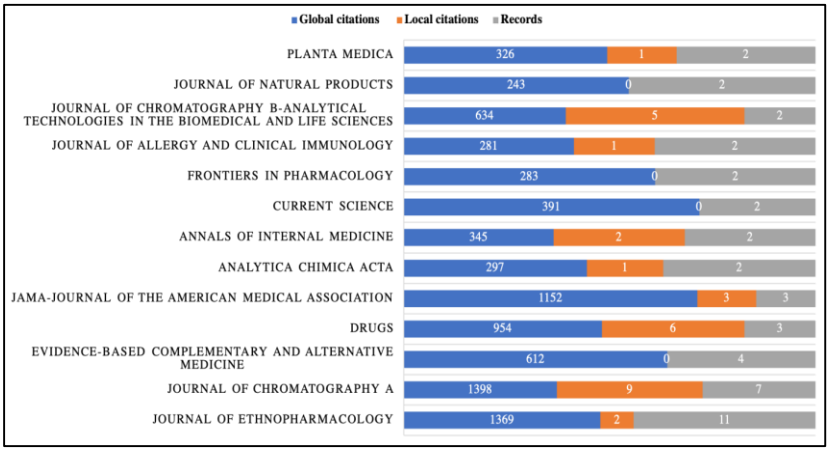


**Figure 4.** Journals published at least 2 studies.

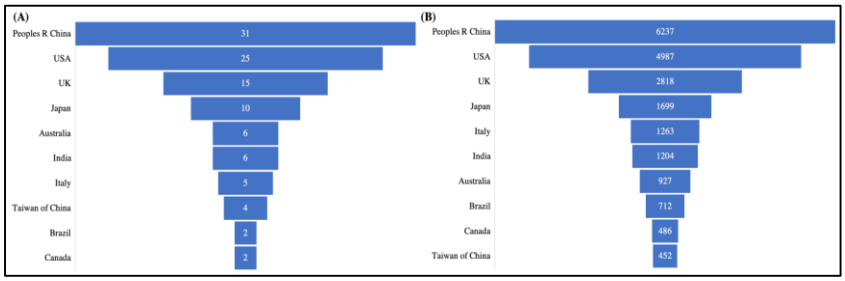


**Figure 5.** Countries/regions produced at least 2 studies.

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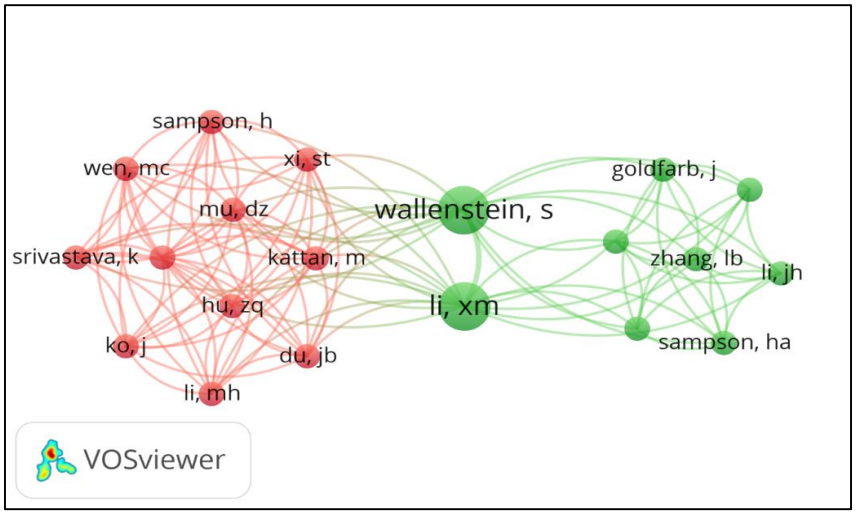


**Figure 6:** Co-authorship countries network visualization mapping

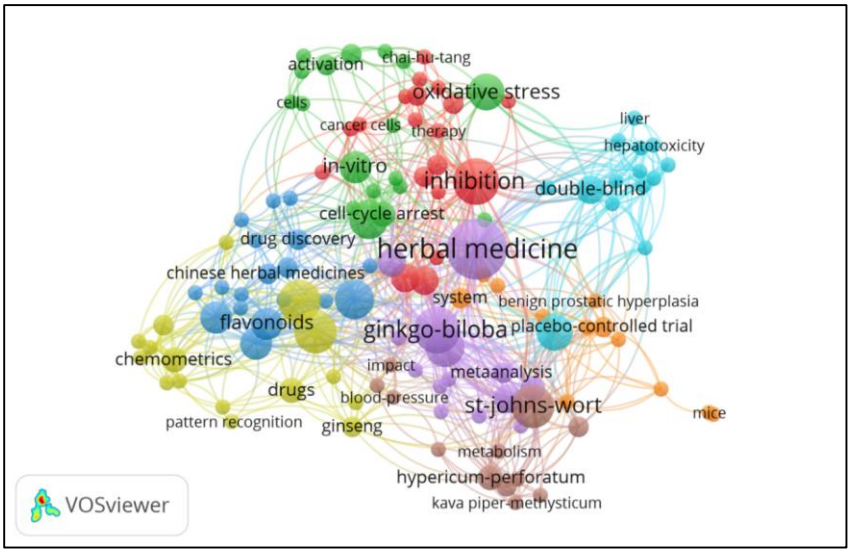


**Figure 7:** All keywords co-occurrence network visualization mapping

## Discussion

This study is the first comprehensive bibliometric analysis on top 100 most cited papers on herbal medicines. Bibliometric analysis plays significant role by providing the referral point to the researchers, policymakers, and practitioners. The current study focused on the global research trends and outcomes of herbal medicines which provide

treatments with least side effects. Results showed that China has published most articles followed by US and UK. This is very unusual as in most of the studies US play a leading role (Shi et al., 2021; Ahmad et al., 2021). It was made possible only because the China has a long history of Chines herbal medicines. According to literature, in China, India and Tibet the treatments for different diseases were carried out by plants though it was recorded after centuries (Murugaiyah and Mattson, 2015). Much of this knowledge was disregarded by modern medicines since last century. Currently plants are mostly valued by the pharmaceutical industries for the perceived activities and mostly inert constituents are discarded. The drug companies only extract and isolate a specific active compound to purify and patent it to be used for commercializing products (Veeresham, 2012). In this scenario US has developed the pharmaceutical whereas China has more focus on the herbal medicines.

Among the top 100 most cited articles, almost half of them are research articles while others are review and proceedings. This indicates that the determination of pharmacological activities, phytochemicals and phytochemistry of herbs are although important but other than experimental work, the knowledge and practices of folk medicine also play important role. Contrary to some other fields of medical science, review articles in herbal medicines are getting more citations because usually they document a huge data in it. Ernst is the most prolific author with highest citations and publications. He has published the review articles as well as research articles.

Journals are considered important tools for the dissemination of research; thus, quality and prestige of a journal play a major role in transmitting the research to the concerned segment of society (Shah et al., 2021). During last decades till 2019, three journals (*Journal of Ethnopharmacology*, *Journal of Chromatography A*, *Evidence-based complementary and alternative medicine*) were ranked the most productive and major journals in the field of herbal medicines due to many publications on herbal plants and their drugs management. *Journal of Ethnopharmacology* ranked as top journal with 1369 citation score and 11 publications that followed *Journal of Chromatography A* with 1398 citation score and 7 publication. The current study has few limitations, firstly, the data used were retrieved from a single database. Secondly, the search was limited to title field. The use of other databases such as Scopus, PubMed, and Google Scholar may alter the citations count.

## Conclusion

Current study provides the basic information and research trend in the herbal or medicinal plants globally. This also provide the base line

reference point to devise a future policy about the herbal drugs, which is almost lacking. China is leader in this field, but the Western and other developed countries also endorse the herbal treatments. There is a dire need of research collaboration between the countries leading in herbal medicine and the countries lacking the facilities or techniques. This may pave the way to broaden the use of herbal medicine as well as it will facilitate to device a global policy on herbal medicines.

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