

Calendula Officinalis of Antibiotic Activity: A Review

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Abstract - Chemical and pharmacological investigations have been conducted on the medicinal herb *Calendula officinalis* Linn. (Asteraceae), which is utilized in traditional medicine in many parts of the globe. According to chemical analyses, its organs include a wide variety of substances, including but not limited to volatile oil, carotene, flavonoids, terpenoids, coumarins, quinones, carbohydrates, lipids, amino acids, and other minor elements. *C. officinalis* extract & pure compounds isolated from various parts of the plant have numerous pharmacological effects, such as anti-inflammatory, antioedematous, anti-oxidant, immunostimulant, and many more. Discuss the antimicrobial properties of *Calendula officinalis* Linn. in this review paper.

Keywords - Pharmacological activities, Antibiotic activity, Medicinal plant, *C. Officinalis*.

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INTRODUCTION

Ayurveda, Siddha, Unani, Yoga, and Naturopathy are all examples of Indian healing modalities. Around 5000 B.C. is when the Ayurveda medical system was first developed. AtharvaVeda, of which Ayurveda is a subset, is the storehouse and treatise of the wisdom and knowledge of great sages & seers, gained, tested, and passed down through successive generations. Ayurveda is more than just a medical practice; it's a philosophy on life. PanchMahabhutas, Tridoshas, Sapta Dhatus, and the Three Malas are the four core ideas of Ayurveda that inform its preventative, promotive, and curative applications. Despite its antiquity, the system itself is very contemporary.[1]

Ayurveda, which literally means "science of life," is sometimes referred to as the "Mother of all Healing." the traditional medical system of the Indian subcontinent, dating back to at least the 12th century BCE. Ayurveda is more than a medical system; it's a philosophy of life. Traditional indigenous medical practices include Ayurveda, Siddha, Unani, and Folk (tribal) medicine. Ayurveda is the most well-established and frequently practiced of these modalities in India. The goal of holistic medicine is to treat patients as whole people, not just symptoms. This means taking measures to promote health and avoid illness. Ayurveda's comprehensive approach to health care means that it does more than just cure the symptoms of illness.

The ancient literature provides this detailed description of each plant in order to help the reader choose which herbs would work best for their unique physical condition.

Whole plants and their parts, animal parts, and minerals are all utilized as remedies in Ayurveda, and sometimes they are used together. In addition, many more strategies are used in an effort to keep a healthy person well and to treat physical and mental illnesses. Rasa, guna, virya, vipaka, and prabhava are names used to describe different qualities that are considered while analyzing the composition of materials in medications and the food. These characteristics are essential to the efficacy and effectiveness of the prescribed medication or nutritional plan.[2]

Medicinal plants, particularly those utilized in Ayurveda, may supply physiologically active compounds or lead structures for the creation of modified derivatives with improved activity and/or lower toxicity. India's diverse flora and fauna have earned it the nickname "botanical paradise of the world." In India, people employ about 6,000 different plants for various medical purposes, including traditional medicine, folk medicine, and herbal medicine. Traditional medical practices are preserved in all nations in the WHO South-East Asia Region. For those in need of medical attention, there

is no shortage of traditional medicine practitioners to turn to.

Plants served as a source of medicine as well as food and clothing for humans. The chemical, medicinal, biological, and industrial potentials of a vast variety of natural products are investigated annually. Since ancient times, people have turned on plants for food, medicine, and other essentials. Since time immemorial, several different medical systems in India and local health traditions have used plants to cure human illness. Plants have been used for medicine for a very long time. The written record shows that people have been using plants for medicinal purposes from at least 4000–5000 B.C. The identification and usage of most of these plants as medicines have been thoroughly recorded by many writers.[3]

Herbal remedies have become a byword for protection against synthetics, which are widely seen as harmful to both humans and the natural world. While herbs had been highly valued for millennia due to their therapeutic, culinary, and aromatic properties, their significance was temporarily eclipsed in the modern era by synthetic goods. More than seventy-five percent of people worldwide use plants or plant-based products as their primary source of medical treatment. About 30 percent of all plant species have been used for therapeutic reasons at some point in history.

MEDICINAL PLANTS

The phrase "medicinal plant" refers to several different plant species utilised in herbalism. It involves both the study of and use of plants for therapeutic reasons. The Latin word "herba" and the ancient French word "herbe" are the origins of the term "herb." Today, the term "herb" is used to describe any component of the plant, including the fruit, seed, stem, bark, flower, leaf, stigma, or root of a non-woody plant. Before, only non-woody plants, such as those that derive from trees and bushes, were referred to as "herbs." These healing plants are also used in certain types of spiritual practises, as well as in food, flavonoids, medication, and perfume.[4]

Medical use of plants dates back well beyond the ancient world. There are references to plants and their uses in ancient Chinese writings, Egyptian papyrus, and Unani scrolls. We know that Unani Hakims, Indian Vaid, and Mediterranean and European cultures employed plants as medicine over 4000 years ago. The native peoples of ancient Rome, Egypt, Iran, Africa, and the Americas all used herbs in their healing rituals, while other civilizations developed traditional medical systems such as Unani, Ayurveda, and Chinese Medicine that systematically utilized herbal medicines.

Conventional medical practices are still widely practiced. Population growth, insufficient drug supply,

prohibitive costs of treatments, side effects of several synthetic drugs, and the development of resistance to currently used drugs for infectious diseases are just some of the reasons why more attention has been paid to the use of plant materials as a source of medications for a wide range of human ailments.[5]

India is well recognized as an ancient culture with a rich tradition of herbal medicine. A vast array of medicinal and aromatic plants used in the manufacture of medicines and perfumes are mostly sourced from India's forests. Over eight thousand different herbal remedies have been formally recognized in India's AYUSH programs. Ayurveda, Unani, Siddha, & Folk (tribal) Remedies are the four primary indigenous medical systems. Indian medicine has two major traditions: Ayurveda and Unani.[6]

According to recent estimates from the World Health Organization (WHO), 80% of people worldwide depend on herbal remedies for some part of their basic medical requirements. Around 21,000 botanical species have the potential to be utilised as medical plants, according to the WHO.

According to information now available, more than 75 percent of the world's population depends mostly on plants & plant extracts for their medical requirements. More than 30% of all plant species have been used medicinally at some point. According to estimates, plant-based medications account for up to 25% of all pharmaceuticals used in industrialised nations like the United States, while they account for up to 80% of all drugs consumed in rapidly growing nations like India and China. As a result, nations like India place a considerably greater value on medicinal plants economically than the rest of the globe. The health care system for the rural population depends on indigenous systems of medicine, and these nations contribute two thirds of the plants utilised in contemporary medicine.[7]

HERBAL MEDICINE USE HISTORY

The need for, and general acceptance of, medicinal plants is rising rapidly at the current time. Plants unquestionably play a significant part in ecosystems by delivering crucial functions. In order to survive as we should, humans and other species need plants. As a matter of fact, herbs, and particularly therapeutic plants, have always served as a general indication of ecosystem health. Of course, people have thought about plants for their medicinal properties ever before recorded history began.[8]

We may assume that early people had some understanding of the qualities of the plants surrounding them long before recorded history

began, since they used these plants for a variety of purposes, including but not limited to cooking, heating, and clothing. In places like China, Greece, Egypt, and India, the use of medicinal herbs has evolved into a well-established scientific discipline. It was customary practise in ancient Persia to employ plants for medicinal, sanitising, and perfume purposes[8]. Plants have been used medicinally for as long as humans have been looking for ways to heal themselves naturally. It's estimated that more than a tenth of all plant species are employed in medicine and cosmetics. It's important to note that not all countries have the same diversity of medicinal plants, and that most herbs used in traditional medicine come from wild populations. The demand for wildlife products has been rising at a rate of 8–15 percent annually throughout Europe, North America, and Asia in the last several decades.[9]

TRADITIONAL MEDICINE

Medicinal plants have been used for hundreds of years. A variety of herbal preparations were used, including tinctures, teas, poultices, powders, or other primitive pharmaceuticals, to treat various medical conditions. The appropriate plants to use and how to apply them for various diseases were transmitted orally. Herbal pharmacopoeias eventually became the standard reference for knowledge on plants used for medical purposes. The scientific basis for modern allopathic medicine can be traced back to ancient medicine, and it is expected that many significant novel cures will be found and marketed in the future by following the leads supplied by traditional experiences and knowledge. Almost every culture has a long-standing herbal history, but not all of them have been well explored. European traditions are especially well-known and have had a significant impact on contemporary western pharmacognosy. Learning about these customs is intriguing because they show how we've been able to create such a wide range of cultural behaviours throughout time.[10]

Because of a lack of knowledge about the science behind the healing effects of plants, the usage of medicinal plants is often linked to superstition and the paranormal in various cultures. Elements of the Doctrine of Signatures, which is illogical in nature, may be found in many of the world's healing traditions. For believers, a plant's outward form is a divinely-inspired code for its curative abilities. Some roots, because of their humanoid appearance, are connected with the feminine form of fertility; for example, red juice and sap is associated with blood or menstrual disorders; yellow blossoms with bile and jaundice; and so on. The plant *Chelidonium majus*, which has been used effectively to cure jaundice, has yellow blooms and a yellow alkaloid-containing latex.[11]

CALENDULA OFFICINALIS

Calendula officinalis is a member of the daisy family (Asteraceae) that is native to southern Europe or the

Eastern Mediterranean. It may be grown as an annual or short-lived perennial. It's been a garden staple for decades, and now it's popping up all over the place in milder temperatures by itself. It has a long history of usage in both the kitchen and the medical world. There are several species of *Tagetes* that go by the popular name "marigold," but this species—also known as pot marigold, English marigold, and Scotch marigold—is not one of them. *C. arvensis*, sometimes known as field marigold, is a similar annual plant native to southern Europe.[12]

The stems of these plants are angular and branching, and their simple, alternating leaves may grow to a length of 2 feet. Fine hairs cover the stems. The leaves, which may be spatulate or oblanceolate, are fragrant and sticky (although newer cultivars typically have this feature significantly reduced), and the leaf margins are undulating rather than serrated.

While most cultivars have orange or yellow daisy-like blooms, white and bicolor varieties are also available. The ray florets and disc florets on the monoecious (individual blooms are either male or female, although both sexes may be found on the same plant) flowers are about a half an inch long and two to three inches wide. Cut flowers may be harvested from these plants nearly continually during their blooming season, which lasts until the first hard frost.[13]



Figure 1. Calendula plants.

The inwardly curved achenes emerge from the styles after pollination by bees. When the petals fall, a ring of grey to light brown seeds is left in its place.

Family: Asteraceae

The ancients knew that *Calendula officinalis* L. had healing properties, thus it has been utilised in traditional medicine ever since. Antimicrobial and antioxidant actions are only two of its many touted health benefits.

Plant Description:

Aromatic and often referred to as pot-marigold or just marigold, *Calendula officinalis* is an annual flowering plant. In normal conditions, its height will increase by

roughly 0.5 m. It has straight, ramified stems. The leaves are oblong-lanceolate in shape, 5–15 cm in length, hairy on both sides, and have toothed edges. There are two rows of hairy bracts around the thick capitula and flower-heads that are 3-8 cm in diameter on the inflorescences. The flowering tops are a year-round fixture. A sharp, curving achene serves as the fruit.[14]

Each stem ends in a composite flower head of 5–7 cm in diameter; the epicalyx is made up of several narrow-lanceolate sepals that are thickly coated with glandular hairs on both sides. Disc florets are pseudohermaphrodites, although the female is infertile. The ray florets around the periphery are female zygomorphic florets because they lack stamens and have inferior ovaries that are more developed than those of tubular florets. Only the female ray blooms produce fruit. The achenes of a heterocarp are bent and ringed like a sickle. As a rule, this plant only lives for one year. It reaches a height of 30–50 cm, has a tap root of approximately 20 cm, and a plethora of slender, secondary roots. The upright, angular, downy stem is branched at various levels. Almost spatulate at their bases, the oblong to lanceolate alternating leaves are entirely tomentose on their upper surfaces.[14]

HERBAL MEDICINE'S PART AS A TRADITIONAL ANTIBIOTIC

In terms of public and personal health, medicinal plants are invaluable. Some chemical components in these plants have been shown to have a measurable physiological effect on humans, which is where their therapeutic usefulness resides.[15]

Antibiotics are generally regarded safe and so well tolerated since they undergo extensive safety testing before being approved for clinical use. However, various antibiotics have been linked to a variety of unwanted side effects, the severity of which may vary greatly from patient to patient, drug to antibiotic, and microbe to microbe. [102,103] A drug's pharmacological or toxicological qualities, or a patient's hypersensitivity to the drug, might all contribute to unwanted side effects. Some of the potential side effects include a high temperature, nausea, and even anaphylaxis.

Microbial

Sometimes bacteria that seem unrelated might really work together for the greater good. To put it simply, bacteria are the most numerous and varied creatures on the planet. Scientists in the field of microbiology relied on morphological and physiological characteristics to distinguish between various species of bacteria prior to Carl Woese's 1987 release of phylogenetic information. *Pseudomonas* was one example of a bacterium described as a result of this. However, despite their limits and biases, breakthroughs in molecular technologies have led to a greater knowledge of bacterial diversity. There are several molecular technologies available now, such as

16S rRNA clone libraries, DGGE, FISH, and Q-Dot blotting to name a few. An ever-increasing number of papers were published once molecular techniques were put into use. Whether you call it microbial ecology, environmental microbiology, or something else entirely, it all has to do with the interdependence and diversity of microscopic organisms and the conditions in which they thrive.[16]

Microorganism

Microorganisms, often known as microbes, are single-celled organisms that are too tiny to be seen with the human eye but are detectable using a microscope. The study of microscopic creatures is called microbiology. Microorganisms include everything from bacteria and fungus to archaea and protists, viruses and algae.

Antibacterial Agents

Antibacterials are substances that prevent or slow the development and spread of bacteria. These substances actively combat bacteria, either eliminating it or keeping it from spreading. It is true that all antibiotic medications and many other chemicals and substances, such as heat and chlorine, may kill germs.[17]

Antimicrobial Drugs

Drugs that kill microorganisms are called "antimicrobials." Each class of antimicrobial medication is named for the bacteria it is most effective against. Antimicrobials, antifungals, antiprotozoal, or antiviral medications are only a few.

Antimicrobial Chemotherapy

The use of antimicrobial drugs in a medical setting to treat infectious disorders is known as antimicrobial chemotherapy. Antibacterial chemotherapy, in which antibiotics are used to treat a bacterial infection, antifungal chemotherapy, and antiviral chemotherapy are the three types of antimicrobial chemotherapy.

Antibacterial Drug

Mycelial bacteria that produce spores are called Gram-positive bacteria, and this category includes *Actinomyces*, *nocardias*, and *Streptomyces*. Mycelium may develop bacillary structures by dividing or fracturing. The fungi known as *actinomyces* may live in anaerobic, microaerophilic, or capnophilic conditions. Aerobic bacteria include *Nocardia* and *Streptomyces*. Pus and discharges contain colonies or granules of species of medicinal and veterinary value.

TOPICAL ANTIBIOTICS AND THEIR NATURAL SUBSTITUTES

Traditional medicine has long made use of plant-based remedies, including both dietary and herbal tincture preparations, as a means of combating sickness. And then Big Pharma became all the rage. Western medicine and pharmaceuticals have come a long way, yet it's easy to overlook how powerful natural antibiotics and other traditional healing methods still are. Before anything else, antibiotics are only a temporary fix. Pharmaceutical medications are effective at reducing bothersome symptoms, but they don't address the underlying cause of sickness. Because of this shortcoming, you are more likely to suffer from the same health issue again. The convenience of OTC antibiotics might lead people to depend on them instead of practising disease prevention via things like healthy eating, regular exercise, and managing stress when they feel unwell.[18]

The germs that cause damage and end up in your body may be eliminated with the use of antibiotics. But they also destroy the beneficial microorganisms in your body that make your immune system strong. Antibiotics may lead to oxidative stress, which can permanently damage your cells and forces your liver to work harder to detox from pharmaceutical medications.

Clearly, antibiotics provide a temporary means of regaining health. Clearly, antibiotics are a temporary fix that may help you get back on your feet as you wait for your body to fully recover. You're healthy, but they also have drawbacks. This is why it's worthwhile to examine the possibility of taking antibiotics in tandem with or instead of natural remedies. Not only may herba remedies assist reduce health problems, but many "natural antibiotics" promote the health of your immune system, liver, and stomach, which is vital for supporting your body's natural healing process and keeping you from becoming ill. Phytoconstituents found in plants have been documented in the scientific literature as a potential source of therapeutically active ingredients.[19]

Time immemorial Alkaloids, tannins, flavanoids, and phenolic chemicals are the most significant of these bioactive plant elements. Roughly 300,000 plant species have been discovered so far, and these produce a vast array of compounds that vary greatly in structure or class. Metabolites are further classified as either main or secondary. Sugars, fatty acids, amino acids, and nucleic acids are examples of primary metabolites, as are compounds necessary for plant growth and development that are thought to be present in all plants.[20]

CONCLUSION

Here, we delve into the antibacterial qualities of *Calendula officinalis* Linn. to both compile the available data on this plant and highlight its many uses as a medicine. Because *C. officinalis* is an excellent source of a broad variety of natural goods, there will be a rise

in future scientific study on the plant in order to develop good active principals.

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