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Review Article

Curcuma Longa (Turmeric); The Magnificent Specie and it's Pharmacological Attributes

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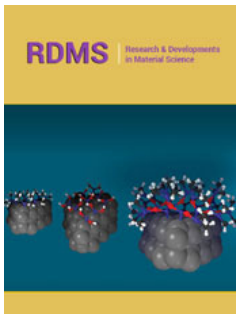

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Abstract

Curcuma longa (Turmeric) is majority beneficial herbal medicinal (therapeutic) plant, linked to the Zingiberaceae family. Curcumin is responsible for the majority of the turmeric's activities, according to extensive studies. It has anti-inflammatory, anti-ulcer, and anti-cancer properties, making it effective in conditions like inflammation, ulcers, and cancer. Antifungal, antimicrobial, renal, and hepatoprotective properties are also present. As a result, it has the ability to treat cancer, diabetes, asthma, obesity, Alzheimer's disease, as well as other chronic diseases that are difficult to treat. This review's goal was to provide a quick rundown of what we know about curcumin's effects now and in the past. Recently published papers on turmeric were searched in worldwide cites such as Science reference Index, PubMed/Medline, and Google Scholar. Recent research has validated turmeric as a treatment for a variety of diseases, particularly those caused by the effects of oxidative stress, such as diabetes, cancer and inflammatory disorders. In the struggle against AIDS, It's used even like a Anti-HIV, anticoagulant and hepatoprotective. As a spice, curcumin is a medicinal agent with a lot of potential. It's also very non-toxic. As the global landscape shifts toward utilising non-toxic plant products with fast therapeutic applications, the production of modern turmeric medicines for the treatment of various diseases should be prioritised. Turmeric needs to be studied further in order to uncover hidden areas and realistic therapeutic applications that can benefit humanity.

Introduction

Since the development of modern science, medicinal plants hold given a credible link intended for the development of fresh drugs as well as the treatment of diseases. Curcuma longa L., also known as turmeric (from the Zingiberaceae family), is widely recognized as a global herbal medicine panacea, with a broad range of pharmacological interventions, according to a thorough review of the literature [1].

The rhizome, or drug component of the plant, produces a yellow powder. Turmeric, the ingredient which gives a distinctive yellow color to curry powder, comes from dried Curcuma longa. Turmeric is known as curcum in Arab countries, saffron in India, kyooukon in Japan, and jianghuang in China. The plant can grow up to a meter tall and has a little stem. Turmeric is a popular spice all around the globe, through a long history of utilize by humans, especially in the East [2].

It is used in traditional drug for the cure of conditions of the gastrointestinal tract, in particular gallbladder and hepatic diseases, diabetic injuries, rheumatism, inflammation, sinusitis and anorexia [3]. Curcuma longa is usually taken orally and can even be used topically and inhaled (in the Ayurvedic tradition) to treat acne, wounds, blistering, swelling, bruising, eczema, pest bites, bacterial infections, ulcers, haemorrhages, and other skin diseases [4]. Turmeric comprises active ingredients curcumin (diferuloylmethane), demethoxycurcumin, and bisdemethoxycurcumin, and even volatile oils (tumerone, atlantone, and zingiberone), sugars, proteins, and resins [5].

Curcumin's ability to remove oxygen-derived free radicals is due to the phenol groups within its composition (structure). Curcumin can remove the following free radicals: hydroxyl radical, singlet oxygen, superoxide radical, nitrogen dioxide [6].

Taxonomical classification

1. Kingdom: Plantae
2. Subkingdom: Tracheobionta
3. Superdivision: Spermatophyta
4. Division: Magnoliophyta
5. Subclass: Zingiberidae
6. Order: Zingiberales
7. Family: Zingiberaceae
8. Genus: Curcuma
9. Species: Longa
10. Scientific name: Curcuma longa

Phytocomponents of (Curcuma longa) turmeric

The qualitative and quantitative phytochemical analysis for dissimilar sections of C. aromatica can be found by extraction methods, and solvents are stated to include many important groups of phytochemical compounds, such as terpenoids, flavonoids, steroids, phenols, glycosides, saponins, tanninus, protein amino acids and volatile oils [7].

Turmeric has a protein content of 6.3 percent, a fat content of 5.1 percent, a mineral content of 3.5 percent, a starch content of 69.4 percent, and a moisture content of 13.1 percent. Curcumin (diferuloylmethane) (3-4%), a phenolic diketone, is dependable for yellow coloring and is made up of curcumin I (94%), curcumin II (6%), and curcumin III (0.3%). Demethoxycurcumin and bisdemethoxycurcumin, two other phenolic diketones, have also been isolated from C. longa rhizomes [8].

An analysis of Gas Liquid has been used to test the essential oils found in the C. longa leaves. Chromatography (automated Perkin-Elmer system) Carbowa capillary column, 20m elongated, 50m long flux ionisation detector) and was found to be high in α-pinene, 1,8cineole, β-pinene, sabinene, myrcene, α-phellandrene, p-ymene, C-8aldehyde, linalool, caryophyllene, geraniol as well as methyl heptanone [9].

Turmeric medicinal and pharmacological properties

Anti-inflammatory properties: Curcumin was found to be as effective as cortisone or phenylbutazone when given orally duringthe cases of acute inflammation. Studies in vitro and in vivo have shown that it can reduce both acute and chronic inflammation. Curcuma longa was found to minimize inflammatory swelling when taken orally [10].

C. Longa can explain its anti-inflammatory properties if it is capable of both inhibiting inflammatory Prostaglandin biosynthesis from arachidonic acid and neutron phillingin inflammatory states. Curcuminoids are all inhibited by LOX, COX, phospholipases, leukotrienes, prostaglandins, thromboxanes, oxide elastase, hyaluronids, collagenases, chemo-attractant protein monocyta, TNF and interleukin-12. They also inhibit leukosynthesis and reduce the formation of prostaglandin through the lipoxygenase pathway [11].

Curcumin inhibited edoema in mice at doses ranging from 50 to 200mg/kg. A dosage of 48mg/kg body weight resulted in a 50% reduction in edema, making curcumin almost as successful as cortisone and phenylbutazone at equivalent doses. A minor dose of 20-80mg/kg reduced foot inflammation and edema in rats [12].

Curcumin in addition prevented formaldehyde-induced arthritis in mice when administered dosage of 40mg/kg, and at doses of up to 2g/kg/day without acute toxicity.

An intraperitoneal injection of turmeric extract contains 4mg total curcuminoids/kg/day for 4 days earlier to induction of arthritis withdrawn joint inflammation in both the acute (75%) and chronic (68%) phase of rheumatoid arthritis caused by streptococcal cell walls in an animal study [13].

Antioxidant action: Turmeric and its curcumin portion have high antioxidant action when compared to vitamins C and E. Curcumin pre-treatment have an important outcome in reducing ischemia-induced heart changes. In an in vitro-study using bovine aortic endothelial cells, on the result of which endothelial hemeoxygenase-1, an inducible stress protein, was measured [14].

When curcumin was incubated for 18 hours, it increased cellular resistance to oxidative harm. It has the ability to protect lipids and haemoglobin from oxidation. Curcumin has antioxidant properties, which means it can greatly reduce the production of Reactive Oxygen Species (ROS) by activated macrophages, for example H2O2, superoxide anions, and nitrite radicals. Its derivatives (bisdemethoxycurcumine and demethoxycurcumin) have antioxidants and can help avoid colelithiatic diseases and treat them [15].

Antimicrobial activity: In the food, drinks, and pharmaceutical sectors, microbial contamination and resistance are key issues. Food preservative the antimicrobial agents, have been used in the past to prevent the level of micro organisims (bacteria) that cause food poisoning and increase the shelf life of processed foods [16].

Antimicrobial properties have been discovered in a variety of plant compounds, including those from C. aromatica. The antimicrobial action was traced to germacrone, according to the phytochemical study. It's fair to say that germacrone has been linked to a variety of biological effects, counting anti-inflammatory, antitussive, antitumor as well as antifungal properties [17]. Added that, the essential oil obtained by fresh C. aromatica rhizomes has shown that it inhibits both gramme positive and gramme negative bacteria development [18].

Curcumin (diferuloylmethane) was isolated and shown to have antibacterial and antifungal activity in opposition to Staphylococcus aureus and Saccharomyces cerevisiae strains. Curcuma aromatica essential oils, Curcuma nankunshanensis, Curcuma elata, Curcuma rubescens, Curcume rubescens, Curcuma rubescens and other essential oils from extra Curcuma species have shown greater antifungal efficacy against S. cerevisiae (183.18g/ml), than essential oils from other Curcuma species. Curcuma rubescens [19].

Antitussive activity: In one sample, C. aromatica was found to have antitussive properties. The ethanol extract from the plant had a dose-dependent antitussive result that was equivalent to codeine phosphate. 1.5 hours after oral administration the extract suppressed cough in mice by 79 percent on a dosage of 400mg/kg body weight, that is equivalent to codeine phosphate (87 percent by a concentration of 40mg). The ethanol extract showed no adverse effects in an acute oral toxicity analysis up to the highest dose of 4g/kg [20].

Antidepressant properties: In Chronic Mild Stress (CMS) model Curcumin's effect was studied. In contrast to standard rats, rats that have undergone the Chronic Mild Stress (CMS) procedure consume significantly less sucrose and have significantly upper level of TNF, IL-6, CRF, and cortisol. Ethanol extract treatment raised the intake of sucrose to a normal level of control, decreased CMS-induced increases in serum IL-6 and TNF-, and decreased CRF levels in serum and medulla oblongata to worse than standard levels. It also restored natural cortisol level in the blood [21].

Curcuma longa ethanolic extract increased cortisol levels, serotonin turnover, and serum corticotrophin-releasing factor while decreasing serotonin, noradrenalin, and dopamine concentrations [22].

The result of orally inducted curcumin on actions in a chronic stress depression model in mice's is demonstrated in a study. Imipramine, an antidepressant, was utilized as a monitor. Curcumin administration exhibited imipramine-like properties. These findings advise that the special effects of prolonged curcumin administration on actions of chronically stressed rats are associated to the modulating properties of Hypothalamic-Pituitary-Adrenal (HPA) axis dysfunction via increasing brain-derived neurotropic factor in the frontal cortex and hippocampus of mice [23].

Analgesic activity: The use of analgesic medications for pain relief, such as opiates and NSAIDs, has remained stagnant due to reports of negative side effects such as addiction and gastrointestinal problems [24].

Several herbs, including C. aromatica, has be studied in an effort to discover usual solutions to these drugs, and have demonstrated significant analgesic activity. Pranav Kumar used Eddy's hot plate (55 °C) method to study the analgesic action of aqueous extract of C. aromatica rhizomes in mice's to induce pain due to high temperature. As compared to diclofenac sodium (10mg/kg), the extract was given mouth at concentrations of 300 and 500g/kg which displayed a longer pain latency [25].

In another study, mice writhed less in the acetic acid-induced writhing test after being given an aqueous extract of C. aromatica rhizomes [26].

Wound healing activity: Powdered C. aromatica rhizomes incorporated into a soft white paraffin ointment have wound-healing properties.

When the manufactured ointment was applied topically to rabbits' acute wounds, it caused major wound reduction and epithelization within 9-11 days [27]. Cream formulations of C. aromatica rhizome extracts revealed considerable wound healing effects when administered externally on excision wounds of Swiss albino mice [28].

Conclusion

Turmeric is a one of a kind source of a number of chemical compounds that are responsible for a wide range of functions. While several studies have been conducted on turmeric, further research is required to uncover its other therapeutic benefits in the fight against disease. To develop new medicines, a drug development programme should be implemented. While crude extracts from the plant's leaves or rhizomes have medicinal uses, modern drugs can only be produced after thorough research into their pharmacotherapeutics, bioactivity, mechanism of action, and toxicities, as well as proper standardization and clinical trials.

As the worldwide landscape shifts toward the use of non-toxic plant products with conventional therapeutic uses, the production of new drugs derived from C. longa must be prioritised for disease control. Further research on C. longa is needed in order to uncover the hidden areas and therapeutic applications that can benefit humanity.

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