https://africanjournalofbiomedicalresearch.com/index.php/AJBR
Afr. J. Biomed. Res. Vol. 27(3s) (September2024); 605-618
Research Article

An Intensive Study on *Curcuma longa* and *Dalbergia sissoo* as Possible Promising Combination for the Treatment of Various Ailments

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Abstract
This review explores the therapeutic potential of *Curcuma longa* and *Dalbergia sissoo* highlighting their pharmacological activities and their use in traditional medicine systems like Ayurveda. *C. longa*, rich in curcumin and other phytochemicals, exhibits a range of biological activities, including antioxidant, anti-inflammatory, and anticancer effects. Clinical trials have shown its potential in treating conditions like uveitis, Alzheimer's disease, asthma, and gastrointestinal disorders. In contrast, *D. sissoo* has limited clinical data, though preclinical studies suggest its effectiveness in bone healing and anti-osteoporotic activities. Despite their shared therapeutic properties, such as antioxidant, anti-inflammatory, anticancer and hepatoprotective effects, studies investigating the synergistic potential of these two plants in combination are lacking. The review emphasizes the importance of future research to explore the combined pharmacological benefits of *C. longa* and *D. sissoo*, especially for chronic inflammation, oxidative stress, and cancer. A combined approach could offer enhanced therapeutic outcomes, making these plants valuable candidates for novel drug development.

Keywords: *Curcuma longa; Dalbergia sissoo;* Combinational therapy; Herbal medicine; Pharmacological synergy

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Receiving Date: 10/07/2024 Acceptance Date: 20/08/2024

DOI: https://doi.org/10.53555/AJBR.v27i3S.2070

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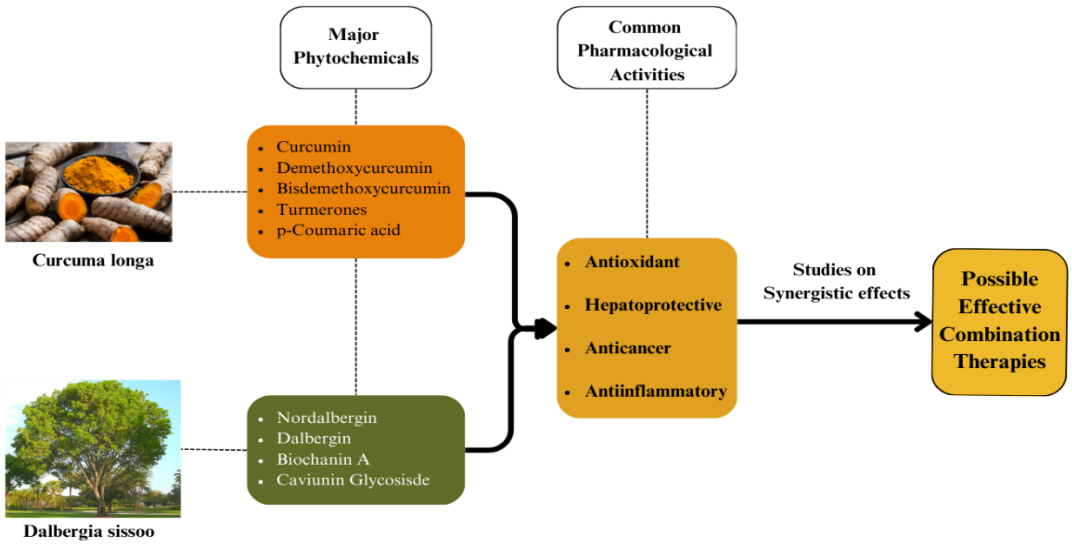
Graphical Abstract:



The need of preclinical and clinical studies for the combinational therapies of *C. longa* and *D. sissoo.*

Introduction

Herbal medicine is the oldest for of healthcare known to human beings. It has been used for centuries and plays an important part in healthcare in both developing and developed countries (Builders, 2019). Roots of herbal medicine can be notes in every single culture around the world. Each traditional medicinal system is influenced by several factors, such as locations, environmental conditions and social influences. However, a common point on which each of these traditional medicinal systems complies is holistic approach of treatment, that not only focuses on treatment or management of single disease, but providing complete care to the patient. Ayurvedic Medicine and Traditional Chinese Medicine (TCM) are two of the well-known herbal medicinal systems (Sam, 2019). In recent time, the popularity of herbal medicines has been increasing. People are becoming aware of the benefits of herbal medicines, and are using herbal medicines in combination with other drugs, or alone to achieve the state of health. Over 80% of world's population is depending on herbal medicine, and so many pharmaceutical companies now showing more interest in integration of herbal medicines with modern medicinal concepts (Qadir & Raja, 2021).

Curcuma longa or Turmeric is also known as "Golden Spice of India", is an herb used for centuries for its medicinal benefits. It is known as one of the most powerful healing herb present in nature (Kumar *et al.*, 2020). Turmeric is part of Indian home-remedies for various ailments, such as flatulence, measles, chronic cough, throat irritation, soreness of eyes and healing of wounds (Bhowmik *et al.*, 2009). Different parts of *C. longa* are used in treatment of various ailments in traditional medicine. Rhizomes of plant are used for liver diseases, jaundice, biliousness, as blood purifier, stimulant and as stomachic (Omosa *et al.*, 2017). Turmeric powder is found to be having biological activities such as wound healing, anti-inflammatory, antiprotozoal and antitumor activities. Curcumin, a major phytochemical present in *C. longa* is known to be having antioxidant, antitumor, antiviral, antiprotozoal and antibacterial properties (Verma *et al.*, 2018). *C. longa* was shown to have anti-tumour activities in prostate cancer, cervical cancer and glioma cancer cells (Yoon *et al.*, 2006). Curcumin derived from *C. longa* has also showed good activities in management of AIDS, along with enhancing the effects of conventional treatments and minimizing their side effects (Prasad & Tyagi, 2015).

Dalbergia sissoo is another important medicinal plant used in folk medicine as remedy for gonorrhoea. In Ayurveda, juice obtained from leaves of *D. sissoo* is used as analgesic, antipyretic, anthelmintic and for treatment of various eye disorders (Bhattacharya *et al.*, 2014b). Wood rasping, dried bark and fresh leaves are reported to have antipyretic, anthelmintic expectorant, abortifacient and aphrodisiac activities (Shah *et al.*, 2010). Chloroform extract obtained from bark of *D. sissoo* shown marked antioxidant potential, whereas, Methanolic extract exhibited strong antioxidant properties as well (Kaur *et al.*, 2011). Silver nanoparticles prepared using leaf extract of *D. sissoo* shown noteworthy antitumor activity against MCF7 cancer cell line in comparison with Doxorubicin anticancer drug (Deep *et al.*, 2020). *D. sissoo* is an important medicinal plant with potential to be used in modern medicines too.

TCM started the use of herb-herb combination therapies thousands of years ago. It offers several advantages such as synergistic effects, lower doses, reduced chances of emergence of medication resistance and enhancement of life quality (Che *et al.*, 2013). Both *C. longa* and *D. sissoo* are important medicinal plants with common medicinal properties, such as anticancer, antioxidant, analgesic and antipyretic activities. Their combination can be a great success in treatment of various ailments with great efficacy and lower adverse effects.

Botanical Profiles

Curcuma longa

Turmeric, or *C. longa*, is a member of the Zingiberaceae family.. **Table 1** represents taxonomical classification of *C. longa*.

***Table 1:* Taxonomical classification of *C. longa* (USDA, 2024)**

Rank	Scientific Name and Common Name
Kingdom	Plantae or Plants
Subkingdom	Tracheobionta or Vascular plants
Superdivision	Spermatophyta or Seed plants
Division	Magnoliophyta or Flowering plants
Class	Liliopsida or Monocotyledons
Subclass	Zingiberidae
Order	Zingiberales
Family	Zingiberaceae
Genus	*Curcuma*
Species	*Curcuma longa* L.

Morphological features

C. longa is a perennial herb with height extending up to 1 meter. The plant has a thick underground stem or rhizome with rings. Reproduction is via rhizomes. Leafy shoots are present with 8 to 12 leaves in each shoot. Leaves can be 1 meter long, pale green colour at bottom and dark green colour on upper surface. Plant also bears yellow-white sterile flowers, borne on a stalk. Viable seeds are not produced from the flowers. Seeds are brown in color, small and shape is ovoid (RBG, 2024).

Phytochemical Constituents

Phytochemistry of *C. longa* is very rich. Numerous studies have revealed the presence of important phytochemical compounds from different part of *C. longa*. Phenolic compounds are most important class of this plant. Some important phenolic compounds present in Turmeric plant are tetrahyrobisdemethoxycurcumin, dihydrocurcumin and dimethoxycurcumin (Czernicka *et al.*, 2019). Some other phenolic compounds characterized in plant include isohammetin, casuarinin, quercetin-3-D-galactoside, sinapic acid, caffeic acid and coumaric acid (Sabir *et al.*, 2021). Sharma *et al.*, (1997) isolated volatile oils from rhizome and leaves of plant, and identified important compounds such as toluene, alpha-thujene, myrcene, sabinene ad linalool, along with numerous other compounds. Curcuminoids are a major group of phytochemicals that are present in *C. longa* and is responsible for its therapeutic properties. Curcumin and curcumin derivatives are extensively studied in recent years for pharmacological actions. Terpenes constitutes major part of essential oil present in *Curcuma* species, including triterpenes, diterpenes, sesquiterpenes and monoterpenes (Ayati *et al.*, 2019).

***C. longa* in traditional medicine**

Strong anti-inflammatory and anti-oxidative qualities are observed in C. longa due to the presence of curcumin and its derivatives. In Indian medicines, it is widely used to impart colour and flavour to the formulations (Dada *et al.*, 2018). Rhizome is used in folk medicine as treatment of cold, cough and body pains. It is used as antiseptic paste, and for achieving glowing skin complexion (Krup *et al.*, 2013). In Ayurveda, turmeric is described for its healing properties, as carminative and in respiratory diseases. It is indicated for diarrhoea in Ayurvedic medicine (A. Singh *et al.*, 2017). It is also described as a potent anticancer agent in Ayurveda (Buch *et al.*, 2012). In TCM, root extract of *C. longa* is used for management of mood disorders, stress and dyspepsia. In TCM, it is also shown to be beneficial in cancer, gastrointestinal, endocrinal, immunological and neurological disorders (Witkin & Li, 2013).

Dalbergia sissoo

D. sissoo, also known as Indian Rosewood, is a member of *Fabaceae* family. **Table 2.** Represents taxonomical classification of *D. sissoo*.

***Table 2:* Taxonomical classification of *D. sissoo* plant *(USDA, 2024a)*.**

Rank	Scientific Name and Common Name
Kingdom	Plantae or Plants
Subkingdom	Trachobionta or Vascular plants
Superdivision	Spermatophyta or seed plants
Division	Magnoliophyta or flowering plants
Class	Magnoliopsida or Dicotyledons
Subclass	Rosidae
Order	Fabales
Family	Fabaceae or Pea family
Genus	*Dalbergia*
Species	*Dalbergia sissoo*

Morphological Features

The plant can grow with approximate height up to 60 feet, with spread up to 40 feet. Crown is irregular and oval in shape. Leaves are odd pinnately compound and are arranged in alternate fashion. Leaves are dark green in colour with blade length up to 4 inches. Flowers are white with pleasant fragrance. Elongated and pod shaped fruits are produced with dry and hard covering. Wood obtained from tree is resistant to decay, heavy, elastic, strong and durable (Bhattacharya *et al.*, 2014a).

Phytochemical Constituents

Column chromatography study of light petroleum extract of *D. sissoo* indicated the existence of stigmasterol and beta-amyrin (Sarg *et al.*, 1999). Saponifibale fraction revealed the presence of 35 fatty acids with beta-linolenic, oleic and palmiteolic acids as major compounds (Sarg *et al.*, 1999). Stem of plant showed the presence of Dalbergin and 2,5-dihydroxydalbergiquinol (Devi *et al.*, 2017). Phytochemical analysis of pods and leaves showed the presence of lipids, oils, free amino acids, proteins, alkaloids, reducing sugars, tannic carbohydrate and flavonoids (Ali *et al.*, 2019). Gas-chromatography of oil obtained from *D. sissoo* pods revealed the presence of linoleic acid, oleic acid, stearic acid, palmitoleic acid, palmitic acid, myristic acid, lauric acid and capric acid (Hossen *et al.*, 2023).

D. sissoo in traditional medicine

D. sissoo is an important medicinal plant. Seeds, leaves, roots, wood and bark have been used for different medicinal purposes in traditional medicines. The plant is known to have antipyretic, anthelmintic, expectorant, abortifacient and aphrodisiac properties (Shah *et al.*, 2010). In Ayurveda, bark of plant has been described as a remedy for dysentery, leukoderma, blood disorders, with properties, such as antipyretic, anthelmintic, expectorant, abortifacient and aphrodisiac (Bhattacharya *et al.*, 2014b). Leaves are often indicated for gonorrhoea, pimples, boils and for removal of pus from urine. Seeds of the plant is used for scabies and buming (Bhattacharya *et al.*, 2014b). It is used as a folk medicine in Africa for the treatment and management of infections, fever, inflammations, skin diseases, ulcers, nose disorders, eye disease, nausea, dysentery, stomach problems, syphilis and blood disorders (Nikum & Nehete, 2021).

Pharmacological Properties

Curcuma longa

Anti-inflammatory properties

C. longa is a well known plant for its anti-inflammatory properties in traditional systems of medicines. Curcuminoids present in *C. longa* plant are major phytochemicals responsible for the anti-inflammatory activity of plant. Curcumin, monodemethxycurcumin and bisdemethoxycurcumin isolated from *C. longa* had shown significant anti-inflammatory properties (Ramsewak *et al.*, 2000). Oil-free aqueous extracts devoid of curcuminoids were also assayed for anti-inflammatory properties and satisfactory activities were noted with comparison to curcuminoids (Bagad *et al.*, 2013). Similar results were obtained in another study conducted for anti-inflammatory activities of polar extracts devoid of curcuminoids (Chandrasekaran *et al.*, 2013).

Antioxidant properties

Turmeric is a useful antioxidant agent. Antioxidant properties of various parts of turmeric plant is popular because to the presence of phytochemicals like ascorbic acid, tannin, flavonoids and polyphenols contents (Chandrasekaran *et al.*, 2013). *In vitro* studies of various extracts of turmeric showed good antioxidant properties, except that of hexane fraction. Strongest antioxidant activity was noted in ethyl acetate fraction of extract (Choi, 2009). Tsai *et al.*, (2011) compared antioxidant activities of essential oils obtained from rhizome of different members of *Curcuma* genus. Antioxidant effectiveness of essential oils were found to be in following descending order *C. longa* > *C. sichuanensis* > *C. aromatica.*

Hepatoprotective properties

Hepatoprotective activity of *C. longa* is due to its antioxidant properties. *C. longa* extract was shown to protect mice liver against hepatotoxicity induced by bleomycin (Karamalakova *et al.*, 2019). Significant hepatoprotective activity against ethanol induced liver toxicity in mice was demonstrated by (I. Singh *et al.*, 2012). In another study, ethanolic extract of *C. longa* was demonstrated to protect against liver toxicity induced by thioacetamide (Salama *et al.*, 2013).

Anticarcinogenic properties

Turmeric has been described as a potent anticancer agent in natural medicinal literatures. Turmeric extract obtained from rhizome of the plant was demonstrated to be effective against Dalton's lymphoma cells. Active compound It was further established that curcumin was the cause of the extract's anticancer properties. (Kuttan *et al.*, 1985). In another study, curcuminoid rich extract was demonstrated to be having significant cytotoxic activities against numerous cell lines including HT-29, HeLa, MCF-7 and A549 (Lateh *et al.*, 2019). Kukula-Koch *et al.*, (2018) compared anticancer potential of total extract of turmeric plant and individual curcuminoids separated from the plant. Superior anticancer activity was obtained in total turmeric extract than individual curcuminoids.

Antimicrobial properties

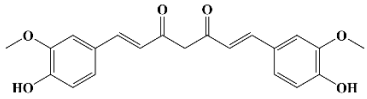
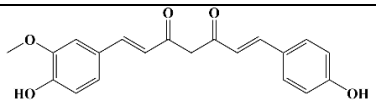
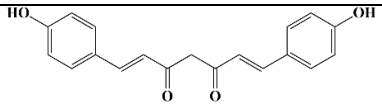
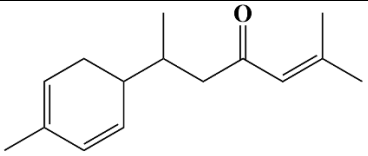
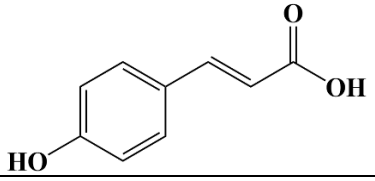
C. longa extract and essential oils have good antimicrobial properties against numerous bacteria, fungi, and parasites. Rhizome extract of plant produced deformities in *Staphylococcus aureus*, showcasing broad antibacterial spectrum of the plant (Gupta *et al.*, 2015). In another study, turmeric oil was tested against fifteen different isolates of dermatophytes. All 15 variants were inhibited by turmeric oil, indicating antifungal potential of turmeric oil (Apisariyakul *et al.*, 1995). *C. longa* extracts were also evaluated for their antiviral properties against polio, measles and dengue viruses, and it was found that the extracts significantly inhibited activities of these viruses, while producing fewer side effects than the conventional antiviral drugs (Ichsyani *et al.*, 2017; Shenge *et al.*, 2021). Furthermore, significant

anthelmintic activity was noted when rhizome extract of plant was tested against *Pheretima posthuman* also known as Indian earthworms (R. Singh *et al.*, 2011).

Cardiovascular Effects

There are several studies suggesting cardioprotective activities of *C. longa*. Both ethanolic and aqueous extracts of plant showed significant cardioprotective activities in rat model against doxorubicin-induced cardiotoxicity (El-Sayed *et al.*, 2011). Study performed by Mohanty *et al.*, (2004) demonstrated healing effect of *C. longa* extracts after myocardial injuries in animal models. Similar myocardium protective effects were shown by Mohanty *et al.*, (2009). Non-toxicity and antihypertensive activities of turmeric extracts was also demonstrated in an investigation conducted by Hasimu *et al.*, (2022). **Table 3** represents major phytochemicals responsible for variety of pharmacological activities of C. longa.

Table 3*: Major phytochemicals and associated pharmacological actions of *C. longa.

Phytochemical	Structure	Pharmacological Actions	References
Curcumin		Antidepressant, antidermatophytic, antiallergic, antimicrobial, antifertility, immunomodulatory, cardioprotective, hepatoprotective, anticancer, neuroprotective, anti-inflammatory, antioxidant.	(Fuloria *et al.*, 2022)
Demethoxycurcumin		Vasodilatory, antifungal, antimicrobial, antimalarial, antihypertensive, neuroprotective, anti-inflammatory	(Hatamipour *et al.*, 2019)
Bisdesmethoxycurcumin		Antioxidant, anticancer, anti-inflammatory, antimutagenic, neuroprotective, antiallergy, cardioprotective, obesity, chronic kidney conditions and in Alzheimer's disease.	(Jain, 2020)
Turmerones	 alpha-turmerone	Anti-parasitic, antifungal, anti-obesity, antioxidant, antihyperglycemic, antidepressant, coagulant, anticancer, antiproliferative, anti-inflammatory, neuroprotective	(Niknejad *et al.*, 2023)
p-coumaric acid		Neuroprotective, antidiabetic, cardioprotective, anti-inflammatory, antioxidant	(F. Chen *et al.*, 2024)

Dalbergia sissoo

Anti-inflammatory properties

The presence of phytochemicals such as alkaloids, flavonoids and glycosides make *D. sissoo* a potent anti-inflammatory agent. Ethanolic root extract of plant had showed potent anti-inflammatory activity during Carrageenan-Induced Paw Oedema in Rats experiment (Sagar & Upadhyaya, 2010). Similar results were also obtained with ethanolic extracts of leaves of *D. sissoo* plant (Hajare *et al.*, 2001). In another experiment, ethanolic extract of bark of plant was utilized for assessing anti-inflammatory properties, and it demonstrated promising results (Asif & Kumar, 2009).

Antioxidant properties

D. sissoo also possess antioxidant properties. Investigation with different extracts of bark revealed chloroform extract having most potent antioxidant properties (Kaur *et al.*, 2011). A similar study was performed by Roy *et al.*, (2011), using ethanolic and aqueous stem bark extracts plant. They found aqueous extract to be more potent antioxidant activity than ethanolic extracts. Lakshmi & Jayshree, (2014) studied isolated several phytochemicals from *D. sissoo* plant, such as dalbergin and phenolic compounds, that were formerly reported for their antioxidant properties.

Hepatoprotective activity

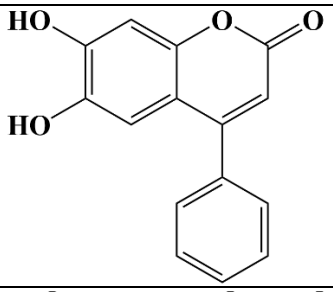
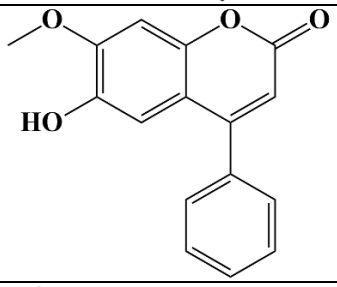
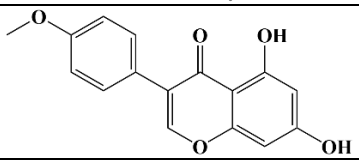
D. sissoo aqueous extracts have been reported for hepatoprotective activities. Aqueous extract of bark of the plant showed significant hepatoprotective and nephroprotective activities in paracetamol and chloroform induced liver and kidney damage in albino rats (Narware *et al.*, 2012). In another study, *D. sissoo* demonstrated better hepatoprotective activity than combined extracts of *Hibiscus rosa* and *Quisqualis indica* (Kumari *et al.*, 2024).

Anticancer activity

Leaves of *D. sissoo* have been extensively studied for its anticancer potential. Developing silver nanoparticles

using leaf extracts of *D. sissoo* showed great inhibitory properties against MCF 7 cancer cell line in comparison to Doxorubicin as standard anticancer drug (Deep *et al.*, 2020). The crude leaf extract of plant also demonstrated good anticarcinogenic activity. It was shown to induce apoptosis in lung adenocarcinoma cells, while showing lesser toxicity to normal lung cells (Thakkar *et al.*, 2023). The plant has been also demonstrated for the preventive potential against carcinogenesis. Leaf extracts were shown to prevent chemical induced carcinogenesis in rats (Sehra & Sharma, 2021). In another study, bark extract showed highest protective activities against UV and DNA damage, along with cytotoxic potentials (Yasmeen & Gupta, 2021). **Table 4.** represents major phytochemicals responsible for various pharmacological activities of *D. sissoo.*

Table 4:*Major phytochemicals and associated pharmacological actions of *D. sissoo

Phytochemicals	Structures	Pharmacological Activities	References
Nordalbergin		Anti-inflammatory, antioxidant, anti-neuroinflammatory	(Lo *et al.*, 2023)
Dalbergin		Antiparasitic, anti-inflammatory, analgesic, antidiabetic, osteogenic, antimicrobial, antioxidant, antiulcer, antidiarrheal, cardioprotective, neuroprotective, anti-spermatogenic	(Al-Snaf, 2017)
Biochanin A		Anticarcinogenic, anti-inflammatory, antioxidant, anticancer, cardioprotective	(Sundaresan *et al.*, 2018)
Caviunin glycoside	-	Anti-inflammatory, chondroprotective (osteoarthritis)	(Kothari *et al.*, 2022)

Clinical Studies

Curcuma longa

C. longa is a potent herbal plant, with mentioning in numerous ancient medicinal texts. In last few decades, a number of preclinical and clinical investigations have been performed for advocating efficiency and safety of plant and the plant extract in management and treatment of various ailments. A common condition that is investigated for anti-inflammatory properties of *C. longa* is arthritis, a disease caused due to inflammation of joints (Salehi *et al.*, 2019). In a randomized placebo-controlled clinical trial, polysaccharide rich *Curcuma longa* extract was administered either alone or in combination with glucosamine sulphate for the treatment of painful knee osteoarthritis. Post treatment analysis revealed significant reduction in use of rescue medication and improvements compared to placebo. Study demonstrated efficacy and safety of polysaccharide rich *C. longa* extract in management and treatment of painful knee osteoarthritis (Madhu *et al.*, 2013). In an another double-blind, randomized, placebo-controlled trial, *C. longa* was administered to patients with complaints of osteoarthritis of knee. Overall improvements in the patients were noted. Assessment of biomarkers of oxidative stress also revealed reduction in oxidative stress by the herb (Srivastava *et al.*, 2016).

The effectiveness of C. longa herb in treating skin conditions has been shown in numerous clinical studies. A phase-II open-label clinical trial was performed to assess the efficacy of orally administered curcumin in patients with plaque psoriasis. The response rate was 16.7% with confidence level of 95%, however, the study demanded further investigations with larger population size for better results (Kurd *et al.*, 2008). In another placebo controlled clinical trial, turmeric tonic was administered to patients with scalp psoriasis. Compared to the placebo, patients who received turmeric tonics showed reduced levels of erythema and induration of lesions (Bahraini *et al.*, 2018). In another phase-I clinical trial, curcumin was assessed for its chemopreventive effectiveness in patients with pre-malignant lesions. Study suggested biological connections of curcumin with chemoprevention of cancer (Cheng *et al.*, 2001).

A number of clinical trials have shown efficiency of turmeric and curcumin as cardioprotective agent. A pilot

randomized clinical trial performed by Aslanabadi *et al.*, (2019) showed that pre-treatment with curcumin can reduce the chances of myocardial injuries in patients with ischemic heart disease, followed by elective percutaneous coronary intervention. In another study, curcumin supplements were prescribed to patients with injuries following acute myocardial infarction. Curcumin supplements demonstrated cardioprotective activities and improvements in in injuries due to myocardial infarctions (Tabaee *et al.*, 2021).

Clinical trials have been performed for the safety and effectiveness of *C. longa* and curcumin for numerous ailments. A 375 mg tid dose of curcumin to 53 patients suffering from chronic anterior uveitis showed significant improvements in 86% of the patients, showing potential of herb in treatment of eye disorders (Lal *et al.*, 1999). For Alzheimer's disease, in a six month long clinical trial, while curcumin showed some biological effects such as raising vitamin E levels and potentially increasing serum Aβ40, it did not significantly improve cognitive outcomes in this short-term trial. The authors suggest that longer, larger studies may be necessary to determine its true efficacy in treating Alzheimer's disease (Baum *et al.*, 2008). *C. longa* was also found to be useful in asthma. In a randomized, double-blind, controlled trial, powdered root of the plant was administered to patients with persistent asthma. Reduction in use of beta-adrenergic agonists, less frequent night-time awakening and better control over disease was reported in patients receiving powdered *C. longa* after 6 months (Manarin *et al.*, 2019). Curcumin is an important herb for gastrointestinal diseases, as discussed in earlier section. In a randomized, double-blind, placebo-controlled trial, *C. longa* was found to be effective in improvising dyspeptic symptoms with efficacy equivalent to omeprazole (Yongwatana *et al.*, 2022). In another investigation, curcumin was found to be safe and effective as a maintaining therapy for ulcerative colitis (Hanai *et al.*, 2006). Additionally, curcumin was found to be useful in reducing gastrointestinal symptoms in persons who complained of irritable bowel syndrome (Lopresti *et al.*, 2021).

Dalbergia sissoo

There are a number of preclinical studies conducted for the pharmacological activities of *D. sissoo* (Chen *et al.*, 2024; Hajare *et al.*, 2001; Lo *et al.*, 2023). However, very limited clinical data is available for the same. In an open-labelled clinical study, leaf extract of the plant was assessed for fracture-healing and anti-osteoporotic activities in post-menopausal osteoporosis. The result showed decline in alkaline phosphate levels along with reduction in TNF-alpha levels. The study demonstrated anti-inflammatory and anti-osteoporotic activities of *D. sissoo* (Meeta *et al.*, 2019). In our efforts to locate further relevant clinical studies, we searched databases such as Google Scholar, PubMed, and ClinicalTrials.gov using the terms '*Dalbergia sissoo* clinical trial' and '*Dalbergia sissoo* clinical study.' However, we were unable to fetch any additional relevant clinical studies directly associated with *D. sissoo*. This emphasizes the necessity of conducting more thorough clinical research to fully investigate the plant's medicinal potential.

Discussion

Herbal medicines are serving human kind since ancient times in healing and improvising health. However, last few centuries have noticed an inclement towards allopathic or synthetic medicines. The awareness about drawbacks of synthetic chemicals and, efficiency and safety advantages of herbal remedies, latter is again gaining back their popularity. *C. longa* is a popular plant with well-known medicinal benefits. It is been part of folk medicine from centuries, and also a common home remedy for management of many ailments. It is an important herb in popular traditional medicinal systems, such as Ayurveda and TCM. Rich phytochemistry of *C. longa* makes it a useful herb with a variety of pharmacological and therapeutic activities (W. Tang & Eisenbrand, 1992). Phytochemicals are responsible for any therapeutic benefit of a herb (Craig, 1997). Major phytoconstituents found in *C. longa* are Curcumin, Demethoxycurcumin, Bisdesmethoxycurcumin, Turmerones and p-coumaric acid. Curcumin been the most important phytochemical in *C. longa*, is responsible for majority of pharmacological activities of herb, via a variety of mechanisms. Curcumin exerts anticancer effects by inhibiting NF-κB and STAT3 pathways (Vallianou *et al.*, 2015). In management of Alzheimer's disease, curcumin works as an antioxidant, modifies microglial activity and promotes disaggregation of amyloid- β plaques (M. Tang & Taghibiglou, 2017). It further provides cytoprotective activities against cataract by protecting lens against peroxidation, maintaining calcium homeostasis and by reducing crystallins in lens (Raman *et al.*, 2016). Curcumin also prevents bacterial adhesion to the host cells, inhibit formation of biofilms and reduces virulence factor of bacteria, thus exerts broad-spectrum antibacterial properties (Zheng *et al.*, 2020). *D. sissoo* is also an important medicinal plant with roots in traditional medicines. Bark, roots, wood, leaves and seeds of the plant have been used for many disorders in traditional medicines. Dalbergin, nordalbergin and biochanin A are the major phytochemicals responsible for the pharmacological activities of the plant. No significant works can be found for the mechanism of these phytochemicals, however, nordalbergin is known to exert neuroprotective effects by production of ROS, activating NLRP3 and inhibiting MAPK/NF- κB signalling pathway (P.-R. Chen *et al.*, 2024).

C. longa have been studied for use in combination therapies with synthetic drugs as well as with natural herbs. With synthetic drugs, the herb has shown success with drugs, such as diclofenac in management of osteoarthritis (Pinsornsak & Niempoog, 2012), minoxidil for management of androgenetic alopecia (Vaughn *et al.*, 2016), polymyxins for resistant bacterial infections (Dai *et al.*, 2020), and with various chemotherapeutic agents such as paclitaxel, cisplatin and doxorubicin for treatment of resisting cancers (Tan

& Norhaizan, 2019; Troselj & Kujundzic, 2014). *C. longa* have also shown potential therapeutic efficiencies in herbal combinations with herbs, such as *Moringa oleifera* as an antiviral combination (Karisma *et al.*, 2022), combination with *Eugenia jambolana* for diabetes mellitus (Rao & Rahila, 2016), and combination with *Berberis Aristata* for antibacterial and hepatotoxicity (Pundarikakshudu & Dave, 2010). In similar way, *D. sissoo* have been studied for combination therapies for variety of ailments. Combination with *Aegle marmelos* proved to be efficient therapy for diarrhoea in calves (Rathor *et al.*, 2021, 2022). Combination of *D. sissoo* with *Datura Stramonium* proved to be an excellent antiseptic preparation (Yadav *et al.*, 2008). Londhe *et al.*, (2024) showed *D. sissoo* and *Cissus quadrangularis* to be an efficient combination against bone marrow oedema.

Both, *C. longa* and *D. sissoo* shares some similar pharmacological activities as shown in **Figure 1**. They have been studied for anti-inflammatory, antioxidant, hepatoprotective and anticancer activities. Though there are some studies that shows pharmacological effectiveness of these plants individually, as well as in combination with other agents. However, studies specifically examining the synergistic effects of *C. longa* and *D. sissoo* in combination are notably absent. This gap in the literature underscores the importance of future research on the combination of these two plants. Given their shared pharmacological properties and their ability to complement other synthetic and natural agents, a combined approach involving *C. longa* and *D. sissoo* could potentially offer enhanced therapeutic outcomes for a variety of ailments. Investigating the synergistic potential of these herbs could lead to the development of novel therapies for conditions such as chronic inflammation, oxidative stress, cancer, and liver disorders.

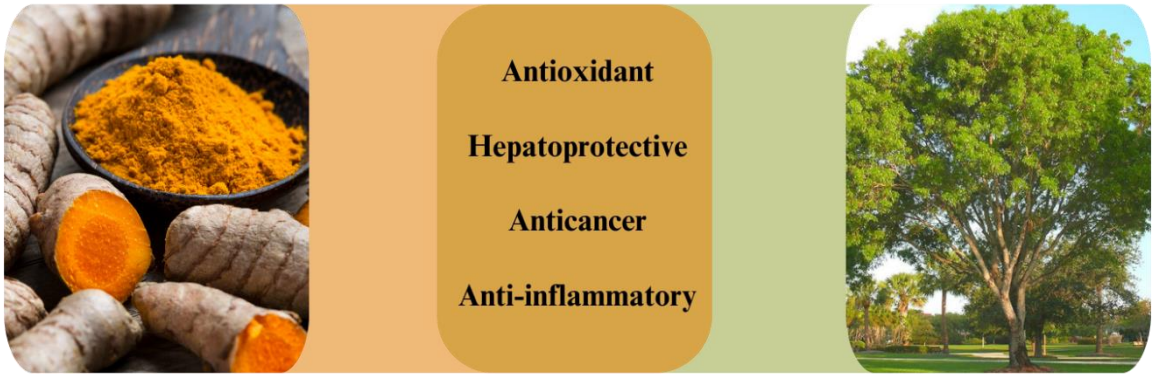


Figure 1: **Common pharmacological activities between *C. longa* (left) and *D. sissoo* (right)**

Conclusion

Both *C. longa* and *D. sissoo* have well documented pharmacological properties including antioxidant, anti-inflammatory, hepatoprotective and anticancer activities, and are been used in traditional medicines such as Ayurveda and TCM. These have also demonstrated promising results for combination therapies with synthetic as well as with other natural herbs. However, despite their potential, there is a notable lack of research specifically examining the therapeutic synergy between these two plants when used together. The complimentary pharmacological activities of both medicinal plants hold promise in combined approach for enhancing treatment outcomes, especially, chronic, oxidative stress and inflammatory disorders. The absence of studies on synergy of these plants warrants the need for future research to explore their synergistic potential in both preclinical and clinical settings. This review emphasizes the importance of studying *C. longa* and *D.* sissoo together as a promising combination therapy for various ailments.

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