

**ETHNOPHARMACOLOGY OF *CARTHAMUS TINCTORIUS* (L.) AND ITS
PHARMACOLOGICAL EFFECTS IN MODERN MEDICINE**

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Relevance

There are approximately 50,000 to 70,000 medicinal plant species worldwide. Of these, only 6,000–7,000 species are widely utilized as medicinal plants in traditional medicine and the modern pharmaceutical field. One such plant is *Carthamus tinctorius* (safflower).

Carthamus tinctorius has been used extensively for centuries in the traditional medicine of China, Iran, and other Eastern countries. It has been employed to improve blood circulation, alleviate pain, provide anti-inflammatory effects, and treat various diseases. Consequently, its ethnopharmacology, rooted in historical experience, continues to generate high scientific interest. Modern research has confirmed the pharmacological activities of safflower, including its antioxidant, anti-inflammatory, hepatoprotective, antidiabetic, antifibrotic, and cardioprotective properties. This positions it as a promising source for the development of new medicinal products in contemporary medicine.

Therefore, integrating traditional ethnopharmacological knowledge with modern pharmacology and clinical research is of great relevance for creating new therapeutic agents from the safflower plant and enhancing the efficacy and safety of drugs.

Key words

Carthamus tinctorius (safflower), antioxidant, anti-inflammatory, hepatoprotective, antidiabetic, antifibrotic, and cardioprotective properties.

Research Objective : The aim of this research is to study the traditional ethnopharmacological applications of *Carthamus tinctorius* (safflower) and evaluate its modern pharmacological effects, including antioxidant, anti-inflammatory, hepatoprotective, and cardioprotective activities. Based on this, the study seeks to develop prospects for the use of safflower-based drugs and therapeutic agents in the medical field.

Materials and Research Methods: Data regarding *Carthamus tinctorius* (safflower) were gathered through comprehensive sources, including classical literature on Chinese medicinal plants and scientific databases such as PubMed, Google Scholar, ACS, Web of Science, and others.

Results and Discussion : Existing literature, particularly from the traditional medicine of China, India, Egypt, and Iran, provided extensive information on safflower species, their main components, and pharmacological applications.

Carthamus tinctorius L., commonly known as safflower or "false saffron," belongs to the **Asteraceae** family. This thistle-like plant grows primarily in arid climates, including South Asia,

China, India, Iran, and Egypt. In Iran, it is represented by six species. Between the 5th and 14th centuries, safflower spread to Western countries such as Italy, France, Spain, and the USA. Local names in Iran include "Golrang," "Kajireh," and "Kafesheh"; their flowers are rich in red and orange pigments and are widely cultivated. Other well-known names for safflower include "Zaffer," "Fake Saffron," and "Dyer's Saffron".

Clinically, in ethnopharmacology, safflower has served as a remedy for conditions such as menstrual pain, postpartum hemorrhage, tetanus, chronic bronchitis, and rheumatism. Safflower flowers are traditionally used for cardiovascular, cerebrovascular, and gynecological diseases.

Research has noted that safflower extract possesses phytotherapeutic effects for cardiovascular diseases. Phytochemical studies have identified **flavonoids, phenylethanoid glycosides, coumarins, fatty acids, and steroids** isolated from various parts of the plant as the primary active constituents. Currently, pharmaceutical research is focused on the antioxidant, anti-inflammatory, and anti-epileptic ethnopharmaceutical applications of safflower.

Safflower has been used in some regions of Asia and Africa as a remedy acting like laxatives and antidotes to poison, and a medicinal oil in order to enhance sweating and cure fevers. It was reported that all parts of the plant have been traditionally employed to increase libido in Pakistan and India. Removing bitter principles, the Institute of Botany affiliated to the Chinese Academy of Sciences in Beijing has processed a new sweet-smelling product well rich in amino acids, minerals and vitamins B1, B2, B12, C and E. There has been numerous evidence in support of the use of safflower medicines for menstrual problems, cardiovascular complications as well as pain and swelling in trauma cases. Musculoskeletal system It was indicated that the pharmacology of safflower contains the excitation of smooth muscles. A dose-dependent raise in contraction characteristics (frequency and amplitude) of uterine tissue in animals such as dogs, rats, cavies, and mice continued over 4 hours. When it came to exert excitation effects on intestinal muscle in the same species, the response persisted for a short period. The bronchi smooth muscle of the cavy was also impacted. Moreover, contraction influences of safflower have also been reported on vessel networks of toad and of dog kidney, yet with a decrease in kidney volume. However, safflower extracts cause a long-term drop in blood pressure in dogs, cats, and rats with hypertension. In dogs, it was shown that injections of safflower can retard the injury to the heart muscle following an infarction. Interestingly, in folk Chinese medicine, safflower was suggested for sciatica, thorax rheumatism, and rheumatoid arthritis. Its seeds appeared highly influential in clinical treatments of osteoporosis and rheumatism; this claim is investigated through an animal trial on anti-bone resorption features of safflower seed. The results highlighted that this plant and its combination with TGF- β 1 can diminish the amounts of cyclooxygenase-2 mRNA, prostaglandin E2, as well as phosphorylation of peptide substrates, whereby bone resorption is inhibited. However this potential is dose-dependent, safflower can be used as a natural Src family kinase inhibitor.

Cardiovascular system The flower extract was demonstrated to enhance peripheral blood flow, inhibit platelet aggregation, and produce beating of myocardial cell sheets. This extract can afford to inhibit or reverse the adrenaline-induced decline in capillary blood flow of rats. Another experimental analysis on the extract of safflower showed that higher concentration of *C. tinctorius* around 13.5% demonstrated the most significant clot lytic activity without any hemolysis. Low concentrations of safflower decoction resulted in an increase in the amplitude

and systolic volume of the heartbeat in dogs. A 14-day intervention using safflower yellow diminished total cholesterol and augmented HDL cholesterol in rabbits without any given impacts on beta-lipoproteins, triglycerides or liver function . Furthermore, Carthamins yellow isolated from safflower with an oral dose of 100 and 200 mg/kg is shown to reduce the blood fluidity in rats with blood stasis, which is of utmost importance in hemorheological disorders . Since safflower can afford to invigorate the blood circulation, it has been chiefly used for cardiovascular complications. It was exhibited that 83% of subjects with coronary disease who received a six-week treatment based on safflower, presented a reduced blood cholesterol level . Heart arrhythmia and hypertension were decreased though a period a TID safflower treatment for four weeks. A combination of safflower and other herbs in the form of a nasal drip accelerated blood flow in the medial cranial artery. The administration of safflower extract at Feng fu, Yamen, Feng chi, along with other acupuncture points every three days improved blood flow in the coronary artery. High-quality edible oil is extracted from brilliant safflower, which finds rich in polyunsaturated fatty acids of utmost importance for managing the cholesterol level in blood. It is nutritionally akin to olive oil due to the high amounts of linoleic or oleic acid. The monounsaturated fatty acid for instance, oleic acid, is helpful in the attempt to reduce low-density lipoprotein (LDL; bad cholesterol) while having no undesirable impacts on high- density lipoprotein (HDL; good cholesterol) in blood. The oil is demonstrated non-allergenic and appropriate in administering medicines by injection. Safflower oil with high amounts of unsaturated fatty acids can decrease the plasma level of cholesterol. It was reported that injectable safflower can afford to treat 40 subjects presenting coronary disease and angina pectoris, with a total effective rate of 90% . In a rat model, safflower reduced platelet aggregation and blood coagulation (50). Likewise, Zhengliang et al. observed that safflower yellow at 220 mg/mL had notable potential to inhibit the aggregation of rabbit platelets and prevent rat thrombosis. Moreover, safflower yellow caused a strong and long-lasting analgesic influence. In animal experiments on mice, the foot-lifting response as a result of formaldehyde, the histamine-mediated enhancement in capillary blood flow, and granulation induced by cotton-ball irritation were all prevented in the presence of safflower. The therapeutic impact of hydroxysafflor yellow A, a main active compound in Carthami flos, was examined on rats inflected with focal cerebral ischemia by using an initial concentration of 3 mg/kg. The results revealed that this ingredient can suppress thrombosis formation, inhibit platelet aggregation, and moderate PGI₂/TXA₂ in rats. Two quinochalcone agents in florets of safflower have been reported to cause anti-inflammatory effects; ginkgolide B (IC₅₀ 5.45 × 10⁻⁶ mol/L), saffloquinoside A (IC₅₀ 10⁻⁵ mol/L) significantly decrease the production of β-glucuronidase from polymorphonuclear neutrophils induced by the platelet-activating factor. Safflower can dilate arteries, diminish hypertension and enhance blood flow and, then improve tissue oxygenation. It causes thrombus formation and dissolves thrombi in the long run. A safflower-based treatment in a case of cerebral thrombosis led to an enhanced and lowered blood pressure which is evident in the majority of patients. Furthermore, herbal decoctions that contained safflower were associated with promising outcomes for the treatment of cerebral embolism. In a meta-analysis study, the treatment of patients with acute ischemic stroke was investigated by injecting red safflower. It was presented that this plant can enhance neurologic functional deficits with 1.19 the relative risk 99% credible region, 7.14 the number of treatments required, and - 0.62 the weight mean deviation. The probable mechanism behind such impact regards a decrease in the plasma ratio of IL-6/IL-10 along with an increase in the concentration of superoxide dismutase, chloramphenicol acetyltransferase, and malondialdehyde, which can suppress the lipid peroxidation. In another comparative study, the superior effectiveness of safflower yellow

and hydroxysafflor yellow A for acute ischemic stroke has been demonstrated as opposed to ginkgo leaf and dipyrindamole.

Conclusion: Safflower is one of the medicinal plants that has played a significant role in the traditional medicine of various cultures since ancient times. In China, India, Arab countries, and Central Asia, it has been effectively used in the treatment of numerous diseases. The great

physician Ibn Sina provided a scientific foundation for the medicinal properties of safflower through his detailed descriptions and recommendations.

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