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Phytochemical analysis and therapeutic properties of medicinal plants *Crocus sativus*: saffron

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Abstract

Crocus sativus Linn (Iridaceae) is well-known for its various domestic and medicinal uses throughout the tropics and subtropics. This plant is helpful because it contains various compounds, including crocetin, crocin, and other flavonoids, which may be used to cure various illnesses. These compounds, particularly crocin, have depressive and anti-inflammatory characteristics, as well as anticancer, analgesic, and other therapeutic effects on various areas of the body, including the heart, respiratory system, genital-urinary system, and central nervous system. According to research and observations, chemoprevention, cell proliferation, antioxidant and obesity effects, apoptosis, lipid peroxidation, and anti-inflammatory processes all have a role in saffron's involvement in treating various food allergies. Since ancient times, saffron has been utilized in traditional medicine in India and other Asian nations. Chemical compounds have been researched for a range of qualities, with many studies focusing on the chemicals found in, or even the medicinal components of, plants.

Keywords: Phytochemical Analysis; Therapeutic Properties; Medicinal Plants; *Crocus sativus*; Saffron

1. Introduction

Crocus sativus (Saffron) red gold herb, has various schools of thought which believe that saffron originated from the French term "Safran," and other people thoughts the word "Saffron" is derived from the Arabic word za'faran, which means "Yellow"[1].Saffron commercially used is made from the part of the flower "Stigma". Stigma part of saffron is 25-30 mm long. Each flower contains three stigmas, and a sum of 150,000–200,000 flowers are harvested to get 1 kg of saffron. In the American market, the cost of one ounce is 30 dollars. Threads of stigma have special value in the plants due to its aroma, coloring agent, and spice taste most expensive herb in the market [2]. It is cultivated in Iran, Spain, Greece, Italy, Pakistan and India, mainly in Kashmir [3]. In ancient Rome and Egypt, saffron was used in drugs as a dying agent for cooking purposes and perfumes [4]. Underground stem ofa Saffron is called corm which goes under the vegetative propagation process for new plants. It's genome size is 1C=3.45 Gbp. Due to this type of reproduction, there is no other source or method to improve its quality, so all saffron plants are genetically identical without any variation in their [5].

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2. Botanical Description

Saffron is a perennial plant belonging to the Iridaceae family. Its height is 10-25 cm from the bulbs. Mother bulbs produce 1-3 daughter bulbs with lateral buds also divided into small buds [6]. The stigmas part is the main part used as a medicine pleasantly warming bitter in taste [7]. Single stigma contains three filaments the color of the stigma is red. Saffron leaves vary in number from 5 to 11. The root of saffron may be fibrous or contractile root, fibrous contractile from the base of the mother bulb and the base of the lateral bud [8]. The flowers of saffron appear in the autumn season at the end of September, composed of three internal tepals and three external, which encounter the upper part of the ovary. The pistil 9 to 10 cm long and thin style shape composed inferior to the ovary [9].

2.1. Phytochemical Analysis of Saffron

Chemical studies have shown that there are 150 volatile oil compounds and various non-volatile compounds of which more are carotenoids present in *Crocus sativus*. It also contains hydrophilic and lipophilic carbohydrates, amino acids, proteins, minerals (Na, Fe, P. Ca, Mg, K, Zn, Cu, Mn, and Se), mucilages, vitamins (especially Riboflavin, Thiamin, Niacin, Ascorbic acid, and folic acid) Gums, alkaloids, saponins and pigments [10]. Characteristic components of *Crocus sativus* are safranal which is in charge of aroma, picrocrocin and causes for unpleasant flavour, and Crocin, responsible for color.

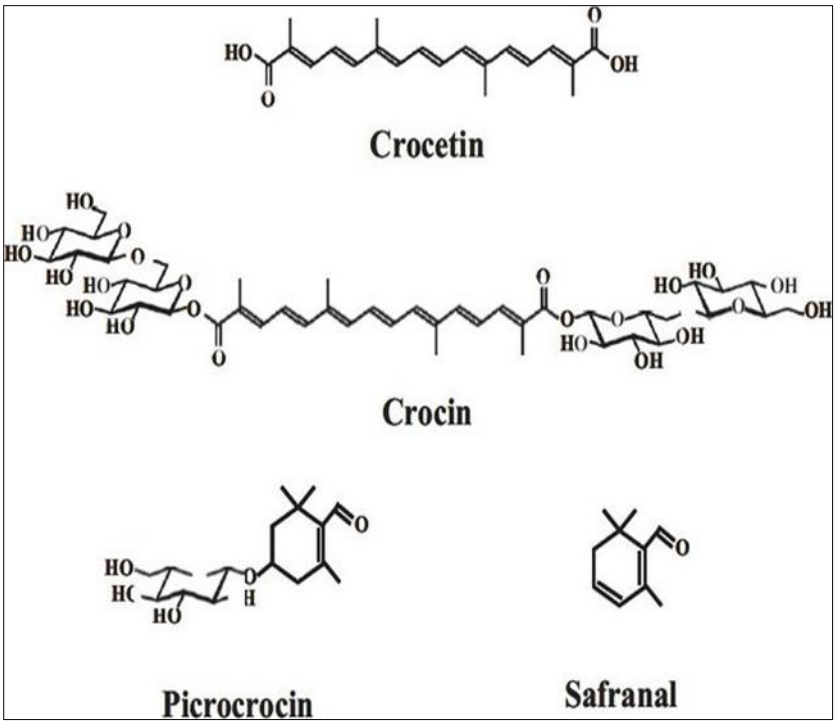

Figure 1 Chemical composition of saffron is [11, 12]

Carotenoids crocetin is the main component of *Crocus sativus*, also called alpha-crocetin. Crocin (digentiobioside), gentioglucoside, glucoside, gentiobioside and diglucoside; β– crocetin, γ- crocetin, lycopene, zeaxanthin, -carotene, -carotene, and mangiocrocin are all 13-cis-crocetin isomers; xanthone is a conjugated glucoside.[13]. Five glucose combined with glycosyl esters of crocetin are responsible for coloring agents [14]. Glycosidic esters of crocetin cis- and trans-crocins attributed medicinal properties and coloring ability [15]. Picrocrocin is the colorless monoterpene glycoside which is the principal element responsible for bitter taste. Picrocrocin is crystallized, and after hydrolyzing, aldehyde safranal and glucose production. *Crocus sativus* contains sixty percent valatile components in which safranal imparts aromatic characteristics. Picrocrocin has existed in fresh flowers of *Crocus sativus*, but due to heat, it decomposes and releases safranal, which is a volatile aldehyde [16]. Chemical formula of picrocrocin is C16H26O7, and 330.37 g/mol is the molecular weight. It is the second most abundant part of *Crocus sativus*, and safranal precursor gives a bitter taste to *Crocus sativus*. Aglycon part of picrocrocin is safranal; its molecular weight is 150.21 g/mol. It is an essential oil have aromatic properties [17, 18].

Table 1 Percentage of Chemical composition of saffron

Sr.No	Components	Mass percentage
1-	Nitrogen free extract	54-57%
2-	Carbohydrates	12-15%
3-	Protein	10-14%
4-	Water	8-15%
5-	Fiber	4-5%
6-	Lipids	3.0-8.0
7-	Total oils	5-9%
8-	Volatile oil	0.3-0.8%
9-	Ash	4%

3. Therapeutic Properties of *Crocus sativus*

Crocus sativus has a lot of medicinal properties; it is used as traditional medicine for various purposes, mainly the gastrointestinal system, respiratory system, or for cosmetics. In Persian traditional medicine, saffron is used for depression and insomnia; it is also typically used for various skin diseases like acne and to protect from UV light.

3.1. Effects of Saffron on GI System

Asia and her colleagues performed a study in which they compared the absorption of crocin and crocetin. They find that crocetin is rapidly absorbed in the bloodstream and detected it in intact free plasma or as a glucuronide conjugate. In mouse plasma, intact crocin is not detected, but crocetin is present after the administration of crocins. This study reveals that if crocins is orally administered, it is hydrolyzed into crocetin in intestinal absorption, and it is partly metabolized into mono-glucuronide and di-glucuronide conjugates [19].

Nabavzadeh et al. (2009) perform a study in which they observe the impact of *Crocus sativus* extract on gastric and pepsin secretion. The researchers discovered that aqueous saffron extracts enhanced basal pepsin and promoted acid production via increasing nitric oxide (NO) [20].Saffron, according to Al-Mofleh, is a stomach ulcer preventative. He and his colleagues employed pylorus ligation, indomethacin, and a number of necrotizing medicines to generate stomach ulcers in order to test this idea (80 percent ethanol, 0.2 M NaOH, and 25 percent NaCl). GI mucus, non-protein sulfhydryl contents, rat stomach histology, baseline gastric output, and ulcer index were also examined. According to the findings, they discovered that saffron has substantial antisecretory and anti-ulcer properties [21].

3.2. Antidepressant Effect

Saffron has been used as an antidepressant for thousands of years, dating back to antiquity. Depression is one of the world's five most prevalent illnesses. A staggering 11.6 percent of the global population is impacted [32]. By 2020, this is anticipated to be the second-leading cause of complete disability. The antidepressant impact of saffron is similar to that of other antidepressants in that it affects the levels of certain neurotransmitters in the brain, most notably serotonin. 5-hydroxytryptamine, or serotonin, is a mood-enhancing neurotransmitter produced from the amino acid tryptophan [22].

3.3. Effect on Learning and Memory Behaviour

According to behavioural and electrophysiological research, saffron extract impacts learning and memory in experimental animals. Ethanol-induced learning impairments in mice were alleviated by aqueous saffron extract, as was the ethanol-induced reduction of long-term hippocampal potentiation, a kind of activity-dependent synaptic plasticity that may support learning and memory. Crocin (crocetin digentiobiose ester) was shown to be responsible for the effects of the saffron extract rather than crocetin. Saffron extract or its active components, crocetin, and crocin, may be useful in treating memory-related neurodegenerative disorders [23]. Crocin has also been demonstrated to protect

neurons against apoptosis caused by both internal and external apoptotic stressors by inhibiting TNF-a-mediated cell death [24].

3.4. Effects on Retinal Function and Ocular Blood Flow

Crocin analogues derived from saffron enhanced retinal and choroid blood flow and accelerated retinal function recovery, suggesting that they might be utilized in ischemic retinopathy and/or age-related macular degeneration are two conditions that can be treated with this drug. [25].

3.5. Effects on Uterus

The plant is used in traditional medicine to promote and regulate menstrual cycles. It also relieves the lumber aches that come with menstruation. Saffron is also helpful in treating other female illnesses, including leucorrhoea and hysteria. Saffron pessaries were used to treat uncomfortable uterine conditions [26]. In rats, a polyherbal formulation, including saffron at dosages of 1000 and 2000 mg/kg, was found to cause uterine contractions [27].

3.6. Uses of Saffron in Cosmetics and Perfumes

Saffron tepals have recently been shown to be high in crocin and kaempferol, making them a valuable source of bioactive chemicals for possible cosmetic compositions [28,29]. Long-term sun exposure is very hazardous since it exposes the skin to UV rays, which are known to cause severe lesions. Saffron has antioxidant properties that protect the skin from harmful sun rays. Saffron lotion, according to research, is more durable than homosalate (a mixture of ingredients and some suspects). Therefore, saffron can be used as a natural source of UV radiation [30,31]. Saffron is known to reduce melanin color. As a result, it acts as a skin cleanser. C. sativus-based preparations have a highly depressant and anti-inflammatory effect on human skin [32].

In traditional herbal teas, saffron can be added to a small basil leaf to overcome spots like acne. Remove and improve blood circulation in your facial skin by using a mixture of dried saffron extract, virgin coconut oil or olive oil, and some raw milk. Erythema, a skin disease that exhibits inflammation, redness, and burning, has been shown to be beneficial for saffron. Antioxidants in saffron are thought to inhibit the production of markers such as tumor necrosis factor (TNF) and interleukins. Applying a formula that contains 3% C. Removing sativus on a person's skin can help treat melanoma. A similar study by Moshiri et al., Found that clinical trials on saffron anti-inflammatory effects in skin care showed that saffron was more effective than placebo [33]. Saffron, the main ingredient of saffron, is the source of the famous "saffron". Saffron is the royal dye used in perfumes in restaurants, palaces, palaces, theatres, and bathrooms in ancient Greece (2000 to 146 BC). From then on it became popular in the community [34,35]. Saffron is also used as a fragrance containing facial oil to soothe kings and chieftains during the Parthian royal period [36].

4. Conclusion

According to research, Saffron has many potentials, uses, and great therapeutic benefits on almost every body region. In this review, I tried to consider the chemical analysis of Saffron (*Crocus sativus*) and the therapeutic action of *Crocus sativus* through several portions of GI structure like the stomach, liver, pancreas, and colon. Saffron's effect on mental problems and its use in skin problems also go through. More clinical trial research, it is evident, will provide a new source of information for undiscovered components of saffron properties and biological ingredients in the future, with the goal of treating or preventing various diseases and disorders.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

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