Review Article

A Review on Phytochemical, Pharmacognostic and Therapeutic profile of *Crocus sativus*

Dr. Heenu Dhar[1], Dr. Shalinder koul[2], Dr. Pallavi A Patil[3], Aakriti Maggo[4], Dr. Arka mondal[5], Dr. Poonam salwan[6]

1. Associate Professor, Department of Pharmacology FMHS, SGT University, Budhera Gurugram (Haryana) -122505, India.
2. Associate Professor, Department of Surgery FMHS, SGT University, Budhera, Gurugram (Haryana) -122505, India.
3. Assistant Professor, Department of Pharmacology Bharthi Vidya Peth college of pharmacy CBD Belapur, Navi Mumbai Maharashtra, India Mumbai, India.
4. Second year MBBS student FMHS SGT University Gurugram (Haryana) -122505, India.
5.Assistant Professor, Department of Pharmacology FMHS, SGT University, Budhera, Gurugram (Haryana) -122505**,** India.
6. Professor & Head department of Pharmacology, FMHS, SGT university, Gurugram, India.

***Corresponding author's E-mail:** arkam741@gmail.com

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ABSTRACT

Far ahead, the confinement of humans on sphere, Medicinal Herbs are in demand for detection, Cure, eradication, and prevention of numerous ailments. *Crocus sativus* stigmas Iridaceae family, generally known as Saffron, is one the highly used shrub. *Crocus sativus* is a small flower with growing roots known as corm, stigmas, petals, bud, leaves, Stem, Bract, Perianth tube and Bracteole. In traditional practice of medicine, several parts of plant such as stem bark, Leaves, aerial roots, vegetative buds, Seeds, fruits, and latex were utilized as therapeutic agent for diabetes, dysentery, as Nephroprotective, Hypertensive, Erythropoiesis, anaemia, atherosclerosis, Alzheimer disease, Anti Diabetic, Anti-Ulcer, glaucoma, asthma, COPD, Crohn's disease, thrombosis, CHF, Stroke, Parkinson disease, osteoporosis, Gout, Headache Angina, inflammations. Various Pharmacognostic studies and investigations have been performed to establish its quality control and assurance parameters and several phytochemicals viz. phytosterols, Phenols, Lipids, fatty acid, amino acids, polysaccharides, tannins, fats flavonoids including triterpenoids are discovered and isolated. *Crocus sativus* flower is known to have various beneficial pharmacological activities like anticancer, Nephroprotective, Hepatoprotective, Analgesic, anti-emetic, Antinociceptive, antimicrobial, antidiarrheal, antioxidant, The present article is an attempt to give a comprehensive literature review for *Crocus sativus* stigmas, Pharmacognostical, phytochemical and pharmacological properties of *Crocus sativus*.

Keywords: *Crocus sativus*, Anti-inflammatory, phytochemicals, Medicinal plants, Phytochemical, Pharmacological profile.

INTRODUCTION

Derived from the word Zafaran in Dari language, the word Saffron dates back to more than 10000 years. Saffron has been in use over 3,500 years. Linneaues coined the scientific name of Saffron in 1762 who named *Crocus sativus* var officinalis, *Crocus sativus l.* Belonging to Iridaceae family[1]. The stigmas of saffron appear like (tiny thread like strands) which are also known as the fall flowering. It is said to be world's one of the most expensive spices used so far[2]. Due to C=C with the structure of carotenoid chemical it leads to unstable products leading to easy oxidation due to air and light[3]. The projecting color of carotenoids is also due to presence of conjugated double bonds in hydrocarbon structure. The compounds are known by single bond alternating with double bonds. Crocin structure is composed of nine consecutively conjugated double bonds, with a shorter carbon chain having crocetin but it is also a glycoside provided with sugar moieties (gentiobiose) at both the ends. last but not least physical property of Crocin sativus is responsible for its characteristic water-dispersibility. In reality crocetin and crocins signifies natural water and ethanol, methanol, and chloroform dispersible carotenoids. Standard quality of saffron mainly depends on the percentage of its three major chemical metabolites within stigmas. Midst constituents of saffron extract, the principal pigment crocetin is regarded as the predecessor of crocin. Biosynthesis of the principal bioactive compounds in *C. sativus L.* The biogenesis responsible for accumulation in the stigma metabolites differentiates into two separate synthetic processes: Safranal is the principal chemical pigment responsible for saffron's typical distinguishing odour. This odour is not seen in lately selected stigmas and is generated via enzymatic and thermal deterioration throughout the storage period[4].

CAS name: (4R)-4-(b-D-Glucopyranosyloxy)-2, 6,6-trimethyl-1-cyclohexene-1-riboxyldehyde.

Molecular Formula: $C_{16}H_{26}O_7$

Molecular Weight: 330.39

Percent Composition: C 58.17%, H 7.92%, O 33.91%

Properties: Crystals, mp154-156, Bitter taste, Alkali unstable. Dispersible in water, alcohol; minutely dispersible in chloroform, ether; Almost indissoluble in petroleum ether, benzene.

Melting point: 154-156, Optical Rotation: D 20-58° (c = 0.6) [4] Especially Picrocrocin ($C_{16}H_{26}O_7$) is a monoterpene glycoside precursor of safranal (C10H14O)[5,6].

The volatile substances present in *Crocus sativus* are made up of more than 34 constituents such as terpenes, alcohols, and their esters, safranal being the paramount constituent. Non-volatile compounds include crocins, crocetin, Picrocrocin and flavonoids. Numerous analytical techniques like UV-Visible, spectrophotometry, TLC, GC-

MS, LCMS and HPLC were developed to look over *Crocus sativus*[7].

Picrocrocin is the derivative of safranal and has been recognized in the Crocus genus. In acidic and alkali conditions, *Crocus sativus* splits into a molecule of water and an Aglycon, which consecutively, throws a water molecule and ultimately leads to the formation of safranal. Kuhn and Winter stein (1933), acquired safranal via Picrocrocin by hydroxylation method and named this chemical moiety as "Safranal"[8]. Safranal happens to be abundant chemical pigment present in saffron essential oil constitute for 60-70% of volatile fraction[9,10]. As said earlier, the important organoleptic principle present is "Safranal" [2,6,6-Trimethylcyclohexa-1,3-dien-1-carboxaldehyde], which is early prepared by de-glycosylation of Picrocrocin. Safranal constitutes about 70% of total volatiles.

***Crocus sativus* Pharmacotherapeutics:**

By definition, the word natural refers to being in accordance with or determined by nature. The term natural products in current scenario are quite commonly understood which refers to herbs, herbal combinations, dietary supplements, traditional Chinese medicine, or Alternative medicine for the treatment of various diseases is getting more popular.

Plants are natural and traditional sources of medications in large parts of the world *Crocus sativus* is one among such a medicinal plant which has been cultivated since time immortal for its stigmas having various therapeutic applications. crocin one of the constituents in *Crocus sativus* was studied for functional and histological alterations in sciatic nerve crush injury which weakens the motor behaviour, resulting into augmented plasma MDA levels finally leading to decomposition in distal segment of nerve, management in the company of crocin ameliorated motor behaviour, retrieved plasma MDA level, and put a stop to histological transforms in sciatic nerve. The neuroprotective result of crocin is possibly conciliated via its antioxidant effect[11].

Safranal equally reveals optimistic effect for clonic and tonic phases and can take part in a significant role, but by using GABA-A, selective antagonist further investigations should be conducted. Safranal exhibiting protective behavior in MCS reveals anti-absence seizure activity[12,13]. Extract of saffron stigmas regulated the reduction in body weight, leukocyte count and hemoglobin levels along with prolonging the lifespan of cisplatin-treated mice[14]. The synergestic effect of cysteine, vitamin E and *Crocus sativus* extract also revealed protective activity against cisplatin-induced toxicity in rats. By modulation of lipid peroxidation, it was monitored that as saffron is having rich concentration of carotenoids may make use of its chemo preventive effects[15].

For the management of mild to moderate phases of depression exclusive of side effect, Saffron at dose of (930 mg/day) was equally effective as imipramine (100 mg/day). Same type of effects were also found in mice[16].

Conventionally *Crocus sativus* has been underutilization by diverse group of countries for numerous defects of eyes, majorly affecting cornea, like: glaucoma, and pathological conditions causing opacity and pus formation. The compound has got very positive effects for improving power of vision and is used to treat hemeralopia, dermatitis and cyanosed sclera caused by a number of illnesses[17].

Anti-Oxidant activity of *Crocus sativus* and its constituents on neurodegenerative disorder such as Parkinsonism their communications with Acetylcholine, dopamine, and glutamine. Although, for the reason to have a thorough outlook of saffron actions on central nervous system, further and in-depth mechanistic investigations are required[18].

Immunomodulatory effect:

Various studies in past have aided the benefit of Saffron in recuperation of body defence mechanism and divulged the role of saffron in enhancing and declining immunoglobulins like: IgG and IgA respectively in contrast to control and sugar pills classes[19]. Additionally monocytes percentage was also increased when compared with placebo[20]. Supplementary study also concluded that petal extract of saffron resulted to enhance immune reaction with no change in blood cell count or microscopic structure of spleen[21].

Anti-diabetic activity or Diabetes relieving character:

The aromatic components drawn from saffron are known to reduce glucose levels in patient with empty stomach, suffering from mild diabetes; as well as in diabetic animals like: rats. Further studies established that 40 and 80 mg/Kg doses of saffron considerably improved poundage and plasma TNF-alpha. Also, fall in the glucose volume in blood along with proteins attached to carbohydrate group is observed[22]. one of the study revealed that compound of saffron immersed in methanol, crocin and various other components isolated from saffron remarkably decrease Hb A1C when blood sugar level was checked after overnight fasting[23]. Likewise, advanced research advised that blood sugar levels were tremendously brought down by crocin[24].

Consumption of extracts of saffron by oral route resulted into significant rise in the poundage and the level of insulin in serum was set under control in diabetic rats when compared with those who did not undertake it[25].

Anti-obesity activity:

Previous analysis depicts that Saffron demonstrate anorectic and anti-obesity consequences in adipocyte mice representations. Furthermore, its character of dropping the concentration of leptin in fatty subjects pointed that the compound decreases the adipocyte content and raise sensitivity towards anti-diabetic hormone[26].

Results of one of the investigations revealed the property of saffron to remarkably reduce the intake of food by obese rats in contrast to those which did not take saffron.

Additionally, crocin demonstrate a significant reduction in poundage, adipocyte content; which controls the fraction of non-lipid filled cells to body[27].

Nephroprotective effect:

Crocin, a saffron derivative has been attempted by research scholars in order to look over its walk-on-part in kidney diseases. Investigations revealed its protective role for progression of sudden kidney failure and accumulation of reactive anti-oxidant species in study models[28].Safranal has been set up to have a protective effect against Nephrotoxicity In a parallel study[29].

Anti-microbial activity:

Various part of plant like: stamen, corolla, bulbs were proved to be righteous fount of germicidal compounds[30].

A variety of extracts of *Crocus sativus* in opposition to numerous strains of bacteria have established an enhanced action in response to bacteria and fungi as experimenting models[31].

Adding together bactericidal character of further mixtures like: aqueous, ethanolic and methanolic of petal were evaluated in opposition to food-borne disease-causing organisms and inference was made against such extracts that they possess antimicrobial activity against majority of disease-causing bacteria[32].

from petal of saffron antibacterial activity of aqueous and alcoholic extracts was evaluated by (MIC) of ethanolic extracts action of Safranal and crocin against Salmonella growth was documented from diverse essences of Saffron[33], hydroalcoholic extract, and ethanolic and chloroform snatches of Saffron portrayed remarkable response in opposition to inspected bacteria, especially Streptococcus sanguinis. Nevertheless, chlorhexidine exhibits broad range of responses under less percentages. Hence, progressive investigations need to be under taken for highly beneficious techniques of obtaining anti-microbial compounds from Saffron[34].

CONCLUSION

Medicinal herbs have been aiding the human kind for eras by giving a worthy drug source. Active chemical constituents from shrubberies are secluded and being developed for Prevention, Eradication, treatment, mitigation, and inhibition of several diseases, but still various crude drugs are not much explored.

Crocus sativus L. one of the known plants of traditional medicines consumed to cure various diseases, particularly pre diabetic conditions, female reproductive disorders, inflammatory diseases, and abscesses. Since it is prominent in traditional medicines, its quality assurance parameters are established by Phytochemical and Pharmacognostic studies several phytochemicals have also been isolated and characterized. Medical Research on different parts of the plants have confirmed its vital application for therapeutic purpose. Numerous aspects of *Crocus sativus* plant are still to be studied and explored, for example, acute and chronic toxicity studies, and proper dose of drug for a particular disease. In depth isolation and characterization of phytoconstituents, synergistic studies, Pharmacokinetic and pharmacodynamic interactions should be done.

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