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Medicinal importance of saffron: A review

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Abstract
Saffron (*Crocus sativus* L.) is an autumn flowering high value, low volume spice crop that grows throughout Mediterranean Europe and Western Asia. Saffron primarily a herb has been valued since antiquity not only as a culinary condiment, but also as a source of dye, perfume and medicine. Saffron has been used for medicinal purposes since decades. Modern pharmacological research confirms large parts of traditional knowledge regarding the medicinal effects of saffron. Saffron is regarded as tonic and antidepressant and has been used in various ancient cultures for strengthening digestion, relieving coughs, smoothing menstruation, relaxing muscle spasms, calming anxiety and improving mood.

Keywords: Kashmir, medicinal, pampore, saffron, uses

Introduction
The state of Jammu and Kashmir is the place where saffron is predominately cultivated in India. In fact Kashmir is considered one of the three prominent cultivating places of saffron all over the world. The word saffron originated from the 12th century old French term Safran, which was derives from the Latin word safranum. It is also related to the Italian Zafferano and Spanish Azafran (Harper, 2001) [41]. Safranum comes from the Arabic word asfar which means "yellow" (Katzer, 2001; Kumar 2006) [42, 43]. Kashmiri saffron is seen as the legend of the saffron species where it has been grown in the fields of Pampore nearSrinagar. Saffron as a cultivated plant grows from altitude of sealevel to almost 2000 m, although it is more acclimatized to hill sides, plateaus and mountain valleys ranging in altitudes between 600 and 1700 m (Delgado *et al.*, 2006) [45]. The advantage with this crop is that this plant can be cultivated in arid or semi-arid areas where the water deficit is extreme in summer (Agavev, 2003).

Review of Literature
Hosseinzadeh *et al.* (2004) [15] reported that two constituents of saffron, *safranal*and *crocin*, have antidepressant activity in mice.
Jagdeep *et al.* (2009) [19] Abe and Saito, (2000) [5]; Abe, (1999) [4]; Sigura *et al.*, (1995) [31] are of the opinion that memory is the ability of an individual to record the information and recall it whenever needed. Dementia is amental disorder characterized by loss of intellectual ability (judgment or abstract thinking) which invariably involves impairment of memory. The most common cause of dementia is Alzheimers disease (AD), which is a progressive neurodegenerative disorder associated with loss of neurons in distinct brain areas and cord. Stressful conditions are often associated with loss of memory and cognitive functions which may lead to threats of schizophrenia and AD. Traditionally herbal drugs have been used to enhance cognitive functions and to alleviate other functions associate with the AD. A number of medicinal plants per se and medicines derived from these plants have shown memory enhancing properties by virtue of their medicinal constituents. *C. sativus* is one of the potent drug yielding herb as for as its medicinal properties are concerned. The saffron extract and two of its main ingredients crocin and crocetin, improved memory and learning skills in ethanol-induced learning behavior impairments in mice and rats. Oral administration of saffron may be useful as treatment for neurodegenerative disorders and related memory impairment.
Abdullaev, (2002) [1, 2], reported that it has antitumoural and anticarcinogenic activity and its cytotoxic and antimutagenic effects have also been reported. It is also used as a tonic and promoter of defences in Ayurvedic medicine, for some disorders in the central nervous system in Chinese medicine and for homeopathic preparations.
Xuan B (1999) [37, 38] reported that Crocin analogs isolated from saffron significantly increased the blood flow in the retina and choroid as well as facilitated retinal function recovery and it could be used to treat ischemic retinopathy and/or age-related macular degeneration.

Verma and Bordia, (1998) [34] revealed that fifty milligrams of saffron dissolved in 100 ml of milk was administered twice a day to human subjects and the significant decrease in lipoprotein oxidation susceptibility in patients with coronary artery disease (CAD) indicates the potential of saffron as an antioxidant.

Fatehi *et al*., (2003) [14] reported that aqueous and ethanol extracts of saffron reduced the blood pressure in a dose dependent manner. EFS of the isolated rat vas deferens also were decreased by these saffron extracts.

Hosseinzadeh and Yiounesi, (2002) [16] reported that **s**affron stigma and petal extracts exhibited antinociceptive effects in chemical pain test as well as acute and/or chronic anti-inflammatory activity and these effects might be due to their content of flavonoids, tannins, anthocyanins, alkaloids and saponins.

Saffron has been reported to have some behavioural effects on the central nervous system. Zhang *et al*., (1994) [39, 40] reported that an alcoholic extract of *C. sativus* decreased the motor activity and prolonged the sleeping time induced by hexobarbital. This study suggests that the ethanolic extract possesses a sedative effect, which is probably responsible for the anticonvulsant effect of the extracts. In Iranian traditional medicine, the saffron had been used as an anticonvulsant remedy. In experiments with mice using maximal electroshock seizure (MES) and pentylenetetrazole (PTZ) tests have demonstrated that the aqueous and ethanolic extracts of saffron possess anticonvulsant activity (Hosseinzadeh and Khosrava, 2002) [16].

Al- Mofleh *et al.,* (2006) reported that *C. sativus* (saffron) suspension possesses anti-ulcerogenic principles which protect against gastric mucosal damage induced by indomethacin and necrotizing agent, through inhibition of gastric acid (attenuation of aggressive factors) and stimulation of mucus secretion (potentiation of defensive factors) in Shay rats. Probably the antiulcer effect is due, partly at least, to the presence of flavonoids in the saffron, although, the involvement of other compounds in saffron cannot be ruled out. Hence, the prolong use of saffron in a small quantity in Arabian Coffee (Gahwa) as a flavouring agent and its use in oriental traditional medicine is substantiated by the results obtained in the present study as saffron also did not cause any apparent deleterious effects on the animals.

Ahmad, (2005) revealed that Crocetin, which is an important ingredient of saffron, may be helpful in preventing Parkinsonism.

Salomi, (1991) [28] reported that crocin and dimethyl-crocetin isolated from saffron were non-mutagenic.

Abdullaev (2002, 2003) [1, 2, 3] demonstrated that the saffron extract itself in concentration up to 1500 mg/plate was non-toxic, nonmutagenic and non antimutagenic. A test compound was considered mutagenic if the number of the His+ revertant colonies was increased at least twice over the value of the corresponding control (MI > 2), over at least three doses levels and a reproducible dose-response curve could be demonstrated.

Salomi, *et al.,* (1991a) [28], Abdullaev, *et al.,* (2002, 2003) [1, 2, 3] reported that saffron or the compounds it contains, such as crocin and dimethylcrocin, are not mutagenic or genotoxic.

Prem Kumar, *et al.* (2001, 2003, 2006) [23, 26] also showed that saffron aqueous extract protects from genotoxicity as well as genotoxins-induced oxidative stress in mice.

Premkumar, *et al.*, 2001, 2006) [24, 26] revealed that oral pretreatment with aqueous saffron extract (20, 40 and 80 mg/Kg) for 5 consecutive days significantly inhibited the genotoxicity of antitumor drugs (cyclophosphamide, mitomycin C and cisplatin), *in vivo*, as revealed by micronucleus and comet assay. It was suggested that saffron could exert its antigenotoxic and chemopreventive effects by the modulation of antioxidants and/or detoxification systems

Nair, (1991) [22] reperted that the oral administration of the saffron extract increased the life span of Swiss albino mice intraperitoneally transplanted with sarcoma-180 (S-180) cells, Ehrlich ascites carcinoma (EAC) and Dalton's lymphoma ascites (DLA) tumors.

Martin, (2002) [20] reported that in an animal model (frog embryos), crocetin, from saffron was effective in treating certain types of cancer The long-term treatment with crocin significantly increased survival time and decreased tumor growth rate, induced by rat adenocarcinoma DHD/K12-PROb cells.

Daly, (1998) [13]; Tarantilis, (1994) [33] revealed that an increase in the levels of b-carotene and Vitamin A in the serum of laboratory animals under oral administration of saffron extracts was detected and suggested that saffron carotenoids possessed provitamin A activity according to the hypothesis that the action of carotenoids was dependent upon its conversion to retinal (Vitamin A), because most of the evidence supporting the anticancer effects of carotenoids were referred to be carotene.

Morjani, (1990) [21], Tarantilis, (1994) [33] are of the opinion that the ethanolic saffron extract significantly inhibited the colony formation and cellular DNA and RNA synthesis, whereas inhibition of protein synthesis was not detected. Crocetin, from saffron inhibited intracellular nucleic acid and protein synthesis in malignant human cell lines and no had effect on colony formation. The inhibition of growth of human chronic myelogenous leukaemia K562 and promyelocytic leukaemia HL-60 cells by dimethylcrocetin, crocetin and crocin with 50% inhibition (ID50) reached at concentrations of 0.8 and 2 mM, respectively.

Rios *et al*., (1996) [27] Demonstrates that saffron, it sex tracts and tinctures have been used in traditional medicine as an antispasmodic, eupeptic, sedative, carminative, diaphoretic, expectorant, stomachic, stimulant, aphrodisiac, emmenagogue and abortive agents

It has also been used for the treatment of ocular and cutaneous conditions (Xuan, *et al*., 1999) [37, 38], lowering blood pressure (Soeda, *et al.*, 2001) [32], for wounds, fractures and joint pain; to prevent the plague and other epidemics; to cure anaemia, migranes and insomnia, promoting and regulating menstrual periods (Akhondzadeh, *et al.*, 2004, 2007) [7, 8] sores and as a cardiotonic (Schmidt, *et al.*, 2007; Bathaie and Mousavi, 2010) and treatment of respiratory disorders (Xi, *et al*., 2007; Xiang, *et al.*, 2006) [36].

It is known for its antigastric effects (Al-Mofleh, *et al*.,2006), antidiabetic activity (Shen and Quin, 2006), anticonvulsant and antidepressant remedy (Zhang, *et al.*, 1994) [39, 40], anti-inflammatory effect (Hosseinzadeh and Yiounesi, 2007) [17], antigenotoxic effect (Prem-kumar, *et al.*, 2003) [23], antioxidant activity (Chatterjee, *et al.*, 2005) [12].

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