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Protective effects of *Crocus Sativus L.* and its main constituents against gastrointestinal injury

Kiandokht Ghanati, and Fatemeh Farkhondeh*

Research Department, International Shahid Beheshti University of Medical Sciences, Tehran, Iran

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ABSTRACT

Crocus sativus L. (C. sativus), commonly known as saffron, is used as a food additive, preservative and medicinal herb. It has been considered as an alternative treatment for gastrointestinal diseases. C. sativus' medicinal effects are associated to its major ingredients including crocin, crocetin and safranal. This study found that the gastrointestinal effects of C. sativus and its major ingredients may be related to their antioxidant and anti-inflammation effects.

Keywords*: Crocus sativus*; crocins; crocetin; safranal; gastrointestinal

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INTRODUCTION

C. sativus is the main part of the plant which used in traditional medicine for treatment of various diseases and recent biomedical finding has been focused on its therapeutic effects. Based on the traditional and modern biomedical findings, the plant and its constituents may be effective treatments for gastrointestinal disorders. The therapeutic effects of *C. sativus* stigma could be related to its main ingredients such as crocins, crocetin, picrocrocin and safranal [1].

MATERIALS AND METHODS

Online literature resources were checked using different search engines such as Medline, Pubmed, Iran medex, Scopus, and Google Scholar from 2000 to 2016 to identify articles, editorials, and reviews about the gastrointestinal effects of *C. sativus* and its main constituents.

NEURODEGENERATIVE DISEASES

Medicinal herbs and their active ingredients contain bioactive substances that act through antioxidants activities [2-31]. Recently, numerous traditional medicines have been found to possess potential gastrointestinal effects by scavenging ROS and detoxifying potent genotoxic oxidants, and have attracted considerable interest as potential candidates for the development of novel gastrointestinal drugs [32-39]. Saffron, the dried stigmas of the flowers of saffron (*Crocus sativus L., Iridaceae*), is widely used in human applications and has commercial value for a long time. Greece, along with India, Iran, Spain, Azerbaijan and Morocco, is one of the principal world saffron producers [5]. It has been reported that saffron and its ingredients have hypolipidemic, anti-inflammatory, antioxidant and anticancer effects, moreover, this is applicable for the treatment of gastrointestinal diseases [5].

C. sativus showed protective effect against hepatotoxicity induced by toxic agents and drugs including $AlCl_3$, carbon tetrachloride (CCl_4), and acetaminophen via ameliorating antioxidant system in structural mice liver [40]. The effects of the saffron as compared to omeprazole against gastric ulcer induced by indomethacin in non-diabetic and streptozocin diabetic rats were studied. Pretreatment with the extract and omeprazole 30 min before administration of indomethacin in non-diabetic and diabetic rats inhibited gastric lesions, elevated lipid peroxidation and decrease

glutathione levels. The effects of the extract were comparable to omeprazole. Therefore, *C. sativus* may be effective against gastric mucosa damages due to its antioxidant activity [41]. The preventive effects of crocin on mouse colitis and colitis-related colon carcinogenesis in male rats induced by azoxymethane (AOM) and dextran sodium sulfate (DSS) were seen. This study indicated that crocin improved colitis and colitis-related colon carcinogenesis induced chemically in mice by suppressing inflammation and the mRNA expression of certain proinflammatory cytokines and inducible inflammatory enzymes (tumor necrosis factor α, interleukin- (IL-) 1β, IL-6, interferon γ, NF-κB, cyclooxygenase-2, and inducible nitric oxide synthase) in the colorectal mucosa and increase in the Nrf2 mRNA expression [42]. The gastroprotective effect of crocin against ethanol-induced gastric injury in rats was also showed that crocin decreased gastric ulcer by decreasing inflammatory, oxidative stress and apoptosis responses. It improved ethanol-altered mucosal levels of GSH, MDA and SOD levels [43]. Salem *et al.* indicated a protective effect of crocin against zearalenone-induced oxidative stress in liver of mice by ameliorating MDA level, the protein carbonyl generation, CAT and SOD activity, and the expression of the Hsp70 [44].

The effect of crocin on oxidative stress in recovery from acute swimming exercise in liver tissue of rats was also studied. Results indicated that crocin treatment reduced AST, ALP, LDH, CK, and XO enzymes levels in rats after swimming. Moreover, crocin increased GSH levels and reduced MDA in swimming rats. This finding indicates that crocin may be effective against exercise induced-oxidative damage in liver by preventing reactive oxygen species (ROS) production [45]. Previous studies have shown that crocin may induce hepatoprotective against diazinon by ameliorating lipid peroxidation [46]. The effects of crocin against cisplatin-induced oxidative stress and apoptosis in the liver of mice indicated that crocins reduced serum aspartate aminotransferase and alanine aminotransferase levels. Crocin improved cisplatin-induced oxidative damages by reducing MDA level and recovering the levels of GSH and antioxidant enzymes. Moreover, liver histopathology showed that crocin improved cisplatin-induced focal necrosis. These data suggest that suppressing effects of crocin against CDDP-induced hepatoxicity [47].

Crocin prevented gastric lesions, elevated lipid peroxidation and reduced glutathione levels induced by indomethacin in non-diabetic and diabetic rats [41]. The effect crocin on patulin (PAT)-induced toxicity in human colon carcinoma (HCT116) was studied. It was seen that antioxidant activity of crocins decreased ER stress activation and lipid peroxidation [48]. The protective effects of safranal against the liver toxicity of diazinon [49] showed that after acute diazinon poisoning, the mRNA expression of TNF-α was elevated in mice liver [50]. Safranal prevented gastric lesions, elevated lipid peroxidation and reduced glutathione levels induced by indomethacin in non-diabetic and diabetic rats [41].

CONCLUSION

This review proposes that the gastrointestinal effects of *C. Sativus* and its constituents may be associated to the antioxidant and anti-inflammatory activities.

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