



Review Article

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Therapeutic effects of *Coriandrum sativum* extracts: A reviewAkbar Anaeigoudari[✉]

Department of Physiology, School of Medicine, Jiroft University of Medical Sciences, Jiroft, Iran

ABSTRACT

Medicinal plants, as a good therapeutic strategy, can be used to treat a wide spectrum of diseases. *Coriandrum sativum* (*C. sativum*) is a plant from Apiaceae family. Numerous reports indicate that *C. sativum* has positive effects on anxiety, seizure, learning and memory ability, as well as pain. This annual plant can also treat colitis, increase appetite, reduce blood pressure, and attenuate myocardial damage. Additionally, it improves liver and kidney function and diabetes mellitus and inhibits osteoclast activity. These beneficial effects of *C. sativum* mainly are attributed to its antioxidant and anti-inflammatory properties. The present paper reviews the impacts of *C. sativum* on different body systems. Information was extracted by searching the Web of Science, PubMed, Scopus, and Google Scholar from January 2010 until the end of February 2024.

KEYWORDS: *Coriandrum sativum*; Inflammation; Antioxidant; Oxidative stress; Nervous system; Liver

1. Introduction

Medicinal plants as a suitable therapeutic strategy are widely prescribed by traditional physicians. The reason for this is that phytochemicals presented in their extracts have fewer side effects than chemical medicines[1]. Medicinal plants are applied to relieve a variety of disorders and diseases such as cardiovascular diseases, psychiatric ailments, gastrointestinal disorders, metabolic syndrome, respiratory disturbances, renal and hepatic injuries, and cancer[2–4].

Coriandrum sativum (*C. sativum*) (coriander) is an annual plant from Apiaceae family with a height of 20 cm–70 cm[5]. Its leaves are bright green with straight, transparent, and soft stems. White flowers are located at the end of stem and the fruits are brown in color and oval in shape[6]. All parts of *C. sativum* are edible and can be used in traditional medicine[7]. Fresh leaves and stem of *C. sativum* possess

minerals, vitamins, and lipids[8] and its seeds contain compounds such as linoleic acid, linalool, kaempferol, quercetin, gallic acid, and caffeic acid[9,10]. *C. sativum* is reported to have antioxidant[11], anti-inflammatory[12], anti-diabetic[13], anti-microbial[14], anti-parasitic[15], and analgesic[16] activities. The positive effects of *C. sativum* on flatulence, diarrhea, and other gastrointestinal disorders have been also documented[17]. The *C. sativum* extract protects nigral dopaminergic neurons against 6-hydroxydopamine[18]. Additionally, it has anti-toxicity effects against heavy metals such as arsenic[19]. Tousson *et al.* demonstrated that *C. sativum* seed extracts could alleviate carbendazim-induced testicular toxicity[20]. In other studies, the sedative[6], anti-aging[21], and anticancer[22] activities of *C. sativum* have been also reported. This review summarizes the beneficial effects of *C. sativum* extracts on diverse body systems.

2. Methods

Information was elicited from the Web of Science, PubMed, Scopus, and Google Scholar from January 2010 until the end of February 2024. Key words were “nervous system” or “liver” or “gastrointestinal”, or “cardiovascular system”, or “kidney” or “diabetes mellitus” and “*Coriandrum sativum*” or “Coriander”.

[✉]To whom correspondence may be addressed. E-mail: anaeiga317@gmail.com; anaeia@jmu.ac.ir

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3. Effect of *C. sativum* on the nervous system

Anxiety is an ailment that disturbs normal function of different body systems, especially the nervous system[23]. It can be an outcome of fear and stressful stimuli[24]. In experimental studies, anxiety is evaluated by behavioral tests such as elevated plus maze and open field tests[25]. These behavioral tests showed that 100 and 200 mg/kg body weight of hydroalcoholic extract of *C. sativum* had anxiolytic effects similar to diazepam in mice[26]. The aqueous extract of *C. sativum* (50, 100, and 200 mg/kg body weight) also exerted considerable anti-anxiety effects in mice when compared with diazepam[27]. Zenki *et al.* also reported that 50 and 100 mg/kg body weight of hydroalcoholic extract of *C. sativum* alleviated alarm substance-caused anxiety-like responses in adult zebrafish[28].

A seizure is a sudden and uncontrolled discharge of brain neurons that affects movement, behavior, and consciousness[29]. It has been discerned that inflammation and oxidative stress have a highlighted role in occurrence of seizures[30]. Anaigoudari *et al.* revealed that the water and ethyl acetate fractions of *C. sativum* (25 and 100 mg/kg body weight) confer alleviative effects against pentylenetetrazole-stimulated seizures in rats, which were linked to its antioxidant properties[31]. Karami *et al.* also found that 100, 500, and 1000 mg/kg body weight of hydroalcoholic extract of *C. sativum* could ameliorate pentylenetetrazole-evoked seizure and brain oxidative damage in rats[32]. In a study by Pourzaki *et al.*, 50, 100, and 200 mg/kg body weight of hydroalcoholic extract of *C. sativum* protected against neuronal death in pentylenetetrazole-challenged rats through reducing oxidative stress[33]. Koppula *et al.* also reported that the aqueous extract of *C. sativum* (100, 200, and 300 mg/kg body weight) exerted anti-stress and anti-amnesic impacts in rats through attenuating oxidative stress[34].

The memory-enhancing effects of seed extract of *C. sativum* (200 mg/kg body weight) in aged mice were also emphasized in the study conducted by Mima *et al.*[35]. Moreover, long-term use of 100 mg/kg body weight of ethanolic extract of *C. sativum* fortified learning process in newborn mice[36]. *C. sativum* fruit extract at 25, 50 and 100 µg/mL doses mitigated neuro-inflammation and cognitive impairment in Parkinson's disease induced by 1-methyl-4

phenyl-1, 2, 3, 6-tetrahydropyridine in mice[37]. In a rat model of diabetic nephropathy, the hydroalcoholic extract of *C. sativum* (100, 200, and 400 mg/kg body weight) ameliorated neuronal activity by suppression of oxidative and nitrosative stress and inflammation[38]. In a study by Begnami *et al.*, the ethyl acetate fractions (30, 100, and 300 mg/kg body weight) of *C. sativum* exhibited ameliorative effects on pain and edema in mice[39]. The effects of *C. sativum* on the nervous system are demonstrated in Table 1.

4. Effect of *C. sativum* on the liver and gastrointestinal tract

The liver is an organ that is needed to digest food and to remove harmful compounds threatening body cells[40]. Therefore, it is an unavoidable necessity to protect the liver against injurious factors. Medicinal plants and products derived from them can play a basic role in preventing liver injuries[41]. Injection of ethanolic extract of *C. sativum* at 300 mg/kg body weight exhibited anti-hepatotoxic impacts against carbon tetrachloride in rats, which could be attributed to the antioxidant properties of phenolic compounds present in its extracts[42]. Sfar *et al.* also found the attenuating effects of 250 mg/kg body weight of polysaccharides derived from *C. sativum* against cadmium-induced liver toxicity in rats by decreasing malondialdehyde level and potentiating superoxide dismutase and catalase activities[43]. Pretreatment with methanolic extract of *C. sativum* at 300 mg/kg body weight mitigated apoptosis and inflammation and protected distant organs including the kidney, lung, and small intestine in a rat model of liver ischemia/reperfusion[44]. Moustafa *et al.* also highlighted that the ethanolic extract of *C. sativum* at 100 g/kg body weight alleviated thioacetamide-induced hepatotoxicity in rats, as evidenced by the reduced activities of liver enzymes including aspartate aminotransferase, alanine aminotransferase, and alkaline phosphatase[45].

Inflammatory bowel disease (IBD) is a gastrointestinal disorder that is characterized by inflammation of the intestines, diarrhea, and abdominal pain[46]. Ulcerative colitis is a form of IBD that involves the colon and rectum[47]. It has been recognized that the

Table 1. Effects of *Coriandrum sativum* on the nervous system.

Types of extract or fraction	Dose	Animal	Effects	Reference
Hydroalcoholic extract	100 and 200 mg/kg	Mouse	Attenuation of anxiety	[26]
Aqueous extract	50, 100 and 200 mg/kg	Mouse	Anxiety relief	[27]
Hydroalcoholic extract	50 and 100 mg/kg	Zebrafish	Improvement of anxiety-like behaviors	[28]
Water and ethyl acetate fractions	25 and 100 mg/kg	Rat	Alleviation of seizure and oxidative stress	[31]
Hydroalcoholic extract	100, 500 and 1000 mg/kg	Rat	Suppression of seizure and brain oxidative damage	[32]
Hydroalcoholic extract	50, 100 and 200 mg/kg	Rat	Prevention of neuronal death through reducing oxidative stress	[33]
Aqueous extract	100, 200 and 300 mg/kg	Rat	Improvement of stress and amnesia through attenuating oxidative stress	[34]
Ethanolic extract	100 mg/kg	Mouse	Potentialiation of learning processes	[36]
Hydroalcoholic extract	100, 200 and 400 mg/kg	Rat	Amelioration of neuronal activity and suppression of oxidative and nitrosative stress, and inflammation	[38]
Ethyl acetate fraction	30, 100 and 300 mg/kg	Mouse	Alleviation of pain and edema	[39]

hydroalcoholic extract of *C. sativum* at 250, 500, and 1000 mg/kg body weight and its essential oil at 0.25, 0.5, and 1 mL/kg body weight cured acetic acid-stimulated acute colitis in rats[48]. In addition, treatment with 100 and 150 mg/kg body weight of hydroalcoholic extract of *C. sativum* improved appetite in rats[49]. The effects of *C. sativum* on the liver and gastrointestinal tract are summarized in Table 2.

5. Effect of *C. sativum* on the cardiovascular system

Cardiovascular diseases are one of the basic factors that threaten natural life of humans[50]. Hypertension plays a key role in occurrence of cardiovascular diseases[51]. Exposure to toxic elements such as arsenic also affects systolic blood pressure[52]. Evidence established that the methanolic extract of *C. sativum* (250 and 300 mg/kg body weight) along with *Citrus limon* (50 and 70 mg/kg body weight) decreased arsenic-induced hypertension and oxidative stress in rats[53]. In rats with hypertension caused by a high-fructose and high-salt diet, *C. sativum* at 1 and 2 g/kg body weight modulated blood pressure[54]. Treatment with methanolic extract of *C. sativum* at 100, 200, and 300 mg/kg body weight also could restore isoproterenol-caused myocardial damage in rats[55]. Dhyani *et al.* demonstrated that the aqueous extract of *C. sativum* seeds at 1 g/kg body weight protected against heart failure in rats *via* fortification of left ventricular function, modulation of lipid peroxidation, and improvement of endothelial receptor expression[56].

Hematopoietic damage can be a result of radiotherapy[57]. Oxidant substances have been distinguished to be responsible for induction of hematopoietic damages evoked by radiotherapy[58]. In mice exposed to ionizing radiations, the aqueous and ethanol extracts of *C. sativum* at 50 mg/kg body weight saved progenitor and hematopoietic

stem cells by mitigation of oxidant factors and enhancement of antioxidant enzymes in these cells[59]. The effects of *C. sativum* are summarized in Table 3.

6. Other effects of *C. sativum*

Metabolic disorders are ailments that alter different aspects of metabolism[60]. Metabolic syndrome such as obesity and diabetes mellitus is a well-known type of metabolic disorder[61,62]. Hyperglycemia[63], dyslipidemia[64], nephropathy[65], and retinopathy[66] are complications caused by metabolic syndrome. It has been manifested that a combination of ethanolic extracts of *C. sativum* and *Trigonella foenum-graecum* at 100 mg/kg body weight alleviated alloxan-induced diabetes mellitus in rats by reducing blood glucose level, cholesterol, triglyceride, very-low-density lipoprotein, and low-density lipoprotein, and increasing high-density lipoprotein[67]. In a study by Attaallah *et al.*, the fruit extract of *C. sativum* alleviated diabetic complications in the gonads of female rats and their offspring[68]. In streptozotocin-induced diabetic rats, *C. sativum* at 100, 200, and 400 mg/kg body weight ameliorated diabetic nephropathy by preventing the formation of advanced glycation end products in the kidney, enhancing glutathione and superoxide dismutase activities, and reducing lipid peroxidation[69]. Polyphenol fraction of *C. sativum* at 25 and 50 mg/kg body weight had positive effects in diminishing blood glucose and lipids and ameliorating inflammation and oxidative stress in mice[70]. It was also found that *C. sativum* at 400 mg/kg body weight lowered serum levels of urea and creatinine and relieved renal dysfunction resulting from gentamicin administration in rats[71]. Treatment with ethanol extract of *C. sativum* at 50 mg/kg body weight also demonstrated

Table 2. Effects of *Coriandrum sativum* on the liver and gastrointestinal tract in rats.

Types of extract	Dose	Effects	Reference
Ethanolic	300 mg/kg	Improvement of liver function and mitigation of oxidative stress	[42]
Methanolic	300 mg/kg	Mitigation of apoptosis and inflammation and protection of distant organs including the kidney, lung, and small intestine	[44]
Ethanolic	100 g/kg	Reduction of AST, ALT, ALP activity and protection of the liver	[45]
Hydroalcoholic	250, 500 and 1000 mg/kg	Improvement of acute colitis	[48]
Hydroalcoholic	100 and 150 mg/kg	Appetite-stimulating effect	[49]

AST: aspartate aminotransferase, ALT: alanine aminotransferase, ALP: alkaline phosphatase.

Table 3. Effects of *Coriandrum sativum* on the cardiovascular system.

Types of extract	Dose	Animal	Effects	Reference
Methanolic	250 and 300 mg/kg	Rat	Decrease of blood pressure and oxidative stress	[53]
Methanolic	100, 200 and 300 mg/kg	Rat	Attenuation of myocardial damages	[55]
Aqueous	1 g/kg	Rat	Treatment of heart failure <i>via</i> fortification of left ventricular function, modulation of lipid peroxidation, and improvement of endothelial receptor expression	[56]
Aqueous and ethanolic	50 mg/kg	Mouse	Protection of progenitor and hematopoietic stem cells and alleviation of oxidative stress	[59]

anti-osteoclastogenic impacts in mice by affecting the nuclear factor kappa B (NF- κ B) and extracellular signal-regulated kinase (ERK) signaling pathways[72].

7. Conclusion

This review shows that *C. sativum* has numerous therapeutic effects on different organ systems. It could relieve anxiety and seizures and improve memory dysfunction. In addition, *C. sativum* exerted hepatoprotective, gastro-protective, cardio-protective, reno-protective, anti-diabetic, and anti-osteoclastogenic effects. However, the therapeutic effect of *C. sativum* on humans has not been explored. Therefore, human studies are recommended in the future.

Conflict of interest statement

The author declares that there is no conflict of interest.

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Data availability statement

The data supporting the findings of this study are available from the corresponding authors upon request.

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