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Role of *Bunium persicum* in human life

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Abstract
Bunium persicum, commonly known as B. Fedtsch or Black cumin, is a commercially important medicinal spice that is widely utilized as a taste enhancer and preservative in various food systems. It's often employed in antispasmodic, carminative, anti-obesity, and lactogage products, suggesting that it has a lot of promise in medicine and food. It's also used to treat a variety of conditions, including digestive and urinary problems, as well as improving breast milk production. The high levels of oxygenated monoterpenes found in *B. persicum* essential oil, particularly γ- Terpinene, cuminaldehyde, ρ-cymene, and limonene, endow various proven therapeutic properties such as antimicrobial and anti-oxidants, anti-inflammatory, anti-diabetes, anti-perlipid and analgesic properties, anti-carcinogenic activities, and so on. This review provides an overview of the therapeutic benefits of black cumin, including antimicrobial, anti-oxidant, anti-parasitic, hypolipidemic and hypoglycemic effects, anti-inflammatory effects, and anti-diabetic effects, with the goal of attracting the attention of potential stakeholders to the immense potential and infinite qualities of black cumin.

Keywords: *Bunium persicum*, human life, γ-terpinene

Introduction
Bunium persicum is a wild caraway plant belonging to the Apiaceae family. It is a perennial aromatic plant with small white or pink flowers and small brown beans that grows wild in Mediterranean climate areas such as Iran, Turkey, Syria, Pakistan, Tajikistan, Afghanistan, North India (Kashmir and Pamir), China, Northern Africa, and South America. Natural compounds, especially medicinal plants, have been increasingly used in food in recent years due to their ability to improve food safety and shelf life. In foods and beverages such as bread frying, rice, yoghurt, cheese, and confectionery goods, herb is used as a seasoning and flavouring agent. It has a heavy earthy fragrance that is enhanced when fried and cooked. This plant is also used in cosmetics and perfumes (Aminzare *et al.*, 2017) [2].
Bunium persicum is widely used in people's diet as a flavoring agent, there is no major concern about the toxic effects of this plant. *Bunium persicum* is used for treating gastrointestinal and urinary disorders such as stomatitis stimulant, flatulent indigestion, dyspeptic headache, relieve of heartburn, colic, and diarrhea (Sofi *et al*., 2009) [28]. It is used as an anticonvulsant, anti-diabetic and anti-asthma, antispasmodic, antiepileptic and flow increaser of breast milk (Hassanzadazar *et al*., 2018) [1]. The seed of *Bunium persicum* contain flavonoids, aldehydes, mono- terpenes, and phenolic acid (Chizzola *et al*., 2014) [13]. It has anti-oxidative, anti-inflammatory, free radical scavenging, antibacterial, and anti-parasitic properties (Agah *et al*., 2013) [29].

Natural components present in *Bunium persicum*
γ-terpinene, ρ-cymene, α-Pinene, cuminaldehyde, limonene, S-3-Caene, Trans-3-Caren-2-ol, Terpinolene, Acetic acid, bonyl acetate, acetylphenylcarbinol (Jamshidi *et al*., 2014) [13]. Caryophyllene, 4-dien-7-al and p-menth-3-en-7-al, Eugenol, 4-dien-7-al and p-menth-3-en-7-al carvacrol, 1,8-Cineole, Camphene, Safrole, pinocarvyl acetate, α-methyl-benzene methanol, croweacin, p-mentha-l,3-dien-7-al, p-mentha-l, Sabinene, Terpinolene, Myrcene, Caranone, and α-Thujene (Shahsavari *et al*., 2008) [4].

Therapeutic benefits of *Bunium persicum*
Anti-microbial property
Due to their inhibitory properties against a wide range of pathogens, gram-positive and gram-negative bacteria, plant-derived compounds, particularly essential oils, are widely known as

antibacterial agents (Raut and Karuppayil, 2014) [5]. Ghasemlou *et al*., (2013) [6] reported that phenolic compound present in *Bunium persicum* responsible for the anti-bacterial property. Essential oils are lipophilic substances, which mean they can easily penetrate through cell walls and membranes. Interactions of essential oil constituents with polysaccharides, fatty acids, and phospholipids increase bacterial membrane permeability, resulting in ion and cellular content loss and cell death (Hassanzadazar *et al*., 2018) [1]. Furthermore, the impacts on proton pump activity, membrane clotting, and cell content leakage can all lead to cell death. Essential oils can also kill them by causing cytoplasmic protein denaturation and cellular enzyme deactivation (Edris, 2007) [7]. Phenolic compounds such as ρ-cymene, γ-terpinene, thymol, and carvacrol have anti-bacterial property (Thippeswamy *et al*., 2013) [8]. The bioactive ompouns present in buniu persicum shows antimicrobial effects on *Escherichia coli* (Gupta *et al*., 2011) [9], *Staphylococus aureus, Bacillus cerus, Listeria monocytogenes,* and *salmonella spp* (Abdalaziz *et al*., 2017). *Bunium* aqueous extract inhibits the growth of *Acinetobacter baumannii* (Bhat *et al*., 2017) [11]. The antifungal properties of cuminaldehyde and ρ-cymene, two primary components of *Bunium persicum* essential oil, were found to be the strongest against a variety of phytopathogenic fungi. In stored masticatories, essential oil suppressed the growth of 15 common food-borne moulds and mycotoxigenic fungi, including *Aspergillus flavus* and aflatoxin B1 secretion (Singh *et al*., 2020) [12].

Antioxidant property

Due to the presence of polyphenolic compounds, flavonoids, estragol, limonene, anethole, carvone, caevacrol, and monoterpene alcohols in *Bunium persicum* shows greater anti-oxidant property (Agrahari and Singh, 2014) [14]. The 2,2-Diphenyl-1-picrylhydrazyl (DPPH) scavenging and β-carotene bleaching experiments revealed that *Bunium persicum* extracts and essential oil have high antioxidant and free radical scavenging properties (Chizzola *et al*., 2014) [13]. Atrooz, (2013) [15] reported that presence of bioactive compounds with radical-scavenging activity in *Bunium persicum* seed extract can prevent hemolysis of human erythrocytes. Differential extracts of *Bunium persicum* had anti-oxidant and antitoxic properties, and might protect leukemic blood rats from hematotoxicity caused by reactive oxygen species (ROS) (Ali *et al*., 2014) [16]. According to the work done by Zangiabadi *et al*., (2012) [17] stated that results of peroxide value (PV) and thiobarbituric acid, *Bunium persicum* can be utilised in daily meals as an efficient and cost-effective natural alternative to synthetic antioxidants (TBA).

Antiparasitic effect

Bunium persicum essential oil and extract have antiparasitic properties, according to several research. According to the research, it has antitoxoplasmosis properties (Kareshk *et al*., 2015) [8]. Mahmoudavand *et al*., (2016) [19] revealed that BP has potent scolicidal activity with few side effects, suggesting that it could be employed as a natural scolicidal agent in hydatid cyst surgery. Trichomonas vaginalis, a flagellated protozoan parasite that causes sexually transmitted illnesses, could be treated with nanoliposomes.od *Bunium persicum* essential oil (Mirzaei *et al*., 2020) [20].

Hypolipidemic and hypoglycemic effects

Bunium persicum seed extract can cause insulin-dependent hypoglycemia. These plants' hypoglycemic action may be due to suppressing glucose synthesis or promoting glucose utilisation in peripheral tissues, particularly muscle and fat tissue. This herb's extract can also serve as a glucose reabsorption inhibitor in renal tubes (Hassanzadazar *et al*., 2018) [1]**.** In a study of diabetic rats, an ethanolic extract of BP seed in various dosages effectively reduced glucose and insulin levels in diabetic rats as compared to healthy rats (Eidi *et al*., 2010) [21]. Several animal researches have demonstrated that *Bunium persicum* has great hypolipidemic effects (Khaksari *et al*., 2014) [22]. *Bunium perssium* aqueous extract significantly decreased total cholesterol, triglycerides, and low-density lipoproteins while simultaneously increasing high-density lipoprotein levels. In hyperlipidaemic animals, the aqueous extract was found to be more effective than an activity in improving their lipid profile (Khaksari *et al*., 2014) [22]. The antioxidant activity of aqueous extracts of *Bunium persicum* components, particularly flavonoids and carvone, provides renoprotection against diabetes and its consequences. In rats, a water extract of *Bunium persicum* showed preventive benefits against diabetes-induced kidney impairment (Sadiq *et al*., 2010) [23].

Anti-inflammatory effects

Bunium persicum extract and essential oil have analgesic and anti-inflammatory effects in the first phase of the formalin test, suggesting that at least some of the analgesic activity is mediated centrally. Meanwhile, the findings support folklore usage of the plant fruits in the treatment of painful and inflammatory illnesses. *Bunium persicum* effective in suppressing this phase's pain response, suggesting that the plant's fruits had an anti-inflammatory impact. The anti-inflammatory action was further confirmed by results obtained from carrageenan-induced paw and croton oil-induced ear edemas, which are reliable animal models for measuring anti-inflammatory activity (Hajhashemi *et al*., 2011) [24]. Essential oil are the main omponent which was reespomsible for the anti-inflammotory property (Kareshk *et al*., 2015) [8].

Anti-diabetic effect

The essential oil of *Bunium persicum* shows thre anti-diabetic property (Gani *et al*., 2020) [27]. *Bunium persicum* seeds extract was utilised to investigate the influence of *Bunium persicum* seeds extract on the level of insulin secretion from isolated Langerhans islets in male mice. In comparison to the glucose 2.8 mM and 16.7 mM groups, insulin secretion in 0.05 and 0.1 mg/ml concentrations of *Bunium persicum* seed extracts in mediums containing glucose 2.8 mM and 16.7 mM increased significantly. In comparison to various doses of hydroalcoholic extracts, 0.05 mg/ml of aqueous extract in mediums containing glucose 2.8 mM and 16.7 mM enhanced insulin secretion. In comparison to the glucose 2.8 mM and 16.7 mM groups, glyburide 10 mM was the most effective in boosting insulin production from isolated islets ($p< 0.001$) (Ahangarpour *et al*., 2014) [26].

Conclusion

Bunium persicum is a valuable seed spice and medicinal plant that grows wild in a particular geography. Due to its flavoring and many functional characteristics, it is frequently used in people's diets. Many people rely on indigenous plants as a safe or primary source of health care. *B. persicum* is a potential seed because it contains a lot of essential oils that are high in phenolic compounds and γ-terpinene, which is a good free radical scavenger. It has anti-inflammatory,

antibacterial, antioxidant, lipid- and glucose-lowering properties. Different food and pharmaceutical businesses can use this seed to improve the quality and shelf life of food goods, as well as generate functional foods/nutraceuticals.

Because of its therapeutic capabilities, it appears that the plant will be widely used in food preservatives and/or the food business in the future. It was discovered that black cumin and its derivatives can be used to reduce spoilage and infections alone or in combination with other food preservatives and/or in the formulation of edible films or coatings. Because of its flavoring benefits, *B. persicum* is commonly utilized in people's diets, and its toxic consequences are not a significant matter.

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