



REVIEW ARTICLE

## Phytochemical and Biological Effects of *Sesamum indicum* L.- A Review

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### ABSTRACT

*Sesamum indicum* L. is from Family Pedaliaceae. It plays an important role in ancient culture and modern system of medicine. It is commonly known as sesame. It is cultivated throughout India, mainly for its seeds and oil. The plant traditionally used in the treatment of hemorrhoids, dysentery, constipation, cough, amenorrhea, dysmenorrhea and ulcers. It also has antifungal, anticancer, antitumor, antiatherosclerotic activity. The total alcoholic extracts of all residual aerial parts of this plant show antioxidant, anticancer, antiaging and anticoagulant activities.

**Keywords:** *Sesamum indicum* L., Chemical compounds, Plants, Bioactivities.

## INTRODUCTION

Herbal medicines are popular in the treatment of many diseases. They are safe and easily available. Sesame "*Sesamum indicum* L." is a commonly growing plant species mainly in tropical and subtropical regions of the world, particularly in Burma, India, China, and Sudan [1]. Sesame seeds are preferably used along with bread, biscuits, crackers, and so forth and as seasoning in food around the world [2]. Sesame seeds are important sources of oil, protein, carbohydrates, and minerals for human nutrition [3]. Sesame seeds color varied from cream-white to charcoal-black, whereas white and black are the typical skin color. Black sesame is used as food for health in traditional beliefs of Asian countries and is included in Pharmacopoeia of the People's Republic of China (PPRC, 2015) as liver and kidney benefiting traditional Chinese medicine (TCM). It has been reported that the seed colors of sesame affect the phytochemical contents and their biological activities [4, 5]. Phytochemical compounds in sesame seed such as sesamin, sesamol, and anthrasesamone F have been proved to have in vitro/in vivo antioxidant and antiaging activity [6–9]. Moreover, sesamin and sesamol showed anti-inflammatory, antihypertensive, and anticarcinogenic effects in numerous studies [10–12]. The common nutritional evaluations of sesame seeds are based on the contents of proteins, oils, and lignans. However, little work was conducted on the correlation between multi-components and antioxidant activity and multicomponent and antiproliferative activity in various sesame seeds varieties. In this review, we have explored the phytochemical and pharmacological properties of *S. indicum* plant.

## PHYTOCHEMICALS

The sesame seeds by expression yield a fixed oil consisting essentially of the glycerides of oleic and linoleic acids with small preparations of stearin, palmitin and mystirin. The oil is bland in taste and almost odourless. Sesamin, another constituent of the oil, may be obtained in long crystalline needles melting at 118 ° F, insoluble in water, light petroleum, ether alkaloids and mineral acids, easily soluble in chloroform, benzene and glacial acetic acid. Liquid fatty acids are present to about 70 %, solid fatty acids 12 to 14 % [13]. Sesame seeds contain two unique substances, sesamin and sesamol occur during refinement the two phenolic antioxidants, sesamol and sesaminol, are formed. Both of these substances belong to a group of special beneficial fibers called lignans, and have been shown to possess cholesterol-lowering effect in humans, and to prevent high blood pressure and increase vitamin E supplies in animals. Sesame seeds are a very good source of copper, and calcium. Just a quarter-cup of sesame seeds supplies 74.0% of the

daily value for copper (14), 31.6% of the magnesium and 35.1% of the daily value for calcium. It is also high in protein, phosphorous, iron and magnesium. Copper is known for reducing pain and swelling of rheumatoid arthritis. Magnesium supports Vascular and Respiratory health (15). Calcium helps to prevent Colon Cancer and Osteoporosis. The seeds also have a good amount of manganese, iron, phosphorus, zinc, vitamin B1, tryptophan and dietary fibers [16]. Three anthraquinones, named anthrasesamones A, B and C, were isolated from the roots of *Sesamum indicum*, and their respective structures were determined to be 1-hydroxy-2-(4-methylpent-3-enyl) anthraquinone, 1,4-dihydroxy-2-(4-methylpent-3-enyl) anthraquinone and 2-chloro-1,4-dihydroxy-3-(4-methylpent-3-enyl) anthraquinone on the basis of spectroscopic evidence. Other two known anthraquinones are isolated from the roots of *S. indicum* and characterized as 2-(4-methylpent-3-enyl) anthraquinone and (E) 2-(4-methylpent-1,3-dienyl) anthraquinone [17]. A new lignan glucoside was isolated from defatted sesame seed flour as sesamolol diglucoside by mass and nuclear magnetic resonance spectroscopy. A quantitative analysis of 65 sesame seed samples showed that sesamolol diglucoside ranged from 5 to 232mg per 100g of seeds with no difference in white and black seeds [18].

## BIOLOGICAL ACTIVITIES

### Antioxidant effect

Sesame increases the recycling of vitamin E, improves liver functions and provides protection against alcohol-induced oxidative stress. Sesamin decreases cholesterol levels while increasing high-density lipoprotein levels [19]. Sesame oil enhances hepatic detoxification of chemicals, reduces the incidence of chemically-induced mammary tumors, and protects against oxidative stress, which is involved in the pathogenesis of endotoxin intoxication. Oxidative stress may be caused by reactive oxygen intermediates (ROI). ROI, including singlet oxygen, nitric oxide (NO), hydrogen peroxide, and free radicals, all of which are important mediators of cellular injury and play a putative role in oxidative stress in endotoxin intoxication. The effects of ethanolic extract of sesame coat on oxidation of low-density lipoprotein (LDL) and production of nitric oxide in macrophages were investigated. The results showed that extract in the range of 0.01-0.8mg/ml markedly inhibited copper-induced LDL oxidation and H<sub>2</sub>O<sub>2</sub> induced cell damage that implies that ethanolic extract could exhibit a protective action on biomolecules and generation of inflammatory mediators in vitro [20].

### Anti-microbial activity

Sesame is naturally antibacterial for common skin pathogens such as *Staphylococcus* as well as common skin fungi such as athlete's foot fungus. As a throat gargle, it kills *Streptococcus* and other common cold bacteria. It helps sufferers of psoriasis and dry skin ailments. It is a useful natural ultraviolet protector. In a study, the results revealed that minimum inhibitory concentration (MIC) of sesame oil against is 10 l/ml. However, for other organism then MIC values were in the range of 350-500 µl/ml. The sesame oil shows best antimicrobial activity and also equal with standard Kanamycin and also it shows highest zone of inhibition against *S. typhi* (21).

### Anti-hypertensive activities

In a study, it is revealed that the sesamin and its active metabolites can induce antihypertensive effects in experimental animal models [22]. A study in hypertensive patients indicated that sesame oil consumption remarkably reduced oxidative stress and simultaneously increased GPx, superoxidase dismutase, and catalase activities. These results support the hypothesis that sesame oil consumption may help to enhance antioxidant defense system in human beings. The investigators suggested that sesamin is a useful prophylactic treatment in hypertension and cardiovascular hypertrophy [23].

### Anti-cancer properties

Sesame oil has been found to inhibit the growth of malignant melanoma in vitro and the proliferation of human colon cancer cells [24]. Sesame seed consumption increases plasma  $\gamma$ -tocopherol and enhances vitamin E activity, which is reported to prevent cancer and heart diseases. Cephalin from sesame seed has hemostatic activity [24].

### Other medicinal uses

In recent experiments in Holland by Ayurvedic physicians, the oil has been used in the treatment of several chronic diseases including hepatitis, diabetes and migraine. These effects are supported by main pathophysiological theories of migraine such as neural and sensitization theories. Sesame flower extract has tumor arresting property. Sesame oil is used as a solvent for intramuscular and has nutritive, demulcent, and emollient properties and has been used as a laxative. The leaves are rich in a gummy matter and when mixed with water from rich bland mucilage that is used in the treatment of infant cholera, diarrhea, dysentery, cataract, boils, carbuncle, menstrual irregularities, poly-urea, stomach- trouble, serious burns

skin [25].

### CONCLUSION

Sesame plant is not only in use for culinary purposes, but also in various applications such as industrial, engineering, and pharmaceutical sesame. Sesame is an important source of phytonutrients such as omega-6 fatty acids, flavonoid phenolic anti-oxidants, vitamins, and dietary fiber with potential medicinal effects. Sesame reveals the truth that it is a more helpful beneficial plant with anti-pyretic, anti-inflammatory, antioxidant, anti-microbial, anti-hypertensive, anti-cancer and other properties.

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