CHAPTER TEN

Biological activities: antiinflammatory, antihyperlipidemic, and antimicrobial of black cumin seeds

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10.1 Introduction

Black cumin is a well-known folk medicine in several parts of the world. It has enriched history and beliefs as an effective medicinal plant (Kulyar et al., 2021). And Muslims consider it to be a cure-all for all diseases (Al-Bukhari).

10.2 Chemical composition

Black cumin holds many useful proteins, carbohydrates, minerals, vitamins, and oils. The percentage of those vital elements depends on agricultural method, harvest period, and the geographical area. Its extracted oil has both the characteristics of fixed and volatile oil, and the fixed oil contains unsaturated fatty acids and slightly saturated fatty acids, counting A and E vitamins. In black seeds, minerals such as potassium, calcium, and iron are present in large proportions, while zinc, magnesium, manganese, selenium, and copper are present in lesser amounts. Furthermore, vital oil extract from black cumin is of useful significance owing to its wealthy volatiles, such as 18.4%—24% *thymoquinone* (TQ), 46.1% *monoterpenes* counting p-cymene, -pinene, thymol, dithymoquinone, nigellone, and thymohydroquinone (Black Cumin, 2016).

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10.3 Biological activities

It showed antioxidant, antiinflammatory, antihypertensive, antibacterial, antiviral, antiparasitic, antifungal, antianxiety, antiulcer, anticancer, hypoglycaemic activity, hepatoprotective, immunomodulatory, and muscle relaxant properties. Furthermore, it improves immunity in patients with compromised immune systems (Forouzanfar et al., 2014; Padhye et al., 2008).The bulk of the curative characteristics of this medicinal plant are owing to the existence of TQ, which is a chief bioactive part of the vital oil (Beheshti et al., 2016). Kolahdooz et al. (2014) discovered that black cumin oil remedy significantly improved sperm count, motility, morphology, sperm volume, and pH.

Black cumin oil is used by Persians and Indians to increase milk production in nursing mothers (Drugs and, 2006). On the other hand, women throughout the globe choose to use herbal sources as milk production stimulators, since herbal medicines are supposed to be safe and easily accessible in the local market (Nigella sativa, 2020). Antimicrobial resistance and the high cost of manufacturing of synthetic medicines increase attention to alternative herbs as they possess the capability to kill microbes and maintain and enhance microbial flora (Adegbeye et al., 2020).

10.4 Antiinflammatory activity

Black cumin oil has been found to show strong antiinflammatory influences on many inflammation-based models through the inhibition of prostaglandins and leukotrienes (Shabana et al., 2013). Its supplementation is used to improve the clinical and inflammatory parameters of asthma, such as pulmonary function tests, eosinophil count, and total serum immunoglobulin E. Furthermore, its oil promotes interferon-/interleukin-4 balance, acts in children with asthma, and inhibits histamine release from mast cells (Ikhsan et al., 2018). Activities of black cumin oil are attributed to its ability to suppress *eicosanoid* production in leukocytes by TQ and the fixed oil of it, by suppressing both cyclooxygenase and 5-lipoxygenase. Black cumin shows an inhibitory influence on nitric oxide release by macrophages, and TQ inhibits the action of histone deacetylase and improves inflammation-associated cancer (Chehl et al., 2009).

10.5 Antihyperlipidemic properties

Black cumin seeds, chiefly *TQ*, act as a lowering agent for cholesterol, triglycerides, and low-density lipoprotein, and they raise high-density lipoprotein. The elevated content of polyunsaturated fatty acids of the black seed synergized the hypolipidemic activity of TQ (Shabana et al., 2013).

10.6 Antimicrobial properties

Antimicrobial properties of black cumin seeds have been found to be effective against a variety of pathogenic bacteria, viruses, parasites, and fungi (Forouzanfar et al., 2014).

10.6.1 Antibacterial activities

Black cumin serves as a strong antibacterial agent against numerous bacterial strains such as *Escherichia coli and Pseudomonas aeruginosa*. Aside from its usefulness in combating antibiotic resistance (e.g., suppressing the growth of methicillin-resistant *Staphylococcus aureus*) (Shabana et al., 2013). Its usage is recommended in the food industry in order to prevent spoilage. TQ components of black cumin inhibit a wide range of gram-negative and gram-positive bacteria.

10.6.2 Antifungal properties

A reasonable inhibitory effect of black cumin seed and oil was observed against several pathogenic fungi such as *Candida albicans*, *dermatophytes*, *non-dermatophytes*, and some *aflatoxin*-producing fungi (Abdallah, 2017).

10.6.3 Antiparasitic properties

Black cumin acts actively against numerous parasitic infections and serves as an antileishmanial, anticestodal, antinematodal, and antischistosomal. Also, it has effective antioxidant properties and might be a good phytotherapeutic agent against malaria parasite infection (Mahmoudv et al., 2015).

10.6.4 Antiviral properties

The limited effectiveness of synthetic antiviral medicines guides people to search for other accessible, cheap herbal remedies like black cumin, which shows antiviral activity against influenza virus (*H9N2)*, infectious laryngotracheitis virus, *hepatitis C virus*, *human immunodeficiency virus*, and severe acute respiratory syndrome virus (SARS-COV-2) (Abdallah, 2017).

10.7 Conclusion

Black cumin represents a promising medicinal plant owing to its biological actions against pathological conditions (inflammation, hyperlipidemia) and pathogens (bacteria, viruses, fungi, parasites), which inhibit the growth of antimicrobial-resistant bacteria, are economical and accessible, and have no limited shelf life as synthetic remedies. Furthermore, it improves male fertility.

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