

The Pharmacological Importance of Nigellasativaas Radioprotective Agent

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Received 22 March 2019;

Accepted 11 April 2019;

Published 20 April 2019

Abstract

Background: Many studies have showed that *Nigella sativa* is used as a natural remedy in treating various diseases across the globe. Indonesia is famous for its rich spices, one of which is the "Black Cumin" seed extract (*Nigella Sativa* N.S). **Purpose:** To analyze the effects of *Nigella sativa* as an antioxidant to inhibit oxidative stress caused by ionizing-free radiation. **Result:** *Nigella sativa* is widely used to diagnose, treat disease, and decrease the level of malondialdehyde (MDA) as one of the final markers of oxidative stress. *Nigella sativa* has been used as a treatment for various types of diseases in the world. Through the components contained in *Nigella sativa* it is believed to have uses as an antimicrobial, anti-inflammatory, antibacterial, antiviral, and as an antioxidant. The mechanism of action of *Nigella sativa* depends on the type of disease. The contents of *Nigella sativa* are essential oils and thymoquinone, dithymoquinone, thymol, carvacrol, nigellidine, nigellimine-N-oxide and alpha-hedrine. As well as some vitamins and omega 3 contained in it. The content of *Nigella sativa* will work together by inhibiting the oxidase reaction. **Conclusion:** *Nigella Sativa* can be used in herbal medicine because it has pharmacological effects; antibacterial, antifungal, antiviral and antioxidant. *Nigella sativa* has many health benefits. *Nigella sativa* contains thymoquinone which can reduce lipid peroxidation and increase antioxidant enzymes. The effectiveness of *Nigella sativa* as a radioprotector can prevent the occurrence of free radicals caused by ionizing radiation.

Keywords: *Nigella sativa*, ionizing radiation, free radicals, oxidative stress

Background

Radiography in the field of dentistry is currently widely used as a tool for diagnosing. Radiographic devices in use will provide emission radiation ion.^[1] Although ionization radiation is used very low, it can cause biological effects due to chemical compounds produced by ionization reactions called free radicals.^[2]

Free radicals can trigger lipid peroxidase processes. If lipid peroxidase binds to oxygen it causes damage to body tissues and causes various diseases, such as cancer, osteosclerosis and aging. Lipid peroxidation is a chain reaction with various damaging effects, and can destroy oxidative polyunsaturated fatty acids which have long chains to produce MDA compounds as components of cell metabolites produced by free radicals. A high concentration of serum MDA shows the oxidation process in the cell membrane used as an index measuring free radical activity in the body. The high levels of MDA in the body can be caused by an increase in free radical activity.^[3]

Indonesia is famous for its rich spices, one of which is the "Black Cumin" seed extract (*Nigella Sativa* N.S). In previous studies it was found that *Nigella sativa* with thymoquinone as an active constituent can inhibit non-enzyme lipid peroxidase in liposomes with a fairly high level of free radicals.^[4] In another study, black cumin seed extract (*Nigella Sativa* N.S) has the ability of OH radical scavenging which is effective in non-enzymatic lipid peroxidation. In the research of dentistry *Nigella Sativa* oil was also found as antibacterial, anti-inflammatory, and as an analgesic in the treatment of pulp tissue in pulpotomy performed on dog dental premolars.^[5]

The active ingredient of *Nigella Sativa* oil is volatile oil which consists of 18.4 -24% thymoquinone, and 46% monoterpenes such as p-simene, and a-pinene. In *Nigella Sativa* oil also contains a lot of aromatic oils, saturated and unsaturated fatty acids, including omega 3 and omega 6, vitamins and minerals.^[6,7] Contents of *Nigella Sativa* include thymoquinone, dithymoquinone, thymol, carvacrol, nigellidine, nigellimine-N -oxide and alpha-hedrin.^[8]

The composition of *Nigella Sativa* oil is known to contain more than 100 components such as aromatics, trace elements, vitamins and enzymes. The contents of nigelon and thymoquinone are known as antihistamines, antioxidants and anti-infectives.^[9] *Nigella Sativa* oil can provide a radioprotective effect on the tongue of rats that experience oxidative stress.^[10] Radiation is a beam of energy that is electrically charged in the form of particles and electromagnetic waves. Radiation consists of two special forms of radiation and electromagnetic radiation. Electromagnetic radiation is radiation that has no radiation mass consisting of radio waves, microwaves, infrared, and visible light such as X-rays, gamma rays, cosmic rays. Particle radiation is radiation that has mass such as beta rays, alpha rays, neutron rays. Ionizing radiation and non-ionizing radiation are radiation which are viewed from the electric charge.^[11]

Purpose

To analyze the effects of *Nigella sativa* as an antioxidant to inhibit oxidative stress caused by ionizing-free radiation.

Material and Method

In this article use the method of meta-analysis of the basic literature and the results of previous research with steps; (1) literature review and research results relating to the chemical content of *Nigella Sativa* and its benefits for the treatment of diseases, especially in the field of dentistry; (2) analysis of the effectiveness of the use of *Nigella Sativa* in the treatment of diseases in the field of dentistry; and (3) conclude as a synthesis of theories and research results to be developed in further research.

Discussion

Radiography is one of the most needed diagnostic tools to be used in overall dental care. Radiographic devices provide ionizing radiation which causes an ionization reaction in objects exposed to radiation. One of them is a panoramic radiograph. Panoramic radiography is an extra-oral photo technique that gives an overview of the maxilla and lower jaw from the right condyle to the left condyle.^[12] The risk posed by ionizing radiation provides a biological effect, which is divided into somatic deterministic effects, somatic stochastic effects, genetic stochastic effects. Further Somatic effects can cause further effects. The immediate or immediate effects stage appears after direct exposure to radiation throughout the body. Chronic or long-term effects appear for a long time after exposure.^[1]

Oxidative stress conditions result in free radical buildup in tissues as unstable atoms or molecules that always try to pair up with electrons to reach a stable state. Free radicals initiate lipid peroxidation directly against cell wall fatty acids. This peroxidation will be influenced by membrane fluidity and membrane structure and function.^[13]

Reactive oxygen species (ROS) are metabolic products from oxygen. Usually there is a balance between the production of ROS and the concentration of antioxidant tissue in the body. This balance is related to the total antioxidant status (TAS) and total oxidant status (TOS) values as determined by oxidative stress index (OSI).^[14] ROS is produced normally through the electron transfer chain of the mitochondrial system and in excessive amounts under various conditions. increasing energy demand. The latter may include, among other factors, exposure to heat and

certain chemicals and poisons, to biological and radiation factors.^[15]

Malondialdehyde is an enzymatic and non-enzymatic product of the breakdown of endoperoxide prostaglandins and lipid peroxidation products. Malondialdehyde (MDA) is a reactive molecule that has the molecular formula $C_3H_4O_2$ as a marker of lipid peroxidation. The MDA measurement is the reaction of 1 MDA molecule with 2 molecules of thiobarbituric acid (TBA) forming a complex of MDA TBA compounds which are pink in color and the quantity can be read UV-Vis at a wavelength of 532-533 nm.^[16,17]

Malondialdehyde is one of the main aldehydes produced and one of the markers of free radicals in the body, which is the final process of lipid peroxidation in cell membranes, a chain reaction between free radicals and Poly Unsaturated Fatty Acid (PUFA).^[18] In the previous research, blood group radiographers and non-radiographers were taken to determine that there were more MDA levels in the radiographic group blood sample than the control group. Based on his research radiation interacts with other atoms or molecules in cells, especially water, which then produces free radicals. Free radicals can cause lipid peroxidation processes and increase MDA levels in the blood.^[3]

In another study on the mechanism of action of *Nigella sativa* reducing MDA levels in experimental animals Spargue Dawley rats induced by cigarette smoke. The mechanism of black cumin / *Nigella sativa* was able to reduce MDA levels in the body. The content of thymoquinone from black cumin / *Nigella sativa* is proven to be able to suppress oxidative stress which the product ultimately produces MDA. The content of vitamin C contained in *Nigella sativa* as an antioxidant capable of working together with vitamin E through its mechanism inhibits oxidation reactions, by donating hydrogen and its hydroxyl groups.^[16]

The *Nigella sativa* plant has been used as an herbal treatment for more than 2000 years.^[18] The seeds are part of this plant that is used for treatment. *Nigella sativa* seeds have a medical role and have been applied in traditional herbal medicine systems in Arabic and Greece. Recently, *Nigella sativa* seeds have been reported to have pharmacological effects including antihelmintic, anticestoda, antibacterial, antifung, antiviral, antioxidant and have anti-inflammatory.^[9]

The ingredients of the active ingredients of black cumin or *Nigella sativa* contain protein, alkaloids, minerals (calcium, iron, potassium), polyphenols, unsaturated fatty acids, vitamin B, folic acid, saponins. *Nigella sativa* is commonly used in the Middle East as a traditional medicine to improve various human health conditions. Essential oils are generally antibacterial and anti-inflammatory, and can warm the stomach.^[7] *Nigella sativa* seed oil contains a number of chemicals that have activities as allergic, anti-asthma, anti-inflammatory, anti-prostaglandin, antihistamines. *Nigella sativa* can be used as root canal treatment in the treatment of pulpotomy performed on dog premolars as anti-inflammatory.^[5]

Nigella sativa can also be used as radio-protective on the tongue of rats that experience oxidative stress. The results of this study support the research hypothesis that the systemic mechanism of *Nigella Sativa* will reduce oxidative damage in tongue tissue irradiated in rat experimental animals. Ionizing radiation can cause changes in physiological changes known as acute radiation syndrome changes depending on exposure and possibly death.

Acute radiation syndrome usually occurs with higher doses of 100 rad (1 gray). In studies conducted Nigella sativa has been shown to provide protection against consistent radiation-induced oxidative stress.^[10]

Nigella sativa has antioxidant properties from some of the results of both in vivo and in vitro studies where Nigella sativa contains thymoquinone which plays a large part of essential oils. Thymoquinone and dithymoquinone are among the main antioxidant components of Nigella sativa. Nigella's intake. sativa in all forms of developing body's antioxidant defense capacity. Some studies show that Nigella sativa decreases lipid peroxidation and increases antioxidant enzymes.^[18]

Conclusion

Nigella Sativa is an herbal treatment that has pharmacological effects; antibacterial, antifungal, antiviral and antioxidant. Nigella sativa has many health benefits. Nigella sativa containing thymoquinone can reduce lipid peroxidation against cell wall fatty acids, reduce MDA levels in rat serum. The effectiveness of Nigella sativa as a radioprotector can prevent the occurrence of free radicals caused by ionizing radiation. Nigella sativa decreases lipid peroxidation and increases antioxidant enzymes.

Limitations

Article as a review of literature readings and expert research on the content of Nigella Sativa and its benefits for human health. It is hoped that a more extensive and explorative study of Nigella Sativa can provide a valuable contribution to the development of current and future dentistry.

Abbreviations

MDA; Malodialdehida; TAS; Total Antioxidant Status; ROS; Reactive Oxygen Spesies; TOS; Total Oxidant Status; OSI; Oxidative Stress Index; TBA; Asam Tiobarbiturat; PUFA; Poly Unsaturated Fatty Acid;

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