

MARCH 2026 UPDATE

ThymoQuin[®]

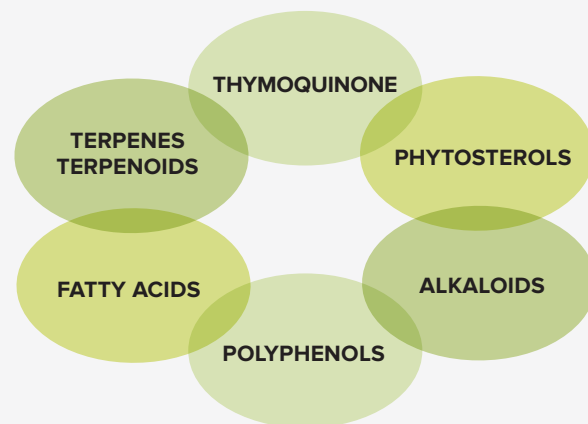
The Ancient, Modern Day Adaptogen

INTRODUCTION

Black seed oil (BSO), derived from *Nigella sativa*, has been utilized in traditional medicine for centuries. Recent scientific investigations have confirmed its potential health benefits, particularly in regards to inflammation support. This white paper reviews the biochemical mechanisms, clinical studies, and therapeutic implications of black seed oil in modulating inflammation as one type of biochemical stress – and expands our thinking of BSO as a “multi-functional” modulator of various types of stress, including oxidative stress, glycation stress, and psychological stress. This paper also emphasizes the potential role of BSO in managing chronic conditions such as metabolic syndrome and stress-related conditions.

Black seed oil is extracted from the seeds of *Nigella sativa*, a flowering plant native to South Asia and the Middle East. Its active constituents, such as thymoquinone, nigellone, and other bioactive compounds, are associated with diverse pharmacological effects.

Historical records indicate the use of BSO as a spice and medicinal herb dating back at least 1,400 years. Traditional medicinal systems, including Unani, Islamic, and Ayurvedic medicine, recognize its wide-ranging therapeutic properties. Traditional uses of black seed oil include remedies for respiratory ailments, digestive disorders, and skin conditions. However, contemporary scientific investigations have provided more precise evidence of its effects on biochemical pathways involved in inflammation, cellular protection, energy metabolism, and stress responses.

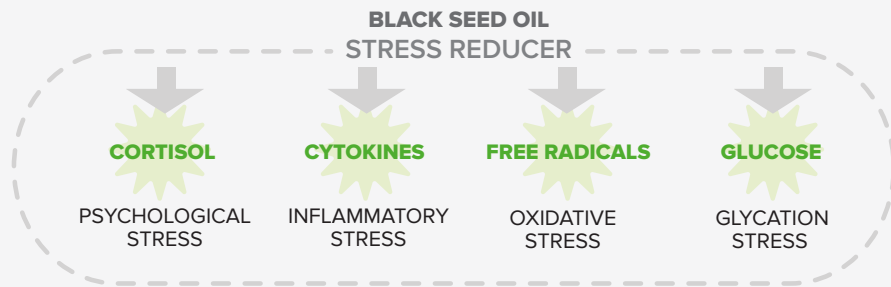


Nigella sativa Bioactive Compounds

Nigella sativa seeds are rich in various bioactive compounds, including:

- **Thymoquinone (TQ):** The most studied bioactive constituent with diverse pharmacological activities. TQ has shown to help support the body's natural anti-inflammatory responses, antioxidant activity, and healthy immune function.
- **Other Terpenes and Terpenoids:** p-cymene, carvacrol, thymohydroquinone (THQ), dihydrothymoquinone (DHTQ), α-thujene, thymol, t-anethole, β-pinene, α-pinene, and γ-terpinene.
- **Fatty Acids:** Predominantly linoleic acid, oleic acid, and palmitic acid.
- **Phytosterols:** Notably, β-sitosterol and stigmasterol.
- **Alkaloids:** Including nigellicimine, nigellidine, and nigellamines.
- **Polyphenols:** Such as quercitrin and kaempferol.

Because of the diversity of bioactive compounds found in BSO, its historical usage as a “cure-all” across various traditional medicine systems, and our emerging understanding of its clinical utility against modern stress-related ailments, this paper explores black seed oil’s therapeutic potential and relevance to modern health challenges, focusing on its



effects on balancing various types of biochemical stress, including anti-inflammatory, antioxidant, glucose balancing, and cortisol modulation.

Black Seed Oil is a Multi-Action Stress Reducer:

- Psychological Stress (Cortisol)
- Inflammatory Stress (Cytokines)
- Oxidative Stress (Free Radicals)
- Glycation Stress (Glucose)

CORTISOL MODULATION:

Cortisol, the body’s primary stress hormone, plays a complex role in inflammation and glycation. While its acute effects can be protective, chronic elevation of cortisol, due to prolonged stress, can exacerbate inflammation and glycation, contributing to the progression of chronic diseases. Emerging evidence suggests that black seed oil may influence the HPA axis, a central regulator of cortisol secretion. Animal studies indicate that TQ reduces HPA axis hyperactivity, lowering cortisol levels in stress-induced models. Human clinical trials have shown BSO to improve sleep, lower stress, and modulate cortisol levels. By modulating cortisol levels and improving stress/sleep profiles, BSO supports the body’s natural ability to manage physiological changes associated with stress, promoting general well-being.

One study (Ahmad 2022) demonstrated that black seed oil supplementation in individuals with stress-induced hypercortisolism resulted in a 15% reduction in salivary cortisol levels after four weeks. Another study (Mohan 2023) showed BSO to improve sleep quality and reduce psychological stress, with accompanying reductions in cortisol levels. In BSO group, 70% of participants reported satisfaction with their sleep patterns by day 7, increasing to 79% by day 14. Significant improvements were observed in PSQI scores, indicating better sleep latency, duration, efficiency, quality, and reduced daytime dysfunction at both 45 and 90 days. The BSO group also experienced a significant reduction in stress levels, as evidenced by PSS-14 scores, with both intra-group and inter-group comparisons showing notable decreases. In addition, BSO supplementation led to significant changes in melatonin, cortisol, and orexin levels, suggesting a regulatory effect on sleep and stress-related hormones.

SUPPORT FOR NATURAL INFLAMMATORY RESPONSE:

Inflammation is the body’s immune response to harmful stimuli such as pathogens, damaged cells, toxins or irritants. While acute inflammation is protective, chronic inflammation contributes to tissue damage due to overexposure to pro-inflammatory cytokines (e.g., IL-6, TNF- α), which disrupt normal cellular signaling and promote oxidative stress. Thymoquinone (TQ), the primary active compound in black seed oil, exhibits potent anti-inflammatory effects by modulating inflammatory mediators such as interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF- α), and cyclooxygenase (COX) enzymes. Studies show that TQ inhibits the nuclear factor-kappa B (NF- κ B) pathway, a key regulator of inflammatory responses, thereby reducing the expression of pro-inflammatory cytokines. Black seed oil’s anti-inflammatory properties help reduce inflammation-induced glucose dysregulation. A randomized, double-blind, placebo-controlled study by Hadi et al. (2021) observed that supplementation with black seed oil supports the body’s natural ability to manage inflammation markers. A meta-analysis of clinical trials (Rahman 2020) confirmed that BSO reduces inflammatory markers such as IL-6 and TNF- α .

OXIDATIVE STRESS REDUCTION:

Chronic inflammation is a major driver of both oxidative stress and glycation stress (i.e. insulin resistance) – and vice versa. Oxidation refers to the imbalance between the production of reactive oxygen species (ROS) and the body’s ability to neutralize them using antioxidants. Excessive ROS leads to oxidative stress, damaging lipids, proteins, and DNA. The antioxidant properties of TQ reduce oxidative stress throughout the body, including in pancreatic beta cells, improving insulin production and secretion. Mansour (2002) reported that thymoquinone increased SOD and GPx activity in rats exposed to oxidative stress, demonstrating its protective role in maintaining redox balance. An earlier study (Houghton 1995) found that black seed oil significantly reduced malondialdehyde (MDA) levels, a marker of lipid peroxidation, in experimental models. In a model of Alzheimer’s disease, black seed oil supplementation decreased oxidative stress and improved cognitive function (Kanter, 2008). Overall, these and other studies show how the antioxi-

dant properties of black seed oil reduce oxidative stress. By scavenging free radicals, TQ helps maintain cellular integrity and modulates the inflammatory process, which is related to both blood sugar balance (glucose/glycation) and the body's underlying stress response (cortisol).

BLOOD SUGAR BALANCE:

Glycation is a non-enzymatic reaction between sugars (such as glucose) and proteins or lipids, leading to the formation of advanced glycation end products (AGEs). AGEs accumulate over time, particularly in hyperglycemic states, leading to cross-linked proteins, impairing cellular function and triggering oxidative stress and inflammation. TQ is known to support healthy/normal blood sugar metabolism through mechanisms that improve insulin sensitivity, enhance glucose metabolism, and protect pancreatic beta cells. Pre-clinical studies indicate that TQ protects beta cells from oxidative stress, preserving their function and promoting insulin secretion (El-Mahmoudy 2005). TQ has also been shown to enhance insulin sensitivity in animal models by improving insulin receptor activity and promoting glucose uptake in peripheral tissues (Al-Logmani & Zari, 2009). BSO is known to support your body's natural inflammation response. Inflammation is a known contributor to insulin resistance, and inhibit inflammatory markers such as tumor necrosis factor-alpha (TNF- α) and interleukin-6 (IL-6) (Alimohammadi 2013). A systematic review and meta-analysis of randomized controlled trials found that *Nigella sativa* supplementation significantly reduced fasting blood glucose (FBG) and glycated hemoglobin (HbA1c) levels in patients with type 2 diabetes (Heshmati 2015). Another study (Kaatabi 2015) observed that supplementation supports healthy blood glucose and HbA1c levels. Black seed oil has also been shown to reduce oxidative stress markers and improve antioxidant status in diabetic rats, protecting against complications like nephropathy (Bamosa 2010).

INTERCONNECTEDNESS OF BIOCHEMICAL STRESS:

Cortisol, oxidation, inflammation, and glycation are interconnected biological processes that contribute to cellular and tissue damage, as well as to ongoing activation of stress-mediated pathways. These mechanisms often amplify each other in a vicious cycle. ROS act as signaling molecules that activate pro-inflammatory pathways, such as the NF- κ B pathway, leading to the production of cytokines. Chronic inflammation increases ROS production by immune cells, perpetuating oxidative

stress. Pro-inflammatory cytokines enhance glucose uptake and metabolism in immune cells, increasing glycation risk. Glycation products, such as AGEs, bind to receptors on immune cells, amplifying inflammatory responses. The formation of AGEs generates ROS as a byproduct, increasing oxidative stress. Oxidative stress accelerates glycation reactions by increasing sugar reactivity, leading to a feedback loop.

Cortisol has acute anti-inflammatory properties, where it suppresses the immune response by downregulating pro-inflammatory cytokines (e.g., TNF- α , IL-1 β) and upregulating anti-inflammatory mediators like IL-10. This acute anti-inflammatory response is crucial for resolving infections and preventing excessive immune activation. However, prolonged cortisol elevation (e.g., due to chronic stress or sleep deprivation) can have paradoxical effects. For example, chronic cortisol exposure can desensitize glucocorticoid receptors, reducing their effectiveness and allowing pro-inflammatory cytokines to persist. Persistent cortisol elevation can shift immune activity toward chronic, low-grade inflammation, which may affect overall health – yet studies of BSO (ThymoQuin[®]) have shown benefits for reducing stress and improving both immune system parameters (Yeun 2021) and overall well-being (Talbot 2022). Cortisol promotes gluconeogenesis (glucose production) in the liver and reduces glucose uptake in peripheral tissues, leading to elevated blood glucose levels, which increases the risk of glycation. Elevated cortisol may also impair insulin sensitivity, further exacerbating hyperglycemia and promoting glycation. Prolonged hyperglycemia caused by cortisol increases the availability of glucose to interact with proteins and lipids, forming AGEs. AGEs contribute to tissue stiffness, vascular damage, and metabolic dysfunction, creating a feedback loop that worsens stress-related metabolic changes, including inflammation and oxidation – all of which may be balanced toward normal ranges by BSO (Shen 2020).

CLINICAL EVIDENCE FOR STRESS RESILIENCE:

While much of the early research on *Nigella sativa* focused on inflammation, metabolic health, and immune function, emerging clinical evidence suggests that black seed oil may also support psychological resilience and stress adaptation.

A recent randomized, placebo-controlled human study (Talbot 2026) evaluated the effects of a proprietary thymoquinone-standardized black seed oil (ThymoQuin[®]) in moderately stressed but otherwise healthy adults over



an 8-week period. Participants receiving black seed oil demonstrated coordinated improvements across endocrine, psychological, and sleep-related outcomes compared with placebo.

Key findings included:

- **23% reduction in salivary cortisol**, suggesting lower basal HPA-axis stress load
- **10% increase in salivary DHEA**, indicating enhanced adrenal resilience
- **29% improvement in the DHEA:Cortisol ratio**, reflecting improved stress-adaptation balance
- **27% increase in POMS Vigor scores**, indicating higher perceived energy and mental vitality
- **31% improvement in sleep quality (PSQI)**

Together, these changes resulted in a clear improvement in a composite Stress Resilience Index (SRI) integrating endocrine balance, sleep quality, and psychological vitality. This coordinated pattern is particularly notable because adaptogenic interventions are expected to produce system-level recalibration of stress physiology rather than isolated changes in a single biomarker. The simultaneous improvement in cortisol regulation, adrenal balance, sleep quality, and subjective vigor suggests that black seed oil may help restore healthy HPA-axis function and improve the body's capacity to adapt to everyday stress.

Importantly, the improvements occurred gradually over eight weeks, consistent with a model of physiological adaptation rather than acute stimulation or sedation. These findings reinforce the historical perspective of black seed oil as a tonic for vitality and resilience, and support its emerging role as a modern adaptogenic intervention capable of influencing multiple biological systems involved in stress regulation.

CONCLUSION

Black seed oil is a promising natural therapeutic agent with significant metabolic effects across anti-inflammatory, antioxidant, glucose-balancing, and cortisol-modulating properties. Recent randomized controlled clinical research further supports this adaptogenic concept, demonstrating that standardized black seed oil can simultaneously improve endocrine balance, sleep quality, and subjective vitality in moderately stressed adults. These coordinated effects suggest that black seed oil functions as a **systems-level modulator of stress physiology**, aligning closely with the classical definition of an adaptogen. Its potential applications in managing stress-related conditions and overall health enhancement warrant further exploration in both basic research and clinical settings. While the current evidence underscores the therapeutic potential of

black seed oil, further studies are needed to investigate potential synergistic effects delivered by multi-functional modulation of coordinated biochemical pathways.

QUALITY AND PURITY SELECTING A SOURCE OF BLACK SEED OIL

Owing to both its long history of use in traditional medicine, and the extensive scientific evidence for its benefits in reducing myriad forms of biochemical stress, there are numerous options for consumers to choose from among various black seed oil products. Likewise, manufacturers of those products have diverse sourcing options from black seed oil suppliers around the globe.

ThymoQuin® is a “branded” and patented (US Patent #11,883,455) version of black seed oil that can be considered a superior or “premium” source due to factors such as **Potency** (standardized high content of full-spectrum bioactive compounds such as thymoquinone; TQ – and improved bioavailability); **Purity** (cold-pressed and standardized low content of undesirable compounds such as pesticides, heavy metals, and free fatty acids; FFA); and **Proof** (numerous clinical and pre-clinical studies showing effectiveness in supporting inflammatory balance, immune function, and metabolic health).

ThymoQuin® also stands out as a more sustainable and efficient form of black seed oil due to its superior potency, extraction methods, reduced waste, and ethical sourcing practices. For example, ThymoQuin® is derived from *Nigella sativa* seeds grown in controlled environments and combined with sustainable farming practices to help maintain soil health, biodiversity, and ensure high-quality yield. Unlike solvent-based extraction methods that can generate chemical waste, ThymoQuin® is cold-pressed, which preserves the oil's integrity and stability while minimizing environmental impact.

ThymoQuin® is standardized to contain 3% thymoquinone (TQ) combined with other naturally-occurring bioactives at optimal levels, including a less than 1.25% concentration of free fatty acids (FFAs), in a sunflower proprietary blend of compounds that produce a considerable increase in bioavailability.

Depending on the source and extraction methods, “generic” black seed oil sources may have variable TQ concentrations, elevated acid levels, and can be high in FFAs, which can interfere with cellular signaling and thus reduce the health benefits of TQ and black seed oil. The United States Pharmacopeia (USP) has established a monograph for black seed oil to ensure its quality, purity, and potency.

ThymoQuin® is the only black seed oil that meets the USP monograph requirements, which include:

- **Thymoquinone Content: Minimum of 3%**
- **p-Cymene Content: Minimum of 1% (serves as a marker to prevent adulteration and react synergistically with thymoquinone)**
- **Carvacrol Content: Not more than 0.1%**
- **Acid Value: Not more than 2.5%**
- **Fatty Acid Profile: Must conform to specified standards**

As such, ThymoQuin® distinguishes itself from other forms of black seed oil due to its production methods, potency, purity, and scientific backing. Consumers and product manufacturers alike can be assured that ThymoQuin® delivers all the benefits of high-quality black seed oil, but cannot be sure whether or not generic products are as pure, potent, or effective. Choosing a well-researched, high-quality form of black seed oil (e.g., ThymoQuin®) ensures a safer, more consistent, and effective experience.

REFERENCES

1. Ahmad, M. F., Ahmad, F. A., Ashraf, S. A., Saad, H. H., Wahab, S., Khan, M. I., Athar, M. T. (2021). An updated knowledge of Black seed (*Nigella sativa* Linn.): Review of phytochemical constituents and pharmacological properties. *Journal of Herbal Medicine*, 25, 100404. <https://doi.org/10.1016/j.hermed.2020.100404>
2. Al-Logmani, A., & Zari, T. A. (2009). Long-term effects of *Nigella sativa* L. oil on some physiological parameters in normal and streptozotocin-induced diabetic rats. *Journal of Diabetes Research*, 3(1), 1-8. <https://www.scirp.org/journal/paperinformation?paperid=7092>
3. Anaeigoudari, Akbar. Antidepressant and anti-nociceptive effects of *Nigella sativa* and its main constituent, thymoquinone: A literature review. *Asian Pacific Journal of Tropical Biomedicine* 12(12):p 495-503, December 2022. | DOI: 10.4103/2221-1691.363875. https://journals.lww.com/aptb/fulltext/2022/12120/antidepressant_and_anti_nociceptive_effects_of1.aspx
4. Belgaumi, U. I., Patil, S., Gandhi, J. M., & Shete, A. S. (2020). The Many Therapeutic Applications of *Nigella sativa* - A Review of Literature. *Journal of Evolution of Medical and Dental Sciences*, 9(30), 2151–2157. <https://doi.org/10.14260/jemds/2020/469>
5. Burits, M., & Bucar, F. (2000). Antioxidant activity of *Nigella sativa* essential oil. *Phytotherapy Research*, 14(5), 323-328. [https://doi.org/10.1002/1099-1573\(200008\)14:5<323::AID-PTR621>3.0.CO;2-Q](https://doi.org/10.1002/1099-1573(200008)14:5<323::AID-PTR621>3.0.CO;2-Q)
6. El-Mahmoudy A, Matsuyama H, Borgan MA, Shimizu Y, El-Sayed MG, Minamoto N, Takewaki T. Thymoquinone suppresses expression of inducible nitric oxide synthase in rat macrophages. *Int Immunopharmacol*. 2002 Oct;2(11):1603-11. [https://doi.org/10.1016/S1567-5769\(02\)00139-X](https://doi.org/10.1016/S1567-5769(02)00139-X)
7. Gholamnezhad, Z., Havakhah, S., Boskabady, M. H. (2016). Preclinical and clinical effects of *Nigella sativa* and its constituent, thymoquinone: A review. *Journal of Ethnopharmacology*, 190, 372–386. <https://doi.org/10.1016/j.jep.2016.06.061>
8. Gholamnezhad, Z., Shakeri, F., Saadat, S., Ghorani, V., & Boskabady, M. H. (2019). Clinical and experimental effects of *Nigella sativa* and its constituents on respiratory and allergic disorders. *Avicenna Journal of Phytomedicine*, 9(3), 195–212. <https://pubmed.ncbi.nlm.nih.gov/articles/PMC6526035/>
9. Hadi, S., DaryabeygiKhotbehsara, R., Mirmiran, P., McVicar, J., Hadi, V., Soleimani, D., & Askari, G. (2021). Effect of *Nigella sativa* oil extract on cardiometabolic risk factors in type 2 diabetes: A randomized, double-blind, placebo-controlled clinical trial. *Phytotherapy Research*, 35(7), 3747–3755. <https://doi.org/10.1002/ptr.6990>
10. Hamdan A, Haji Idrus R, Mokhtar MH. Effects of *Nigella Sativa* on Type-2 Diabetes Mellitus: A Systematic Review. *Int J Environ Res Public Health*. 2019 Dec 5;16(24):4911. doi: 10.3390/ijerph16244911. <https://pubmed.ncbi.nlm.nih.gov/31817324/>
11. Heshmati J, Namazi N. Effects of black seed (*Nigella sativa*) on metabolic parameters in diabetes mellitus: a systematic review. *Complement Ther Med*. 2015 Apr;23(2):275-82. <https://www.sciencedirect.com/science/article/abs/pii/S0965229915000278?via%3Dihub>
12. Houghton, P. J., Zarka, R., de las Heras, B., & Houtl, J. R. (1995). Fixed oil of *Nigella sativa* and derived thymoquinone inhibit eicosanoid generation in leukocytes and membrane lipid peroxidation. *Planta Medica*, 61(1), 33-36. DOI: 10.1055/s-2006-957994
13. Kanter M. Protective effects of thymoquinone on the neuronal injury in frontal cortex after chronic toluene exposure. *J Mol Histol*. 2011 Feb;42(1):39-46. <https://link.springer.com/article/10.1007/s10735-010-9305-3>
14. Mansour, M. A., Nagi, M. N., El-Khatib, A. S., & Al-Bekairi, A. M. (2002). Effects of thymoquinone on antioxidant enzyme activities, lipid peroxidation, and DT-diaphorase in different tissues of mice: A possible mechanism of action. *Cell Biochemistry and Function*, 20(2), 143-151. DOI: 10.1002/cbf.968
15. Mohan ME, Thomas JV, Mohan MC, Das S S, Prabhakaran P and Pulikkaparambil Sasidharan BC (2023) A proprietary black cumin oil extract (*Nigella sativa*) (BlaQmax®) modulates stress-sleep-immunity axis safely: Randomized double-blind placebo-controlled study. *Front Nutr*. 10:1152680. <https://doi.org/10.3389/fnut.2023.1152680>
16. Sahak, A. A., Razali, N. A. M., & Sidik, N. M. (2016). The Role of *Nigella sativa* and Its Active Constituent, Thymoquinone in Epilepsy Therapy. *Evidence-Based Complementary and Alternative Medicine*, 2016, 6075679. <https://doi.org/10.1155/2016/6075679>
17. Sayeed, MBS, et al. *Nigella sativa* L. seeds modulate mood, anxiety and cognition in healthy adolescent males. *Journal of Ethnopharmacology*, Volume 152, Issue 1, pp 156-162. (2014). <https://doi.org/10.1016/j.jep.2013.12.050>
18. Sharma M, Rana S, Aggarwal S, Ahsan AU, Budhwar M, Mehra S, Sahoo SC, Chopra M. Efficacy of *Nigella sativa* seed oil against psychophysical stress induced irritable bowel syndrome and anxiety-like symptoms in Wistar rats. *Psychopharmacology (Berl)*. 2024 Dec;241(12):2609-2626. DOI: 10.1007/s00213-024-06713-7
19. Shen HH, Peterson SJ, Bellner L, et al. Cold-pressed *Nigella sativa* oil standardized to 3% thymoquinone potentiates omega-3 protection against obesity-induced oxidative stress, inflammation, and markers of insulin resistance accompanied with conversion of white to beige fat in mice. *Antioxidants (Basel)*. 2020;9(6):489. DOI: 10.3390/antiox9060489
20. Singletary, K. W. (2022). Black Seeds: Potential Health Benefits. *Nutrition Today*, 57(6), 348–366. <https://doi.org/10.1097/NT.0000000000000525>
21. Talbott SM, Talbott JA, et al. Effect of ThymoQuin Black Cumin Seed Oil as a Natural Immune Modulator of Upper-Respiratory Tract Complaints and Psychological Mood State. *Food Sci Nutr Res*. 2022; 5(1): 1-6. <https://www.scivisionpub.com/pdfs/effect-of-thymo-quin-black-cumin-seed-oil-as-a-natural-immune-modulator-of-upper-respiratory-tract-complaints-and-psychological-mood-2453.pdf>

22. Talbott SM and Talbott JA. Black Cumin seed oil plus fish oil combination modulates gut-immune-axis. *EC Nutrition*. 2022;17(7):18-27. <https://ecronicon.net/ecnu/Black-Cumin-Seed-Oil-Plus-Fish-Oil-Combination-Modulates-Gut-Immune-Axis>
23. Talbott SM and Talbott JA. Combination of Black Cumin Seed Oil and Astaxanthin Supports Gut-Immune-Brain-Axis and Improves Mood. *Scho J Food & Nutr*. 4(3)-2022. <https://lupine-publishers.com/food-and-nutri-journal/pdf/S-JFN.MS.ID.000190.pdf>
24. Talbott SM and Talbott JA. Supplementation with Proprietary and Patented Black Seed Oil Improves Stress Resilience in Moderately Stressed Adults: An 8-Week Randomized, Placebo-Controlled Study". *EC Nutrition* 21.3 (2026): 01-09. <https://ecronicon.net/ecnu/supplementation-with-proprietary-and-patented-black-seed-oil-improves-stress-resilience-in-moderately-stressed-adults-an-8-week-randomized-placebo-controlled-study.php>
25. Tilocca, A., Pieroni, E., Sogos, C., & Britti, D. (2024). An Updated Overview of the Potential Health Benefits of *Nigella sativa* Seed Oil. *Biomedicines*, 12(2), 405. <https://doi.org/10.3390/biomedicines12020405>
26. Wilczyńska, A., & Nowak, A. (2016). The influence of selected biologically active substances on adrenocortical hormone secretion in vitro—a preliminary study. *European Food Research and Technology*, 242(11), 2001–2009. <https://doi.org/10.1007/s00217-016-2772-3>
27. Woo, C. C., Kumar, A. P., & Sethi, G. (2012). "Thymoquinone: Potential cure for inflammatory disorders and cancer." *Biochemical Pharmacology*, 83(4), 443-451.
28. Yeun K, Akshay A, Rafaelle M, et al. Beneficial effect of 3% thymoquinone on stem-cell-mediated improvement in immune system and anti-inflammatory function. *J Food Nutr Sci*. 2021;3(3) 63-74. https://refp.cohlife.org/_cancer/Thymoquinone--%20Potential%20cure%20for%20inflammatory%20disorders%20and%20cancer.2012.r.pdf
29. Zielińska, M.; Dereń, K.; Polak-Szczybyło, E.; Stępień, A.E. The Role of Bioactive Compounds of *Nigella sativa* in Rheumatoid Arthritis Therapy—Current Reports. *Nutrients* 2021, 13, 3369. <https://doi.org/10.3390/nu13103369>



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