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File: ■ Black Cumin (*Nigella sativa*, Ranunculaceae)

■ Learning
■ Memory

HC 041654-555

Date: October 31, 2016

RE: Review of Black Cumin for Improving Learning and Memory

Sahak MKA, Kabir N, Abbas G, Draman S, Hashim NH, Hasan Adli DS. The role of *Nigella sativa* and its active constituents in learning and memory. *Evid Based Complement Alternat Med*. 2016;2016:6075679. doi: 10.1155/2016/6075679.

Black cumin (BC; *Nigella sativa*, Ranunculaceae) seed oil has been used historically as a preventative and restorative medicine. BC has been reported to have many useful properties such as immunopotential, bronchodilatation, antitumor, antihistaminic, antidiabetic, antihypertensive, anti-inflammatory, antimicrobial, hepatoprotective, and gastroprotective effects. However, according to the authors, there is a relative lack of research supporting the use of BC on the central nervous system, in particular learning and memory. This review article reports in vitro, in vivo, and clinical studies that support the potential use of BC to enhance learning and memory.

Constituents

The traditional effects of BC are mostly attributed to the fixed and essential oils, especially the quinone constituents, including thymoquinone, which makes up 30-48% of the total quinone compounds. Thymoquinone is neuroprotective in several in vitro models such as amyloid beta (A β)-induced neurotoxicity. The essential oil also contains thymol, carvacrol, γ -terpinene, and *p*-cymene, which also have anticholinesterase and antioxidant effects in vitro, and flavonoids that are reported to improve learning, memory, and cognition in animal models. The anticholinesterase activity is consistent with positive effects on learning and memory, especially following scopolamine administration.

Other effects of BC in animals include the following:

- Hyperglycemia is associated with cognitive decline. In rat models, pretreatment with BC reduced streptozotocin-induced cognitive impairment, restored antioxidant enzyme levels, ameliorated spatial memory disturbances, reduced oxidative stress, and normalized the hypothalamus-pituitary-adrenal gland axis.
- In a rat model of cognitive impairment, thymoquinone improved antioxidant enzyme levels and spatial learning.
- A study in rats demonstrated that BC can improve spatial memory performance.

- One study in rodents showed that BC can decrease anxiety and increase serotonin turnover in the brain.
- Epilepsy can cause poor cognition. BC hydroalcoholic extract prevented learning and memory declines in a rodent model of epilepsy.
- Hypothyroidism is associated with learning and memory impairments. In neonatal rats, hypothyroidism was reversed by BC hydroalcoholic extract.

In humans

The authors very briefly describe two uncontrolled studies in humans. In one study, executive functions in various memory-related tests such as logical memory, digit span, letter cancellation, Rey-Osterrieth complex figure, trail making, and Stroop tests were improved in elderly subjects taking 500 mg/day of a commercial BC product for nine weeks. In another study, mood was stabilized, anxiety was decreased, and memory was improved in adolescent male subjects taking 500 mg/day BC for four weeks. The authors do not mention whether the two studies were controlled nor do they identify the products used.

The mechanism by which BC enhances learning and memory is still unknown. However, the anticholinesterase effect is surely a major component. The authors conclude that the preclinical data support further research on the potential use of BC to treat neurodegeneration-related diseases or brain injury affecting learning and memory.

—Heather S. Oliff, PhD

Referenced article can be accessed at <http://www.hindawi.com/journals/ecam/2016/6075679/>.

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