

Nanosizing *Nigella*: A Cool Alternative to Liberate Biological Activity

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Background: Seeds of *Nigella sativa*, commonly referred to as “black cumin”, are rich in a spectrum of biologically active substances and thus associated with a range of potential health benefits. Unlocking the activity of these phytochemicals traditionally requires solvent extraction. Previously, we have explored nanosizing as an alternative to liberate the biological activity of natural products, such as *Solanum incanum*, *Pterocarpus erinaceus*, *Loranthus micranthus* and *Cynomorium coccineum*.

Objectives: Nanosizing natural products may increase their activity for a number of reasons ranging from an improved bioavailability to physical nano-toxicity. Because *Nigella sativa* is amenable to being “milled down”, this spice has been employed to explore the underlying causes of increased activity upon mechanical particle size reduction.

Methods: *Nigella sativa* seeds were pre-milled employing a household flour mill followed by extensive grinding exploiting a planetary ball mill. The particles were characterized employing Laser Diffraction, Photon Correlation Spectroscopy and Scanning Electron Microscopy connected with Energy Dispersive X-ray Diffraction. Finally, the samples were evaluated for sterility profile, and nematicidal and antioxidant activities.

Results: Suspensions containing fairly uniform particles of *Nigella sativa* showing diameters in the range of 100-1000 nm have been obtained. These nanosuspensions are characterized by considerably reduced microbial contamination when compared to the bulk material and reasonable antioxidant and nematicidal activities when employed at higher concentrations. This activity is comparable to the one of the ethanolic extract of the seeds and is significantly higher when compared to the one of aqueous extracts. A combination of “sterilization and extraction by milling”, improved liberation of soluble substances from small particles, surface activity and physical nano-activity of the particles itself is likely responsible for the activities observed.

Conclusion: Nanosizing of the entire natural products provides an interesting alternative to solvent extraction as it results in the liberation of active ingredients and certain additional activities. The resulting nanosuspensions can be investigated further and optimized for applications in Nutrition, Agriculture, Medicine, and Cosmetics.

Keywords: Antioxidant activity, ball milling, heat-sterilization, nanoparticles, nematodes, *Nigella sativa*.