Title: Nigella sativa —weed or remedy? Optimization of active substances extraction, biological activity testing and pharmacological applications.

Nigella sativa L., known as black cumin or black seed, belongs to *Ranunculaceae* family and is an annual herbaceous plant. The nutritional value and characteristic taste of *Nigella sativa* seeds and seed oil make for their use as food ingredients in various cuisines. They have been described as a source of essential oils, saponins, alkaloids, unsaturated fatty acids, glycolipids, and fat-soluble vitamins. The dominant contribution to the biological activity of black seeds is attributed to thymoquinone.

Here, we present the optimization of supercritical carbon dioxide (sCO_2) extraction of *Nigella sativa* seed oil using central composite rotatable design and response surface methodology. Mathematical models based on polynomial and power equations were utilized to describe the influence of temperature, pressure, extraction time and sCO_2 flow on oil yield. Kinetics of oil and thymoquinone extraction were analyzed. It was found that in order to collect thymoquinone-rich *N. sativa* oil fraction, appropriate for health-related applications, the extraction should be carried out at 40 °C and 10-15 MPa. Following application of higher pressure of 35 MPa enables effective extraction of remaining fixed oil which can be utilized in food industry as a source of polyunsaturated fatty acids.

We have also evaluated the applicability of *N. sativa* seed extract in antibacterial skin formulations by examination of its activity against methicillin-resistant *Staphylococcus aureus* as well as cytotoxicity against human dermal fibroblasts. At last, we proposed the mechanism of the potential protective effect of glutathione on *Escherichia coli* cells grown in a high concentration of thymoquinone.