

A Cytotoxicity Assessment of *Nigella sativa* Oil by using the *Allium cepa* Test

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Structured Abstract

Background: *Nigella sativa* oil, commonly known as black seed oil, is renowned for its wide range of medicinal properties, including antioxidant, anti-inflammatory, and antimicrobial effects. However, its potential cytotoxic and genotoxic effects have not been extensively studied. The *Allium cepa* test, employing onion bulbs, is a widely recognized bioassay used to evaluate the cytotoxicity and genotoxicity of various substances through parameters such as root length, root growth rate, mitotic index, and chromosomal aberrations. This study investigates the impact of *Nigella sativa* oil on *Allium cepa*, providing insights into its biological activity and potential health risks.

Methods: The *Allium cepa* samples were exposed to five different concentrations of *Nigella sativa* oil, namely a 0% v/v concentration as the control, a 25% v/v concentration, a 50% v/v concentration, a 75% v/v concentration, and a 100% v/v concentration. They were exposed for a period of 24 hours and 48 hours separately. The macroscopic parameters, the root length and root growth rate, were observed by measuring the length of the roots of the exposed test samples every day over the course of seven days. The microscopic parameters, mitotic index and chromosomal aberration, were observed via the squashing method.

Results: The results of this study strongly suggests that *Nigella sativa* oil is cytotoxic and genotoxic since increased concentrations of it causes a decrease in root length, inhibition of growth rate, decrease in mitotic index, and an increase in chromosomal aberrations. All these parameters showed significant differences at $p > 0.05$ when analysed with the one-way ANOVA method and the Tukey post hoc test, solidifying the claim that *Nigella sativa* oil is cytotoxic and genotoxic. The increase in exposure period from 24 hours to 48 hours also showed that the parameters significantly worsened, indicating that the cytotoxic and genotoxic effects of *Nigella sativa* oil increases as exposure time increases.

Conclusion: Based on the findings of this study, *Nigella sativa* oil exhibits significant cytotoxic and genotoxic effects at certain concentrations. This study highlights the need for further research to explore the safety and biological implications of *Nigella sativa* oil in various applications.

Keywords: *Nigella sativa*, *Allium* test, Black seed oil, Cytotoxicity

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