# *Nigella sativa* – a promising source of bioactive compounds with beneficial effects in CVD

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## Introduction

Cardiovascular diseases (CVD) continues to be the major cause of morbidity and mortality worldwide, despite socioeconomic status. Plant bioactive compounds are studied as complementary therapies in CVD. Among natural products, *Nigella sativa* (N. sativa) and its bioactive compounds or derived products proved their efficacy against multiple cardiovascular risk factors through its antioxidant capacity, antihypertensive, hypolipidemic, or anti-atherosclerotic effects. Therefore, this study aimed to evaluate the N. sativa oil effect using an *in vivo* model of induced myocardial infarction with isoproterenol in rats.

## Materials and methods

Plant Characterization: Fourier-transform infrared (FT-IR) spectroscopy, Liquid chromatography-mass spectrometry (HPLC-MS), Gas Chromatography - mass spectrometry (GC-MS). Animal study- thirty rats were divided into three groups as follows: the control group (saline solution), the isoproterenol group (45 mg/kg), and N. sativa oil group (isoproterenol – 45 mg/kg and N.sativa oil (NSO) 0.4 mL/100g). The myocardial infarction was induced on the 14th day of the experiment. Electrocardiography was performed at the beginning and after one day from infarct induction. Serum analysis was evaluated using biochemical evaluation like alanine aminotransferase (ALT), aspartate aminotransferase (AST) and myocardial fraction of creatine kinase (CK-Mb). The inflammatory status was evaluated by measuring tumor necrosis factor-alpha (TNF-a), interleukin-6 (IL-6), and interleukin-1β (IL-1β) inflammatory cytokines.

## Results and Discussions

### GC-MS analysis

The GC-MS analysis revealed that NSO had a-Thujene as major compound (43 %) followed by p-Cymene (34%), a-Pinene (8 %), b-Pinene (5%), and Sabinene, D-Limonene and Thymoquinone (2%). Other minor compounds like hexanal, camphene, a-terpinene, eucalyptol, g-terpinene, terpinolene and cuminone had concentrations less than 1%.

### LC-MS analysis

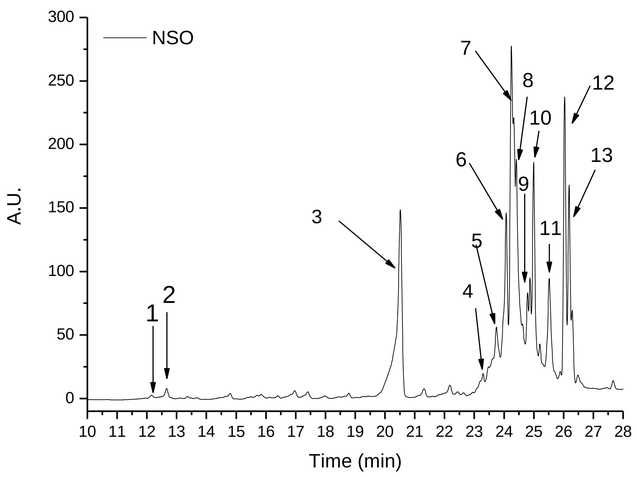


**Figure 1. HPLC chromatogram of Nigella sativa oil (NSO)** where 1 - p-hydroxybenzoic acid; 2- Norargemonine; 3- Thymol-derivative ; 4 – Kaempferol; 5- Hydroxymatairesinol; 6 – Matairesinol; 7 – Tanin; 8 – Isohydroxymatairesinol; 9 -Catechin derivative; 10 – Tymol; 11 - Tymol-derivative; 12 – Tanin; 13 - Tanin

### FTIR analysis

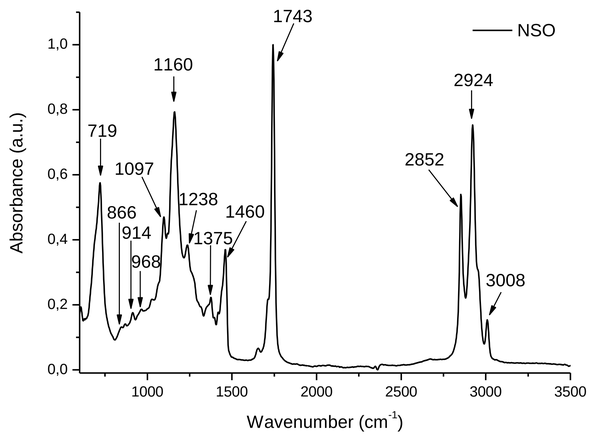


**Figure 2. Nigella sativa oil (NSO) general FTIR spectra (600-3500 cm-1)**

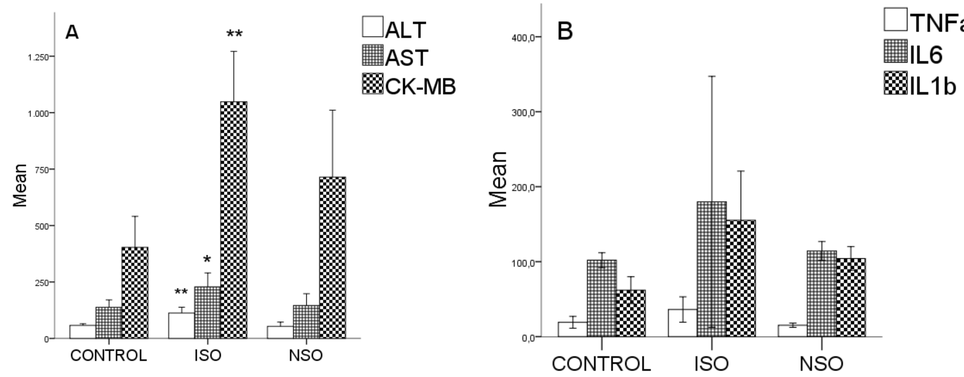


**Figure 3. ALT, AST and CK-MB serum levels in the experimental groups**. Values are presented as mean ± SD (n = 10); *p < 0.05, **p < 0.01 significantly different from control group (A). **Inflammatory markers IL6, IL 1beta and TNF-alpha serum levels in the experimental groups.** Values are presented as mean ± SD (n = 10); (B)

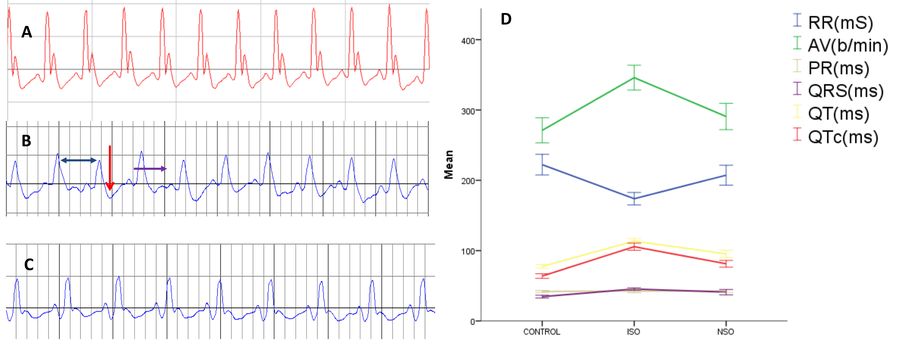


**Figure 4. The ECG records** in experimental groups with (A) control group, (B) ISO group, (C) NSO + ISO group, on day 15 after MI induction, 24 h after ISO administration and (D) **ECG parameters recorded after MI (day 14).** Specific changes characteristic for lesions in acute MI are observed on ECG records at 24 hours after ISO administration: increased RR interval (blue arrow), ST-segment depression (red arrow), QT interval prolongation (purple arrow).

## Conclusions

*Nigella sativa* represent important sources of bioactive compounds with potential health benefits. The anti-inflammatory and cardioprotective effects of N. sativa oil in the isoproterenol-induced experimental myocardial infarction indicate its potential use in human diets with promising applicability in the control of several associated CVD risk factors.

**References**

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