

**EFFECT OF *Nigella sativa* SEEDS AND HONEY MIXTURE ON  
CARDIOVASCULAR DISEASE RISK FACTORS IN  
HYPERCHOLESTEROLEMIC ADULTS**

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The aim of this study is to investigate the effect of *Nigella sativa* (*N. sativa*) seeds and honey mixture in modulating the cardiovascular disease (CVD) risk among hypercholesterolemic and healthy subjects, and to assess the lipid-soluble antioxidants capacity of samples using photochemiluminescence (PCL) method. Three groups of sixty-five subjects aged 25 to 58 were selected in the first study. Two groups (healthy and hypercholesterolemic subjects) were supplemented with *N. sativa* seeds and honey mixture at 50 mg/kg body weight daily for three months and another group as control (healthy subjects without supplementation). Fasting blood samples were taken at baseline and after three months supplementation for measuring total cholesterol (TC), triglycerides (TG), low density lipoprotein-cholesterol (LDL-c), high density

lipoprotein-cholesterol (HDL-c), blood glucose and hemoglobin concentration. The findings significantly (all  $p < 0.05$ ) demonstrated that *N. sativa* seeds and honey mixture revealed hypolipidemic, antiobesity and hypotensive effects. Results shown a significant reduction in TG (by 20.1%), TC:HDL-c (by 12.3%) and increased HDL-c (by 15.0%) among healthy subjects. Moreover, supplementation significantly decreased TC (by 6.2%), TG (by 13.3%), TC:HDL-c (by 19.5%) and increased HDL-c (by 8.4%) among hypercholesterolemic subjects. The antiobesity effect shown a significant reductions in body weight, body mass index and body fat (2.3%, 2.2%, 4.5% and 1.8%, 1.9%, 4.5% in healthy and hypercholesterolemic subjects, respectively). The hypotensive effect was only shown in hypercholesterolemic subjects with significant reductions in systolic blood pressure by 3.9% and diastolic blood pressure by 5.5%. However, no significant effect of *N. sativa* seeds and honey mixture on blood glucose and hemoglobin concentrations. Based on the second part of the study, it is postulated that the positive effects could be due to the antioxidant activity action since the finding of lipid-soluble antioxidants in the mixture of *N. sativa* seeds with honey showed the highest synergistic effects compared with the *N. sativa* seeds or honey alone. The findings show that the mixture of *N. sativa* seeds and honey has beneficial effects on hypercholesterolemic subjects and as a natural source of antioxidant properties in maintaining a better health as well as in preventing the CVD risk factors.

Abstrak tesis yang dikemukakan kepada Senat Universiti Malaysia Terengganu sebagai memenuhi keperluan untuk ijazah Master Sains.

**KESAN CAMPURAN BIJI *Nigella sativa* DAN MADU TERHADAP  
FAKTOR RISIKO PENYAKIT JANTUNG DALAM GOLONGAN  
DEWASA YANG MENGHIDAPI HIPERKOLESTEROLEMIA**

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Tujuan kajian ini dijalankan ialah untuk mengkaji kesan campuran biji *N. sativa* dan madu terhadap subjek hiperkolesterolemik dan sihat dalam mengawal faktor risiko penyakit jantung, serta menentukan keupayaan antioksidan larut-lemak dalam semua sampel dengan menggunakan kaedah *photochemiluminescence* (PCL). Seramai 65 orang subjek telah dipilih, berumur antara 25 hingga 58 tahun dan dibahagikan kepada tiga kumpulan dalam kajian pertama. Dua kumpulan (subjek sihat dan hiperkolesterolemia) telah diberikan suplemen campuran biji *N. sativa* dan madu sebanyak 50 mg/kg berat badan setiap hari selama tiga bulan manakala satu kumpulan lagi sebagai kawalan (subjek sihat tanpa suplemen). Sampel darah berpuasa telah diambil sebelum dan selepas tiga bulan kajian bagi pengukuran jumlah kolesterol

(TC), trigliserida (TG), lipoprotein-kolesterol berketumpatan rendah (LDL-c), lipoprotein-kolesterol berketumpatan tinggi (HDL-c), glukosa darah dan kepekatan hemoglobin. Hasil kajian menunjukkan bahawa campuran biji *N. sativa* dan madu mempunyai kesan penurunan lipid, antiobesiti dan pengurangan tekanan darah secara signifikan (semua  $p < 0.05$ ). Keputusan kajian menunjukkan penurunan secara signifikan pada TG (20.1%), nisbah TC:HDL-c (12.3%) dan peningkatan HDL-c (15.0%), bagi subjek yang sihat. Manakala subjek hiperkolesterolemik menunjukkan penurunan yang signifikan pada TC (6.2%), TG (13.3%), nisbah TC:HDL-c (19.5%) dan peningkatan HDL-c (8.4%). Kesan antiobesiti menunjukkan kemampuan yang signifikan dalam penurunan berat badan, BMI dan lemak badan (penurunan sebanyak 2.3%, 2.2%, 4.5% bagi subjek sihat dan 1.8%, 1.9%, 4.5%, bagi subjek hiperkolesterolemik). Kemampuan kesan penurunan tekanan darah hanya dapat dilihat pada subjek hiperkolesterolemik dengan penurunan yang signifikan bagi tekanan darah sistolik sebanyak 3.9% dan tekanan darah diastolik sebanyak 5.5%. Walau bagaimanapun, campuran biji *N. sativa* dan madu tidak memberi kesan terhadap glukosa darah dan juga kepekatan hemoglobin. Berdasarkan keputusan dalam bahagian dua kajian, kesan positif yang terhasil ini adalah dijangkakan berkemungkinan disebabkan oleh aktiviti antioksidan larut-lemak dalam campuran biji *N. sativa* dan madu yang menunjukkan kesan sinergi yang paling tinggi berbanding dalam biji *N. sativa* atau madu sahaja. Sehubungan itu, penemuan kajian menunjukkan bahawa campuran biji *N. sativa* dan madu mempunyai kesan yang positif terhadap subjek hiperkolesterolemik dan juga sebagai sumber antioksidan semulajadi untuk mengekalkan kesihatan yang baik serta mencegah faktor risiko penyakit jantung.