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Protective effect of Nigella sativa L. extracts and thymoquinone, its active constituent, on renal ischemia-reperfusion-induced oxidative damage in rats

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Abstract

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Generation of reactive oxygen species and lipid peroxidation are associated with tissue injury following Ischemia/Reperfusion (I/R). Therefore, this model was used to assess the antioxidant effects of aqueous and ethanolic extracts of Nigella sativa and its active ingredient, thymoquinone, on oxidative stress following renal I/R injury (IRI). Male wistar rats were injected with aqueous and ethanolic extracts (doses of 0.7, 1 and 1.6 g/kg i.p.) and thymoquinone (doses of 2.5, 5 and 10 mg/kg i.p.). Normal saline was injected to control group (10 ml/kg) and one group was selected as a sham that did not have I/R. The markers of oxidative stress including thiobarbituric acid reactive substances (TBARS), total sulfhydryl (SH) groups and antioxidant capacity of kidney tissue (using FRAP assay) were measured. The left kidneys were exposed to warm ischemia for 60 min followed by reperfusion for 90 min. Agents were administrated prior to reperfusion. IRI caused a significant increase in TBARS level and decrement in both antioxidant power (FRAP value) and total thiol concentration in kidney homogenate samples. In the aqueous extract pretreated groups (in all doses) and ethanolic extract groups (with doses of 0.7 and 1 g/kg), there was not found any effective results. In the ethanolic group (1.6 g/kg), a reduction in TBARS level ($P<0.001$) and elevation in antioxidant power (FRAP value) ($P<0.05$) and total thiol concentrations was seen ($P<0.05$). Thymoquinone also reduced lipid peroxidation products ($P<0.001$; 5 and 10 mg/kg) and increased antioxidant power ($P<0.05$ with 2.5 mg/kg, $P<0.01$ with 5 mg/kg and $P<0.001$ with 10 mg/kg) and total thiol concentrations ($P<0.05$ with 2.5 mg/kg and 5 mg/kg and $P<0.01$ with 10 mg/kg) in ischemia-reperfusion injured rat kidneys. This study suggests that ethanolic extract of N. sativa and thymoquinone may be useful agents for the prevention of renal ischemia-reperfusion (IR)-induced oxidative injury in rats.

Reaxys Database Information

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Author keywords

Lipid peroxidation; Nigella sativa; Renal ischemia-reperfusion; Thymoquinone

Indexed Keywords

EMTREE drug terms: alcohol; lipid; Nigella sativa extract; reactive oxygen metabolite; sodium chloride; thiobarbituric acid reactive substance; thiol derivative; thymoquinone

EMTREE medical terms: animal experiment; animal model; antioxidant activity; aqueous solution; article; black cumin; concentration (parameters); controlled study; disease association; drug dose comparison; drug efficacy; experimental model; fluorescence recovery after photobleaching; kidney homogenate; kidney ischemia; kidney parenchyma; kidney perfusion; lipid peroxidation; male; nonhuman; oxidative stress; rat; renal protection; reperfusion injury; treatment outcome

Chemicals and CAS Registry Numbers: alcohol, 64-17-5; lipid, 66455-18-3; sodium chloride, 7647-14-5; thiol derivative, 13940-21-1; thymoquinone, 490-91-5

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