

Research Report

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Tea Seed Oil Restores Blood Pressure, Redox Balance and Lipid Homeostasis in L-NAME-Induced Hypertensive Rats

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Abstract

Background: Hypertension remains a leading cause of cardiovascular disease and mortality worldwide. This study explores the potential of tea seed oil (TSO) in mitigating hypertension-related complications in a rat model induced with N(G)-nitro-L-arginine methyl ester (L-NAME). TSO was extracted following standard protocols, and experimental groups (A - E) were administered L-NAME along with varying doses of TSO or Enalapril Maleate (as a positive control) for 28 days. Blood pressure indices were measured non-invasively, and blood and tissue samples were collected for biochemical analyses.

Results: Groups B and E showed significant changes in systolic blood pressure (SBP) compared to the control (Group A). Additionally, SBP decreased notably in groups C, D, and E compared to hypertensive group B. The administration of TSO at the highest dose (0.6 ml/kg) caused a reduction in diastolic blood pressure (DBP) in group D, similar to the effect of enalapril maleate in group E. Group B, subjected only to L-NAME administration, exhibited notable increases in LDL-C. Liver function markers like AST, ALT, and ALP showed significant changes across groups, with TSO administration leading to reductions in AST in groups C and D, and in group E compared to group B. Group B rats showed a significant rise in malondialdehyde (MDA) compared to Group A. TSO administration in Groups C and D slightly reduced MDA towards Group A levels. In Group E, MDA significantly differed from both groups A and B. Catalase (CAT) decreased significantly in group B but remained unchanged in groups C, D, and E compared to A or B. Superoxide dismutase (SOD) decreased significantly in group B compared to A but increased in C, D, and E compared to B. Glutathione peroxidase (GPx) decreased in groups B and C compared to A but increased in C compared to B. Groups D and E showed no significant difference in GPx values compared to either A or B. Reduced glutathione (GSH) increased significantly in TSO-treated Groups C and D and in the standard drug group compared to A or B.

Conclusions: These findings highlight the therapeutic potential of TSO as a natural adjunct in the management of hypertension and its related complications.

Keywords Hypertension; Blood Pressure; Tea seed oil; Oxidative stress; Antioxidant enzymes

1 Background

Hypertension remains the leading risk factor for cardiovascular diseases, and its annihilative effect is felt in the form of reduced life expectancy and premature death. The escalating global incidence of hypertension is linked to factors such as excessive salt intake, physical inactivity, tobacco and alcohol consumption, and the aging process (Wang et al., 2023). An individual is considered hypertensive if their systolic blood pressure (SBP) reaches 130 mm Hg or higher and/or if their diastolic blood pressure (DBP) exceeds 80 mm Hg (Muntner et al., 2019).

In developed nations, hypertension ranks as the fourth contributor to premature deaths and seventh in developing countries. Globally, hypertension is responsible for nearly 16.5% of annual deaths, with projections estimating that by 2030, 23.5 million people will succumb to hypertension-related complications (Kibret and Mesfin, 2015; Oliveira et al., 2021). The prevalence of hypertension in Africa is particularly alarming, with current projections indicating that 150 million people will be affected by 2025, with Nigeria alone accounting for 40 million of this estimate (Akindele, 2014).

Throughout history, plants have been explored as an indispensable source of medicine due to their easy affordability and lack of common side effects associated with synthetic drugs (Parasuraman, 2018). Tea (*Camellia*