ABSTRACT

Neurodegenerative disorders including Parkinson's disease (PD) are characterized by progressive dopamine producing neuron's loss combined with oxidative stress, neuroinflammation, and mitochondrial malfunction. Medicinal plants are known for their activities against oxidative stress and inflammation highlight their importance as natural neuroprotective substances with less adverse effects. Investigating the mechanistic insights of *Ziziphus jujuba* and *Elettaria cardamomum* extracts in a rotenone-induced mice model of Parkinson's disease aims their modulations of oxidative stress and inflammatory pathways at the genetic level.

Males' mice were assigned to control, rotenone, and treatment groups. To create a PD-like illness, rotenone (2.5 mg/kg, s.c.) was given over 21 days; EthZJ (Ethanolic *Ziziphus jujuba*) extract (200 mg/kg), EC-Eth (*Elettaria cardamomum* ethanolic) extract (200mg/kg), EC-Aq (*Elettaria cardamomum* Aqueous extract) (200mg/kg) was administered orally as pre and post treatment. After experimental period total RNA was extracted from the brain hemispheres. cDNA was synthesized for qRT-PCR analysis of ten genes Nrf2, Hmox1, Sod2, Mt1, Txnrd1, IL6, TNF-α, Th, Drd2 and housekeeping gene GAPDH.

The rotenone group showed significant downregulation of antioxidant and dopaminergic genes (Nrf2, Th) and upregulation of pro-inflammatory genes (IL6, TNF-α), confirming oxidative and inflammatory stress, Treatment with *E. cardamomum* extracts implied its modulatory effect on inflammatory and antioxidant signaling by upregulation of Nrf2 and Th and decreasing TNF-α expression ($p < 0.05$). Conversely, *Z. jujuba* produced only minor, non-significant modifications revealing a small declining trend in TNF-α expression. Non-significant changes in genes Sod, Txnrd1 and Mt1 were seen among groups.

Although *E. cardamomum* has neuroprotective effects achieved via Nrf2 activation whereas *Z. jujuba* exhibits restricted central efficacy, perhaps limited to peripheral antioxidant modulation. repression and activation of inflammatory cytokines. By providing insightful mechanical insight into the molecular basis of medicinal plant–mediated neuroprotection, the study therefore supporting the possible therapeutic value of *E. cardamomum* in oxidative and inflammatory neurodegenerative disorders generally.