



# Ameliorative effects on motor and biochemical deficits of *Celosia cristata* and *Callistemon citrinus* methanolic leaf extracts in a reserpine-induced mouse model of parkinsonism: behavioral, antioxidant and MAO-B evidence

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## Abstract

**Objective** Parkinson's disease (PD) ranks as one of the most common neurodegenerative conditions worldwide. The goal is to explore effect of methanolic leaf extracts from *Celosia cristata* and *Callistemon citrinus* on motor impairments and neurochemical changes in a reserpine-induced mouse model of Parkinsonism, offering insights into their potential symptomatic and biochemical ameliorative value.

**Methods** Either sex Swiss albino mice were assigned randomly to different groups ( $n=5$ ). Nine groups were created to produce a Parkinson's disease-like state using RES at a dose 5 mg/kg intraperitoneally, with each group receiving 200 mg/kg and 400 mg/kg per oral of *Celosia cristata* and *Callistemon citrinus* methanolic leaf extracts and their combinations for five consecutive days. Behavioral tests (Open field, Actophotometer, Rotarod) and biochemical evaluations (SOD, GPx, LPO, and MAO-B) were conducted 24 h after the last administration. Data were statistically analyzed using one-way ANOVA and Dunnett's test.

**Results** Reserpine administration decreased locomotor activity, hindered motor coordination, reduced SOD and GPx levels, and elevated LPO and MAO-B compared to controls. *Celosia cristata* and *Callistemon citrinus* methanolic leaf extracts, as well as their combination at 200 mg/kg and 400 mg/kg, ameliorated behavioral deficits, biochemical parameters, and MAO-B alterations caused by reserpine. The combination of both plants at 400 mg/kg total dose (MCEl+MCal 400) showed the greatest overall effect ( $P < 0.001$ ); however, this is consistent with a total-dose effect rather than confirmed pharmacological synergism.

**Conclusion** Methanolic leaf extracts from both plants, *Celosia cristata* and *Callistemon citrinus*, along with their combinations, demonstrated significant amelioration of motor and biochemical deficits via antioxidant mechanisms, improving behavioral impairments caused by reserpine. Reduction of MAO-B activity may reflect attenuation of oxidative stress rather than direct enzyme inhibition. These results suggest symptomatic and biochemical ameliorative promise of methanolic leaf extracts from *Celosia cristata* and *Callistemon citrinus*, indicating their appropriateness for use in PD.

**Keywords** Parkinson's disease · Reserpine · Monoamine oxidase-B · Motor and biochemical amelioration · Antioxidant

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## Introduction

Parkinson's disease (PD) is a neurodegenerative condition with a rising occurrence, impacting 6.1 million individuals worldwide in 2016 and 7.1 million in 2021, projected to reach 12 million by 2040. PD impacts 1 to 2% of those over 60, posing significant economic and social challenges for aging populations in developed nations [1, 2].

PD results in deterioration of nerve cells in brainstem, mainly dopaminergic nerve cells within substantia nigra pars compacta (SNpc), causing diminished axon terminal in-