Brenania Brieyi root bark extracts ameliorate chronic inflammation-mediated oxidative stress in rats

Chukwuma, Ifeoma F. [1], Apeh, Victor O.[1], Ezeanyika, Lawrence U. S. [1],and Ogugua, Victor N[1].

Presented by: Chukwuma Ifeoma Felicia

Department of Biochemistry, Faculty of Biological Sciences, University of Nigeria, Nsukka.

*Corresponding author: Email: chukwuma.ifeoma@unn.edu.ng; odoifeoma1@gmail.com +2347064614452

Abstract

Oxidative stress is implicated in the pathogenesis of many chronic diseases. This study determined the effect of methanol and chloroform extracts of root bark of *Brenania brieyi* on inflammation-induced oxidative stress in rats. Cotton pellet-induced inflammatory model was used to induce oxidative stress. The rats were treated with varying concentrations of each extract, and indomethacin (standard drug) for 7 days. On day 8, their blood samples collected by cardiac puncture was used for determination of biochemical parameters of oxidative stress such as the extent of lipid peroxidation, superoxide dismutase, catalase, glutathione peroxidase activities along with reduced glutathione, vitamins C, and E levels using standard methods. The bioactive compounds responsible for bioactivity were determined with FTIR spectroscopic and gas chromatography-mass spectrometry GC-MS) techniques. Results obtained showed a significant ($p < 0.05$) decreases in malondialdehyde level, an increase in superoxide dismutase, and catalase activities, reduced glutathione level with a significant increase in vitamin C in groups 6 and 9 was observed in the extracts treated groups compared with the untreated group. A total of sixteen bioactive compounds with known antioxidant / anti-inflammatory activities were identified in the extracts with 9-Ocadecenoic acid being the most abundant. The result of this study suggests that *B. brieyi* has antioxidant activities, and hence could be used in the management, and treatment of oxidative stress-related diseases.

Keywords: *Brenania brieyi ;* Oxidative stress; antioxidants activity; anti-inflammatory activity.

CAHD 2020

INTRODUCTION

Overview of inflammation

Inflammation is a complex protective response of vascular tissues to invasion by harmful stimuli (Anosike *et al*., 2012; Enechi and Nwodo, 2015).

The primary functions of inflammation are to rapidly destroy or isolate the injurious agent, remove damaged tissue, and then restore tissue homeostasis (Markiewski and Lambris, 2007; Ashley *et al*., 2012; Benly 2015).

There are generally five cardinal signs of inflammation namely: Redness, swelling, heat, pain, and loss of function.

The complex events, and mediators involved in the inflammatory reactions can induce, maintain or aggravate oxidative stress (Anosike *et al*., 2012)

CAHD
2020

Oxidative stress

Oxidative stress is defined as an imbalance between the production of reactive species, and antioxidant defense activity, and it plays a major part in the development of chronic, and degenerative ailments (Sen and Batra, 2013; White *et al*., 2014).

These diseases/ or disorders are consequences of oxidation of biomolecules mainly lipid, protein, amino acids, and deoxyribonucleic acids (DNA) (Bala and Halder, 2013; Ogugua *et al*., 2013).

The quest for the discovery of new anti-inflammatory, and antioxidant drugs was born out of the increasing side effects associated with the use of synthetic drugs.

Results and Discussion

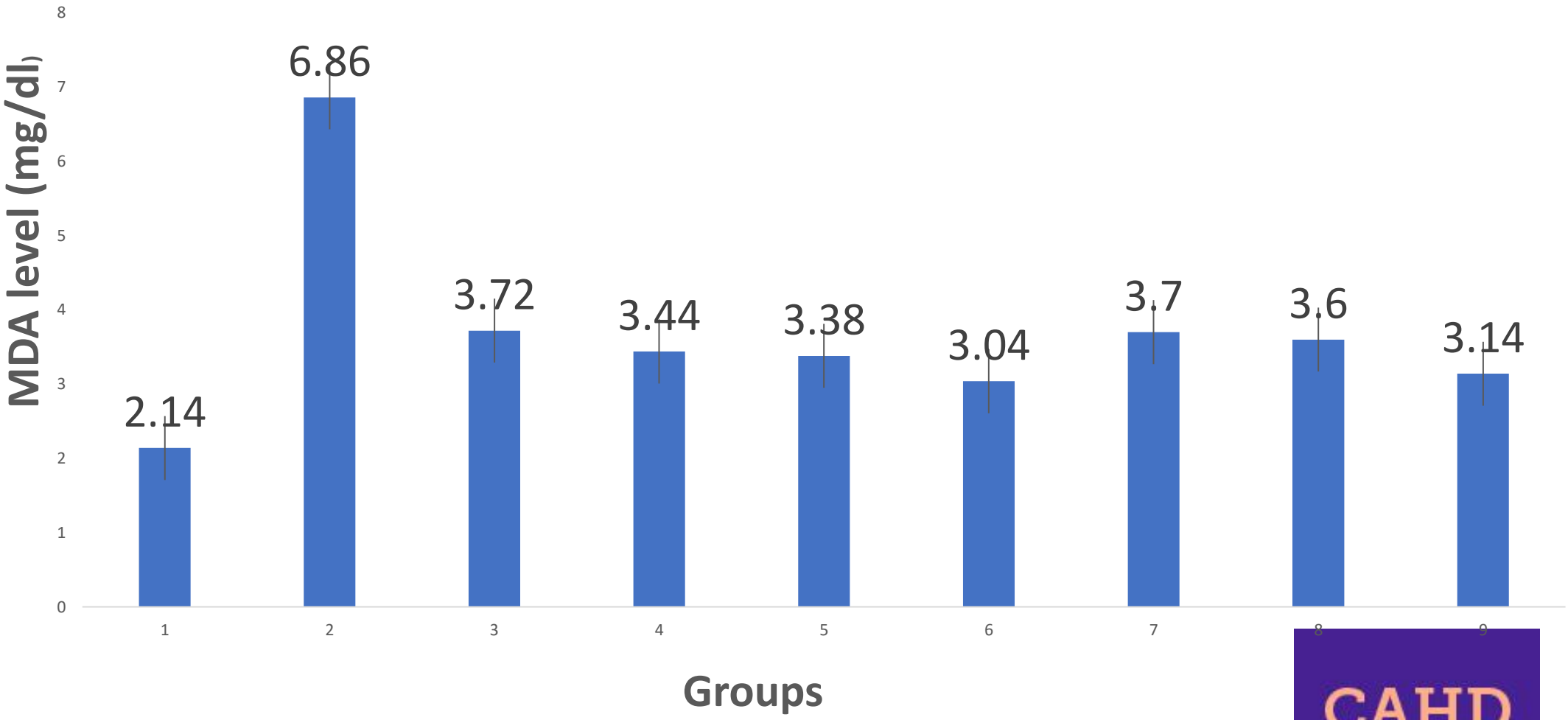

Figure 1: Malondialdehyde level of rats implanted with cotton pellet

CAHD 2020

Table 1: Effects of the methanol and chloroform extracts of *B. brieyi* on serum antioxidant enzymes activities of rats implanted with cotton pellet

Groups	Treatment	Doses	Superoxide dismutase (u/l)	Catalase (u/l)	Glutathione peroxidase (u/l)
1	Normal rats	-	11.46 ± 0.05^{c}	3.64 ± 0.16^{d}	0.50 ± 0.07^{c}
2	Control (N. S, ml/kg b. w.)	I	11.34 ± 0.06^{a}	1.36 ± 0.15^{a}	0.36 ± 0.05^{a}
3	Indomethacin (mg/kg b. w.)	10	11.40 ± 0.03^{bc}	1.80 ± 0.24^{ab}	1.80 ± 0.24^{ab}
4	Methanol Ext. (mg/kg b. w.)	50	11.39 ± 0.04^{b}	2.12 ± 0.06^{bc}	0.38 ± 0.03^{ab}
5		100	11.42 ± 0.03^{bc}	2.18 ± 0.27^{bc}	0.40 ± 0.07^{ab}
6		200	11.42 ± 0.02^{bc}	3.30 ± 0.06^{d}	0.44 ± 0.05^{abc}
7	Chloroform Ext. (mg/kg b. w.)	50	11.41 ± 0.21^{b}	2.16 ± 0.17^{bc}	0.36 ± 0.05^{a}
8		100	11.42 ± 0.03^{bc}	2.58 ± 0.20^{c}	0.38 ± 0.04^{ab}
9		200	11.43 ± 0.02^{bc}	2.68 ± 0.30^{c}	0.44 ± 0.06^{abc}

Values are expressed as mean ± SD (n = 5). Mean values with different letters of the alphabet down the column differed significantly ($p < 0.05$) while mean values with same letters of the alphabet down the column are not-

Table 2 : Effects of the methanol and chloroform extracts of root bark of *B. brieyi* on serum non–enzymatic antioxidant concentrations of rats implanted with cotton pellet

Groups	Treatment	Doses	Glutathione (mg/dl)	Vitamin C (mg/dl)	Vitamin E (mg/dl)
1	Normal rats	-	2.62 ± 0.08^{f}	1.42 ± 0.10^{d}	0.62 ± 0.02^{cd}
2	Control (N. S, ml/kg b. w.)	I	0.68 ± 0.08^{a}	1.02 ± 0.04^{a}	0.42 ± 0.03^{a}
3	Indomethacin(mg/kg b. w.)	10	1.14 ± 0.18^{b}	1.06 ± 0.05^{a}	0.56 ± 0.04^{abcd}
4	Methanol Ext. (mg//kg b. w.)	50	2.24 ± 0.05^{e}	1.08 ± 0.08^{ab}	0.46 ± 0.07^{ab}
5		100	2.54 ± 0.13^{f}	1.12 ± 0.04^{ab}	0.52 ± 0.03^{abc}
6		200	2.58 ± 0.13^{f}	1.22 ± 0.08^{c}	0.70 ± 0.04^{d}
7	Chloroform Ext. (mg//kg b. w.)	50	1.58 ± 0.05^{c}	1.04 ± 0.05^{a}	0.56 ± 0.05^{abcd}
8		100	2.00 ± 0.12^{d}	1.04 ± 0.11^{a}	0.60 ± 0.05^{bcd}
9		200	2.22 ± 0.16^{e}	1.18 ± 0.04^{bc}	0.56 ± 0.02^{abcd}

Values are expressed as mean ± SD (n = 5). Mean values with different letters of the alphabet down the column are significantly different ($p < 0.05$) while mean values with same letters of the alphabet down the column are not significantly different ($p > 0.05$).

CAHD 2020

Table 3: Compounds identified in the root bark of *B. brieyi* with GC-MS analysis

S/N	Methanol extract	Chloroform extract
1.	Decanoic acid	Undecanoic acid
2.	Pentadecanoic acid	Tetradecanoic acid
3.	9, 12-hexadecadienoic acid	14-methylpenta decenoate
4.	9-ocatadecenoic acid	Hexadecanoic acid
5.	Octadecanoic acid	9,12-Octadecadienoic acid
6.	Eicosanoic acid	9-Octadecenoic acid
7.	6,9-pentadecadien-1-ol	Ocadecanoic acid
8.	4, 8, 12 -tetradecatrienal	Nonadecanoic acid
9.		6,9-Pentadecadien-1-ol
10.		Squalene

CAHD 2020

CONCLUSION

The findings from this research work unveiled the potency of *B. brieyi* in ameliorating inflammation-induced oxidative stress. The extracts inhibited peroxidation of biomembrane and also restored the endogenous antioxidant status of the inflamed rats. Thus, it could be applied as a therapeutic agent in preventing onset or management of oxidative stress related diseases/ disorders.

CAHD
2020

Supplimentary Materials

All Materials generated in this research work are embedded in the presentation

Funding

Not applicable

Acknowledgments

The authors wish to appreciate all the students, technical staff and lecturers that help in making this research work a success.

THANK YOU

FOR

LISTENING

CAHD
2020