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Inhibitory effect of *Solanum anguivi* fruit extracts against lead-induced lipid peroxidation in rat liver and kidney

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Abstract

Rapid incidence of liver and kidney disorders resulting in high mortality nowadays is of great concern and there is this very need to salvage the sudden death resulting from the disorders. Lipid peroxidation which is the hallmark of oxidative stress that damage body tissues is prominent as one of the causative factors leading to many chronic and degenerative diseases. This study is sought to investigate the inhibitory effect of aqueous and ethanolic extracts of *Solanum Anguivi* fruit against lead acetate induced lipid peroxidation in the liver and kidney tissues of albino rats in vitro using thiobarbituric acid reactive substances (TBARS) assay. The results obtained indicate a concentration dependent increase in inhibitory potential of the extracts against lead acetate in both liver and kidney tissues. Highest extract inhibitory potential was (90%) at highest extract concentration (160mg/ml) and this was obtained in the liver tissue. Hence, the results from this study suggest that oxidative stress in liver and kidney tissues could be potentially prevented or managed by dietary intake of *Solanum Anguivi* fruits.

Keywords: Lipid peroxidation; Degenerative-diseases; *Solanum anguivi*; Lead acetate; Thiobarbituric acid reactive species; Inhibitory-potential

1 Introduction

Solanum anguivi fruit is a nourishing vegetable that is eaten raw or cooked and has been used in folk medicine in the treatment of various diseases such as diabetes, hypertension, malaria, strokes (Yoshikawa et al., 2001). It is one of the richest sources of edible saponin which has been reported as bioactive compound in plants responsible for antioxidant, antidiabetic and antihyperlipidemic properties (Kim et al., 1998). *Solanum anguivi* fruit is mostly grown in South-Western part of Nigeria as well as nations within the tropics. Research from various quarters has revealed that oxidation of lipids is a crucial step in the pathogenesis of several disease states, most especially in adults and infant patients (Flora, 2002). Myriads of pro-oxidants have been identified to cause oxidative damage to biomolecules such as proteins, lipids and DNA (Halliwell and Gutteridge, 1985). This usually occur due to imbalance between the productions of reactive oxygen species (ROS) and the body biological system's ability to readily detoxify the reactive intermediates or easily repair the resulting damage (Halliwell, 1994). Lead is a heavy metal and generally known as environmental contaminant causing oxidative stress in the exposed individuals leading to tissue damage (Tugbobo and Oloyede, 2014). Evidences have shown that about 93% cases involving both sexes in Pakistan with high blood lead levels resulted from lead contaminated public water supply, fish ponds as well as sea foods via effluents from industrialized cities (Grandjean, 2001). Hence, it is in the light of this that the present investigation sought to investigate the inhibitory effect of aqueous and ethanolic extracts of *Solanum anguivi* fruit against lead acetate induced lipid peroxidation in the liver and kidney tissues of albino rats.

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2 Material and methods

Collection of Sample: Fresh *Solanum anguivi* fruits were collected from a farm land at Ikeji-arakeji area in Osun State. The fruits were identified and authenticated by a plant scientist in Department of Plant Science, Joseph Ayo Babalola University, Ikeji-Arakeji, Osun-State with a voucher specimen number 17 and was deposited accordingly at the herbarium.

2.1 Preparation of Extract

2.1.1 Aqueous extract

50g of the powdered sample was extracted with distilled water (500ml) via maceration for 48hrs using method by (Aguawa and Mittal, 2009). The mixture was filtered and decanted using sterile Whatman filter paper No1. The filtrate measured up to 425ml and evaporated to dryness using freeze dryer to obtain a yield of 10%. The crude extract was later subjected to bioassay analysis and concentrations of 10, 20, 40, 80, and 160mg/ml were obtained via serial dilution.

2.1.2 Ethanolic extract

120g of powdered sample were extracted with solvent combination via maceration of 70% ethanol for 48hrs using the maceration method by (Malairjan et al., 2008). One litre of 70% ethanol was used and the mixture was filtered and decanted using sterile Whatman filter paper No1. The filtrate measured up to 600ml and evaporated to dryness using a freeze dryer to obtain 11.8% yield.

2.2 Lipid Peroxidation Assay

The liver and kidney tissue homogenates used were prepared from normal healthy albino rats. Rats were decapitated under mild diethyl ether anesthesia and the liver and kidney were quickly excised, placed in ice and weighed. The tissue was subsequently homogenized in cold saline (1/10 w/v) with about 10 up-and-down strokes at approximately 1,200rpm in a Teflon glass homogenizer. The homogenate was centrifuged for 10min at 3,000 x g and a low-speed supernatant was collected and used for the lipid peroxidation assay. The lipid peroxidation assay was carried out using modified method of (Ohkawa et al., 1979).

3 Results

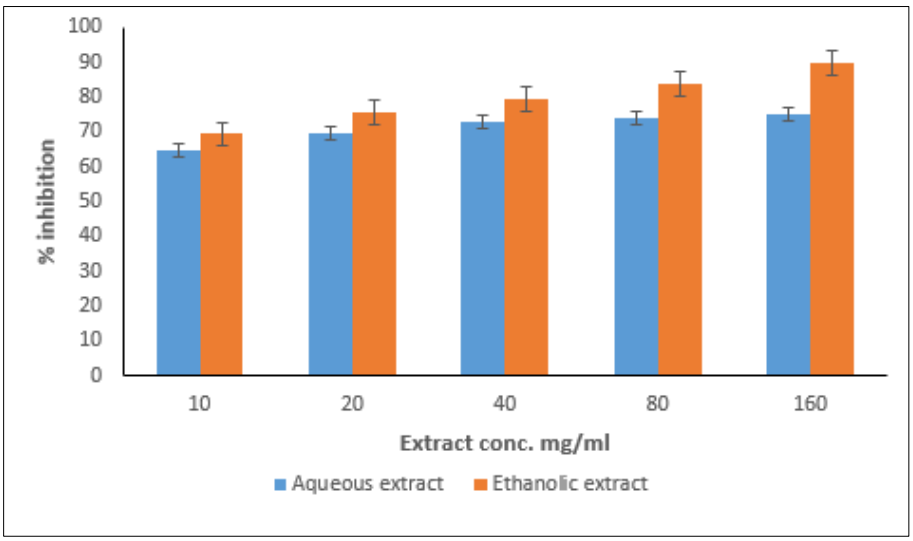

Figure 1 Inhibitory potential of Solanum anguvi fruit against lead-induced lipid peroxidation in rat kidney

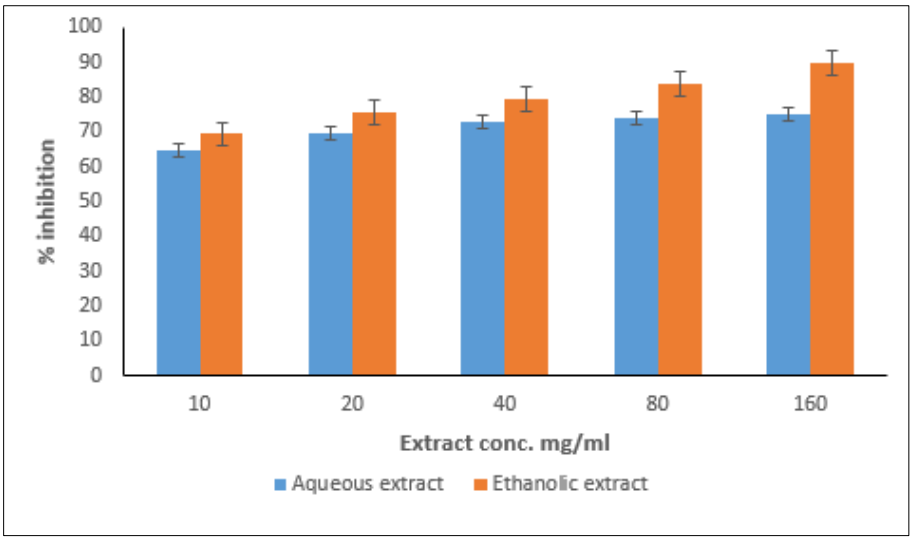

Figure 2 Inhibitory potential of Solanum anguivi fruit against lead-induced lipid peroxidation in rat liver

4 Discussion

The results from lipid peroxidation assay showed remarkable increase in levels of thiobarbituric reactive species (TBARS) on administration of lead acetate. The finding that lead causes significant increase in malondyladehyde content in brain (Oboh et al, 2007) agreed with this study where elevation of thiobarbituric reactive species induce by lead acetate was sharply decreased with the administration of Solanum anguivi fruit. The results in Figure 1show that highest extract inhibitory potential (85%) of Solanum anguivi fruit against lead acetate induced lipid peroxidation in rat kidney was obtained at maximum extract concentration (160mg/ml) demonstrated by ethanolic extract of Solanum anguivi fruit. Besides, the lowest extract inhibitory potential against lead acetate induced lipid peroxidation in rat kidney (65%) was obtained at minimum (10mg/ml) extract concentration demonstrated by aqueous extract of Solanum anguivi fruit respectively. Similarly, Figure 2 above show that ethanolic extract of Solanum anguivi fruit demonstrated higher inhibitory potential against lead acetate induced lipid peroxidation in rat liver than aqueous extract. The highest extract inhibitory potential (90%) against lead acetate induced lipid peroxidation in rat liver was obtained at maximum (160mg/ml) extract concentration demonstrated by ethanolic extract of Solanum anguivi fruit. However, the lowest extract inhibitory potential against lead acetate induced lipid peroxidation in rat liver (63%) was obtained at minimum (10mg/ml) extract concentration demonstrated by aqueous extract of Solanum anguivi fruit respectively. Lead is a notable pro-oxidant capable of inducing oxidative stress in liver and brain cells leading to cancer and neuronal disorders such as cerebral edema (Needleman, 1997). The therapeutic effect of Solanum anguivi fruit extracts against lead acetate-induced lipid peroxidation in this study could be attributed to its inherent phytochemicals that aid its potent antioxidant activities.

5 Conclusion

The results obtained from the study justified the fact that *Solanum anguivi* fruit is a potent antioxidant food supplement with very high inhibitory potential against lead-induced lipid peroxidation in animal tissues. This further implies that the fruit possesses antioxidant properties which could offer protection against oxidative stress related diseases and thus, reduce health burdens in the society.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

The authors hereby declare no conflict of interest in this research work.

References

[1] Agunwa, C.N. and Mittal, G.C. (2009). Study of anti-ulcer activity of aqueous extract of Pyrenacanthia staudtii leaves using models of experiment gastric ulcer in rats. Eur. Journal of pharmacol. 40: 126-128.

[2] Flora, S.A. (2013). Relationship between lipid oxidation and pathogenesis of disease. Mutation Research, 523: 15-23.

[3] Grandjean, N.A. (2001). Acute toxicity of lead in Pakistan metropolis water channels. Pakistan Journal of Nutrition, 21: 169-175.

[4] Halliwell, B. and Gutteridge, J.M.C. (1985). Handbook of methods for oxygen radical research, Greenwald RA. Eds. CRC Press. Boca-Raton FL, pp. 177-180.

[5] Halliwell, B. (1994). Free radicals, antioxidants and human diseases. Journal of Lab. and Clin. Med. 1119: 598-620.

[6] Kim, J.D., Seely, R.R., Stephen, T.D., and Fahim, M.S. (1998). Assessment of antioxidant activity of saponin in some selected African plants. Pakistan Journal of Biological Science. Vol. 9: 1466-1471.

[7] Malairjan, P., Gopalakrish, G., Narasimhan, K. and Veni, K.J.K. (2008). Evaluation of anti-ulcer activity of Polyathia longitolia (Sonn) thewaites in Experimental Animals. India J. Pharmacol, 40: 126-128.

[8] Needleman, B.D. (1997). Lead induced oxidative stress in liver and brain tissues. Exp. Pathol. 1067: 241-253.

[9] Oboh, G., Puntel, R.L., and Rocha, J.B.T. (2007). Hot pepper (Capsicum annum and Capsicum Habanero) prevents Fe2+ -induced lipid peroxidation in brain in-vitro.

[10] Ohkawa, H., Ohishi, N., and Yagi, K. (1979). Assay for lipid peroxides in animal tissues by thiobarbituric acid reaction. Anals of Biochem., 95: 351-358.

[11] Tugbobo, O.S. and Oloyede, I.O. (2014). Protection by Garlic against lead-induced oxidative stress and genetic birth defects. Journals of Oxidants and Antioxidants Med. Sciences. Vol. 3 (1): 79-82.

[12] Yoshikawa, M, Murakami, T., Kishi, A. (2001). Medicinal Flowers…Marigold hypoglycemia gastric emptying inhibitory and gastro-protective principles from Egyptian Calendula officialis. Chemical Pharmaceu Bulle, 49: 863-870