Journal of Chemical Research Advances
ISSN: 2582-7995

Research Article
Open access

Antioxidants activities of four different solvent extracts of *Corchorus tridens* leaf using DPPH free radical scavenging assay

Ushie OA[1]*, [2]Kendeson AC, [1]Longbab BD and Galadima A
[1]Department of Chemical Science, Federal University Wukari, Taraba State, Nigeria.
[2]Department of Chemical Sciences, Federal University of Kashere, Gombe State, Nigeria

Corresponding author: afiushie@yahoo.com

Received on: 22/11/2022 Accepted on: 15/01/2023 Published on: 23/01/2023

ABSTRACT

Aim: This study was aimed to evaluate and compare antioxidant activities of four crude extracts of *C. tridens* leaves which locally used as a delicacy in many parts of Nigeria especially the South-western part.

Method and Materials: The samples of leaves of *C. tridens* plant were collected from the environment. A 100 g powdered sample of plucked leaves after proper treatment was weighed and transferred into extraction container for serial exhaustive extraction using cold maceration method for 96 hours (4 days) using 250 mL each of hexane, ethyl acetate, acetone, and methanol. At the end of each extraction, the extract was filtered using filter paper and evaporated to dryness on a water bath at 60 °C to obtain a thick sticky, dark colored extract. The percentage yields were calculated and noted. The antioxidant activities of the crude extracts of *C. tridens* leaf was determined using the DPPH (1,1-Diphenyl-2-Picrylhydrazyl) method.

Results: The free radical scavenging potential of the crude extracts and the standard (Vitamin C) as indicated by the maximal inhibitory concentration (IC_{50}) values showed that methanol extract had the highest inhibitory effect (34.38 mg/mL) of all the crude extracts, followed by acetone extract (37.31 mg/mL), ethyl acetate extract (46.69 mg/mL) and the least was hexane (66.38 mg/mL) as compared to the standard (Vitamin C) which had a value of (22.52 mg/mL).

Conclusion: It was concluded that all the extracts exhibited antioxidant activity but methanol extract had the most antioxidant activity which was comparable with the standard used. This may be due to phyto-compounds in the solvent owing to its polarity, hence, plant's leaves can be used to manage oxidative stress.

Keywords: Anti-oxidant, *Corchorus tridens*, Extract, Oxidative stress.

How to cite this article: Ushie OA, Kendeson AC, Longbab BD and Galadima A (2023). Antioxidants activities of four different solvent extracts of *Corchorus tridens* leaf using DPPH free radical scavenging assay. J. Chem. Res. Adv., 04(01): 10-14.

Introduction

Malnutrition which is a plague bedeviling the developing countries in spite of increased basic food production, micronutrient deficiencies and other nutritional related diseases still afflict most people (Ejoh et al., 2005). This has led to the quest for sources of food from wild food sources as well as cultivated plants. Vegetables are well known to offer potential food sources in both rural and urban communities, resulting in household food security (Maroyi, 2011). These vegetables tend to add taste and flavor as well as substantial amount of protein, fiber, minerals and vitamins to diets (Catarino et al., 2019); they have also been reported to possess health benefits which include antioxidant activities. Antioxidants are used for management of health conditions which involve free radicals, such as cardiovascular and neurodegenerative diseases (Ushie et al., 2019; Kendeson et al., 2021). Free radicals are molecules with odd number of electron that are highly reactive and partial reduction in molecular oxygen can generate reactive oxygen species which is a feature of degenerative diseases (Freeman and Crapo 1982; Hogg, 1998). Most vegetables are reported to contain phyto-compounds that have the ability to scavenge these free radicals, such as those found in the species *Corchorus* which are majorly found in Africa (Fawzi, 2018). The genus *Corchorus* have been reported to possess pharmacological properties such as antimicrobial, aphrodisiac, anticancer, anti-mutagenic activities etc (Kumari, et al., 2019). Four of the *Corchorus* species are found in Nigeria, which includes: *Corchorus tridens*, *Corchorus aestans*, *Corchorus fascicularis* and *Corchorus olitorius* (Osawaru et al., 2012; Adeyinka and Akintade, 2015). These four species are well distributed in the country and are popularly called Ewedu in (Yoruba) the South-

western region (Osawaru, et al., 2012), turgunnuwa, or Lalo in (Hausa/Fulani) the Northern region (Gwarzo et al., 2017) and, Atyever in (Tiv) the Northern-central region (Shomkegh et al., 2013). *C. tridens*, commonly called Bush Okra, (Omojola et al., 2018) has been used as vegetables for many years and reported to possess health benefits. Gwarzo et al., (2017) reported the use of the leaves and young shoots of the plant for vegetable and soup herb, and as a good fodder for camels and other domestic stock. They also reported its use as good fiber used for fishing lines in northern Nigeria and the stems are used for horizontal ties of conical hut roofs. This research work is aimed at evaluating and comparing the antioxidant activities of four crude extracts of *C. tridens* leaves which is locally used as a delicacy in many parts of Nigeria especially the South-western part.

Materials and Methods

Sample collection and preparation

The leaves of *C. tridens* plant were collected from environment of Federal University, Wukari, in wukari Local Government Area, Taraba State, Nigeria. The plant was identified by Department of chemical sciences Federal University, Wukari, Taraba state, Nigeria. The plucked leaves were properly air dried at room temperature for three weeks, pounded into fine powder using pestle and mortal and stored in a well closed container for further use. A 100 g of powdered sample was weighed and transferred into extraction container for serial exhaustive extraction using cold maceration method for 96 hours (4 days) using 250 mL each of hexane, ethyl acetate, acetone and methanol. At the end of each extraction, the extract was filtered using filter paper and evaporated to dryness on a water bath at 60 °C to obtain a thick sticky, dark colored extract. The percentage yields were calculated and noted.

Antioxidant Activity

The antioxidant activity of the *C. tridens* extracts was determined using DPPH (1,1-diphenyl-2-picryl hydrazyl) free radical scavenging assay described by Mahdi-Pour et al., (2012) and Kendeson et al., (2021) with some slight modifications. The extracts/standard (1.5 mL each) at various concentrations of 0.0313, 0.0625, 0.1250, 0.2500, and 0.500mg/mL were mixed with 1.5 mL of DPPH solution and incubated at 37°C for 30min. The absorbance of each mixture was measured at 517 nm using a spectrophotometer (V-730 UV-Vis Spectrophotometer, Jasco, USA). The DPPH scavenging activity was calculated as follows:

Percentage (%) inhibition = $A_0 - A_1 / A_0 \times 100$; Where A_0 = the Absorbance of control and A_1 = the Absorbance of standard/sample. All measurements of free radical scavenging activity were performed in duplicate. The (%) inhibition values were plotted against the sample concentration and the concentrations of standard/sample resulting in 50% inhibition on DPPH (IC_{50} value) were calculated using the linear regression equation.

Results and Discussion

The antioxidant activity of samples and standard were shown (Tables 1 & 2 and Fig. 1,2 & 3). Comparing antioxidants activities of the crude extracts to that of standard (Vitamin C) at the various concentrations range (0.313–0.500 mg/mL), it was observed that free radical scavenging activity of crude extracts increased with increase in concentration from 0.313 to 0.500 mg/mL (Table 1). Also, methanol extract had the highest free radical scavenging ability with a maximal inhibitory concentration (IC_{50}) of 34.38 mg/mL, this was comparable to that of Vitamin C which had an IC_{50} value of 22.52 mg/mL; acetone extract was next in activity with an IC_{50} value of 37.31 mg/mL; then ethyl acetate 46.69 mg/mL; and the least was hexane 66.38 mg/mL (Table 2; Fig 1 & 2). The difference in scavenging abilities could be, due to types and concentrations of the phytochemicals each solvent could extract. Phytochemicals which are responsible for scavenging free radical (antioxidants) are mostly polar compounds and are extracted by polar solvents. Antioxidants are known for their protective mechanisms in animals' cells by preventing free radical species production – which are extremely reactive species with the ability to accept electrons from other molecules to balance their electron pairs thereby oxidizing and changing these molecules, converting the existing free radicals to harmless molecules (Kumar et al., 2014; Maulana et al., 2019). Antioxidants could be used for management of some health conditions which involve free radicals, resulting in oxidative stress that can contribute to inflammatory, ischemic, cardiovascular, and neurodegenerative diseases responsible for cancer (Jadid et al., 2017; Kendeson et al., 2021). There are very few reports on the medicinal properties of *C. tridens* except that it contains vitamins that could be responsible for its nutritional values (Dzerefo et al. 1995).

Table 1: Antioxidant Activity of the Crude Extracts (Absorbance @ 517 nm)

Concentration	Absorbance				
(mg/mL × 10^{-2})	Methanol	Acetone	Ethyl acetate	Hexane	Vitamin C
3.13	0.161	0.164	0.174	0.184	0.147
6.25	0.158	0.159	0.167	0.174	0.134
12.50	0.144	0.149	0.157	0.170	0.127
25.00	0.118	0.117	0.134	0.159	0.081
50.00	0.068	0.079	0.098	0.122	0.025

Table 2: Percentage Inhibition and the IC_{50} of the Crude Extracts

Concentration	% Inhibition				
(mg/mL × 10^{-2})	Methanol	Acetone	Ethyl acetate	Hexane	Vitamin C
3.13	19.10	17.59	12.56	07.54	26.13
6.25	20.60	20.10	15.91	12.56	32.66
12.50	27.64	25.13	21.10	14.57	36.18
25.00	40.70	41.21	32.66	20.10	59.30
50.00	65.83	60.30	50.75	28.64	87.44
IC_{50}	**34.38**	**37.31**	**46.69**	**66.38**	**22.52**

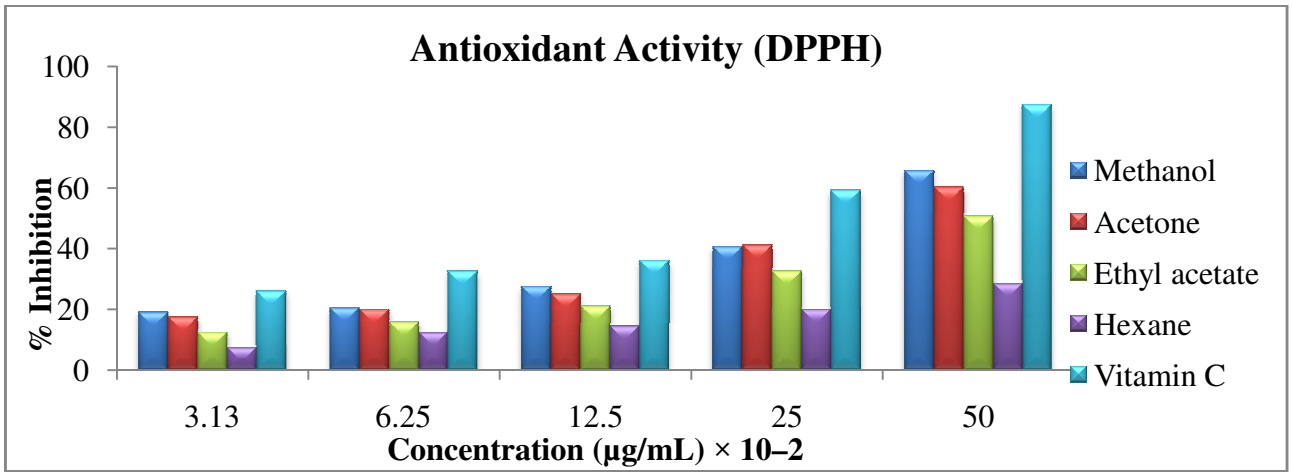

Fig 1: Chat showing the % Inhibition of the Extracts and Standard

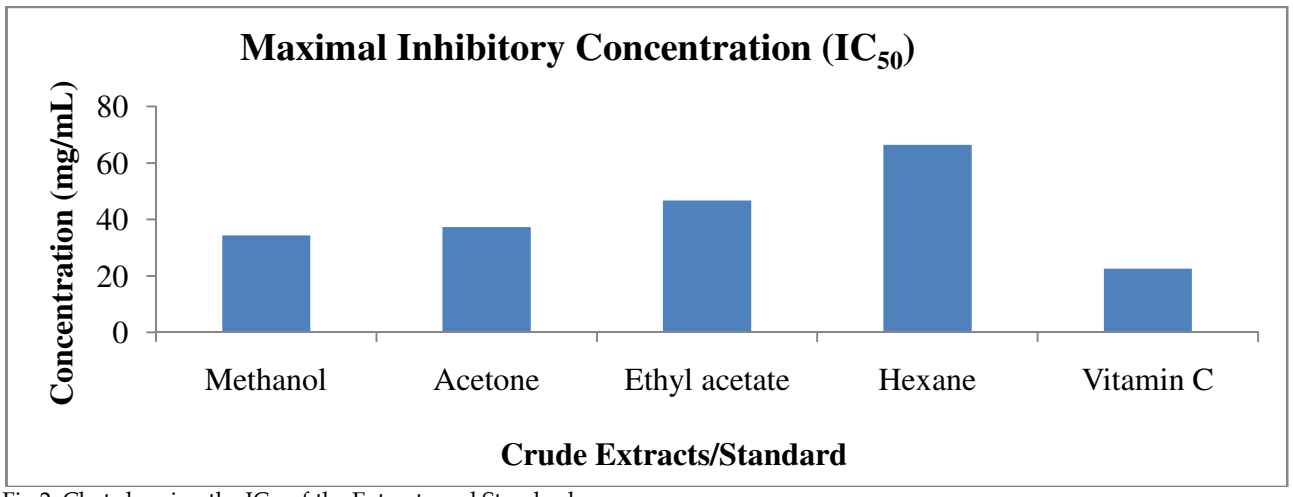

Fig 2: Chat showing the IC_{50} of the Extracts and Standard

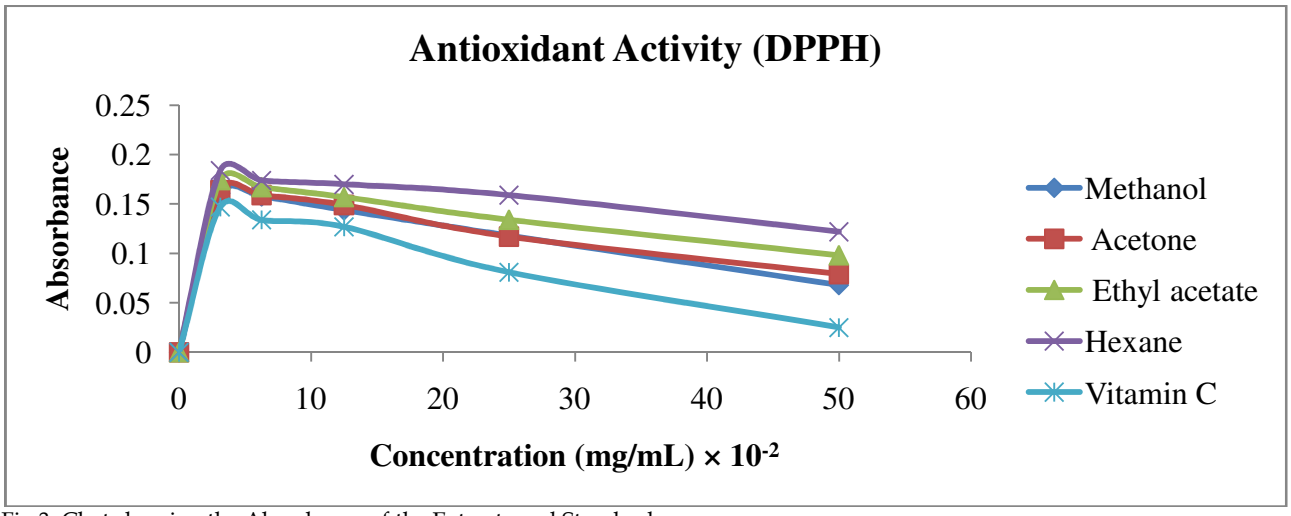

Fig 3: Chat showing the Absorbance of the Extracts and Standard

Conclusion

It was concluded that all the extracts of *C. tridens* leaves exhibited antioxidant properties; hence, the plant leaves could serve as a natural antioxidant, a precursor for antioxidant drugs development in pharmaceutical industries, as well as a good source of diet for man and animals.

Reference

Adeyinka CA and Akintade JM (2015). Morphological Characterization and Hybridization in Four Species of *Corchorus*. Journal of Biology and Nature, 4(3): 179-192.

Catarino L, Romeiras MM, Bancessi Q, Duarte D, Faria D, Monteiro F and Moldão M (2019). Edible Leafy Vegetables from West Africa (Guinea-Bissau): Consumption, Trade and Food Potential. Foods, 8(10): 493. https://doi.org/10.3390/foods8100493.

Dzerefo MC, Shackleton MC and Scholes CM (1995). Seed Germination, Nitrogen Nutrition and Water Requirements of the Edible Herb *Corchorus tridens* (Tiliaceae). Economic Botany, 49(4): 380-386

Ejoh AR, Tanya AN, Djuikwon NV and Mbofung CM (2005). Effect of Processing and Preservation Methods on Vitami C and Total Carotenoid Levels of some *Veronia* (bitter leaf) species. African Journal of Food Agriculture, Nutrition and Development, 1(2): 2005. DOI:10.18697/ajfand.9.1525

Fawzi MN (2018). Seed Morphology and its Implication in Classification of some Selected Species of Genus *Corchorus* L. (Malvaceae). Middle East J. Agric. Res., **7**(1): 1-11.

Freeman AB and Crapo DJ (1982). Biology of Disease: Free Radicals and Tissue Injury. *Laboratory investigation*; Journal of Technical Methods and Pathology, 45(5): 412-426.

Gwarzo SU, Gimba CE, Adeyemo DJ and Paul ED (2017). Neutron Activation Analysis (NAA) and Energy Dispersive X-ray Fluorescence Analysis (EDXRF) on *Corchorus tridens* Linn. ChemSearch Journal, 8(2): 50-55.

Hogg N (1998). Free Radicals in Disease. *Seminars in Reproductive endocrinology*, 16(04): 241-248. http://dx.doi.org/10.4314/bajopas.v5i1.6

Jadid N, Hidayati D, Hartanti RS, Arraniry AB, Rachman YR and Wikanta W (2017). Antioxidant Activities of Different Solvent Extracts of *Piper retrofractum* Vahl. Using DPPH Assay. *AIP Conference Proceedings* 1854, 020019 (2017).

Kendeson AC, Kagoro ML and Adelakun AE (2021). Phytochemical and Pharmacological evaluation of Nigerian *Kalanchoe pinnata* (Lam.) Stem-bark. J. Chem. Soc. Nigeria, 46(4): 0751-0756.

Kumar S, Sandhir R and Ojha S (2014). Evaluation of antioxidant activity and total phenol in different varieties of *Lantana camara* leaves. Biomedicalcentral (BMC) Research notes, **7**: 560-569. DOI:10.1186/1756-0500-7-560

Kumari N, Choudhary BS, Sharma KH, Singh KB, Kumar AA (2019). Health-promoting properties of Corchorus leaves: A review. Journal of Herbal Medicine, 15**:** 100240.

Mahdi-Pour B, Jothy SL, Latha LY, Chen Y and Sasidharan S (2012). Antioxidant activity of methanol extracts of different parts of *Lantana camara*. Asian Pacific Journal of Tropical Biomedicine, 2(12): 960-965.

Maroyi A (2011). Potential role of traditional vegetables in household food security: A case study from Zimbabwe. African Journal of Agri. Research, 6(26): 5720-5728.

Maulana TI, Falah S and Andrianto D (2019). Total phenolic content, total flavonoid content, and antioxidant activity of water and ethanol extract from Surian (*Toona sinensis*) leaves. *IOP Conference Series:* Earth and Environmental Sci., 299: 1-10.

Omojola J, Akomolafe GF, Adediwura SC, Adesuji ET, Joshua ES and Labulo AH (2018). Microgravity-Induced Early Growth and Anatomical Alterations in *Corchorus tridens* (Bush Okra). *Monograph of Atmospheric Research* 2018, Edited by A. B. Rabiu and O. E. Abiye, Centre for Atmospheric Research, Anyigba, Nigeria. pp. 112-115.

Osawaru ME, Ogwu MC, Chime AO and Amorighoye AR (2012). Morphological Evaluation and Protein Profiling of three accessions of Nigerian *Corchorus* Linn. Species. Bayero Journal of Pure and Applied Sciences, 5(1): 26-32.

Shomkegh SA, Mbakwe R and Dagba BI (2013). Ethnobothanical Survey of Edible Wild Plants in Tiv Communities of Benue State, Nigeria. Journal of Natural Sciences Research, 3(7): 17-24.

Ushie OA, Azuaga TI, Aikhoje EF, Neji PA, Abeng FE and Adashu JM (2019). Antioxidant activities of Hexane, Chloroform, Acetone and Methanol Extract of *Swietenia macrophylla*. International Journal of Clinical Chemistry and Laboratory Medicine, (IJCCM), 5(4): 6-10. https://dx.doi.org/10.20431/2455-7153.0504002.

******