Oyeleke et al., 2021
J. basic appl. Res biomed 7(1): 18-23

https://doi.org/10.51152/jbarbiomed.v7i1.209

JBAAR
Journal of Basic and Applied Research in Biomedicine
ISSN 2413-7014

Original Article

Comparative Studies on the Phytochemical Constituents and *in vitro* Antioxidant Activities of Methanol and Ethyl Acetate Leaf Extracts of *Talium Trangulare*

[1]Oyedotun M. Oyeleke, [2]Mutiat O. Bamigboye [1*]Boyede D. Olowookere, [1]Kehinde E. Alabi, [3]Samuel K Oladele, [1]Johnson O. Oladele

[1]Biochemistry Unit, Department of Chemical Sciences, Faculty of Sciences, Kings University, Ode-Omu, Nigeria.
[2]Chemistry Unit, Department of Chemical Sciences, Faculty of Sciences, Kings University, Ode-Omu, Nigeria.
[3]Department of Chemistry, Faculty of Sciences and Education, University of Nigeria, Nsukka. Nigeria

*Corresponding Author: bd.olowokere@kingsuniversity.edu.ng

Received: 23-3-2021
Revised: 15-4-2021
Published: 5-6-2021

Keywords:
Talium trangulare;
Phytochemicals;
Free radical;
Antioxidant;
TPC; FTIR

Abstract: Medicinal herbs have been known for their use as an alternative medicine in the management and treatment of different categories of diseases. The present study was designed to assess the phytochemical constituents present in methanol and ethylacetate leaves extract of *Talium trangulare* and its antioxidant potentials against free radicals comparatively. The functional groups of the phytochemicals were carried out using FTIR techniques while the phytochemical component of the extract was determined by standard methods. The comparative studies of antioxidant abilities of methanol and ethylacetate leaves extracts of *Talium trangulare* were evaluated by various antioxidant assays, including 1,1-diphenyl-2-picrylhydrazyl (DPPH), hydrogen peroxide, hydroxyl radicals, scavenging activities. These different antioxidant activities were compared with standard antioxidants compounds such as ascorbic acid and Gallic acid. The total phenolic content in ethylacetate extract is higher than what was obtained from methanol extract of *Talium trangulare*, however, methanol extract has higher tannins and flavonoids content. The methanol extract was found to have demonstrated high reduction capability and powerful free radical scavenging, especially against DPPH radical and hydrogen peroxide as compared with the ethylacetate leaves extract. The results that was obtained in the present study clearly established the antioxidant potency of both ethylacetate and methanol leaf extracts of *Talium trangulare*. The methanol extract shows better antioxidant activities and more flavonoids and tannin than the ethylacetate extract. In conclusion, the methanol leaf extract of *Talium trangulare* has comparatively better *in vitro* antioxidant potentials with corresponding phytochemical content than ethylacetate extract.

Cite this article as: Oyeleke, O.M., Bamigboye, M.O., Olowookere, B.D., Alabi, K.E., Oladele, S.K., Oladele, J.O. (2021). Comparative Studies on the Phytochemical Constituents and in vitro Antioxidant Activities of Methanol and Ethyl Acetate Leaf Extracts of *Talium Trangulare*. Journal of basic and applied Research in Biomedicine, 7(1): 18-23 https://doi.org/10.51152/jbarbiomed.v7i1.209

INTRODUCTION

Phytochemicals possess great therapeutic properties and they make plants a suitable place for their domain. Phytochemicals present in these plants make them to be called medicinal plants, they guard against some illness, ailment and disease like; asthma and bronchitis, diabetes, heart diseases, insanity, epilepsy, skin disorders, fever and diarrhoea (Alabri, et al., 2014; Oladele *et al.*, 2020a; Oladele *et al.*, 2021) and can also serve as antioxidant for the body (Oladele *et al.*, 2020b). These organic substances (phytochemicals) are active ingredients used as precursors in the production of drugs (Hannah, et al., 2016) and it has been revealed that 80 % of drugs directly or otherwise are obtained from plants (Hannah, et al., 2016). This made the understanding of these phytochemicals in plants important. These phytocompounds have to be extracted, isolated and characterized. It consists of alkaloids, flavonoids, tannins, saponins, phenolic compounds, etc. (Zhao, et al., 2013, Ziotek, et al., 2016) which have noteworthy role to play in human health systems. Flavonoids are important set of polyphenols widely distributed among the plant flora, it is made up of more than one benzene ring in its structure and numerous reports support their use as antioxidants or free radical scavengers (Kar, 2007).

Alkaloids are the largest group of secondary metabolites, they comprise of ammonia compounds of nitrogen bases synthesized from amino acid precursors with various radicals replacing one or more of the hydrogen atoms in the peptide ring, most containing oxygen. Its function is in the defence of plants against pathogens and herbivores; thus, they are used as pharmaceuticals, stimulants, narcotics, and poisons due to their potent biological activities Phenolic compounds, terpenoids are good antioxidant, thereby protecting the human body against oxidative damage through reactive oxygen species, including some radicals like hydroxyl, peroxyl, hypochlorous acid, peroxynitrite, and superoxide anions (Chao, et al., 2014). Tannins are heterogeneous group of high molecular weight polyphenolic compounds with the ability to form complexes with proteins, alkaloids, polysaccharides etc., they help in some epidemiological association with decreasing frequency of chronic disease (Courtneya, et al., 2015). Saponin is derived from Saponaria vaccaria (Quillaja saponaria), a plant, which abounds in saponin and was once used as soap.

Saponins therefore possess 'soaplike' behaviour in water, i.e. they produce foam. They are very vital therapeutically as they are shown to have hypolipidemic and anticancer potentials. The solvent used in extracting these phytochemicals from plants is based on the compounds targeted or isolated (Sasidharam, et al., 2011, Ajanal, et al., 2012 and Mahali, et al., 2012). A solvent that is non-toxic, with preservative action that is quick in evaporating so a crude extract can be obtained and does not interfere with the phytochemicals present in a plant is considered a good solvent to be used in extracting (Das, *et al*., 2011). Since a plant has varieties of these phytochemicals, a good solvent is required for a good yield in the synthesis of drugs. This present study examines the effect of methanol and ethyl acetate on the extraction yield and the qualitative content of phytochemicals present in *Talinum triangulare*. Also, we investigated the antioxidant and free radical scavenging activities of the extracts.

MATERIALS AND METHODS

Chemicals and Reagents

methanol, gallic acid, Folin–Ciocalteu's reagent, HCl, H_2SO_4, Na_2CO_3, aluminium chloride, potassium acetate, potassium persulphate, sodium nitroprusside, hydrogen peroxide, sulphanilic acid, glacial acetic acid, naphthylethylenediamine dichloride, NADH were all purchased from Merck, USA. DPPH

(1,1-diphenyl-1,2-picryl hydrazyl), TPTZ (2,4,6,-tripyridyl-s-triazine), Ferrozine, Deoxyribose Sigma (St Louis, MO, USA). Trichloroacetic acid (TCA), L-Ascorbic acid, and all other chemicals and reagents used were of analytical grade.

Plants Collection
Fresh samples of *Talium trangulare* leaves were harvested in a garden at Obada area of Kings University, Ode-Omu, Osun State, Nigeria. The plant was identified and deposited at the Botany unit of the Department of Biological Sciences, Osun State University, Osogbo, Osun State, Nigeria.

Preparation of Extract
The fresh samples of *Talium trangulare* leaves were air dried at room temperature to constant weight after which they were pulverized into powder using an electrical blender. The powdered leaf materials were cold-macerated with 6 volumes of 80% methanol ethyl acetate separately for 72 hours. Crude extracts were obtained through filtration and then concentrated. Each paste was then freeze dried.

Phytochemical analysis
Qualitative screening of both the methanol and ethylacetate leaf extracts of *Talium trangulare* was carried out to identify the active phytochemicals like phenols, flavonoids, saponins, tannins, coumarins, alkaloids, terpenoids, anthraquinones and anthocyanins using established protocols as detailed by Oladele et al (2020b).

FT-IR Spectroscopic Analysis: Fourier Transform Infrared Spectrophotometer (FTIR) is currently the best technique and equipment to evaluate types of chemical bonds/functional groups present in natural products or phytochemicals. The wavelength of light absorbed is the salient feature of the chemical bonds seen in the annotated spectrum. By interpreting the infrared absorption spectrum, the chemical bonds in a compound can be determined. Dried powder of ethanol solvent extract of *Talinum triangulare* was used for FTIR analysis. 10mg of the dried extract powder was encapsulated in 100mg of KBr pellet, in order to prepare translucent sample discs. The powdered sample of the extract was loaded in FTIR spectroscope (Shimadzu, Japan), with a Scan range from 400 to 4000 cm^{-1} with a resolution of 4 cm^{-1}.

Reducing Power Assay: The reducing power of various extracts was based on Fe (III) to Fe (II) transformation according to the method of Oyaizu (1986). The Fe (II) was monitored by measuring the formation of Perl's Prussian blue at 700 nm, using vitamin C and tannic acid as standards. The extract or standard (100 - 1000 µg/ml) was mixed with phosphate buffer (pH 6.6) and potassium ferricyanide. The mixture was incubated at 50°C for 20 min. Trichloroacetic acid (2.5 ml of 10%) was added to the mixture. A portion of the resulting mixture was mixed with $FeCl_3$ (0.5 ml of 0.1%) and the absorbance was measured at 700 nm in a spectrophotometer. Higher absorbance of the reaction mixture indicated reductive potential of the extract.

Hydrogen Peroxide Scavenging Assay: The ability of the extract to scavenge hydrogen peroxide was determined according to the method of Ilhami et al. (2005). A solution of hydrogen peroxide (40 mM) was prepared in phosphate buffer (pH 7.4). Different concentrations of plant extract were added to a hydrogen peroxide solution (0.6 ml, 40 mM). The absorbance of hydrogen peroxide at 230 nm was determined after 10 min against a blank solution containing phosphate buffer without hydrogen peroxide. The percentage inhibition of hydrogen peroxide of extracts and standard compounds (Vitamin C and Tannic acid) was calculated using the following formula:
% inhibition $[H_2O_2] = [(A_0-A_1)/A_0] \times 100$
Where A_0 was the absorbance of the control, and A_1 was the absorbance in the presence of the sample of extract and standards.

Hydroxyl Radical Scavenging Assay: Hydroxyl radical scavenging activity of the extracts was determined by the method of Klein et al (1981) with a slight modification. 0.5 ml of extract or standard (Vitamin C and Tannic acid) at different concentration was taken in test tubes. 1 ml of Fe-EDTA solution (0.13% ferrous ammonium sulphate and 0.26% EDTA), 0.5 ml of 0.018% EDTA solution, 1 ml of 0.85% DMSO solution and 0.5 ml of 22% ascorbic acid were added into the test tubes. The test tubes were capped tightly and warm at 85°C for 15 minutes into the water bath. After incubation, the test tubes were uncapped, and 0.5 ml ice-cold TCA (17.5%) was added to each of the test tubes immediately. 3 ml of Nash reagent (7.5 g of ammonium acetate, 300 µl glacial acetic acid and 200 µl acetylacetone were mixed and made up to 100 ml) was added to all the tubes and incubated at RT for 15 minutes. Absorbance was taken in UV-spectrophotometer at 412 nm wavelength. Percentage hydroxyl radical scavenging (% HRSA) activity was calculated using the following equation:
$\%HRSA = \{(A_0-A_1)/A_0\} \times 100$
Where A_0 is the absorbance of the control, and A_1 is the absorbance of the extracts/standard.

DPPH – Radical Scavenging Assay: The radical scavenging activity of plant extracts was measured as described by Mensor et al. (2001). The stable 2, 2 diphenyl-1-picryldydrazyl (DPPH) radical was used for the determination of free radical scavenging activities of the extracts. A portion (1 ml) each of the different concentrations (40-1000 µg/ml) of the extracts or standard (Vitamin C and Tannic acid) in test tubes was added to 1 ml of 1 mM DPPH in methanol. The mixtures were vortexed and then incubated in a dark chamber for 30 min after which the absorbances were measured at 517 nm against a DPPH control containing only 1 ml of methanol in place of the extract. All calculations were carried out in triplicates. The inhibition of DPPH was calculated as a percentage using the expression:
$\% I = [(A_{control} - A_{sample})/ A_{control}] \times 100$
Where % I is the inhibition of the DPPH free radicals in percentage; $A_{control}$ is the absorbance of the control reaction containing all reagents except the test compound, and A_{sample} is the absorbance of the test compound.

Statistical Analysis: The results were analysed using SPSS Version 12. Data were expressed as mean ± standard error of the mean (mean ± SD). Student's t-test was employed for comparison between two sets of data while $p < 0.05$ was considered statistically significant.

Table 1: Phytochemical components of methanol and ethylacetate leaf extract of *Talium trangulare*

PHYTOCHEMICALS	MTT	EATT
Phenol	+	+
Coumarins	+	+
Saponin	+	+
Tannin	+	+
Anthraquinone	-	-
Anthocyanin	+	-
Betacyanin	-	+
Glycosides	+	+
Phlobotannin	-	-
Oils and resin	+	+
Proteins	+	+
Quinones	+	-
Flavonoids (Alkaline reagent)	+	+
Flavonoids ($Fecl_3$ reagent)	+	+
Alkaloids	+	+
sterols	+	-
Vitamin c	+	+
Sterols and phytosterols	+	-
triterpenoids	+	+
terpenoids	+	-

RESULTS

Preliminary phytochemical analysis of the extracts
The results of qualitative analysis of both methanol and ethylacetate leaf extracts of *Talium trangulare* is shown in Table 1. It revealed that both extracts are rich in phenol, coumarins, saponin, tannin, glycosides, oils and resin, flavonoids, alkaloids, sterols, and vitamin C. None of the extracts contained anthraquinone or phlobatannin. Only methanol extract has anthocyanin, terpenoids, quinones, sterols and phytosterols as

part of its constituents while ethylacetate extract contained betacyanin.

Total phenols, flavonoids and tannins analysis of the extracts

Table 2 shows the quantitatively analysis of total phenols, flavonoids and tannins present in both methanol and ethylacetate leaf extracts of *Talium trangulare*. The methanol extract has a higher total flavonoid content of 139.56 ± 10.14 equivalent of catechin than ethylacetate extract with 128.28 ± 9.59. Similarly, methanol extract contained higher tannin (2.91 ± 0.20) than ethylacetate leaf extract. However, ethylacetate leaf extract has higher total phenolic content 193.46 ± 8.52 gallic acid equivalent than methanol extract which has 111.74 ± 10.34.

Table 2: Total phenols, flavonoids and tannin components of methanol and ethylacetate leaf extract of *Talium trangulare*

	MTT	EATT
Total Flavonoid Content (catechin EQ)	139.56 ± 10.14	128.28 ± 9.59
Total Phenolic Content (Gallic acid EQ)	111.74 ± 10.34	193.46 ± 8.52
Tannin content	2.91 ± 0.20	2.73 ± 0.14

Table 3**:** FTIR spectral peak valves and functional groups obtained from methanol leaf extract of *Talinum triangulare*

S/N	Peaks wavelength (cm^{-1})	Functional groups
1	692.47	Aromatic CH out-of-plane bend
2	914.29	OH bend
3	1033.88	CO stretch
4	1323.21	Skeletal C-C vibrations
5	1643.41	C=C stretch
6	1660.77	unsaturated C=O stretch
7	2320.54	Alkenyl stretch
8	2850.88	Methylene C-H asym./ sym. Stretch
9	2918.40	Methyl C-H asym./ sym. Stretch
10	3416.05	Hydroxyl group H-bonded OH stretch

Fourier Transform Infrared Spectroscopic Analysis of the extract

The FTIR spectral of methanol and ethylacetate leaf extracts of *Talium trangulare* are presented in Fig. 1 and 2. Table 3 and 4 depicted the data on the peak values and the probable functional groups (obtained by FTIR analysis) present in the methanol and ethylacetate extracts respectively. The region of IR radiation helps to identify the functional groups of the active components present in extract based on the peak's values of the FTIR spectrum. When the extract was passed into the FTIR, the functional groups of the components were separated based on its peak's ratio. The results of FTIR analysis of methanol leaf extract of *Talinum triangulare* confirmed the presence of aromatic CH, OH bend, CO stretch, Skeletal C-C vibrations, C=C stretch, unsaturated C=O stretch, Alkenyl stretch, Methylene C-H, and Hydroxyl group H-bonded OH str. The absorbance bands analyses in the process are observed in the region between 400–4000 cm^{-1} are 692.47, 914.29, 1033.88, 1323.21, 1643.41, 1660.77, 2320.54, 2850.88, 2918.40, and 3416.05 cm^{-1}. Similarly, analysis of ethylacetate leaf extract of *Talinum triangulare* confirmed the presence of Aliphatic bromo compounds CO stretch, C-O stretch, C-O-C stretch, C=C stretch, Skeletal C-C vibrations, C=C stretch, unsaturated C=O stretch, Ketone C=O, Methylene C-H asym., C-H stretch, and Hydroxyl group H-bonded OH stretch.

Table 4: FTIR spectral peak valves and functional groups obtained from ethyl acetate leaf extract of *Talinum triangulare*

S/N	Peaks wavelength (cm^{-1})	Functional groups
1	781.20	Aliphatic bromo compounds, C- Br stretch
2	1039.57	CO stretch
3	1159.26	C-O stretch
4	1246.06	C-O-C stretch
5	1643.41	C=C stretch
6	1384.94	Skeletal C-C vibrations
7	1633.76	C=C stretch
8	1666.55	unsaturated C=O stretch
9	1732.13	Ketone C=O
10	2852.81	Methylene C-H asym./ sym. Stretch
11	2924.18	C-H stretch
12	3417.98	Hydroxyl group H-bonded OH stretch

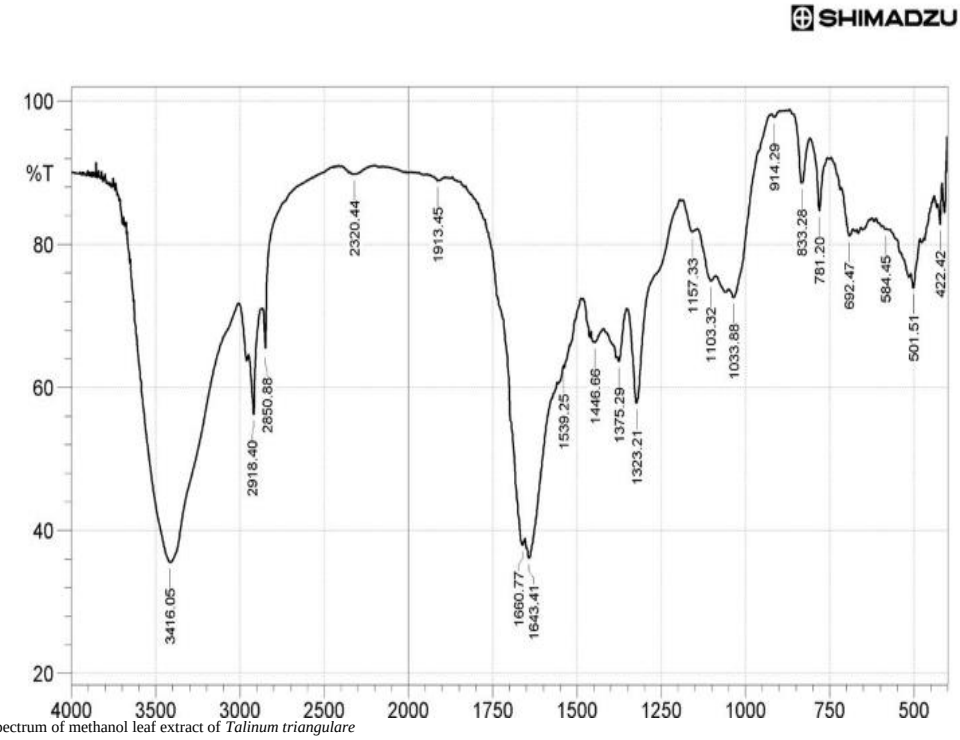

Figure 1: FTIR spectrum of methanol leaf extract of *Talinum triangulare*

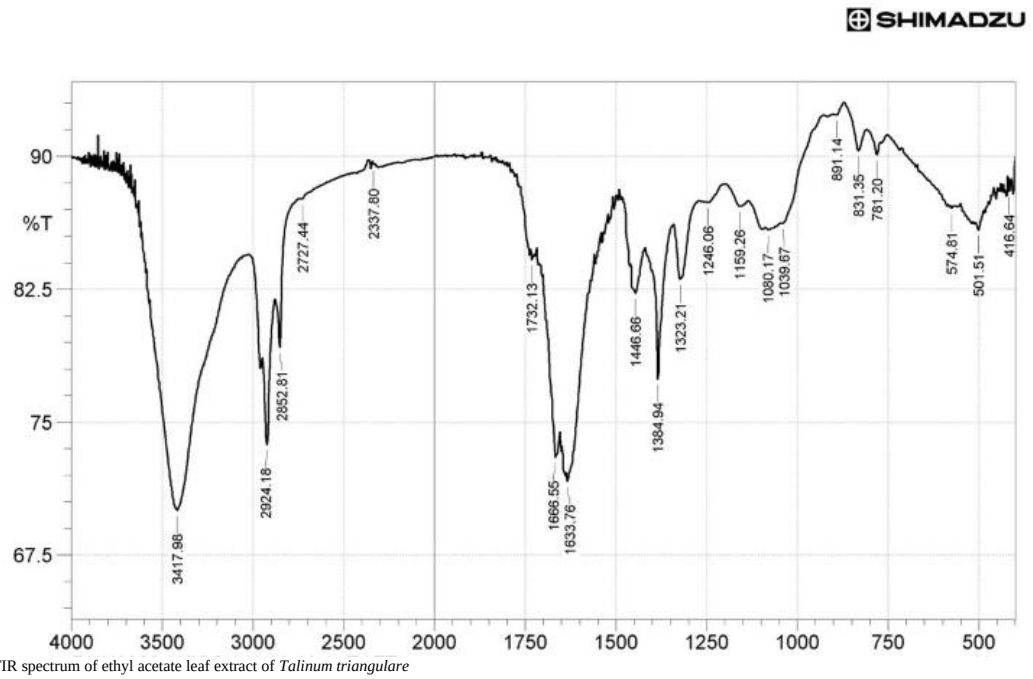

Figure 2: FTIR spectrum of ethyl acetate leaf extract of *Talinum triangulare*

DPPH free radical scavenging activity

The in vitro antioxidant activity of methanol and ethylacetate leaf extracts of Talium trangulare was measured in comparison to the standard antioxidants (Ascorbic and Gallic acids). The percentage of DPPH radical scavenging activity was followed in a dose-dependent manner. The methanol extract showed the highest DPPH free radical neutralizing activity as well as a lower effective at a concentration of 800ug/ml than the ethyl acetate extract and the standard antioxidants (Fig. 3). This indicated that methanol leaf extract of *Talium trangulare* has the highest capacity to reduce oxidative stress caused by free radicals.

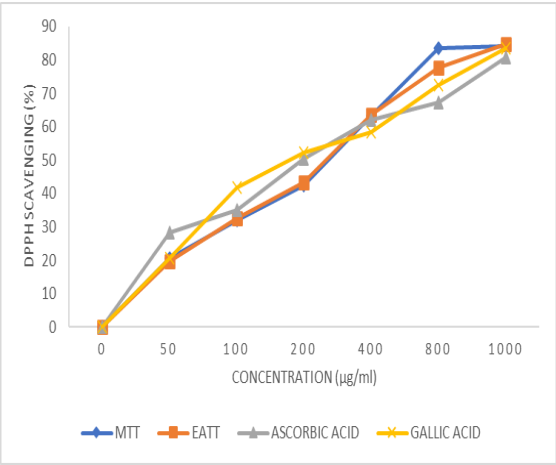

Figure 3: DPPH scavenging activities of different concentrations of methanol and ethylacetate leaf extracts of *Talium trangulare* as compared with antioxidant standards (Ascorbic acid and Gallic acid).

Hydroxyl radical scavenging activity

The hydroxyl radical is the major reactive oxygen species responsible for lipid oxidation and potentially severe biological damage. This assay shows how methanol and ethylacetate leaf extracts of *Talium trangulare* and the standard antioxidants (Ascorbic and Gallic acids) inhibit hydroxyl radical-mediated deoxyribose degradation generated in a Fenton reaction. The hydroxyl radical scavenging capacity of methanol leaf extract of *Talium trangulare* was the highest at the concentration of 1000 µg/mL (Fig. 4). The results show that methanol leaf extract of *Talium trangulare* could provide a major source of antioxidant. Moreover, the ability of the methanol extract to quench hydroxyl radicals might be of direct relevance to the prevention of lipid peroxidation.

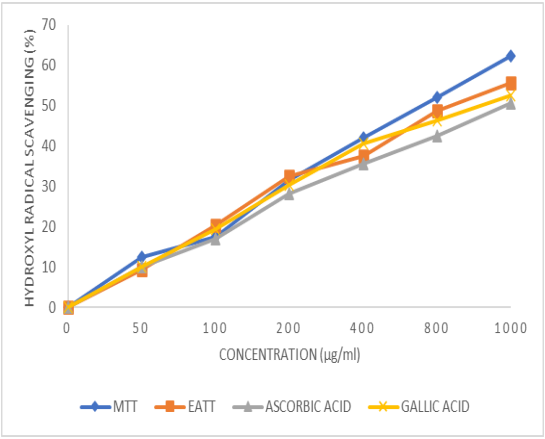

Figure 4: Hydroxyl radical (·OH) scavenging activities of different concentrations of methanol and ethylacetate leaf extracts of *Talium trangulare* as compared with antioxidant standards (Ascorbic acid and Gallic acid)

Reducing Power Activity

Ferric reducing activity power of methanol and ethyl acetate extract of *Talium trangulare* were assayed for with ascorbic acid and Gallic acids as standards (Fig. 5). Results indicated that the extracts and standards could reduce the Fe^{3+} ion in a concentration-dependent manner. However, ethyl acetate leaf extract of *Talium trangulare* showed higher reducing power activity than methanol extract.

Hydrogen Peroxide Scavenging Activity

The results of the *in vitro* hydrogen peroxide scavenging activity of methanol and ethylacetate leaf extracts of *Talium trangulare* and the standard antioxidants (Trolox, Ascorbic and Gallic acids) was shown. The percentage hydrogen peroxide scavenging activities of the methanol and ethylacetate leaf extracts, ascorbic acid and Gallic acid were 92.46, 90.63, 60.13, and 56.64 % respectively at the concentration of 1000 µg/mL

(Fig. 6). Although, the inhibition hydrogen peroxide occurred in a dose-dependent manner, methanol leaf extract of *Talium trangulare* has the highest activity, suggesting that the extract has the capacity to reduce oxidative stress caused by hydrogen peroxide.

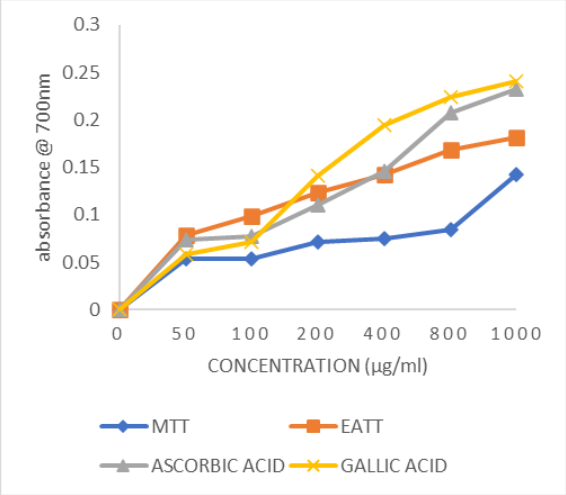

Figure 5: Ferric reducing power activities of different concentrations of methanol and ethylacetate leaf extracts of *Talium trangulare* as compared with antioxidant standards (Ascorbic acid and Gallic acid)

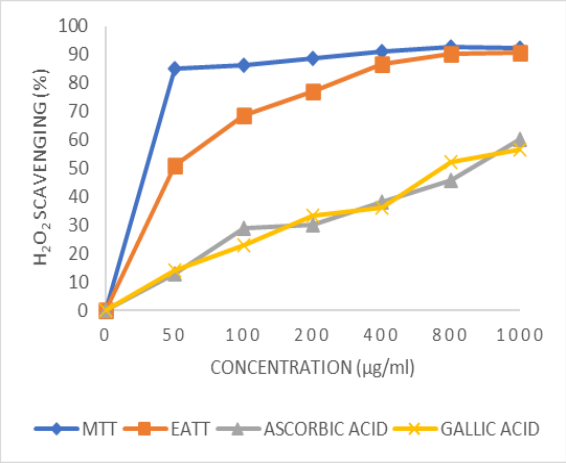

Figure 6: Hydrogen peroxide (H_2O_2) scavenging activities of different concentrations of methanol and ethylacetate leaf extracts of *Talium trangulare* as compared with antioxidant standards (Ascorbic acid and Gallic acid)

DISCUSSIONS

The difference between solvents resides is their polarity which affects their capacity in extracting phytochemicals. The miscibility of organic solvents with each other or even other types of solvents is another fact to be considered in order to improve the polyphenol extraction yield as well as other antioxidant activities shown by several studies (Metrouh-Amir *et al*., 2015; Iloki-Assanga *et al*., 2015). The solubility of the phenolic compounds was mostly influenced by the nature of solvent used and their polarity. Methanol is a known polar protic solvent, while ethyl acetate is less polar as compared with methanol polarities (Ju et al., 2007).

The amount of total phenolic content (TPC), total flavonoid content (TFC), tannins and other phytochemicals content of *Talium trangulare* extracts were given as shown in the results. The results showed variations in the levels of TPC and TFC of the two extracts. As shown, the TPC content in ethylacetate extract is higher than what was obtained from methanol extract of *Talium trangulare*. The lower content of phenolic compounds in methanol extract compared to ethylacetate may be explained by the low solubility of polyphenols in this solvent which could be attributed to bonds, hydrogen force between protein and polyphenols (Sripad *et al*., 1982). However, lower value of TFC was obtained in ethylacetate extract of *Talium trangulare* as compared to value obtained from methanol extract.

The retrieval of phytochemical from plant could probably be influenced by dielectric constant, chemical structure of organic solvents, and also with chemical properties of plant phytochemical. There is presence of anthocyanin, quinones, sterol, phytosterols and terpenoids in methanol extract which were not present in ethyl acetate extract, so also there was presence of betacyanin in the ethyl acetate extract with no such in the methanol extract, this means that this plant contains less of aglicones than flavonoid heterosides.

The connections between tannins contents and extraction solvents can be related to the polymerization amount for the tannins extracted by different solvents (Naima *et al*., 2015). The methanol extract contained higher amount of tannins than the ethyl acetate extract which would have contributed to the antioxidant potentials of *Talium trangulare*. Flavonoids, Phenolic acids, and tannins are the central dietary phenolic compounds which contributed to the protection of cells against pathogens and predators. Antioxidant activity of phenolic compounds is owed to their ability to scavenge free radicals, donate hydrogen atoms or electrons or chelate metal cations (Nagendran, 2006).

FTIR analysis was done to ascertain some functional groups presence in the both the methanol and ethylacetate extracts comparatively to show their phytochemicals potentials and different functional groups. Methanol leaf extract was documented to contain aromatic CH, OH bend, CO stretch, Skeletal C-C vibrations, C=C stretch, unsaturated C=O stretch, Alkenyl stretch, Methylene C-H, and Hydroxyl group H-bonded OH str. On the other hand, ethylacetate extract contained Aliphatic bromo compounds CO stretch, C-O stretch, C-O-C stretch, C=C stretch, Skeletal C-C vibrations, C=C stretch, unsaturated C=O stretch, Ketone C=O, Methylene C-H asym., C-H stretch, and Hydroxyl group H-bonded OH stretch.

Radical scavenging activities are critical to prevent the damaging role of free radical in different diseases. DPPH is known to abstract labile hydrogen, and the ability to scavenge the DPPH radical is related to the inhibition of lipid peroxidation (Kedare and Singh, 2011). The results indicate that the methanolic extract and the ethyl acetate extract of *Talium trangulare* have differential capacities to scavenge the DPPH free radicals. The methanol extract showed better DPPH free radical neutralizing activity as well as a lower effective at a concentration of 800ug/ml than the ethyl acetate extract. The result shows comparative DPPH free radicals scavenging abilities as compared with ascorbic acid and of gallic acid standards with methanol extract having the higher activities.

The hydroxyl radicals have been reported to affect the known biomolecules like nucleic acids, proteins, lipids and polypeptides (Shi et al., 2004; Oladele *et al.*, 2020c). The result indicated that methanol and ethyl acetate extract of *Talium trangulare* could scavenge hydroxyl radicals effectively. The methanol extract showed more hydroxyl radical scavenging activity than ethyl acetate extract. Data showed that methanol extract at concentration of 400, 800 and 1000ug/ml together with ethyl acetate extract and gallic acid showed a considerable hydroxyl capacity than ascorbic acid. This may be due to the presence of its more polyphenolics, hydrogen donors and reducing agents in the extract (Hatano et al., 1989).

Similarly, ferric reducing activity power of methanol and ethyl acetate extract of *Talium trangulare* were assayed for with ascorbic acid and Gallic acids as standards. Results indicate that the extracts and standards could reduce the Fe^{3+} ion in a concentration-dependent manner. Here, the ethyl acetate extract has more ferric ion reducing antioxidant power than the methanol extract. The higher the ferric ion reducing power of an extract the higher the power of the extract with greater potentials as antioxidants.

Hydrogen peroxide is a weak oxidizing agent that inactivates few enzymes directly usually by oxidation of essential thiol (-SH) groups. It can also cross some cell membranes rapidly; once inside the cell, it can probably react with Fe^{2+} and possibly Cu^{2+} ions to form hydroxyl radicals and this could be the source of

many of its toxic effects (Kumaran and Karunakaran, 2007). The methanol extract showed good scavenging ability than the ethyl acetate extracts as compared with the standard compounds. The values for the methanol extract were found to be higher at concentrations of 50, 100, 200 and 400ug/ml compared to the values of ethyl acetate at the same concentration.

CONCLUSION

The need for a continuous search of oxidative stress mechanisms and effective intervention strategies for scavenging of free radical activities cannot be over-emphasized. The methanol and ethyl acetate leaf extract of *Talium trangulare* which is used in traditional plant medicine to manage numerous diseases was screening for phytochemical analysis and antioxidant activity in this study. The results here shown that the methanolic extract and the ethyl acetate extract of *Talium trangulare* extract consist some phytochemicals which are of great health benefits such as phenol, quinones, flavonoids, alkaloids. We can conclude that by using methanol extraction the total phenolic content is lower than by using ethyl acetate extraction, but for total flavonoids contents, the methanol extraction is more effective.

ACKNOWLEDGEMENT

Author is thankful to the Technical staff of Chemical laboratories, Kings University, Nigeria making their laboratories available for the successful completion of research work.

Funding

There is no funding source**.**

Conflict of interest

The authors have no conflict of interest.

REFERENCES

Ajanal, M, Gundkalle M and Nayak S. (2012). Estimation of total alkaloid in chitrakadivati by UV-spectrophotometer. *Ancient Science of life*. 31(4): 198-201

Alabri, T.H.A., A.H.S. Al Musalami, M.A. Hossain, A.M. Weli and Q. Al-Riyami, (2014). Comparative study of phytochemical screening, antioxidant and antimicrobial capacities of fresh and dry leaves crude plant extracts of *Datura metel. L. J. King Saud Univ. Sci*. 26: 237-243.

Chao P-Y, S.-Y. Lin, K.-H. Lin et al., (2014). "Antioxidant activity in extracts of 27 indigenous Taiwanese vegetables," *Nutrients*. 6 (5): 2115–2130,

Courtneya, R. J. Sirdaartaa,b, B. Matthewsc, I. E. Cock. (2015). Tannin components and inhibitory activity of Kakadu plum leaf extracts against microbial triggers of autoimmune inflammatory diseases. *Pharmacognosy Journal*. 7(1): 18-31.

Das, K, Tiwari, RKS, Srivastava DK. (2010). Techniques for evaluation of medicinal plant products as antimicrobial agent. Current method and future trends. *Journal of medicinal plants Res.* 41: 104-111.

Hannah Hepsibah, G. Jeya Jothi. (2016). A comparative study in the effects of solvents in the phytochemical profile and biological potential of *ormocarpum cochinchinese* auct non (LOUR). *International Journal of Pharmacy and Pharmalogical science.* 9(1): 67-72.

Hatano, T., Edamatsu, R., Hiramatsu, M., Mori, A., Fujita, Y., 1989. Effects of tannins and related polyphenols on superoxide anion radical and on 1,1-diphenyl-2-picrylhydrazyl radical. *Chem. Pharm. Bull*. 37: 2016–2021.

Ilhami G. I., Haci A. A. and Mehmet C. (2005). Determination of *in vitro* antioxidant and radical scavenging activities of Propofol. *Chem Pharmacol Bull*. 53(3): 281-285.

Iloki-Assanga SB, Lewis-Luján LM, Lara-Espinoza CL, Gil-Salido AA, Fernandez-Angulo D, Rubio-Pino JL, Haines DD. (2015). Solvent effects on phytochemical constituent profiles and antioxidant activities, using four different extraction formulations for analysis of Bucida buceras L. and Phoradendron californicum. *BMC Research Notes*. 8: 1–14.

Ju, S.P., Liao, M.L., Yang, S.H. and Lee, W.J. (2007). Hydrogen-bond dynamics of interior and surface molecules in a water nanocluster: Temperature and size effects. *Molecular Physics*. 105(4): 429–438.

Kar, A. (2007). Pharmacognosy and Pharmacobiotechnology (Revised-Expanded Second Edition). New Age International Limted Publishers New Delhi. pp 332-600

Kedare, S.B. and Singh, R.P. (2011). Genesis and development of DPPH method of antioxidant assay. *J. Food Sc. Technol*. 48(4): 412-422.

Klein S.M, Cohen G., Cederbaum A.I. (1981). Production of formaldehyde during metabolism of dimethyl sulphoxide by hydroxyl radical generating system. *Biochem*, 20: 6006–6012.

Kumaran, A. and Karunakaran, R.J., (2007). In vitro antioxidant activities of methanolic extract of Phyllanthus species from India. *LWT-Food Science and Technology*, 40: 322-352.

Mahdi-Pour, B., Jothy, S.L, Latha, L., Chen, Y and Sasidharan S. (2012). Antioxidant activity of methanol extracts of different parts of Lantana cannar. *Asian pacific journal of tropical biomedium*. 2(12): 960-965

Mensor, L. L., Menezes, F. S., Leitão, G. G., Reis, A. S., Santos, T. C. D., Coube, C. S., & Leitão, S. G. (2001). Screening of Brazilian plant extracts for antioxidant activity by the use of DPPH free radical method. *Phytotherapy research*. *15* (2): 127-130.

Metrouh-Amir H, Duarte CMM, Maiza F. (2015). Solvent effect on total phenolic contents, antioxidant, and antibacterial activities of Matricaria pubescens. *Industrial Crops and Product.* 67: 249–56.

Nagendran Balasundram, Kalyana Sundram, Samir Samman. (2006). Phenolic compounds in plants and agri-industrial by-products: antioxidant activity, occurrence, and potential uses. *Food Chem*. 99: 191–203.

Naima, R., Oumam, M., Hannache, H., Sesbou, A., Charrier, B., Pizzi, A., & Charrier-El Bouhtoury, F. (2015). Comparison of the impact of different extraction methods on polyphenols yields and tannins extracted from Moroccan Acacia mollissima barks. *Industrial Crops and Products*. 70: 245-252.

Oladele JO, Ajayi EIO, Oyeleke OM, Oladele OT, Olowookere BD, Adeniyi BM, Oyewole OI, Oladiji AT. (2020)a. A systematic review on COVID-19 pandemic with special emphasis on Curative potentials of medicinal plants. *Heliyon*. 6: 1-17. https://doi.org/10.1016/j.heliyon.2020.e04897

Oladele JO, Bamigboye MO, Olowookere BD, Oyeleke OM, Anyim JC, Oladele KS, Oyewole IO. (2020)b. Identification of bioactive chemical constituents present in the aqueous extract of *Telfairia occidentalis* and its *in vitro* antioxidant activities. *Journal of Natural & Ayurvedic Medicine*. 4(2): 1-10.

Oladele JO, Oyeleke OM, Oladele OT, Oladiji AT. (2021). Covid-19 treatment: Investigation on the phytochemical constituents of *Vernonia amygdalina* as potential Coronavirus-2 inhibitors. Computational toxicology. 18. 100161. https://doi.org/10.1016/j.comtox.2021.100161

Oladele, JO., Adewale, OO., Oyeleke, OM., Oyewole IO., Salami, MO., Owoade G. (2020)c. *Annona muricata* protects against cadmium mediated oxidative damage in brain and liver of rats. *Acta facultatis medicae Naissensis.* 37 (3): 252-260. DOI:10.5937/afmnai2003252O.

Oyaizu M. (1986). Studies on product of browning reaction prepared from glucose amine. *Japan J Nutr*. 44: 307-315.

Sasidharan, S, Chen Y, Saravanan D, Sundaram KM, Yoba, Lathal. (2011). Extraction, isolation and characterization of bioactive compounds from plants extraction. *African journal of traditional altern medicine; 8:1-10*

Shi, Y., Lan, Y., Matson, C., Mulligan, P., Whetstine, J.R., Cole, P.A., Casero, R.A., Shi, Y., (2004). Histone demethylation mediated by the nuclear amine oxidase homolog LSD1. *Cell* 119 (7): 941–953.

Sripad, G., Prakash, V., & Rao, M. S. N. (1982). Extrability of polyphenols of sunflower seed in various solvents. *Journal of Biosciences*, 4(2): 145-152.

Zhao, Y.S. Chen, Y. Wang, C. L, J. Wang, and J. Lu. (2018). "Effect of drying processes on prenylflavonoid content and antioxidant activity of Epimedium koreanum Nakai." *Journal of Food and Drug Analysis*. 26(2): 796–806.

Złotek, U, S. Mikulska, M. Nagajek, and M. Swieca. (2016). "Effect of different solvents and number of extraction steps on the polyphenol content and antioxidant capacity of basil leaves (Ocimum basilicum L.) Extracts. *Saudi Journal of Biological Sciences*. 23(5): 628–633.