Antioxidant Activity of the Fruit and Stem bark of *Tetrapleura tetraptera*

Taub (Mimosaceae).

Famobuwa, O.E[3]. Lajide, L[1]. Owolabi, B.J[1]. Osho, I.B[2]. and Amuho, U.E[3].

1. Dept. of Chemistry, Federal University of Technology, Akure. Nigeria.

2. Dept. of Animal production and health, Federal University of Technology, Akure. Nigeria.

3. Dept. of Chemistry, Adeyemi Federal University of Education, Ondo. Nigeria.

Corresponding Author: O.E. Famobuwa, Chemistry Department, Adeyemi Federal University of Education, Ondo, Nigeria. E-mail: edyniyi@yahoo.com

Abstract

The present investigation was carried out to evaluate the antioxidant activity of ethanol extracts of *Tetrapleura tetraptera* stem bark and fruit. 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging assay and Ferric Reducing Antioxidant Property (FRAP) assay were carried out to determine the antioxidant activity of the extracts. The antioxidant activity of the extracts which was determined by DPPH increases with a corresponding increase in concentration. The DPPH for the stem bark ranged from 28.74% to 85.26% while that of fruit ranged from -10.56% to 66.01%. The percentage antioxidant activity of the stem bark extract is almost at par with that of Ascorbic acid while that of fruit extract is about 75%. But at 25 mg/ml, the fruit extract showed a pro-oxidant activity. The reductive ability of the stem bark extract ranged from 0.393 to 1.641 mg Ascorbic acid equivalent per mL of extract (about two-fifth of the reference drug) while that of fruit extract ranged from 0.342 to 1.325 mg Ascorbic acid equivalent/ml of extract (one-third that of reference drug). The efficacy of the fruit and stem bark extracts of *T.tetraptera* in some of its bioactivities may be attributed to its favourable antioxidant potential.

Key words: *Tetrapleura tetraptera,* DPPH radical scavenging assay, Fe^{+3}reducing assay

1.0 Introduction

Tetrapleura tetraptera Taub (Mimosaceae) popularly called Aridan, in the Yoruba speaking area of South West Nigeria. It is a perennial, single-stemmed plant with dark green leaves. It is found in the rain forest belt of West Africa. The plant has many ethno-medicinal and non-medicinal uses such as anti-ulcer, anti-microbial, anti-convulsant, emulsifying, contraceptive, and as a nutritive agent.[1;2] Due to the foaming ability of the fruit, it is used in the production of black soap. The dry fruit has a pleasant aroma that is insect-repellant in nature [3]. The use of the fruit as spices in foods is as a result of its medicinal value. There is wide acceptance of medicinal plants in preference to synthetic drugs nowadays, because they are cheaper and of little or no adverse effect. Thus, there is great demand for natural antioxidants, because of lack of any undesirable effect. The objective of the present investigation was to evaluate, comparatively, the antioxidant potential of different concentrations of the stem bark and fruit of *T.tetraptera.*

2.0 Materials and Methods

2.1 Collection of Plant Material: Fresh plant parts were collected from a plantation in Ondo, South-west, Nigeria. Identification and authentication were carried out by Mr. R.A. Sanni of the Department of Biology, Adeyemi College of Education, Ondo, Nigeria, with voucher number ACH 2614. Fresh plant material was washed under running tap water, air dried and then homogenized to fine powder and stored in airtight bottles.

2.2 Solvent Extraction: Thoroughly washed plant parts were dried in shade for five days and then powdered with the help of blender. The powdered plant parts were extracted successively with ethanol in Soxhlet extractor for 48 h. The solvent extracts were concentrated under reduced pressure and preserved at 5°C in airtight bottle until further use.

2.3 Antioxidant property:

The ferric reducing property was determined by assessing the ability of extracts to reduce $FeCl_3$ solution as described [4]. Briefly, extracts (0-250 µL of stock) were mixed with 250 µL 200mM Sodium phosphate buffer (pH 6.6) and 250 µL of 1% potassium ferrocyanide, the mixture was incubated at 50^{o}C for 20 mins, thereafter 250 µL of 10% trichloroacetic acid was added, and subsequently centrifuged at 650 rpm for 10 mins, 1000 µL of the supernatant was mixed with equal volume of water and 100 µL of 0.1g/100 mL ferric chloride, the absorbance was later measured at 700 nm. A higher absorbance indicates a higher reducing power.

1,1-diphenyl-2 picrylhydrazyl free radical scavenging ability: The free radical scavenging ability of the extracts against DPPH (1,1-diphenyl-2- picrylhydrazyl) free radical was evaluated as described [5]. Briefly, appropriate dilution of the extracts (1mL) was mixed with 1mL of 0.4mM methanol solution containing DPPH free radicals, the mixture was left in the dark for 30 mins and the absorbance was measured at 516nm. The DPPH free radical scavenging ability was subsequently calculated.

Scavenging activity (%) = A – B / A x 100

Where A is absorbance of DPPH and B is absorbance of DPPH and extract combination.

3.0 RESULTS

Figure 1: Ferric reducing antioxidant property

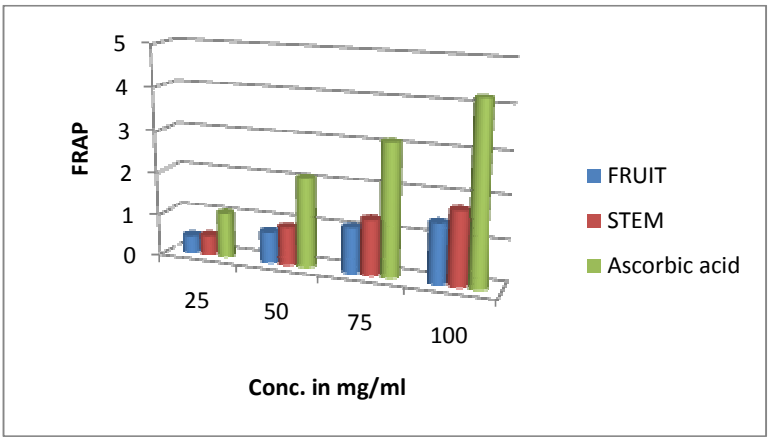
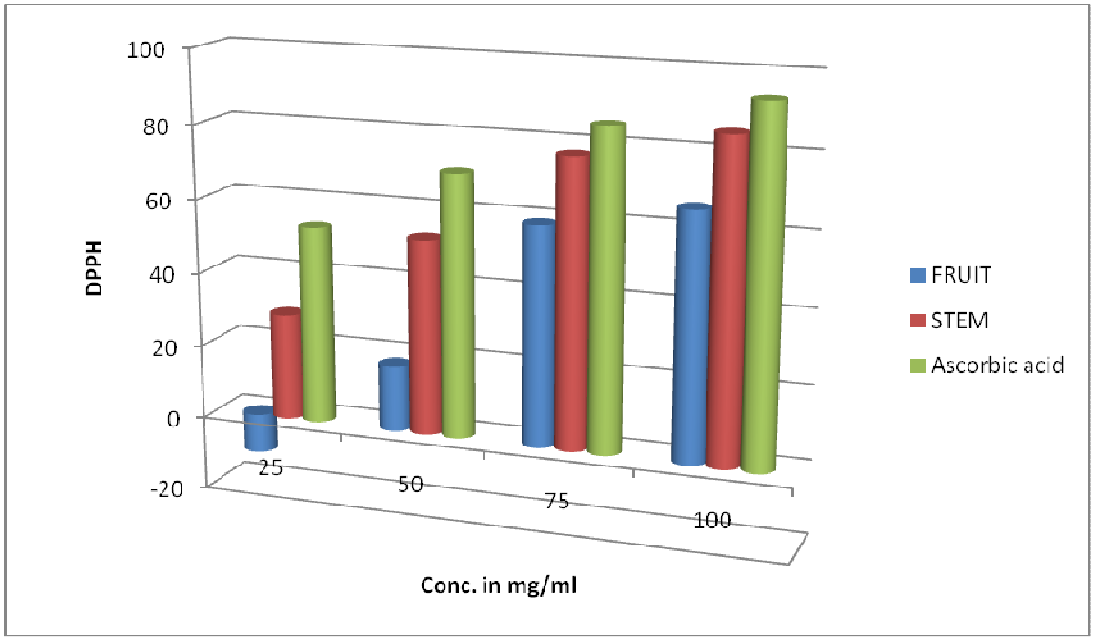


Figure 2: DPPH free radical scavenging ability (%)



4.0 DISCUSSION

Studies have shown that the reactive oxygen species of low reactivity can be converted to a highly reactive species [24]. Reaction of hydrogen peroxide (H_2O_2) with low valence forms of the transition metal ions iron (Fe^{2+}) and copper (Cu^{2+}) ion lead to the formation of $^{\cdot}OH$

(Fenton reaction) or species of comparable reactivity such as Fe^{2+}(Ferryl ion) or $Cu(OH)_2^+$ a copper III complex. The hydroxyl radical $^{\cdot}OH$, abundant under physiological conditions are quite reactive, reacts rapidly with any type of biological molecules in living cells, such as sugars, amino acids, phospholipids and nucleobases (the components of nucleic acids) [6]

The antioxidant activities have been reported to be the concomitant development of reducing power.[7].

The reductive ability of the stem bark extract ranged from 0.393 to 1.641 mg Ascorbic acid equivalent per mL of extract (about two-fifth of the reference drug) while that of fruit extract ranged from 0.342 to 1.325 mg Ascorbic acid equivalent/ml of extract (one-third that of reference drug) as shown in figure 1.

The antioxidant activity of the extracts which was determined by DPPH increases with a corresponding increase in concentration. The DPPH for the stem bark ranged from 28.74% to 85.26% while that of fruit ranged from -10.56% to 66.01%. The percentage antioxidant activity of the stem bark extract is almost at par with that of Ascorbic acid while that of fruit extract is about 75% (Figure 2). But at 25 mg/ml, the fruit extract did not show any anti-oxidant but pro-oxidant activity. This implies that 25mg/mL or lower concentration of the fruit extract is not safe as an anti-oxidant agent. The efficacy of the fruit and stem bark extracts of *T.tetraptera* in some of its bioactivities may be attributed to its favourable antioxidant potential.

The extracts have shown concentration dependent radical scavenging activity, conversely, at 25 mg/ml, the extract of the fruit of *T. tetraptera* is pro-oxidant. Though the scavenging activity of the standard was higher than those of ethanol extracts, they are potential antioxidant drugs..

CONCLUSION

The efficacy of the fruit and stem bark extracts of *T.tetraptera* in its bioactivities may be attributed to its potential antioxidant activity. From the results, the stem bark performed better as an anti-oxidant agent. Further studies on isolation of active constituents and their biological activities are to be carried out.

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