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(RESEARCH ARTICLE)

Assessment of antioxidant potentials of functional parts of medicinal plant (*Jatropa multifida*)

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Abstract

The present research was conducted to evaluate antioxidant properties and phenolic potentials of leaf and flower parts of a medicinal plant (*Jatropa multifida*). Extracts were prepared from the leaf and flower of the plants with aqueous and methanolic solvents system at 5.0% concentration. Total phenolic contents of plant extracts was determined by Folin-Ciocalteu method while free radical scavenging ability of leaf and flower plant extracts was assessed using 2,2-diphenyl-2-pricrylhydrazyl [DPPH]. Results revealed significantly ($P<0.05$) high antioxidant potentials obtained from flower extract which was comparatively higher than that obtained from leaf extract. Highest DPPH inhibition (74%) was exhibited by methanolic flower extract of *Jatropa multifida* plant, while the least (66.9%) DPPH inhibition was demonstrated by aqueous leaf extract. Besides, *Jatropa multifida* methanolic flower extract contained highest amount (18.0mg of catechol g^{-1}) of phenols while the lowest amount (8.0mg of catechol g^{-1}) was obtained from aqueous leaf extract of the plant. Results from this investigation suggest that high radical scavenging potentials of this medicinal plant may be attributed to the hydrogen donating ability of phenolics, while organic solvent has higher extractable properties.

Keywords: *Jatropa multifida*; Dipheny; Picryl hydrazy; Antioxidant potentia; Folin-Ciocalteu method

1. Introduction

Myriad of studies on phytomedicines have reported that phenolic compounds protect against oxidative stress [1]. Some of these medicinal plants have been investigated for their antioxidative properties and used for treatment of various diseases [2]. Most of the bioactive metabolites from these plants especially flavonoids demonstrated potent antioxidant activity in vitro and in vivo [3]. Many synthetic antioxidants and metal chelator components have also exhibited toxic or mutagenic effect coupled with suppression of body immunity which have shifted attention towards naturally occuring antioxidants [4]. *Jatropa multifida* is grown specifically for its essential oils in its leaves and flowers where thymol, eugenol, citral, geraniol and linalool have been extracted [5]. Medicinal plants play pivotal role in the health care of ancient and modern cultures, Indians and Chinese system of medicine depend solely on plant based drugs to treat various human ailments since they contain different components of therapeutic value [6].

Besides, plant based drugs remain very important source of therapeutic agents due to availability, relatively cheaper cost as well as non-toxic nature compared to unorthodox medicine [7]. Most medicinal plants contain antioxidant compounds that protect the cells against the damaging effects of reactive oxygen species such as superoxide anions, hydroxyl radicals and hydrogen peroxide [8]. These radicals are are generated in human body via aerobic respiration or rather from exogenous sources and thus play crucial roles in the development of various ailments such as arthritis,

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asthma, cardiovascular disorders, neurodegenerative and parkinson diseases. However, phenolic compounds from medicinal plants possess strong antioxidant activity and may help protect the cells against oxidative assault caused by free radicals [9].

Hence, the present study was aimed to assess the untapped antioxidant potential of functional parts of *Jatropa multifida* medicinal plant.

2. Material and methods

2.1. Collection of Plant Sample

Fresh leaves and flowers of *Jatropa multifida* plant were fetched from a reserved virgin forest neear Ikere-Ekiti township, Ekiti State, Nigeria. The plant was authenticated at the herbarium centre of Department of Agricultural Technology, Federal Polytechnic, Ado-Ekiti.

2.2. Preparation of Plant Extracts

The aqueous extract was prepared by extracting 150g of powdered sample in cold sterile distilled water, aggitated with mechanical shaker, and filtered via buchner funnel with No 1 whatman's filter paper, frozen at -40^{0}C and dried with freeze dryer for 72hrs and percentage yield of 11.33% was obtained [10]. 120g each of powdered samples was extracted with (70%) methanol. The mixture was decanted and filtered with No 1 Whatman's filter paper which measured up to 600mls and was evaporated to dryness to give 9.96% yield.

2.3. DPPH Radical Scavenging Assay

10µl of plant extract (leaf and flower) was added to 100µl of DPPH solution in a microtitre plate. The reaction mixture was incubated at 25^{0}C for 5mins and was left in the dark for 30mins after which the absorbance was read at 520nm. DPPH with corresponding solvents without plant extract served as control while methanol with corresponding plant extracts served as blank and was calculated as……

$$\% \text{ Inhibition of DPPH} = \frac{Control_{Absorbance} - Test_{Absorbance}}{Control_{Absorbance}} \times 100$$

The free radical scavenging ability of leaf and flower extracts of *Jatropa multifida* plant was determined by 2, 2-diphenyl-2-picryl-hydrazyl (DPPH) using method described by [11]. DPPH is a protonated radical with maximum absorption at 517nm that decreases with the scavenging of the proton radicals by plant extracts. It is a commercially available stable free radical, purple in colour where the antioxidant molecules in the extracts react with DPPH when incubated and thus convert it into di-phenyl hydrazine, which is yellow in colour. The degree of decolouration of purple to yellow was measured at 520nm which is a measure of scavenging potential of plant extracts.

2.4. Determination of Total Phenols

The total phenolic content of the *Jatropa multifida* extracts was determined with [12] method. A reaction mixture of (v/v) Folin-Ciocalteu reagent and (w/v) sodium carbonate was added to the extracts and the mixture was vortexed and incubated at 400C for 30min after which the absorbance was measured at 765nm. Phenols react with phosphomolybidic acid in Folin-ciocalteau reagent in alkaline medium to produce blue colored complex which is estimated colorimetrically.

2.5. Statistical analysis

Samples were analyzed in triplicate and the results were presented as Mean ± S.D.

3. Results and discussion

Table 1 Inhibitory potential of leaf and flower aqueous extracts against DPPH radicals

Exract conc. (mg/ml)	% Inhibition (leaf)	% Inhibition (flower)
Basal	-	-
Control	-	-
10	22.41	40.51
20	32.46	41.32
40	46.06	61.82
80	62.51	70.10
160	66.91	72.82

Table 2 Inhibitory potential of leaf and flower methanolic exrracts against DPPH radicals

Exract conc. (mg/ml)	% Inhibition (leaf)	% Inhibition (flower)
Basal	-	-
Control	-	-
10	25.00	37.11
20	38.91	37.25
40	52.65	57.80
80	63.92	59.20
160	67.07	74.10

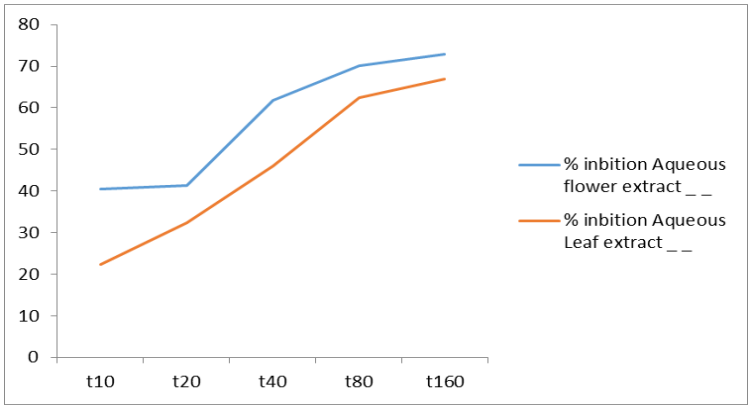

Figure 1 Inhibitory potential of leaf and flower aqueous extracts of Jtropa multifida against DPPH radicals

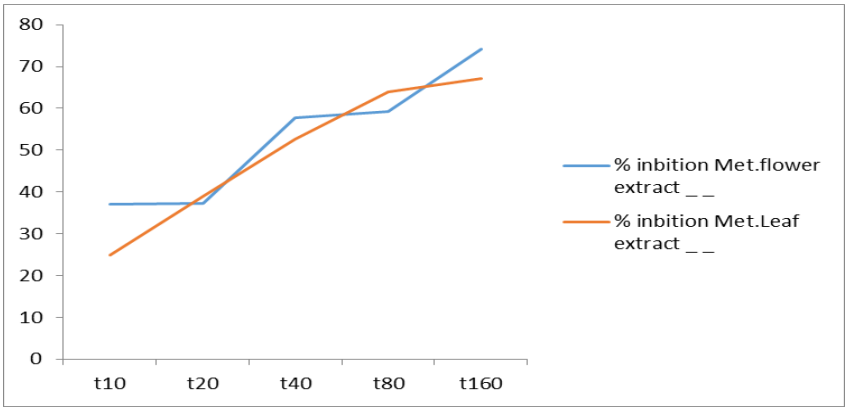

Figure 2 Inhibitory potential of leaf and flower methanolic extracts of *Jatropa multifida* against DPPH radicals

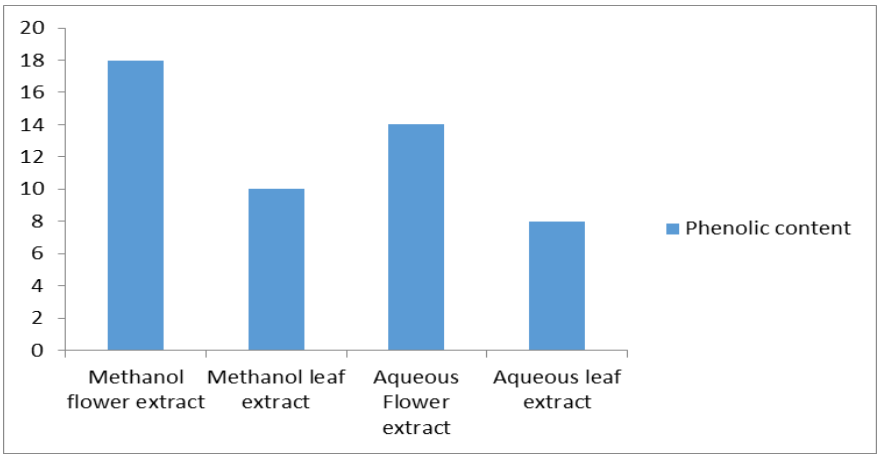

Figure 3 Total phenolic content of aqueous and methanolic extracts of *Jatropa multifida* leaf and flower

4. Discussion

Free radicals are constantly generated resulting in extensive damage to tissues and macromolecules leading to development of various diseases. Medicinal plants are employed as alternative therapy to mitigate the oxidative stress related diseases [13]. Results from this study showed that DPPH scavenging ability of the two parts of *Jatropa multifida* plant screened in aqueous and methanolic solvent system significantly ($P<0.05$) demonstrated strong DPPH inhibition. The flower extracts demonstrated higher DPPH inhibition (74% and 72.8%) in methanol and aqueous solvent system respectively when compared to leaf extract with (67.1% and 66.9%) obtained from methanol and aqueous solvent system respectively.The high antioxidant capacity of the plant extracts may be attributed to the hydrogen donating ability of its inherent phenols and flavonoids [14]). DPPH is a stable free radical in aqueous and organic medium usually used as a substrate to evaluate the antioxidative activity of antioxidant [15]. It accepts an electron or hydrogen radical to become a stable diamagnetic molecule. Phenolics are pharmacological active component of plant which are capable of neutralizing free radicals, chelating metal catalysts and as well inhibiting activity of oxidizing enzymes in biological system [16]. Hence, the higher antioxidant potential demonstrated by *Jatropa multifida* flower extract suggests the flower part a better antioxidant riched part of the plant and more suitable for medicinal therapy for treating oxidative stress related diseases. Besides, antioxidant activity of plant often associate with its inherent phenolic compounds as plant phenols constitute its major group of primary antioxidants [17]. Figure 3 shows the total phenolic content of *Jatropa multifida* plant extracts. The flower extract of the plant possessed higher higher phenolic content than the leaf extract. This further suggests a good correlation between phenolic content and antioxidant activity of the plant which could possibly react with reactive oxygen species (ROS) and thus, inhibit lipid peroxidation that gives rise to oxidative stress [18].

5. Conclusion

It can be inferred from the data obtained in (Tables 1 and 2) above that flower part of *Jatropa multifida* plant possesses higher antioxidant potentials which are of greater medicinal values than the leaf part even though both are highly functional.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest.

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