

EVALUATION OF FREE RADICAL SCAVENGING ACTIVITY OF CRUDE EXTRACTS OF *SIDA CORDIFOLIA*

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Article Received on
28 Sept. 2017,

Revised on 18 Oct. 2017,
Accepted on 08 Nov. 2017

DOI: 10.20959/wjpr201715-10125

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ABSTRACT

In the present study, different extracts of aerial parts of *Sida cordifolia* plant using solvents like water, 50% aqueous methanol, methanol were tested for DPPH free radical scavenging activity. *Sida cordifolia* is a perennial sub shrub of the mallow family Malvaceae native to India. The study was carried out to estimate the qualitative analysis of various phytoconstituents and in vitro estimation of antioxidant activities of alcoholic extracts of *Sida cordifolia*. Among different extracts studied for free radical scavenging activities, potent anti oxidant is 50% aqueous extract of *Sida cordifolia*. Aqueous methanol

extract is shown to be more potent than water extract of *Sida cordifolia*. Further isolation of particular phytoconstituent is needed for the study of antioxidant nature of *Sida cordifolia*, suggesting that the plant contain potential bioactive compounds. results were compared with that of standard (Vit C).

KEYWORDS: *Sida cordifolia*, phytoconstituent.

INTRODUCTION

Medicinal plants are used as a source for relief from illness and available in the form written documents phytochemically and the percentage submitted to bioactivity study is even smaller. Thus, any photochemical research of a given plant will reveal only a narrow spectrum of its constituents. Historically it is known that numerous therapeutic agents are developed from natural and synthetic sources by preliminary screening of phytochemicals. So in order to discover a bioactive compound of early civilization in emerging and developing countries, preliminary screening was carried out. The potentiality of phytochemical to develop into a new drug is still unexplored. Among the estimated plant species, less research work was carried principle as new drug random screening of medicinal plants is essential.

The drugs natural or modified further synthetically as single phytochemical entities are currently in use economically. Medicinal plants represent a rich source of antioxidant and anti-inflammatory agents. All parts of plants are used for extract as raw drugs and they possess varied medicinal properties.

Sida cordifolia L. (Malvaceae) is a perennial sub shrub of the mallow family Malvaceae native to India. The specific name, *cordifolia*, refers to the heart-shaped leaf. It is commonly known as bala (Sanskrit), country mallow, heart-leaf sida or flannel weed, known as Bala in Ayurveda (Indian system of medicine) for its anti-rheumatic and antipyretic activities (Muzaffer *et al.*, 1991). It is also used in folk medicine for the treatment of inflammation of the oral mucosa, blennorrhoea, asthmatic bronchitis, aching joints, cough, wheezing, edema and nasal congestion. The plant contains mainly alkaloids, fatty oils, steroids, resin, resin acids, mucin and potassium nitrate. The different concentrations of alcoholic extracts were subjected to preliminary phytochemical screening for the identification of different phytochemicals and were found to have ephedrine, pseudoephedrine, sterculic, malvalic and coronaric acid, saponins, betaphenethylamine, hypaphorine and ecdysterone. The seeds show demulcent and laxative effects as well as the root infusion was found to possess astringent, diuretic and tonic properties and help in treating hemiplegia, facial paralysis and in urinary disorders (The Wealth of India, 1972; Rastogi and Malhotra, 2001). There are scanty reports on the analgesic, anti-inflammatory and hypoglycaemic activities of the plant (Table 1). The present study focuses on the evaluation of these activities from aerial and root extracts of *Sida cordifolia*.

Table 1: Medicinal properties of *Sida cordifolia*.

S.No	Activity	Part of the plant	Reference
1	Hepatoprotective	Aerial parts	Kumar and Mishra., 1997.
2	Anti inflammatory Properties	Aerial and root parts	Kanth <i>et al.</i> , 1999
3	Antioxidant	Water extracts of herb	Auddy <i>et al.</i> , 2003
4	Anti inflammatory activity	ethyl acetate and alcohol extracts	Diwan and Kulkarni., 1983
5	Anti inflammatory activity	aerial part, root extract	Diwan <i>et al.</i> , 1983
6	Hypotension	Herb	Medeiros <i>et al.</i> , 2006
7	Hepatoprotective	Fumaric acid isolated from <i>S.cordifolia</i>	Kumar <i>et al.</i> , 1997
8	Hepatoprotective effect	aqueous extract of <i>S. cordifolia</i>	Silva <i>et al.</i> , 2006
9	Antibacterial activity against <i>F. verticillioides</i>	leaf extract	Mahesh <i>et al.</i> , 2008.
10	Parkinson's disease	herb	Khurana & Gajbhiye.,

			2013
11	Wound healing activity.	roots	Jaiswal <i>et al.</i> , 2004
12	Hypoglycaemic		Shah &Khan., 2014
13	Reducing effect of the oro-facial nociceptive response	leaf extract	Bonjardim <i>et al.</i> , 2011
14	Anti-pyretic and anti-ulcerogenic	methanolic extract	Philip <i>et al.</i> , 2008
15	Antidiabetic and anti-hypercholesterolemic	aerial parts	Kaur <i>et al.</i> , 2011

In the human body, oxygen centered free radicals and other reactive oxygen species may be produced as by products of biochemical pathways. Excessive release of such free radicals can cause oxidative damage to bio molecules i.e. DNA, RNA, Proteins and Lipids. This may eventually lead to chronic diseases like atherosclerosis, cancer, diabetes, aging and other degenerative diseases in human (Halliwell, 1994). Plants contain a wide variety of phytochemicals act as free radical scavengers include phenolic compounds and some other endogenous secondary metabolites (Cai *et al.*, 2003). Most of the plants have medicinal value with great antioxidant potential and used as adjunctive therapy in the treatment of diabetes, diarrhoea and hyperlipidemia. The main constituents of medicinal plants such as saponins, flavanoids and polyphenols are known to be major bioactive compounds in Ayurvedic medicine.

These activities affirm the presence of biologically active compounds in the plant. Further investigations are in progress for the isolation of bioactive molecules and the establishment of the mechanism of actions to produce potential bioactive molecules from this plant. Taking into consideration of vast potentiality of plants as sources for antioxidants, systematic approach is followed to screen *Sida cordifolia*, a local flora for anti oxidant anti inflammatory potential.

Experimental section

Plant material collection and preparation of extract: The leaves of *Sida cordifolia* (Fig: 1) were collected near Kondapalli, Krishna district, Andhra Pradesh, India.



Fig 1: Twig of *Sida cordifolia*.

Free radical scavenging activity (FRSA): DPPH (1, 1-diphenyl-2-picrylhydrazyl) scavenging radical activity was determined on the basis of reduction of coloured methanolic solution of DPPH method of Szabo *et al.* FRSA of the test substances added to the methanolic solutions of DPPH is inversely proportional to the differences in initial and final absorption of DPPH solution at 570 nm. Drug activity was expressed as that 50% inhibitory concentration (IC_{50}). The reaction mixture contained 1×10^{-4} M methanolic solution of DPPH and various concentrations of the test substances. The activity was determined using vitamin C as standard. Percentage inhibition was determined by comparing the absorbance values of test and control tubes.

The DPPH radical scavenging activity (%) of the sample was calculated as:

$$\% \text{ DPPH scavenging activity} = 1 - \frac{\text{absorbance of sample}}{\text{absorbance of control}} \times 100.$$

IC_{50} values were obtained from the best fit line drawn concentration (μg) vs. percentage inhibition.

RESULTS

The results showed that the inhibition of DPPH radical was dependent on the concentration of the extract. The extent of percentage inhibition also increased from a low polarity solvent extract to a high polarity solvent extract. The standard citric acid 1, 2.5 and 5 $\mu\text{g}/\text{ml}$ showed 10.98, 34.14 and 74.23% inhibition respectively (Table 2). Among all extracts, 50% alcoholic extract showed more % inhibition when compared with other extracts (Table 3). Previous studies showed the extracts have high phenolic content. Free radical activity could be due to the phenol content. The results obtained in the current study indicating that *S. cordifolia* is a potential source of natural antioxidants.

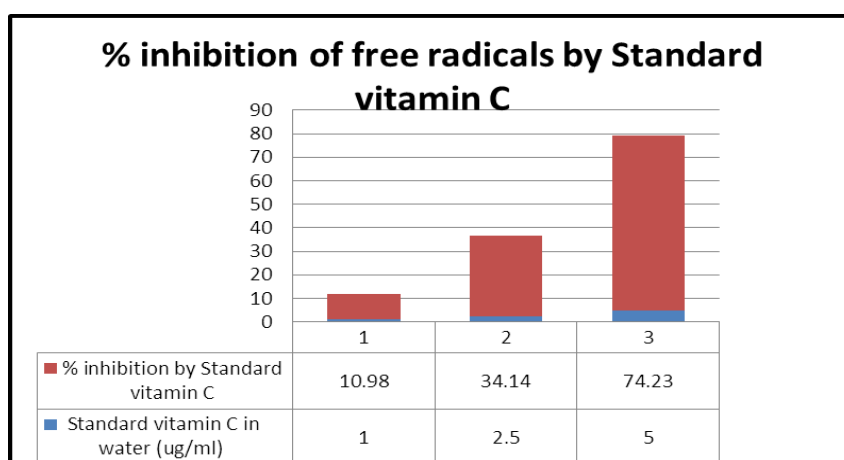


Table 2: Percentage free radical scavenging activity of different concentrations of Standard Vit C.

*values are mean of triplicate.

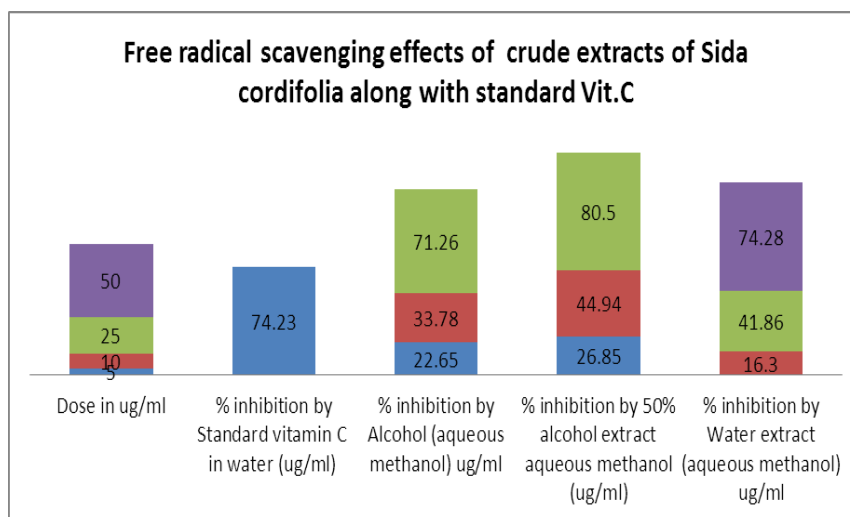


Table 3: Percentage free radical scavenging activity of different extracts of *Sida cordifolia* along with standard Vit C.

*values are mean of triplicate

Nowadays Antioxidants have gained more importance on account of their positive effects, as health promoters in the treatment of cardiovascular problems, atherosclerosis, many forms of cancer, the ageing process, etc. many antioxidant compounds which are naturally occurring in plant sources have been identified as free radical scavengers. In present study, *in vitro* antioxidant activity (FRSA) of extracts of *Sida cordifolia* (Table 4) show potential free radical scavenging activities expressed in IC₅₀ (µg/ml).

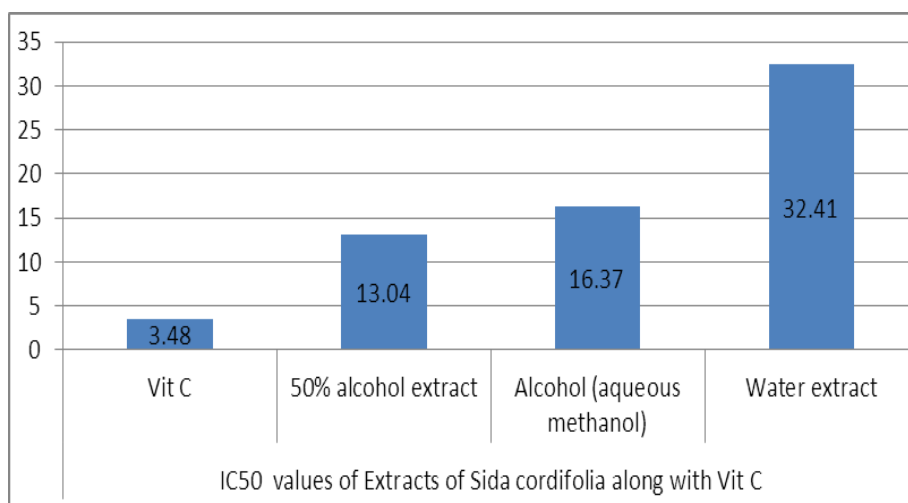


Table 4: IC₅₀ values of free radical scavenging activity of different extracts of *Sida cordifolia* along with standard Vit C.

DISCUSSION

These activities affirm the presence of biologically active compounds in the plant. Further investigations are in progress for the isolation of bioactive molecules and the establishment of the mechanism of actions to produce potential bioactive molecules from this plant. Taking into consideration of vast potentiality of plants as sources for antioxidants, systematic approach is followed to screen the local flora for anti oxidant anti inflammatory from *Sida cordifolia*.

Different solvents are used to isolate antioxidants because of their differences in polarities. Water, aqueous methanol, 100% methanol, the solvents commonly used in extraction processes. The nature of the selected solvent determines the antioxidant activity of the extract and the yield (Gong *et al.*, 2012). In this study, aqueous methanol and water were preferred as solvents for the extracts to be prepared.

There are a number of methods and modifications have been practiced to determine antioxidant activity of the different plant extracts and their isolated compounds. Total antioxidant activity, metal chelation, radical scavenging (DPPH) effects and reducing power as well as activities destructive to active oxygen species such as the superoxide anion radical, hydroxyl radical and hydrogen peroxide are widely used for this purpose (Shimada *et al.*, 1992).

There are a number of methods are practiced to determine the free radical scavenging activities of antioxidants. Among them, fast, easy and reliable method is the DPPH method and it is a preferred method because it does not require a special reaction and device. DPPH is a stable, synthetic radical that does not disintegrate in water, methanol, or ethanol. The free radical scavenging activities of extracts depend on the structural conformation and the ability of antioxidant compounds to lose hydrogen (Shimada *et al.*, 1992; Fukumoto and Mazza, 2000). The DPPH free radical, which is at its maximum wavelength at 517 nm, can easily receive an electron or hydrogen from antioxidant molecules to become a stable diamagnetic molecule (Soares *et al.*, 1997). Owing to the DPPH radical's ability to bind H, it is considered to have a radical scavenging property. A solution of DPPH radicals prepared in methanol is converted into DPPH-H (diphenylhydrazine) molecules in the presence of an antioxidant agent, as shown in the following equation. In the environment, there is decreasing quantity of DPPH radicals and followed by discoloration. The discoloration of the DPPH therefore

reflects the radical scavenging activity of the analysed extract (Guo *et al.*, 2007; Molyneux, 2004).

Phenolic compounds and polyphenols are the most abundant phytoconstituents in plants. Generally antioxidant compounds are in the phenolic form. The antioxidant properties of phenolic compounds originate from their properties of proton loss, chelate formation and dismutation of radicals. Their structure activity relationships are examined for this purpose. Phenols are compounds that have the ability to destroy radicals because they contain hydroxyl groups. These important plant components give up hydrogen atoms from their hydroxyl groups to radicals and form stable phenoxyl radicals; hence, they play an important role in antioxidant activity.

CONCLUSION

Among different extracts studied for free radical scavenging activities, potent anti oxidant is 50% aqueous extract of *Sida cordifolia*. Aqueous methanol extract is shown to be more potent than water extract of *Sida cordifolia*. Further isolation of particular phytoconstituent is needed for the study of antioxidant nature of *Sida cordifolia*, suggesting that the plant contain potential bioactive compounds. Further bioactive studies and the identification of these compounds in *Sida* species are more useful in studies of immunostimulating effects.

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