

Native wild plants in Karachi, Pakistan: Rich source of antioxidant raw material

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Abstract: Extracts of nine plants were studied for DPPH radical scavenging and reducing abilities. *Pentatropis spiralis*, *Calotropis procera*, *Heliotropium curassavicum*, *Withania somnifera* and *Chenopodium album* showed reducing power ranging from 34% to 146%. *Suaeda fruticosa*, *Trianthema portulacastrum*, *Pluchea lanceolata* and *Rumex dentatus* has excellent antioxidant potential proved by their DPPH scavenging and reducing power. 1000µg/10µl chloroform extract of *S. fruticosa* gave 92% scavenging with IC₅₀ value less than 0.7µg/10µl while its hexane extract possessed 80% reducing activity at 100µg/10µl concentration. DPPH free radical scavenging by methanolic extract of *Trianthema portulacastrum* was 60% and 76% at 1000 and 100µg/10µl respectively with IC₅₀ value of 0.03µg/10µl while the reducing activity of 124% at 100µg/10µl. Methanolic extract of *P. lanceolata* showed 91% and 70% scavenging activity at 1000 and 100µg/10µl with IC₅₀ value of 0.7µg/10µl. Reducing power is comparable with the reference BHA standard that is 98% at 100µg/10µl concentration. *Rumex dentatus*' extracts are excellent DPPH scavengers and hydrogen donors produced 156% reduction. Chloroform extract was inefficient antioxidant. These results make these plants a candidate for future research for treating ailments due to imbalance in free radicals.

Keywords: Antioxidant activity, DPPH free radical scavenging, reducing power, wild plants.

INTRODUCTION

The Scientists all over the world are logically involved in collecting the information about the possible uses of plants resources and their products from wild areas. In Pakistan there is a range of climatic and environmental conditions supporting wide variety of economically important plants (Qureshi *et al.*, 2010). It is about time to carry out detailed botanical, chemical and pharmacological research to screen and identify such useful plants as indigenous resources. A well known fact about fruits, vegetables, and whole grains is their indispensable role for great health benefits. This led to the expansion of research in the field of identifying specific bioactive components, such as antioxidants, which may be responsible for improving and maintaining health in plants related to wild areas. In previous studies it is reported that several plants of this eco-region (Pakistan) contains biologically active compounds (Rasool *et al.*, 1991). The aim is to search among the wild plants commonly available in vicinity of our workplace for their possible role in medicinal field. This kind of study will also scientifically verify the use of herbal medicine.

Antioxidant and reducing potential of plants affect their healing power. More is the strength of plant to curb the stress producing free radicals such as super oxide anions, hydrogen peroxide, hydroxyl, nitric oxide and per oxynitrite, higher will be its medicinal value. Antioxidants may offer resistance to oxidative stress primarily through

free radical scavenging and inhibiting lipid per oxidation, metal ion chelating and reducing capacity, therefore, may support the treatment of deadly diseases like cancer, rheumatoid arthritis, cardiovascular diseases, nephrotoxicity, diabetes mellitus, atherosclerosis, myocardial infarction, anemia, asthma, inflammation, Alzheimer's disease and other neurodegenerative disorders. Human bodies have both enzymic and non enzymic antioxidant ways to prevent and help cure these diseases but once the diseased condition prevails it overwhelms the antioxidant pathways and then the body needs exogenous antioxidant. Various forms of antioxidants such as vitamins, minerals, carotenoids and polyphenols have been reported to be present in food stuffs that are beneficial for various disorders by preventing damage against cell proteins, lipids and carbohydrates (Berris 1991). Besides, plants having internal antioxidant potential there are plants for instance *Withania somnifera* that enhances the antioxidant potential by increasing the level of specific natural enzymes viz super oxide dismutase, catalase and glutathione per oxidase in brain of rodents (Dhuley, 2007) and *Pluchea lanceolata* that has the restoration capability of such enzymes (Jahangir *et al.*, 2005). Anti oxidant properties of plants help as anti-stress, cognition-facilitator, anti-inflammatory and anti-aging in experimental animals and in clinical situations (Bone, 1996).

Nine wild plant species that were selected for the study are *Pentatropisspiralis* (Forsk) Decene, *Calotropis procera* (*Asclepiadaceae*), *Heliotropium curassavicum* L.

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(Boraginaceae), *Withania somnifera* L. Dunal (Solanaceae), *Suaeda fruticosa* L. Forsk, *Chenopodium album* L. (Chenopodiaceae), *Trianthema portulacastrum* L. (Aizoaceae), *Pluchea lanceolata* DC. Oliv (Astraceae), *Rumex dentatus* L. (Polygonaceae). All these plants are shrubs (xerophytes) and drought resistant which are well adapted to semi arid ecosystem. These plants are commonly found growing in drought and salt affected areas. Such plants also contain some ethno-botanic values (Bhatti *et al.*, 1998). In the present study the commercial potential of these plants are investigated on the basis of their antioxidant (DPPH scavenging and Hydrogen donation) activities. In previous studies selected plants were either reported as of herbal medicine or used as an insect or pest repellent (Qureshi *et al.*, 2010; Qasim *et al.*, 2010). Such discoveries are not only helpful to be used against animal/human disease driving forces but can also be used against plants intrusions such as crown gall disease (Nighat *et al.*, 2009).

MATERIALS AND METHODS

Plant material

Selected nine wild plants were collected from fields of PCSIR Laboratories Complex Karachi, Pakistan, in the month of February and March 2010 and authenticated by flora of Pakistan. The whole plant material was rinsed with distilled water and shade dried. One Kg of the dried plant material was ground and soaked in one L ethanol for further fractionation in hexane, Chloroform, ethyl acetate and methanol (table 1). These fractions are then evaporated under reduced pressure to obtain isolated specified solvent extracts. The extracts of each plant were then subjected to antioxidant activities.

Antioxidant assay

The DPPH radical scavenging activity (Nicole *et al.*, 1996) of test solutions that are various plant extracts in different concentrations (5-100 µg/ml) were estimated by adding 5 µl of test solution with 95 µl of 0.3mM ethanolic DPPH radical solution in 96 well plate and incubated at 37°C for 30 minutes followed by measuring the absorbance at 515nm in micro titer plate reader, Spectramax plus 384, Molecular Devices, USA. The positive control sample is DMSO added to DPPH radical solution.

The DPPH radical scavenging effect is measured in terms of percentage by formula:

$$= \frac{Ac - As}{Ac} \times 100$$

Ac is the absorbance of control

As is the absorbance of test sample

Total reducing ability

The reducing power of specified plant extracts in corresponding solvents was determined according to the

method (Oyaizu *et al.*, 1986), extracts were mixed with 250 µl of 0.2M phosphate buffer of pH 6.6 and 250 µl of 1% potassium ferricyanide solution and incubated at 50°C. After 20 minutes, 250 µl of 10% trichloroacetic acid was added and mixture was centrifuged for 10min at 3000 rpm to collect 250 µl of supernatant in another test tubes followed by the addition of equal volume of deionized water. Finally to complete the reaction 50 µl of 0.1% of ferric chloride was added before measuring the absorbance on Specord 200, Jena, Germany. Reducing power of sample is directly proportional to the absorbance at 700 nm. Controls are reagents without sample extracts while Butylated hydroxyl anisole (BHA) is used as reference standard.

STATISTICAL ANALYSIS

Data was analyzed using SPSS 16.0.0 and IC₅₀ values were determined by linear regression statistics using least square method. All assays for Analysis of antioxidant potential and reducing activities are done in triplicates.

RESULTS

The phytochemical properties of nine wild plants of Karachi, Pakistan were determined. The free radical scavenging and reducing power of different organic extracts of selected plants were determined by methods identified in materials and methods section. The recovered amounts of crude extracts and extracts in different organic solvents are mentioned in table 1. IC₅₀ values for antioxidant activity in crude and isolated solvent fractions of nine wild plants are shown in table 2 and table 3 shows reducing activity of crude and isolated solvent fractions of same plants.

Pentatropis spiralis extracts in ethylacetate gave very good antioxidant activity at 1000 µg/10 µl than extract in methanol at same concentration having IC₅₀ value 0.75 µg/10 µl while its reducing activity is also found to be 77.6% that is best among other plant extracts in same solvents. *Calotropis procera* is another plant used in study and it has considerable reducing power in methanol extract that is 109.5% while other extracts also produce more than 50 % reducing activity although the antioxidant activities in crude, methanol and ethyl acetate extracts are not found significant. The *Helitropium curassavicum* is also studied for its activities and fig 1c shows that 100 µg/10 µl crude and ethyl acetate extracts of plant produce more than 40% DPPH scavenging activity while methanol extract showed more than 36% activity. Ethyl acetate extract also produced the activity at 1000 µg/10 µl extract solution while the other extracts with same concentration got turbid and hence the activity could not be determined. Activity in hexane extract was comparable in 1000 µg/10 µl concentration but decreased in 100 µg/10 µl extract. Besides antioxidant activity by scavenging phenomena,

Table 1: Weight in grams of crude and isolated solvent fractions of nine wild plants of Karachi, Pakistan

Plant	Crude	Hexane	Chloroform	Ethyl Acetate	Methanol	Water
<i>Pentatropis spiralis</i>	13	1.5	1.0	2.8	4.0	2.0
<i>Calotropis procera</i>	14.7	2.2	1.5	2.9	5.1	3.2
<i>Heliotropium curassavicum</i>	15.0	2.0	1.8	4.5	4.2	2.5
<i>Withania somnifera</i>	10.0	1.4	1.5	2.0	4.0	1.1
<i>Suaeda fruticosa</i>	9.8	1.0	1.5	3.1	3.2	1.0
<i>Chenopodium album</i>	12.5	1.5	2.0	3.1	4.2	1.4
<i>Trianthema portulacastrum</i>	10.0	1.1	1.9	1.9	2.9	1.0
<i>Pluchea lanceolata</i>	10.5	1.2	2.0	3.1	3.0	1.2
<i>Rumex dentatus</i>	10.8	1.3	2.6	2.2	3.3	1.4

Table 2: IC₅₀ values for antioxidant activity in crude and isolated solvent fractions of nine wild plants of Karachi, Pakistan (NS= Non significant)

Plants	IC ₅₀ of Antioxidant Activity (µg/10 µl)				
	Crude	Methanol	Chloroform	Eth. Acetate	Hexane
<i>Pentatropis spiralis</i>	NS	3.6	11	0.75	NS
<i>Calotropis procera</i>	NS	NS	10	NS	10
<i>Heliotropium curassavicum</i>	1.25	1.39	NS	7.2	NS
<i>Withania somnifera</i>	NS	NS	1.5	NS	10.43
<i>Suaeda fruticosa</i>	0.58	NS	0.68	NS	0.6
<i>Chenopodium album</i>	NS	4.55	8.33	3.42	4.3
<i>Trianthema portulacastrum</i>	0.065	0.03	NS	NS	NS
<i>Pluchea lanceolata</i>	NS	0.7	0.65	4.27	6.87
<i>Rumex dentatus</i>	0.79	NS	NS	7.19	NS

Table 3: Reducing activity of crude and isolated solvent fractions of nine wild plants of Karachi, Pakistan (NS= Non significant)

Plants	Reducing Activity (100 µg/10 µl)				
	Crude	Methanol	Chloroform	Eth. Acetate	Hexane
<i>Pentatropis spiralis</i>	54	56.5	67.3	77.66	NS
<i>Calotropis procera</i>	50.83	109.5	77.66	66.83	58.33
<i>Heliotropium curassavicum</i>	54.16	65.0	40.0	38.0	34.0
<i>Withania somnifera</i>	132.16	146.16	110.33	48.83	83.16
<i>Suaeda fruticosa</i>	66.83	NS	38.0	NS	80.0
<i>Chenopodium album</i>	98.3	71.16	64.6	86.3	80.0
<i>Trianthema portulacastrum</i>	45.1	124	45.16	24.83	25.9
<i>Pluchea lanceolata</i>	78.5	97.16	70.33	63.83	51.0
<i>Rumex dentatus</i>	156.0	52.0	NS	78.0	51.0

reducing potential of all extracts were determined and found to be around 40% while crude and methanolic extracts gave more than 50% potential (54% and 65% respectively). Among all solvents ethyl acetate is one of the best to make whole plant extract, the antioxidant activity of ethyl acetate extract was observed at both concentrations with IC₅₀ value of 7.2µg/10µl along with 38% reducing activity. *Withania somnifera* is also used in study. In present study (fig. 1d) only the chloroform extract of *Withania somnifera* plant produced 100% DPPH scavenging activity at 1000µg/10µl concentration while it is reduced to almost half in 100µg/10µl extract with the IC₅₀ value of 1.5µg/10µl. Hexane extract has also shown approximately 40% activity at both concentrations

with relatively higher IC₅₀ value i.e. 10.43%. Methanolic extract was found to be least effective at these extract concentration. Reducing strength of whole plant extract in almost all solvents used in the process is excellent. Overall chloroform extract was found to be the most effective antioxidant that has more than 100% reducing activity when compared with BHA reference standard. Fig. 1e shows the antioxidant results of *Suaeda fruticosa* in present study that the activity of 1000 µg/10 µl and 100 µg/10 µl chloroform extract (92% and 73%) and hexane extracts (75% and 76%) are observed with IC₅₀ values of less than 0.7 µg/10 µl of extracts along with the desirable reducing power at 100µg/10 µl extract (table 3). All the extracts (methanolic, chloroform, ethyl acetate and

hexane) of *Chenopodium album* (fig. 1f) produced around or more than 50% DPPH scavenging activity when the plant extracts used at 1000 µg/10 µl concentration and also showed considerable activity when used at 10 times lesser concentration *i.e.* 100 µg/10 µl. The IC₅₀ values are given in table 2. Reducing power of all plant extracts are worth representing (ranging from 65% to 98%). The methanolic extract showed the IC₅₀ Value equals to 4.55 µg/10 µl and the reducing power of plant crude extract (first fraction in ethanol) is 98.3%. *Trianthema portulacastrum* whole plant was used to make extracts in different organic solvents and in water as described in material and method. Fig. 1g represents the DPPH scavenging activity of 1000 µg/10 µl and 100 µg/10 µl extract concentration and reducing potential at 100 µg/10 µl concentration. Methanolic extract found to show 60% and 76% DPPH scavenging activity at both extract concentration respectively with IC₅₀ value of only 0.03 µg/10 µl. DPPH scavenging activity 21% and 46% was also observed in an aqueous extract of plant. Results from methanolic extract were confirmed for the reducing potential of the plant that gave very high activity that is 124% when BHA was used as reference standard. Present study showed the remarkable DPPH scavenging and reducing activity of some of the extracts of whole plant of *Pluchea lanceolata* (fig. 1h). Methanolic extract of *P. lanceolata* was observed to give best antioxidant potential (91% and 70% of scavenging activity at 1000 and 100µg/10µl extract concentration with IC₅₀ value of 0.7µg/ 10µl. The hydrogen donating property is also comparable with the reference BHA standard that is determined to be 98% at 100µg/10µl concentration. The activities of other extracts are also in considerable range. The antioxidant assays were performed for various extracts of whole plant *Rumex dentatus*. Crude and hexane extracts were found to show better DPPH scavenging activity when diluted to 100 µg/10 µl rather than 1000µg/10µl and found to be 156% when compared to BHA standard. Chloroform extract was inactive both for free radical scavenging and also lacks the hydrogen donating power therefore, found to give no activity at all.

DISCUSSION

Pentatropis spiralis is very important medicinal plant belongs to Asclepiadaceae family mostly found in Sindh and Punjab areas in Pakistan. It is used traditionally as emetic, stringent and for the treatment of gonorrhoea (Bashir *et al.*, 2009). The antioxidant activity and radical scavenging potential of the plant was not studied yet therefore the results of present study are new. Present study reveals that an excellent DPPH scavenging activity and reduced activities with low IC₅₀ value make the plant medicinally important.

Calotropis procera is a well known medicinal plant having wide range of data in traditional medicine for the

treatment of leprosy, piles, ulcers, tumors (Larhsini *et al.*, 1997; Mohsin *et al.*, 1989) and diseases damaging soft tissues like spleen, liver and abdomen (Setty *et al.*, 2007). Our study shows extracts of plant in all solvents used produce considerable reducing activity at 100µg/10µl concentration but methanolic extract showed best reducing activity *i.e.* 109.5% as shown in fig. 1b. Methanolic extract was also found to be most efficient antimicrobial agent in the study conducted (Neenah, 2013). The antimicrobial agents perform their task in many ways and one of them is scavenging the free radicals of microbes that may also be considered as the mechanism of antimicrobial activity in the mentioned study. The DPPH scavenging activity of different solvent extracts of whole plant are not very significant in case of our experimental conditions. Chloroform extract at 100 µg/10 µl gives around 40% antioxidant activity that is more than the activity determined at its 1000 µg/10 µl extract solution, this may because some dense particles were observed in concentrated solution that might hindering the reaction or light pathway during reading the absorbance. Our results represents that the mechanism of free radicals elimination through *Calotropis procera* extracts is by the reduction and not by scavenging. Total reducing capacity produced by conversion of Fe³⁺ to Fe²⁺ is more significant in all solvent extracts. Antioxidant potential of *Calotropis procera* root extracts is due to the capability of donating hydrogen atom (Shashank *et al.*, 2013) and the reducing ability is due to reductones presence (Tanaka *et al.*, 1988). Ethanolic extract studied were found DPPH radical scavenging activity with IC₅₀ of 28.57µg/ml (Tsala *et al.*, 2015) is quite high when compared with data obtained in our study.

The *Helitropium curassavicum* is often found in salty and alkaline areas and is a low, spreading herb. It has been used for the treatment of inflammations, ulcers and other wounds in traditional way. Study for anti parasitic activity of chloroform extract was done in Saudi Arabia (Sattar *et al.*, 2010) while the antioxidant and radical scavenging data for this plant is not generated yet by any other group of researcher. Fig. 1c depicts that, 100 µg/10 µl crude and ethyl acetate extracts of plant produce more than 40% DPPH scavenging activity and methanol extract gave more than 36% activity. Ethyl acetate extract also produced the activity at 1000 µg/10 µl extract solution. Activity in hexane extract was better in 1000 µg/10 µl concentration than in 100 µg/10 µl extract as expected. Reducing strength of all extracts were also determined and observed near 40% while crude and methanolic extracts showed more than 50% potential (54% and 65% respectively). Ethyl acetate is one of the best solvent to make whole plant extract as antioxidant activity in particular solvent was observed at both concentrations with IC₅₀ value of 7.2µg/10µl along with 38% reducing activity, in another study strong antibacterial and antifungal activities were exhibited by 30% ethyl acetate

extract of *Heliotropium indicum* while extracts in all other solvents were not found as good as ethyl acetate extract (Priscilla, 1995). Taken together all data, Heliotropium acts through its reducing potential rather than its oxidizing power.

Withania somnifera is a well known herb for its enormous pharmacological activities like adaptogen, antibiotic, abortifacient, aphrodisiac, astringent, anti inflammatory, deobstruent, diuretic, narcotic, sedative and tonic (Singh et al., 2010) and is found to exhibit potent antioxidant protection (Abou-Douh, 2002). These effects were confirmed by animal studies that produced effective anti inflammatory response while in separate studies in middle aged males; anti aging effects on them were also evaluated (Bone, 1996). In present study (fig. 1d) 100% DPPH scavenging activity was determined in chloroform extract of *Withania somnifera* plant at 1000µg/10µl concentration but reduced to almost half in 100µg/10µl extract with the IC₅₀ value of 1.5µg/10µl. Hexane extract produced around 40% activity at both concentrations but with IC₅₀ value relatively higher, 10.43%. Least efficacy of methanolic extract in this study was supported by study in which methanolic extract of roots of *W.somnifera* was also claimed to be poor antioxidant (Dipankar et al., 2012). Excellent reducing power of whole plant extract in almost all solvents used in the process is observed. Chloroform extract was the most effective antioxidant with more than when compared with BHA reference standard. *Withania somnifera* exhibits more of its pharmacological activity due to the presence of steroidal lactones that are more soluble in less polar solvents like chloroform and hexane and therefore in our study the methanolic extract of the plant due to its more polar nature may not be able to provide the better DPPH scavenging and at the same time chloroform is most efficient solvent to give more than 100% reducing activity.

The antioxidant results of *Suaeda fruticosa* in chloroform extract at different concentrations (92% and 73%) and similarly of hexane extracts (75% and 76%) shows very low IC₅₀ values i.e. less than 0.7 µg/10 µl of extracts along with the with excellent reducing power at 100µg/10 µl extract (table 3). Our results support the hepatoprotective activity of aqueous methanolic extract of *Suaeda fruticosais* reported in literature (Jalil et al., 2013) that proved the potent antioxidant characteristics of this plant. Anticancer activity found in methanolic extract of aerial parts of this plant reported to have IC₅₀ value of 50 µg/ml (Ullah S et al., 2012). *Suaeda fruticosa* aqueous extract was used to treat the hypercholesterolemia in rats and found to produce desirable effects (Bennani-Kabch et al., 1999). The antioxidant potential of *Suaeda fruticosa* found by our experiments supported the above mentioned treatment findings that are obviously due to the scavenging of free radicals in diseased conditions.

Methanolic, chloroform, ethyl acetate and hexane extracts of *Chenopodium album* (fig. 1f) were found to have more or near to 50% DPPH scavenging activity at 1000 µg/10 µl concentration and also showed good activity when used at 10 times lesser concentration i.e. 100 µg/10 µl. The antioxidant activity is high may be due to the higher contents of total phenols in *Chenopodium album* determined by group of researcher (Kaurand Kapoor, 2002) and phenols exhibit antioxidant potential (Awika et al., 2003). Reducing power of all plant extracts are also worth mentioning (ranging from 65% to 98%). The IC₅₀ value of ethanolic extract of leaves of *C.album* was determined as 36.17 µg/ml (Nileshand Abhay, 2012) while in our study the methanolic extract showed the IC₅₀ Value equals to 4.55 µg/10 µl. Same group of researchers found the reducing power of ethanolic plant extract to be 31.12 µg/ml while in our study it is 98.3% in crude extract. The antioxidant and reducing power of *C.album* attributes to its well known anti inflammatory, analgesic and anti cancer activities. The reducing potential of *C.album* is more considerable than DPPH radical scavenging activity showing that in *C.album* extracts, the reductones are present that in actual terminates the reactions of free radical chain (Dorman et al., 2003).

The data in present study for *Trianthema portulacastrum* is novel because considerable work was not done on antioxidant potential of plant extracts of *Trianthema portulacastrum*. The IC₅₀ value for antioxidant potential of methanolic extract of plants has only 0.03 µg/10 µl. Results from methanolic extract were confirmed for the reducing potential of the plant that gave very high activity that is 124% when BHA was used as reference standard. Observations proved that methanolic extract of plant material served as best extraction solvent for this plant. Traditionally the plant is used as vegetable. The medicinal values of this plant are many for eg. it is used to treat liver and spleen edema (Javed et al., 2000). It is also known for its hepatoprotective effect by keeping the concentration of antioxidant enzyme same in diseased condition if treated with ethanolic extract of *T. portulacastrum* (Kumar et al., 2004). Methanolic Leaf extract of plant produces the best zone of inhibition against gram positive and gram negative bacterial strains while the chloroform and aqueous extracts showed less antibacterial activity, this activity is attributed for phytophenolics in the plant (Kavitha et al., 2014), in present study the methanolic extract of plant also exhibit the best DPPH scavenging activity as well as excellent reducing power.

Pluchea lanceolata is used in many medicinal preparations for the treatment of various diseases including some related to imbalance in free radicals in the human body for instance inflammation, carcinogenesis and pathological conditions related to liver. These diseases sometimes related to free radicals and their imbalance. The use of plant for remedies of such ailments

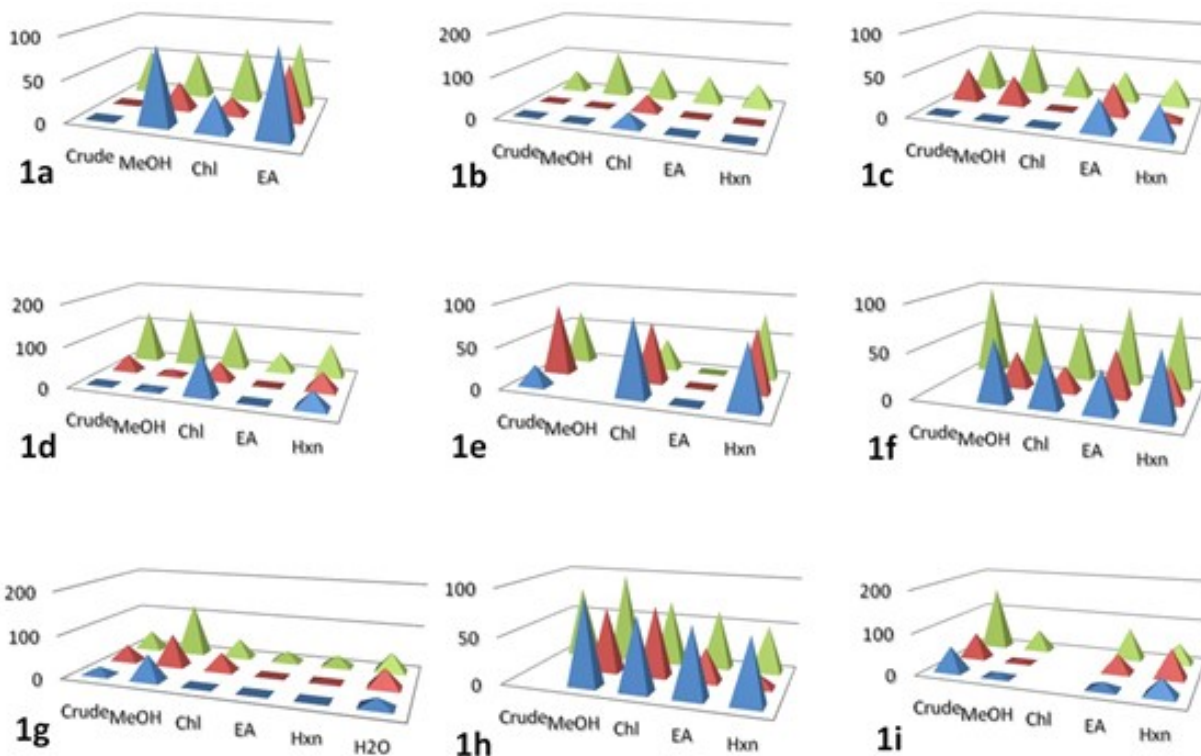


Fig. 1: DPPH Scavenging/ Reducing Activities of Plant extracts at 1000µg/ 10µl, 100µg/ 10µl and 100µg /10µl respectively; 1a) *Pentatropis spiralis* 1b) *Calotropis procera* 1c) *Heliotropiumc urassavicum* 1d) *Withania somnifera* 1e) *Suaeda fruticosa* 1f) *Chenopodium album* 1g) *Trianthema portulacastrum* 1h) *Pluchea lanceolata* and 1i) *Rumex dentatus*

may utilize the scavenging and reducing activity of this plant material as some of the extracts of whole plant and methanolic extract of *P. lanceolata* was observed to be best (91% and 70%) with IC_{50} value of 0.7µg/ 10µl. The hydrogen donating property that is reducing power is also comparable with reference BHA standard that is found to be 98%. The activities of other extracts are also in considerable range. Methanolic extract of *P. lanceolata* roots have shown approximately (75% scavenging activity when compared with ascorbic acid (Surendra and Goyal, 2011). Ethanolic extracts of this plant produced profound anti inflammatory activity and lowers the edema in experiments also due to its antioxidant properties (Srivastava *et al.*, 1990; Kaith, 1995). In a related work methanolic extracts of all parts of *P. lanceolata* exhibited very good anti-inflammatory and an excellent anti arthritic activity by virtue of their phytochemical properties (Deepika and Vidya, 2013).

The antioxidant assays for *Rumex dentatus* in Crude and hexane extracts were found to show better DPPH scavenging activity at diluted extract from 1000µg/10µl to 100 µg/10 µl may be due to the reason that diluted extracts may have more functional groups exposed and available for the DPPH scavenging. Level of hydrogen donating property of crude extract was also impressive that is 156% when compared to BHA standard though

chloroform extract was inactive both for free radical scavenging and also lacks the hydrogen donating power therefore, found to give no activity at all. The results are in support of findings of another group of researcher who reported no activity in chloroform extract of the same plant (Humeera *et al.*, 2013). Ethyl acetate fractions exhibited 78% reducing ability that is more than any other organic solvent fraction (Elzaawely and shinkichi 2012), reported in their research article that the ethyl acetate extract of leaves and roots of *R. dentatus* proved to be most efficient reductant. Other species of genus *Rumex* are also revealed as antioxidant agents (El-Bakryand Eman, 2012).

CONCLUSION

The aim of this study is to determine the potent antioxidant activities of various wild plants found in the vicinity. As the natural sources are less toxic and hence are on safer side compared with the synthetic ones, these wild plants then can be used as natural source of antioxidant molecules to be used as nutritional supplement to support and enhance the bio protective activity of endogenous free radical eradication system and/or to be used in antioxidant-based drugs formulation/ designing to cure pathological conditions involving the imbalance in antioxidant enzyme and metabolic disorders

that start producing extra burden of free radicals. The present study exhibited that *Pentatropis spiralis*, *Helitropium curassavicum*, *Withania somnifera*, *Suaeda fruticosa*, *Chenopodium album* and *pluchea lanceolata* are wild plants having capability to scavenge free radicals in-vitro. In-vitro antioxidizing capacity attributed by reduction power is also evaluated in plants under study and is found to be best in *Withania somnifera*, *Chenopodium album*, *Pluchea lanceolata* and *Rumex dentatus* while moderate activity was found to occur in *Pentatropis spiralis*, *Calotropis procera*, *Suaeda fruticosa* and *Trianthema portulacastrum*.

Taken together all the essential data, *Suaeda fruticosa*, *Chenopodium album* and *Pluchea lanceolata* are the plants that exhibit excellent antioxidant properties and therefore, can be optimal targets for further experiments to elucidate their mechanism of action and their potential to extract a lead molecule from them to be used as true antioxidant based drug molecule.

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