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Evaluation of Antioxidant Potential of Some Selected Wild Edible Plants

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ABSTRACT

The present study was designed to evaluate the antioxidant potential of *Amaranthus viridis* L., *Chenopodium album* L., *Salvadora persica* L. and *Solanum nigrum* L. These plants commonly grow as wild plants, and are recommended as alternate food source because of their rich nutritional contents. The crude extracts of their leaves in petroleum ether, chloroform, methanol and distilled water were studied. Significant DPPH scavenging activity was found in petroleum ether extracts of *C. album* (29.3%) whereas petroleum ether extracts of *S. nigrum* exhibited minimum value (8.43%). On the other hand, distilled water extracts of *C. album* exhibited the highest (0.697 nm) total antioxidant activity while chloroform extracts of *A. viridis* (0.513 nm) turned out to be the lowest. These findings ensured the antioxidant effectiveness of these wild edible plants, the possible source of future novel antioxidants. In conclusion, these wild edible plants may have potential use into pharmaceuticals, cosmetics as well as food industries in near future.

Key Words: Wild edible plants, antioxidant evaluation, DPPH scavenging evaluation

INTRODUCTION

Those plants whose fruits, leaves or roots are considered to be suitable as food by both rural and urban communities are labelled as wild edible plants (Maroyi, 2011). World-widely, there are around 700 wild species of plants that are harvested to meet food needs (Ghane *et al*., 2010). These wild plants play substantial role in improvement of agriculture, and some of these now have been cultivated as well (Sanchez-Mata *et al*., 2011).

Amarathus viridis L., *Chenopodium album* L., *Salvadora persica* L., and *Solanum nigram* L. are categorized as valuable food source among these wild edible plants (Abbasi *et al*., 2013; Teklehaymanot & Giday, 2010; Kumar *et al*., 2009). These wild edible plants are rich in scavenging radicals, i.e. flavonoids and phenols, hence can be characterized as natural dietary antioxidants (Kaur & Kapoor, 2002). Antioxidants are actually the free radical oxygen terminators, which are produced by number of factors, such as breakdown of food, use of tobacco or some other drugs and exposure to radiations (Sharma *et al*., 2013). In the absence of antioxidants, this reactive oxygen species eagerly persuade to oxidative impairment of variety of biomolecules (i.e. proteins, lipids, DNA, etc.) and can cause multiple chronic disorders like diabetes, arthritis, cancer, atherosclerosis, and neurodegenerative diseases as well.

Hence, the deleterious reactions triggered by these reactive oxygen species can be detoxified by certain antioxidant drugs, which eliminate pro-oxidants and scavenge free radicals. But in developing countries like Pakistan pharmaceutical based drugs are quiet expensive and unaffordable for most of the people. In this situation, wild edible plants will be a good choice for treatment as compared to allopathic drugs because these wild edible plants possessed flavonoids, phenolic compounds and are classified as natural antioxidants. The significance of wild edible plants as natural antioxidants had been stressed by number of workers at international level (Souri *et al*., 2008; Srivastava *et al*., 2009; Thenmozhi *et al*., 2011). Moreover, these edible plants have capability to grow in wild, so this could be approachable and cheap source for local communities.

In this scenario, a considerable attention is needed to evaluate the antioxidant properties of wild edible plants so that people can be benefited. Current research effort was aimed to create nutritional awareness among various communities on the health beneficial potency of traditionally and ethnobotanically important wild edible plants in terms of their antioxidant activity, radical scavenging capacity and their total phenol, flavonoid and flavanol contents.

MATERIALS AND METHODS

The collected plant samples were identified and authenticated from Dr. Sultan Ahmad Herbarium, GC University, Lahore. The leaves of these plants were dried at room temperature. The dried leaves were ground with the help of pestle and

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mortar. About 10 grams of every ground leaf material was macerated for its crude extract in sequence with 40 ml of each polar and non-polar solvents (i.e. petroleum ether (PE), chloroform (CHL), methanol (MEOH) and distilled water (DH_2O) serial-wise). The residue was soaked in each solvent after every filtration in series while the obtained filtrate was conserved and labelled in the transparent glass containers. The antioxidant evaluation of the well-dried plant extracts was carried out by DPPH and total antioxidant assay as follows:

2, 2-Diphenyl-1-Picrylhydrazyl Radical Scavenging activity

The extracts of each plant in different solvents were treated by DPPH (2, 2-diphenyl-1-picrylhydrazyl radical) assay, by following the protocol given by Erasto *et al*. (2004). Briefly, 0.5 ml of each extract was mixed with 1 ml of dimethyl sulphoxide (DMSO) and 0.5 ml of DPPH. All these components were well-homogenized and kept in dark for 30 minutes. Spectrophotometer was used for the determination of DPPH radical scavenging activity at 517 nm. The following formula was applied for calculation of percentage (%) of scavenging activity on DPPH radical.

$$\text{Percentage scavenging activity (SC \%)} = \frac{Absorption\ (control) - Absorption\ (sample)}{Absorption\ (control)} \times 100$$

For comparison BHT (Butyl hydroxyl touline) and Alpha tocopherol at different concentrations (5, 2.5, 1 and 0.5 mg/ml) were assayed.

Determination of total antioxidant capacity

Prieto & Agular (1999) protocol was employed for the measurement of the total antioxidant potential. 1.9 ml of reagent mixture solution (0.6 M sulphuric acid, 4 mM ammonium moybdate and 28 mM sodium phosphate) was mixed with about 0.1 ml of all solutions. Sixty minutes incubation at 95°C was done for reaction mixture and after normalizing at room temperature the absorbance was noted at 695 nm. The antioxidant activity of BHT (butyl hydroxyl touline) (0.5 mg/ml) was determined for making comparison.

RESULTS AND DISCUSSION

The present investigation was aimed to evaluate the antioxidant potential of some important wild edible plants, such as *Amaranthus viridis* L., *Chenopodium album* L., *Salvadora persica* L., and *Solanum nigrum* L. The results thus obtained were documented in Table 1 and Figs., 1 & 2.

DPPH radical scavenging activity of *A. viridis* leaves was found as 0.054 nm, 0.064 nm, 0.059 nm and 0.062 nm in extracts of PE, CHL, MEOH, DH_2O, respectively. However, the percentage DPPH activity of extracts of PE, CHL, MEOH, DH_2O were 27.5%, 13.7%, 21.3% and 16.8%, respectively. CHL extract of *A. viridis* leaves exhibited the highest DPPH radical scavenging activity (0.064 nm) while PE extract showed minimum value (0.054 nm). In respect to % DPPH, PE extract showed the highest potential (27.5%); however, least value was recorded in CHL extract (13.7%).

DPPH radical scavenging activity of *C. album* leaves extracts in DPPH assay was found as 0.053 nm, 0.057 nm, 0.063 nm and 0.062 nm in PE, CHL, MEOH, DH_2O solvents, respectively. However, the percentage DPPH of leaves of *C. album* was determined as 29.3% in PE, 23.1%, in CHL, 15.0% in MEOH and 16.4% in DH_2O extracts. Results of MEOH extracts of *C. album* leaves were in compliance of Saha *et al.* (2011) findings. MEOH extract exhibited the peak value (0.063 nm) of DPPH radical scavenging activity, while PE ether showed the least, i.e. 0.053 nm. In concern with percentage DPPH, PE extracts exhibited the extreme value of 29.3% whereas MEOH extracts demonstrated minimum value of 15.0%.

Antioxidant activity of *S. persica* leaves in DPPH assay was observed as 0.054 nm, 0.061 nm, 0.060 nm and 0.064 nm in solvents of PE, CHL, MEOH, DH_2O, respectively. Moreover, 27.0%, 18.2%, 19.0% and 14.1% percentage DPPH in extracts of PE, CHL, MEOH, DH_2O were estimated respectively. Tiwari *et al*. (2011) had stated the similar results for PE extract of *S. persica* leaves, i.e. 27.0%. DPPH assay results showed that DH_2O has highest potential, i.e. 0.064 nm. On the other hand, PE exhibited with least value (0.054 nm). PE extracts *S. persica* leaves reported with maximum percentage of DPPH scavenging activity (27.0%) although lower value was observed in extract of DH_2O (14%).

Solanum nigrum leaves in DPPH assay antioxidant activity was determined as 0.065 nm, 0.064 nm, 0.064 nm and 0.062 nm in DH_2O extracts, respectively. While percentage DPPH of this wild edible plant was reported as 8.43%, 13.7%, 14.6% and 12.8% in PE, CHL, MEOH, DH_2O extracts, respectively. As the PE extracts of *S. nigrum* leaves showed the maximum value (0.065 nm) so is evident from present study that it can proficiently scavenge reactive oxygen species. However, minimum value (0.062 nm) recorded in DH_2O. The highest percentage of DPPH was noticed in MEOH extracts (14.6%) while in PE extracts minimum value (8.43%) was observed.

Leaves of *Amaranthus viridis* reported 0.617 nm, 0.513 nm, 0.675 nm and 0.654 nm

antioxidant activity in PE, CHL, MEOH, DH_2O, respectively. Results showed the highest potential in MEOH extract (0.675 nm) while CHL extract exhibited minimum value (0.513 nm). The antioxidant activity of PE, CHL, MEOH, DH_2O extracts of the leaves of *C. album* was 0.626 nm, 0.624 nm, 0.616 nm and 0.697 nm, respectively. It is evident from concluded data that DH_2O has highest value (0.697 nm) while MEOH extract showed least value (0.616 nm). *S. persica* leaves antioxidant activity in PE, CHL, MEOH, DH_2O was found to be 0.625 nm, 0.641 nm, 0.647 nm and 0.624 nm, respectively. Maximum antioxidant activity was observed in MEOH (0.647 nm) while lowest in DH_2O (0.624 nm). In leaves of *S. nigrum*, the antioxidant activity of PE, CHL, MEOH, DH_2O extracts were observed as 0.685, 0.633, 0.625 and 0.637 nm, respectively. Total antioxidant capacity of MEOH extracts (0.625 nm) closely lies with reported value (0.671 nm) of Rao *et al*. (2012). Highest antioxidant were observed in PE (0.685 nm) and the lowest value (0.625 nm) was observed in extract of MEOH.

It is evident from the results of antioxidant activity in DPPH assay that among all the studied wild edible plants peak values were frequently detected in PE, CHL, MEOH, DH_2O of *S. nigrum*, i.e. 0.065 nm, 0.064 nm and 0.064 nm, respectively.However, in case of CHL extracts *A. viridis* also showed the same highest value (0.064 nm). On the other had in DH_2O extract *S. perisca* showed maximum potential, i.e. 0.064 nm. While *C. album* showed the least value in the extracts of PE and CHL, i.e. 0.053 and 0.053nm respectively. In case of minimum value in MEOH and DH_2O extract was showed by *A. viridis*.

From the results of percentage (%) of DPPH, it is observed that *C. album* has highest value in PE as well as in CHL extracts, i.e. 29.3% and 23.1%, respectively. But for the extracts of MEOH and DH_2O *A. viridis* was found to be showing maximum potential (21.3% and 16.8% respectively). Lowest percentage of DPPH was observed by *S. nigrum* in the extracts of PE, CHL, MEOH, DH_2O (8.43%, 13.7% and 12.8% respectively), while in MEOH the lowest value was exhibited by *C. album*.

The results of antioxidant activity using antioxidant assay indicated highest PE extract value in *S. nigrum* (0.685 nm), while in CHL extract *S. perisca* was found to be the most effective. Moreover, *A. viridis* and *C. album* showed their maximum potential in MEOH and DH_2O, respectively.

Table 1: Activity of various extracts of leaves using DPPH assay (Absorption at 517 nm) solvents

Plants / Extracts	***Amaranthus viridis* L.**	***Chenopodium album* L.**	***Salvadora perisca* L.**	***Solanum nigrum* L.**
Petroleum ether	0.054 ± 0.010	0.053 ± 0.012	0.054 ± 0.01	0.065 ± 0.008
Chloroform	0.064 ± 0.006	0.057 ± 0.005	0.061 ± 0.010	0.064 ± 0.009
Methanol	0.059 ± 0.008	0.063 ± 0.006	0.060 ± 0.006	0.064 ± 0.008
Distilled water	0.062 ± 0.007	0.062 ± 0.008	0.064 ± 0.005	0.062 ± 0.009

Standards	**Absorption**
Alpha tocopherol	0.095
Butylhydroxytouline	0.074
Blank	0.075

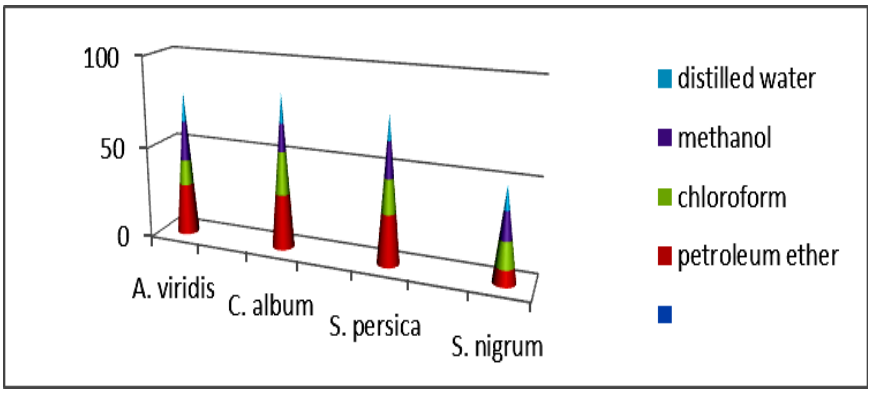

Fig., 1: Percentage (%) DPPH of various extracts of leaves

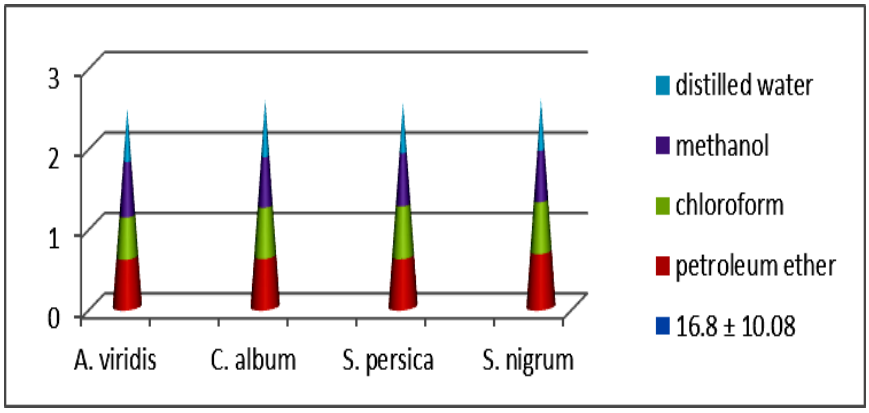

Fig., 2: Antioxidant activity of various extracts of leaves (Absorption at 695 nm)

CONCLUSION

From the present investigation, it can be concluded that PE extract of *S. nigrum* leaves showed maximum value (0.065 nm) of antioxidant activity in DPPH assay, while the lowest value was observed in PE and CHL extracts of *C. album*. The highest percentage (%) of DPPH was noticed in PE extract of *C. album,* whereas *S. nigrum* PE extract exhibited the lowest value. Antioxidant activity in antioxidant assay presented maximum value for *C. album* DH_2O extract, while *A. viridis* CHL extract showed minimum value. The outcomes of present study suggested that antioxidant evaluation of wild edible plants is indispensible to certify the medicinal value of these plants. Phytochemicals may be primary or secondary present in these wild edible plants may be responsible for this antioxidant mechanisms. It is the time to create awareness among people regarding diet related health benefits of these neglected precious plants. Therefore, concerned stake holders should immediately take necessary measures for the preservation as well as judicious use of such natural resources of the country.

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