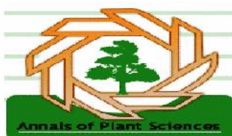

Original Research Article

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Nutraceutical properties of *Stellaria media* (L.) Vill. and *Persicaria chinensis* (L.) H. Gross under Brahmaputra valley agro-climatic condition

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Abstract: A substantial number of herbs have been used as dietary source and plays a vital role in improving our health. Antioxidant compounds in diet play an important role as a health protecting factor. Various herbs have been reported to exhibit antioxidant activity which contains many different antioxidant compounds (i.e. vitamin C and E, carotenoids and phenolic compounds), that serve as free radical scavengers. The present study was subjected to investigate the nutraceutical property and antioxidant activity of *Stellaria media* (L.) Vill. (Family-Caryophyllaceae) and *Persicaria chinensis* (L.) H. Gross (Polygonaceae) found available in Brahmaputra Valley agro-Climatic Condition. The protein and carbohydrate content were slightly higher in case of *P. chinensis* than that of *S. media*. But the total crude fibre content was found to be more in *S. media*. It has been observed that ascorbic acid and total phenolic content was higher in *P. chinensis* than that of *S. media*. Free radical scavenging activity was evaluated using 1, 1-diphenyl-2-picrylhydrazyl (DPPH) free radical. The overall antioxidant activity of *P. chinensis* was the stronger than that of *S. media*. The IC_{50} value of the methanolic extract of *P. chinensis* is 520.78± 0.79 and that of *S. media* is 1020 ± 0.68µg/ml. The study reveals that the use of these plants as therapeutic agent would exert several beneficial effects by virtue of their antioxidant activity and also can be a rich source of nutrition in our diet system.

Key Words: *Stellaria media*, *Persicaria chinensis,* Antioxidant activity, DPPH, Total Phenolic content, Ascorbic acid, Gallic acid.

Introduction

For sustaining healthy and active life, our diet should contain proper nutritional elements which have health promoting as well as health protective activity. The dietary habits of population in different region of the world have been determined mainly by the availability of foods locally and local practices. Production of certain free radicals such as super oxide, hydrogen peroxide, hydroxyl and nitric oxide radicals are the consequence of body's natural metabolic process which may be involved in the onset of many diseases such as cancer, rheumatoid arthritis, and atherosclerosis as well as in degenerative processes associated with ageing[1]. Almost all organisms are well protected against free radical damage by enzymes such as superoxide dismutase and catalase, or compounds such as ascorbic acid, tocopherols and glutathione[2]. When the mechanism of antioxidant protection becomes unbalanced by factors such as aging, deterioration of physiological functions may occur, resulting in diseases and accelerating aging. However the natural antioxidant such as vitamin C, E, carotenoids, phenolic compounds, etc. that are present in herbs and spices are responsible for inhibiting or preventing the deleterious consequences of oxidative stress exerted by the reactive oxygen species (ROS)[3]. It has been reported that the antioxidant activity of plant materials are well correlated with the content of their phenolic compounds[4,5]. Phenolic compounds, especially phenolic acids and flavonoids, are ubiquitously present in vegetables, fruits, seeds, tea, wines and juices; thus they are an integral part of the human diet. In a broad sense, nutritive foods are those foods, which not only provide nutrition but at the same time have health protective and health promoting properties.

Persicaria chinensis is a perennial plant species from the Polygonaceae family and is one of the most common plants found in the

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China and Malaysia and are commonly used in herbal remedies. This plant can be used for gastritis treatment, anti-inflammation, promoting blood circulation, dysentery, diuretic and hemorrhage[6]. *Stellaria media* is a cool-season annual plant belongs to the family Caryophyllaceae and is native to Europe and North America and is used in various folk medicines. *S. media* is used as an astringent, carminative, anti-asthmatic, demulcent, depurative, diuretic, expectorant, etc. *S.media* is also used for kidney complications, inflammation in rheumatic joints, wounds, ulcers, skin diseases, bronchitis and period pain[7].

Though these plants do not originate from the North-Eastern region of India, yet they are very common in Brahmaputra Valley agro-climatic condition. The present investigation was made to evaluate the nutraceutical properties and antioxidant activity of these plants and make a comparative study between these two medicinal plants.

Materials and Methods

The herbs *P.chinensis* and *S.media* were collected from the foot hills of Nilachal and marshy land nearby Guwahati, Assam respectively. The location of Guwahati is 26°11′0″N 91°44′0″E with annual average rainfall 1,717mm, average temperature ranging from 18° to 38°c, humidity 76.6%. Collected herbs were washed thoroughly, sliced and oven dried at 60^0C until get constant weight. The dried slices were powdered and kept at 4^0c for further analysis.

Methods of analysis: Chemical analysis was done on moisture free basis. Analysis was carried out to estimate the macro nutrient components *viz*. total protein, total carbohydrates, crude fibre and ascorbic acid and antioxidant activity of the samples.

Total Protein Estimation: The total protein content of *P. chinensis* and *S. media* was estimated by following the method developed by Lowry *et al.,*[8]. Extraction was carried out with buffers used for the enzyme assay. 500 mg of the sample was grinded well with a mortar and pestle in 5ml of the buffer and after centrifuging; the supernatant was used for protein estimation. The reading was taken in UV-Vis Spectrophotometer at 660nm and the amount of protein present was calculated by plotting the value in a standard curve of Bovine Serum Albumin (BSA).

Total Carbohydrate Estimation*:* The total carbohydrate content of the samples was estimated by Anthrone method[9]. 100mg dried samples were hydrolyzed with 2.5 N HCl for about 3 hours in a boiling water bath. Sodium carbonate was added to neutralize the extracts. Subsequently the extracts were centrifuged and supernatant were collected. The residue was washed thrice with distilled water and all the supernatants were pooled and final volume was adjusted to 100ml. 0.5ml of the extracts were taken and volume made up to 1ml distilled water. 4ml of Anthrone reagent was added to the above solution. Absorbance was taken in UV-Vis spectrophotometer at 630nm and the amount of carbohydrate present was calculated by plotting the value in a standard curve of standard Glucose solution.

Ascorbic Acid Content Estimation: The amount of ascorbic acid present in the samples was calculated by extracting the sample in 4% oxalic acid and titrating the extract against the 2, 6-dichloro phenol indophenols dye until the end point where pink colour appears that persist for a few minutes[10]. The amount of dye consumed is equivalent to the amount of ascorbic acid present in the samples. Standard ascorbic acid solution was used as the reference and the calculation was done by the following formulae:

$$\text{Amount of ascorbic acid}\left(\frac{\text{mg}}{100\text{g}}\right)\text{sample} = \frac{0.5 \times V_1 \text{ ml} \times 100 \text{ ml}}{V_2 \text{ ml} \times 5\text{ml} \times \text{weight of the sample}} \times 100$$

Where V_1= volume of oxalic acid, V_2= volume of the sample.

Total Phenol Content Estimation: The total phenol content was determined by the Folin-Ciocalteau's method[11]. 200µl of the sample extracts (1mg/ml) was taken and volume made up to 2ml. 0.3ml of Folin-Ciocalteau reagent was added. After 5mins, 0.8ml of 20% Na_2CO_3 was added and the final volume was made 5ml. Absorbance was taken by UV-Vis Spectrophotometer at 765nm after 30 minutes incubation. The amount of phenol content was determined using Gallic acid as standard. Results were expressed as µg/mg (Gallic acid equivalent/dry weight).

Antioxidant activity estimation: The antioxidant activities of the sample extracts along with standard were assessed on the basis of the radical scavenging effect of stable DPPH[12]. A solution of DPPH of concentration 0.2 mM was prepared in 70% methanol and kept overnight. Stock solution (20mg/ml) of the extract was prepared in 70% methanol. Various concentration of the extracts *viz.*10, 20, 50,100,150,200,300,400 and 500 µl were taken in different test tubes and the volume was made up to 1000µl. 1ml DPPH was added to each solution and kept at dark for 30 minutes. Ascorbic acid and Gallic acid were taken as standards. Optical density of these samples was measured at 517nm along with blank where 1ml methanol with 1 ml DPPH solution was taken. The activities of the samples are measured in terms of percent inhibition (IC_{50}) and calculated by the following formulae:

$$\text{Percent (\%) inhibition of DPPH activity} = \frac{A - B}{A} \times 100$$

Where, A = Optical density of the blank
B = Optical density of the sample

Statistical Analysis: The data were subjected to statistical analysis. All the assays were recorded in triplicates and the values were expressed as mean ±S.D. IC_{50} value was calculated by plotting a graph with percent inhibition on y-axis and concentration on x-axis.

Result and Disscussion

The phytochemical analysis was done for total carbohydrate content, total protein content, total ascorbic acid content, total phenol content in both herb extracts of *Stellaria media* and *Persicaria chinensis* (Table1). The antioxidant activity was measured using DPPH assay. In *P.chinensis,* the total phenol content was found to be higher (54.73 ± 0.64µgGAE/mg) as compared to *S. media* (25.32 ± 0.39µg GAE/mg). The ascorbic acid content was also higher in *P. chinensis* (56.94 ± 0.36mg/100gm) as compared to *S. media* (42.01 ± 0.62mg/100 gm). The carbohydrate content was higher in *P. chinensis* (19.35 ± 0.06 %) than that of *S. media* (17.37 ± 0.37%). The protein content of both the herbs was found to be 4.23 ±0.11% and 3.32 ± 0.15% in *P. chinensis* and *S. media* respectively. The antioxidant activity of *P. chinensis* (IC_{50}=520.78 ± 0.79 µg/ml) was much higher as compared to *S. media* (IC_{50}=1020 ± 0.68 µg/ml) (Fig: 1 and 2).

Table 1: Phytochemical analysis of *Stellaria media* and *Persicaria chinensis.**

Variety	Carbohydrate (%)	Protein (%)	Crude Fibre (%)	Ascorbic Acid (mg/100gm)	Total Phenol Content (µgGAE/mg)	Inhibition concentration (IC_{50}) (µg/ml)
S.media	17.37 ± 0.37	3.32 ± 0.15	13.44 ±0.53	42.01 ± 0.62	25.32 ± 0.39	1020 ± 0.68
P.chinense	19.35 ± 0.06	4.23 ±0.11	9.65 ± 0.35	56.94 ± 0.36	54.73 ± 0.64	520.78 ± 0.79

*Values represented in the table are mean±S.D of three replicates.

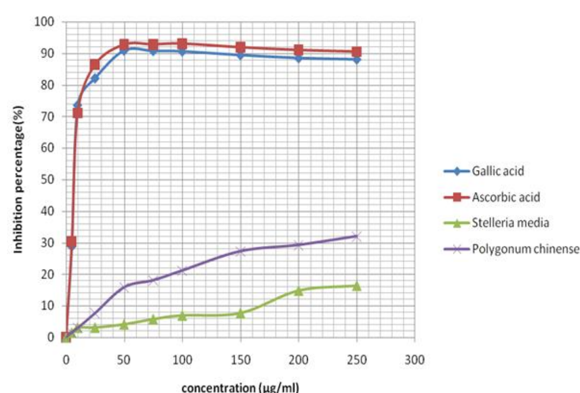

Figure 1: DPPH free radical scavenging activity of methanolic extract of *S.media* and *P. chinensis* at 517nm.

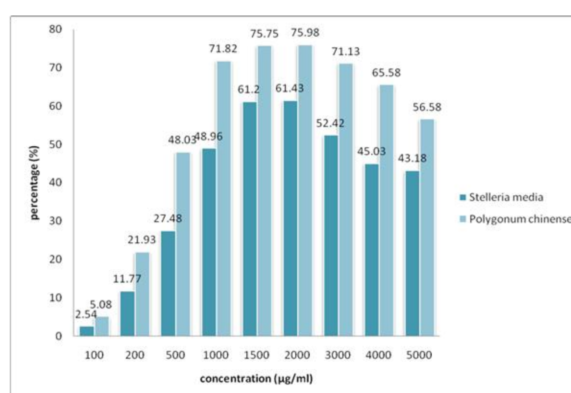

Figure 2: DPPH free radical scavenging activity of methanolic extract of *S.media* and *P. chinensis* (higher concentration) at 517nm.

The most common antioxidants present in herbs are vitamins C, carotenoids, flavonoids and thiol (SH) compounds, etc. There were several reports that the contribution of phenolic compounds to antioxidant activity was much greater than those of vitamin C and carotenoids[13,14,15]. The present investigation suggests that the major source of antioxidant capacity of *Persicaria chinensis* and *S. media* may be not from vitamin C, but rather from phenolic compounds. Moreover, these plants are also a rich source of nutritive components such as carbohydrate, crude fibre and protein that are essential for our daily diet. Therefore, the supplementation of these natural antioxidants through a balanced diet could be much more effective than the supplementation of an individual antioxidant such as vitamin C or vitamin E.

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