Evaluation of the Chemical Composition of *Sonchus eruca and Sonchus asper*

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Abstract: *Sonchus eruca* and *Sonchus asper* were analyzed for their chemical evaluation, vitamins and bioactive secondary metabolite. The results revealed the presence of bioactive constituents comprising alkaloids (1.24 to 1.34 mg/100 g), saponins (1.46 to 1.72 mg/100 g), flavonoids (1.61 to 1.34mg/100 g), phenols (1.32 to1.44 mg/100g), saponins (0.12 to 0.41mg/100 g) and tannins (0.02 to 0.61 mg/100g). The medicinal plants contained ascorbic acid (33.21 to 20.12 mg/100 g), riboflavin (0.24 to 0.72 mg/100 g), thiamine (0.31 to 0.15 mg/100g), and niacin (0.03 to 0.05 mg/100 g). [Journal of American Science 2010;6(9):231-235]. (ISSN: 1545-1003).

Key words: *Sonchus eruca* and *Sonchus asper*, bioactive compounds.

1. Introduction

The asteraceae or sunflower family (formerly composite, also known as the Aster family) is a family of dicotyledonous flowering plants [1]. It is the largest family of Angiosperms comprises of over 1535 genera and 23000 species, distributed in three sub-families and 17 tribes [2]. It is also the largest plant family in Pakistan, represented by over 650 species distributed in 15 tribes [3]. This family has considerable ecological and economical importance. Members of this family occur from the Polar Regions to the tropics, and may range over all habitats, from dry deserts to swamp, and from rain forests to mountains [4]. The plants of this genus show in vitro antioxidants potential. The biological assays revealed diverse antioxidants effects for the tested extracts [5]. A recent study found for *Sonchus oleraceus* have high Fe^{+2} chelating activity and also showed antioxidant effect in the mouse brain [6].

A new phytotoxic enol tautomer of 4-pyridylpyruvic acid, named ascosonchine was isolated from the culture filtrate of *Ascochyta sonchi*. Such a leaf pathogen is a potential biocontrol agent of *Sonchus arvensis* a perennial herbaceous weed occurring throughout the temperate regions of the world Ascosonchine [7].

Genus *Sonchus* showed a marked reduction in its relative growth rate at elevated levels of ozone. The extent of chlorophyll a destruction was higher in both *M. sativa* and *S. oleraceus* than in the other species tested [8]. Numerous pharmacological activities on the genus *sonchus* have been reported. The leaves of *S. wightianus* are used in earache by rural communities of India [9]. The juice of *S. alpinus* is useful in deafness, gout, and old age. The roots of *S. arvensis* are used in cough, bronchitis, and asthma. The leaves are applied to swellings, while its latex is used for the treatment of eye diseases.The extract of *S. asper* is applied to wounds and boils. The leaves and roots of the plant are used in indigestion and as a febrifuge, while its roots act as a vermifuge. Its stems are given as a tonic and sedative [10]. Antioxidant activities, including the radical Scavenging effects and iron-chelating activities have been reported for *S. oleraceus*. [11]. the present study was designed to evaluate the minerals, vitamins and secondary metabolite constituents of *S. asper* and *S. eruca* commonly used in herbal.

2. Materials and Method

2.1 Plant materials

The plants *Sonchus eruca and Sonchus asper* were collected at Parachinar Kurram agency, N.W.F.P Pakistan, in July 2008 and both were identified by Plant taxonomist. The voucher specimen has been deposited in the Herbarium of our Botany department Kohat University of Science and Technology Kohat (KUST). The whole plants were air-dried for 10 days and milled into powder with electrical grinder and finally stored in airtight bottles before analysis.

2.2 Alkaloid determination

3 g of the sample were weighed into a 250 ml beaker and 250 ml of 25% acetic acid in ethanol was added and covered to stand for 4 h. This was filtered and the extract was concentrated using a water-bath to one-quarter of the original volume. Concentrated ammonium hydroxide was added drop wise to the

extract until the precipitation was complete. The whole solution was allowed to settle and the precipitate was collected by filtration and weighed [12].

2.3 Tannin determination

1g of the sample was weighed into 250 ml plastic bottle. 100 ml of distilled water was added and shaken for 1 h in a mechanical shaker. This was filtered into a 100 ml volumetric flask and made up to the mark. Then 10 ml of the filtrate was pipette out into a tube and mixed with 5 ml of 0.1 M $FeCl_3$ in 0.1 N HCl and 0.008 M potassium ferrocyanide. The absorbance was measured in a spectrophotometer at 120 nm wavelength, within 10 min. A blank sample was prepared and the colour also developed and read at the same wavelength. A standard was prepared using tannin acid to get 100 ppm and measured [13].

2.4 Determination of total phenols

For the analysis of the phenolic component, the fat free sample was boiled with 100 ml of ether for 30min. 10ml of the extract was pipette into a 100 ml flask, then 20ml of distilled water was added. 4ml of ammonium hydroxide solution and 10 ml of concentrated amyl alcohol were also added. The samples were made up to mark and left to react for 40 min for colour development. The absorbance of the solution was read using a spectrophotometer at 550 nm wavelengths [12].

2.5 Saponin determination

The samples were ground. 25 g of each plant samples were dispersed in 250 ml of 25% ethanol. The suspension was heated over a hot water bath for 4 h with continuous stirring at about 60°C. The mixture was filtered and the residue re-extracted with another 200 ml of 20% ethanol. The combined extracts were reduced to 40 ml over water bath at about 90°C. The concentrate was transferred into a 250 ml separator funnel and 20 ml of diethyl ether was added and shaken vigorously. The aqueous layer was recovered while the ether layer was discarded. The purification process was repeated thrice. 60 ml of n-butanol was added. The combined n-butanol extracts were washed twice with 10 ml of 5% aqueous sodium chloride. The remaining solution was heated in a water bath. After evaporation, the samples were dried in the oven to a constant weight. The saponin content was calculated in percentage [14].

2.6 Flavonoid determination

20 g of the plant species were extracted repeatedly with 150 ml of 80% aqueous methanol at room temperature. The whole solution was filtered through Whatman filter paper no. 42 (125 mm). The filtrate was later transferred into a crucible and evaporated to dryness over a water bath and weighed [15].

2.7 Determination of riboflavin

10 g of the sample was extracted with 150 ml of 50% ethanol solution and shaken for 1 h. This was filtered into a 250 ml flask; 15 ml of the extract was pipette into 50 ml volumetric flask. 10 ml of 5% potassium permanganate and 10 ml of 30% H2O2 were added and allowed to stand over a hot water bath for about 30 min. 2 ml of 40% sodium sulphate was added. This was made up to 50 ml mark and the absorbance measured at 550 nm in a spectrophotometer [16].

2.8 Determination of thiamin

10g of the sample were homogenized with ethanolic sodium hydroxide (100 ml). It was filtered into a 250 ml flask. 10 ml of the filtrate was pipette and the colour developed by addition of 10 ml of potassium dichromate and read at 360 nm. A blank sample was prepared and the colour also developed and read at the same wavelength [16].

2.9 Determination of niacin

10 g of the sample was treated with 100 ml of 1 N sulphuric acid and shaken for 40 min. 5 drops of ammonia solution were added to the sample and filtered. 10 ml of the filtrate was pipette into a 50 ml volumetric flask and 5 ml potassium cyanide was added. This was acidified with 5ml of 0.02N H_2SO_4 and absorbance measured in the spectrophotometer at 450 nm wavelengths [16]

2.10 Determination of ascorbic acid (vitamin C)

10 g of the sample was weighed into an extraction tube and 200 ml of EDTA/TCA (2:1) extracting solution were mixed and the mixture shaken for 30 min. This was transferred into a centrifuge tube and centrifuged at 2900 rpm for about 25 min. It was transferred into a 250 ml volumetric flask and made up to 100 ml mark with the extracting solution. 20 ml of the extract was pipette into a volumetric flask and 1% starch indicator was added. These were added and titrated with 20% $CuSO_4$ solution to get a dark end point [17].

3. Results and Discussion

Table 1 analyzing the quantitative determination of phytochemical constituents of *Sonchus eruca* and *S. asper*. High quantity of flavonoids, saponins and alkaloids were found. *S. eruca* contains more flavonoides contents (1.48 mg/100 g) as compared to *S. asper* (1.34 mg/100 g). The values of phenolic compounds, saponins and tannins were very trace on both plants.

Table 1**.** Phytochemical composition of the whole parts of *Sonchus* eruca and *Sonchus asper* expressed as mg/100g dry weight.

Phytochemicals	***S. eruca***	***S. asper***
Alkaloids	1.14 ± 0.2	1.34 ± 0.01
Flavonoids	1.61 ± 0.21	1.34 ± 0.10
Phenols	1.32 ± 0.02	1.44 ± 0.13
Tannins	0.02 ± 0.8	0.61 ± 0.14
Saponins	0.12 ± 0.04	0.41 ± 0.02

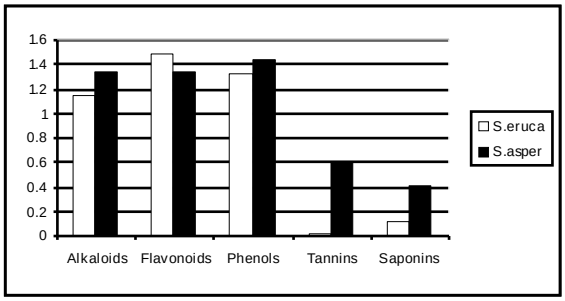

Figure 1. Results are mean of triplicate determinations on a dry weight basis ± standard deviation

Table 2. Vitamin composition *of Sonchus eruca* and *Sonchus aspe*r on mg/100 g dry Weight.

Vitamin	*Sonchus eruca*	*Sonchus asper*
Ascorbic acid	33.21 ± 0.11	20.12 ± 0.24
Riboflavin	0.24 ± 0.11	0.72 ± 0.13
Thiamine	0.31 ± 0.20	0.15 ± 0.12
Niacin	0.03 ± 0.11	0.05± 0.07

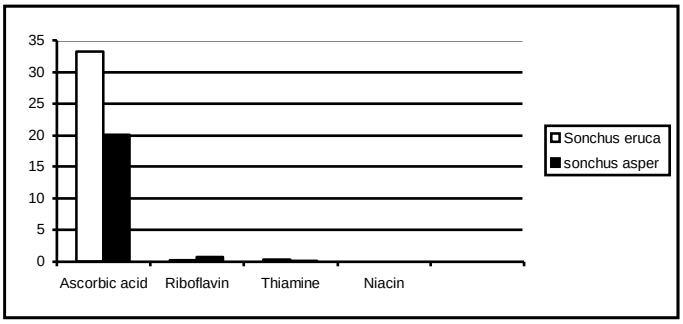

Figure 2. Results are mean of triplicate determinations on a dry weight basis ± standard deviation

Results of analysis of *Sonchus eruca* and *Sonchus asper* showed that the plants are rich in vitamins (Table 3). Ascorbic acid (vitamin C) was found to be 33.21 mg/100 g in *sonchus eruca* and 20.12; mg/100 g in *Sonchus asper*. Riboflavin, thiamine and niacin were also detected in both plants in little amount.

Secondary metabolite constituents of *S. eruca* and *S. asper* detected include the alkaloids and flavonoids. Pure isolated alkaloids and their synthetic derivatives are used as basic medicinal agents for their analgesic, antispasmodic and bactericidal effects [18]. Flavonoids, on the other hand exhibit Antioxidant activities, including the radical Scavenging effects and iron-chelating activities have been reported for genus *Sonchus*. It has been recognized that flavonoids show antioxidant activity and their effects on human nutrition and health are considerable. The mechanisms of action of flavonoids are through scavenging or chelating process [19]. From these finding both *S.*

eruca and *S. asper* may be antioxidant activities due the presence of flavonoids contents. Phenolic compounds are a class of antioxidant agents, which act as free radical terminators [20]. Currently number of synthetic antioxidants available but generally there is still a demand to find more information concerning the antioxidant potential of these plant species. The extract of *S. asper* is applied to wounds and boils [10]. Due to the presence of flavonoids which acts as anti-inflammatory. This agreed with the findings of polyphenolic compounds with known properties, which include free radical scavenging, inhibition of hydrolytic and oxidative enzymes and anti-inflammatory action [21]. Some evidence suggests that the biological actions of these compounds are related to their antioxidant activity [22]. In particular, despite widespread use of wild plants as medicines in Pakistan, there have been also found the relationship of total flavonoid and phenol contents with antioxidant activity. In the longer term, plant species (or their active constituents) identified as having high levels of antioxidant activity in vitro may be of value in the design of further studies to unravel novel treatment strategies for disorders associated with free radicals induced tissue damage [23].

Tannins comprise a large group of natural products widely distributed in the plant kingdom. They have a great structural diversity the condensed tannins, also known as proanthocyanidins. The application of proanthocyanidins as health protective antioxidants addition, proanthocyanidins were recognized as beneficial for vision. Similarly tannins containing chines herbs are used in Intestinal disorders, such as diarrhea and dysentery, intestinal parasites, rectal prolapse, hemorrhoids Bleeding, including functional bleeding, hematochezia (blood in the stool), bleeding hemorrhoids, and topically for bleeding wounds and ulcerations [24]. This is the reason extract of *S. asper* is used to wounds and boils [10].

Saponins are a class of chemical compounds, one of many secondary metabolites found in natural sources, with saponins found in particular abundance in various plant species [25].There is tremendous, commercially driven promotion of saponins as dietary supplements and nutriceuticals. There is evidence of the presence of saponins in traditional medicine preparations [26].

These plants are good source of vitamins including ascorbic acid, riboflavin, thiamine and niacin. Both plants have higher amount of ascorbic acid. Vitamin C is also a highly effective antioxidant. Even in small amounts vitamin C can protect indispensable molecules in the body, such as proteins, lipids (fats), carbohydrates, and nucleic acids (DNA and RNA) from damage by free radicals and reactive oxygen species that can be generated during normal metabolism as well as through exposure to toxins and pollutants (e.g. smoking). Vitamin C may also be able to regenerate other antioxidants such as vitamin E [27].Severe vitamin C deficiency has been known for many centuries as the potentially fatal disease, scurvy. Scurvy is rare in developed countries because it can be prevented by as little as 10 mg of vitamin C daily [28]. Ascorbic acid is used in herbal medicine for the treatment of common cold and other diseases like prostrate cancer [18]. As a result of the availability of ascorbic acid extract of *S. eruca* and *S. asper* may be used as antioxidant and stop bleeding. This study, therefore, has provided some biochemical basis for the ethnomedical use of extracts from *S. eruca* and *S. asper* in the treatment and prevention of infections. As rich source of phytochemicals, minerals and vitamins both these plants can be a potential source of useful drugs.

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