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CASE STUDY

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Chemical composition and Antioxidant capacity of Spartium junceum grown in Lebanon

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Abstract

The importance of Spartium junceum L. grown in Lebanon was investigated in this study. The chemical composition of three different S. junceum extracts (methanolic, water, and methanolic/water extracts) from different parts of the plant (stem, flower and legume) was determined using phytochemical screening analysis. Then the in vitro antioxidant capacity of these extracts was evaluated using the DPPH test. The obtained results revealed the presence of different metabolites such as phenols, flavonoids, alkaloids among others in the different prepared extracts from the studied parts of this plant.

The methanolic extract exhibited a significant antioxidant activity compared to the water and water/methanolic extracts. On the other hand, a significant antioxidant activity has been noticed for these parts mainly with the methanol extract. Therefore it was lower in water and water/methanol extracts.

Keywords: Spartium junceum L, chemical composition, antioxidant activity, DPPH

1 | INTRODUCTION

Natural products have shown an importance in several fields which prompted researchers to study its synthesis, biosynthesis and biological activities. More studies are searching for natural antioxidants that could be used in food or for therapeutic purposes in order to replace synthetic antioxidants known by their possible risks to human

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health.

Spartium junceum L. belongs to Fabaceae family that possesses a lot of applications in many domains (1). Also, saponins extracted from this plant served as a natural surfactant in beverage emulsions to substitute the synthetic surfactant (2).

Thus, the objective of this study is to determine the chemical composition of flowers, legumes and stems of S. junceum grown in south Lebanon by using three different solvents (methanol, water and methanol/water). Secondly, the antioxidant potential of these different parts was explored in vitro using the DPPH test.

2 | MATERIAL AND METHODS

2.1 | Plant collection and preparation of powder

Fresh samples were collected from south Lebanon in spring 2016. It were washed, well cleaned and air-dried under room temperature for several days. Then, the dried plants were ground to obtain a fine powder which was preserved in a container for later use.

2.2 | Extraction technique

Three solvents (methanol, water and water/methanol (v/v)) were used. Dried plant powder (50 g) were mixed with 500 mL of each of the used solvents. The mixtures were then placed for extraction by sonication at 60 ∘C for 1 hour with a frequence of 40 000 Hz (3). The resultant mixtures were filtered through vacuum filtration and the extracts were kept in the freezer for later lyophilization (ALPHA 1-2 LD, Fisher Bioblock).

2.3 | Preliminary phytochemical screening

To determine the chemical composition of the extracts of S. junceum, different types of metabolites were qualitatively detected following the method described by (4).

2.4 | Antioxidant activity assay or DPPH radical scavenging assay

The antioxidant capacity of the extracts was performed using the free radical 2,2-diphenyl-1-picrylhydrazyl (DPPH) described by (5). Briefly, different concentrations of the extracts (0.05, 0.2, 0.3, 0.4 and 0.5 mg/mL) were prepared. On a tube containing 1 mL of extract 1 ml of the DPPH reagent (0.15 mM) was added. The mixture was well shaken, and kept in dark room for 30 minutes. After that, the absorbance was measured at 517 nm by a Gene Quant 1300 UV-Vis spectrophotometer. As a positive control to this test, ascorbic acid was used while water-methanol v/v was used as blank. To calculate the scavenging ability the following equation was used:

% Antioxidant activity = [(Abs control - Abs sample) / Abs control] x 100

3 | RESULTS AND DISCUSSION

3.1 | Preliminary phytochemical screening

A classic chemical investigation is realized in order to detect the metabolites present in the flowers, legumes and stems of S. junceum.

Phytochemical compounds such as saponins, phenols, glucides, lignin, anthroquinone, flavonoids, alkaloids, tannins, resins, diterpenes, fixed oils and lipids were detected. Therefore, quinones, reducing sugars, proteins & amino acids, sterols/steroids, phlobatannins, anthocyanin and flavonones were absent in the aqueous extract from this plant.

In the methanolic extract, phenols, flavonoids, alkaloids, resins, cardiac glycosides, anthraquinones, saponins, fixed oils and fatty acids, and terpenoids were screened positive. However. tanins, quinones, proteins and aminoacids, reducing sugars, phlobatannins, anthocyanin, Flavonones and sterols/steroids were absent.

Finally, the hydroalcoholic extract revealed the presence of phenols, saponins, fixed oils, alkaloids, lignin, tannins, resins, flavonoids, quinones, diterpenes and Anthroquinones. However, it was revealed

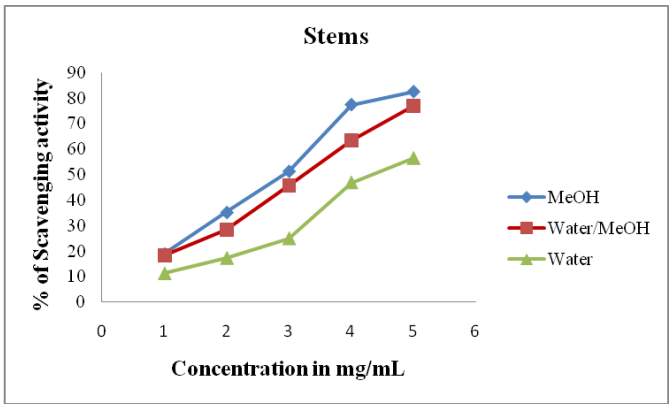

FIGURE 1: Antioxidant activity of the methanol, methanol/water and water extracts from the stems ofS. junceum

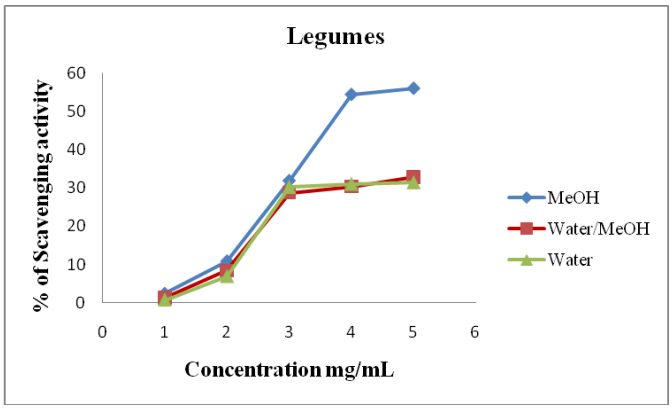

FIGURE 2: Antioxidant activity of the methanol, methanol/water and water extracts from the legumes ofS. junceum

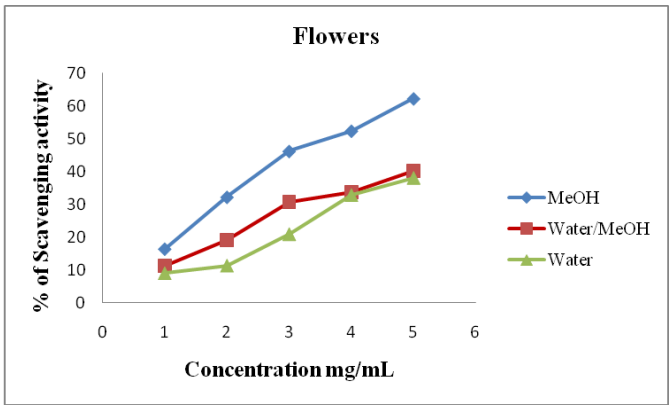

FIGURE 3: Antioxidant activity of the methanol, methanol/water and water extracts from the flowers ofS. junceum

the absence of proteins and aminoacids, glucides, reducing sugars, quinones, flavonones, phlobatannins, anthocyanin, and sterols/steroids.

3.2 | Antioxidant activity

Despite the fact that free radicals are advantageous in some cases, their excess could generate an oxidative stress causing chronic and harmful disorders in human beings (6). Thus, scientists are searching for plants having a high antioxidant potential. In the present study, the antioxidant capacity of the hydroalcoholic, methanolic and aqueous extracts from the stems, legumes and flowers of S. junceum grown in Lebanon was assessed using the DPPH method. Our obtained results showed that the concentrations of the three extracts from the three used parts presented a strong correlation with the DPPH test. An increase of the antioxidant activity was observed with the increased concentration of extracts (Figures 1,2 & 3). This result was expected since there is a close proportional relationship between the scavenging capacity of the extracts and their phenolic contents (7) .

Also, our results revealed that the antioxidant activity was the highest in the stems of the studied plant. In addition, the methanol extract was the most important solvent. It showed the highest antioxidant capacity compared to the others at all concentrations in stems, legumes and flowers. However, legumes of this studied plant showed the lowest antioxidant power at various concentrations and in all extracts.

4 | CONCLUSION

Secondary metabolites are of great importance and their presence in the plant makes it a great candidate for medicinal plants.

Spartium junceum possessed high potential of antioxidant activity mainly due to the presence of the identified compounds. This activity was higher in stems than flowers and legumes respectively. Also, the methanol was the best solvent used to obtain high antioxidant power.

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