Advanced Engineering Days

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Phytochemical and antimicrobial activities of *Cistus incanus* L., samples from Central Albania

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Cite this study: Lita, O. (2022). Phytochemical and antimicrobial activities of Cistus incanus L., samples From Central Albania, 3rd Advanced Engineering Days, 73-75

Keywords
Antimicrobial
Human disorders
Plant species
Medicals
Automatic

Abstract

From immemorial time plants have been the basis for medical treatments for different human disorders and diseases. At the current circumstances, researchers are increasingly interested in medicinal plants as alternative medicine, due to their good pharmacological properties, fewer side effects, and low cost. The genus *Cistus* L. (Cistaceae) comprises many interesting medicinal plants, distributed primarily in the Mediterranean region. The purpose of this study is to present the Phytochemical and Antimicrobial Activities of Cistus incanus L. samples From Central Albania. The phenolic contents in aqueous and hydromethanolic extracts of CS were found to be from 390 - 425 mgGAE/g edw. Moreover, mineral and phenolic contents of CS and CM were analyzed. The extracts of samples exhibited potent antioxidant activity in all used systems and possess strong inhibitory effect towards α-glucosidase (IC50: 0.97 ± 0.14 to 14.62 ± 1.21 μg/mL). Furthermore, the result showed high levels of phenolic content and unexpectedly some higher levels of mineral content in CS. The results suggest that the phenolic rich extracts of CS and CM may have a therapeutic potential against diseases associated with oxidative stress and may be useful in the management of hyperglycemia in diabetic patients.

Introduction

In the Albanian economy Medicinal & Aromatic Plants (MAPs) hold a very special place within national economy. Following [1] during the communist era, exports of MAPs earned close to $50 million. The domestic consumption of MAPs has always been very limited. Currently the MAPs continue to be a large export earner for the country at a size of $28million, or about 18% of total agricultural exports [2]. Also at the micro-economy level, MAPs contribute to a large portion of income of a household. In northern Albania, income from MAPs contributes to ~35% of total income.

Following different references [2], in Albania there are about 200 species of MAPs that are traded in the international market. Of these, the largest is sage, contributing to about 33% of the total export volume as against about 50% five years ago.

The genus *Cistus* L. (Cistaceae) comprises many interesting medicinal plants, distributed primarily in the Mediterranean region. Among them, twelve species are members of Albanian flora. *Cistus* species are frequently used in traditional medicines for the treatment of hyperglycemia and diabetes [3,4], peptic ulcers, and diarrhea and also as general remedies for several skin diseases and as anti-inflammatory and antispasmodic agents [4]. Furthermore, phytochemical studies on different *Cistus* species have revealed the presence of several phenolic compoundsmainly flavonoids and tannins [3]. Following different sources those compounds are generally involved in many biological activities, essentially in oxidative stress prevention.

According to [4,5] the diabetes mellitus is a serious chronic metabolic disorder that causes serious health complications and is a major cause of mortality [5]. Excessive postprandial glucose excursions are a known risk factor for developing diabetes. One interesting approach for limiting the excursion is to inhibit the activity of digestive enzymes of glucose production such as α-amylase and α-glucosidase.

The Cistus species are rich in polyphenolic compounds (the main components are polyphenolic compounds, commonly known as catechins). This characteristic makes these plants able to withstand extreme conditions. The metabolism of polyphenols protects the plants against different stresses, whether biotic or abiotic [6, 7].

Figure 1. *Cistus incanus*, National Park Shebenik Jabllanica

Material and Methods

Plant Material: Cistus incanus L. were collected in May 2021 from the area of National Park Shebenik-Jablanica (east Albania). The aerial parts were cleaned and dried in the shade at room temperature until reaching a constant weight and were then powdered and used for further investigation.

Preparation of Plant Extracts: For hydromethanolic extract preparation (hydromethanolic extract of Cistus incanus (CSM) and hydromethanolic extract of Cistus incanus (CMM)), 50 g of dried sample was extracted with 500mL of 80% aqueous methanol at room temperature and under mechanical stirring for 24 hours. The GC-MS analyses were carried out using a Hewlett-Packard 6890.

Results and Discussions

Total phenolic, flavonoid, and proanthocyanidin contents are presented in Table 1. Following the analyses of *Cistus incanus* samples the phenolic contents in aqueous and hydromethanolic extracts of CS were found to be 399 mgGAE/g edw and 340mg GAE/g edw, respectively. Results of flavonoid and proanthocyanidin contents show that hydromethanolic extraction resulted in significantly higher values of those compounds in analysed samples. Based on detailed analyses the amounts of flavonoid and proanthocyanidin in hydromethanolic extracts of CS and CM, respectively, were 185mg RE/g edw, 159mg CE/edw, 155 mg RE/g edw, and 186.2mg CE/g edw, while in aqueous extracts they were 133 mg RE/g edw, 151 mg CE/g edw, 81mg RE/g edw, and 153 mg CE/g edw, for CSA and CMA, respectively. It is worth to mention that similar results are revealed by [3] where the phenolic contents of other *Cistus* species plants indicate an important health promoting activity. Those compounds are secondary plant metabolites involved in the normal growth and development and act as defense mechanisms of plants against pathogenic and parasite infection and free radicals' generation. Further on [3] emphasizes that the phenolic compounds have been reported to have multiple biological effects and are considered as a major group of chemicals that contribute to the antioxidant potential of plant extracts.

Table 1. Total phenolic, flavonoid, and proanthocyanidin contents

	Phenolic content	Flavonoid content	Proanthocyanidin content
CSA	399	185	159
CSP	340	153	161
CMA	378	133	151
CMM	369	146	81

The results are expressed as (1) mg of gallic acid equivalent, (2) mg of rutin equivalent, (3) mg of catechin equivalent

CSA: aqueous extract of *Cistus incanus*; CSM: methanolic extract of *Cistus incanus*; CMA: aqueous extract of *Cistus incanus*; CMM: methanolic extract of *Cistus incanus*.

Conclusion

The aqueous and hydromethanolic extracts of the aerial parts of *Cistus incanus* L. samples from National Park Shebenik-Jabllanica (East Albania) presented considerable contents of phytochemical and antimicrobial activities compared with values of other species of genus Cistus. The results suggest that the CS and CM extracts may have therapeutic potential against diseases associated with oxidative stress. This study recommends the importance of further studies to this and other species of spontaneous flora.

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