

Phytochemical Screening and Mineral Composition of *Anthyllis Barba Jovis* L. Leaves

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ABSTRACT

Introduction: *Anthyllis barba jovis* is an endemic Fabaceae of the Mediterranean basin. This species is very little studied, and therefore, deserves a greater interest. We undertook a phytochemical screening (search for saponin, alkaloids, flavonoids, tannins, terpenes, sterols, free quinones and anthocyanins) and an analytical study on the mineral composition of leaves.

Materials and Methods: The fresh plant was collected from Soug Rguibette station in El Kala National Park, Willaya of El Tarf (Eastern Algeria) in autumn 2020.

Nitrogen (N) was determined by the Kjeldahl method. Calcium and magnesium were determined by titrimetry, total phosphorus and iron by spectrophotometry while sodium and potassium were determined by flame spectrophotometry.

Results and discussion: Phytochemical screening revealed that the leaves are rich in flavonoids, saponins, and gallic tannins and moderately rich in terpenes and sterols, anthocyanins and free quinones.

The ash content in the leaves was 7.89% of fresh matter. The sodium was the dominant component with 610 mg/100g of dry matter, followed by potassium (252 mg/100g) and then calcium (107 mg/100g). The contents of magnesium (38.9 g/100g), phosphorus (14.64 mg/100g), nitrogen (12.0 mg/100 g) and iron (4.2 mg/100g) were very low.

Conclusion: This study has allowed us to know some important aspects of *Anthyllis barba-jovis* that will be used to develop the cultivation of this species to better exploit its medicinal qualities.

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INTRODUCTION

Algeria conceals an important plant heritage thanks to the diversity of its climate (Mediterranean, continental and Saharan) and its geography (coastal regions, mountainous massifs, high plateaus, steppe and Saharan oases). Among these species, *Anthyllis barba jovis* (Judea beard), of the family Fabaceae, endemic to the Mediterranean basin. It is little known in Algeria and very little studied. It is presented in the form of a shrub of approximately 1 meter, with erect branches, white-silky, very leafy, not spinescent. Leaves imparipinnate, sheathing petiole, with 4-9 pairs of linear-oblong, equal silky-silver leaflets. Flowers light yellow, numerous, in terminal and axillary heads, pedunculate, surrounded by a sessile, cut foliaceous bract; calyx scarcely swollen, hairy-silky, with 5 nearly equal teeth, not feathery, much shorter than the tube; leaf blade equal to the tab; carina straight, obtuse; pod oblong, acuminate, glabrous, with one seed.¹

The seeds are very resistant to salinity, allowing this species to colonize a habitat suitable for halophytes.²

Elsewhere, this species is used in the pharmaceutical industry due to its antioxidant, anti-inflammatory and anti-diabetic properties, as well as for the essential oils present in the flowers and seeds. The morphology of the plant and its high tolerance to high salinity, wind and drought offer the possibility of being introduced as an ornamental landscape plant for Mediterranean coastal areas.³ The aim of this study is to know some aspects of this species (phytochemical screening and mineral composition of the leaves) in order to take advantage of its medicinal qualities.

KEYWORDS:

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MATERIALS AND METHODS

Sample Collection and Preparation

The leaves of *Anthyllis barba-jovis* were collected from the station of Soug Rguibet (latitude 36° 54 North and longitude 08° 17 East) next to the lake Mellah at the National Park of El Kala in the Wilaya of El Tarf located in the North-East Algeria, in autumn 2020.

The identification of the species was carried out at the laboratory of Plant Biology of Chadli Bendjedid University of El Tarf (Algeria).

The harvest of the plant was carried out in the early morning during a non-rainy day according to the guidelines of the World Health Organization (WHO).

The leaves were dried in the shade and in the open air until they were completely dry, then they were reduced to powder.

Phytochemical Screening

The secondary metabolites were explored according to the methods of Harborne⁴ for alkaloids and flavonoids; Sofowora⁵ for saponins; Dohou et al.⁶ for tannins; Bouquet⁷ for terpenes and sterols; Razafindrambao⁸ for anthocyanins; Christensen and Abdel-Latif⁹ for free quinones.

Mineral Composition

From the ash we could determine the mineral composition in nitrogen (Kjeldahl method), total phosphorus (P) (spectrophotometric determination), and iron (Fe) (spectrophotometry according to the (Triazine method)

Calcium (Ca²⁺) and magnesium (Mg²⁺) were determined by Titrimetry and finally, sodium (Na⁺) and potassium (K⁺) were determined by flame spectrophotometry after saturation with ammonium acetate and extraction with KCl.

RESULTS AND DISCUSSION

Phytochemical Screening

The phytochemical screening (Table 1) revealed that this plant is rich in saponins, flavonoids, gallic tannins and moderately

Table 1: Results of the phytochemical tests of *Anthyllis barba-jovis*.

Chemical component	Presence / absence
Alkaloids	-
Saponins	+++
Flavonoids	+++
Gallic tannins	+++
Coumarins	-
Cardenolides	-
Terpenes and sterols	++
Volatil oils	-
Anthocyanins	++
Leuco-Anthocyanins	-
Free quinones	++

Meaning of the symbols: +++ Strongly present, ++ Abundantly present, + Presence, - Absence.

rich in terpenes and sterols, free quinones and anthocyanins. These results are consistent with those of Pistelli et al.¹⁰ for the same species and those of Ghalem¹¹ who worked on *Anthyllis vulneraria*. The phytochemical screening on the other hand, was negative for alkaloids. These results are very close to those found in three fabaceae of the genus *Genista*.¹² In general, the presence and distribution of different active ingredients is under the influence of several parameters, such as the stage of development, genetic origin of the species, climate, nature of the soil, water, altitude etc.

Mineral Composition

The ash content of the leaves was 7.89 % of fresh matter, which is much lower than those found in other fabaceae: 15.1 % in *Genista numidica*, 15.7% in *Genista ferox* and 15.6% in *Genista tricuspidata*.¹² This value is also; lower than the 11.69% reported by Ghalem¹¹ in *Anthyllis vulneraria* leaves, but close to that recorded by Alexandru et al.¹³ for *Anthyllis macrocephala* species (6.53%). These differences could be related to the influence of the genetic origin of each species. On the other hand the modest amount in ash content found in our sample may be due to internal transfers of mineral elements between different organs of the plant, moreover the sampling of leaves was performed at the flowering stage during which the fruit set phase (transformation of the ovary into fruit) is prepared.¹⁴

Leaf Analysis for Mineral Elements Revealed the following Amounts:

The leaf analysis of mineral elements showed that sodium is the dominant component with a rate of 610 mg/100g of dry matter, followed by potassium (252 mg/100g) and then calcium (107 mg/100g). The contents of magnesium (38.9 g/100g), phosphorus (14.64 mg/100g), nitrogen (12.0 mg/100 g) and iron (4.2 mg/100g) are very low. This order of preponderance correlates well with the work of Ati¹² on three Fabaceae species of the genus *Genista*.

The predominance of sodium could be explained by the proximity to the sea where salty waters and soils are mostly rich in sodium chloride. Skiredj¹⁵ reported that plants can contain elements, such as sodium that play beneficial roles in their growth and in the quality of their products without being essential; they are called: accessory elements, semi-halophilic, growing especially on the Mediterranean coast.

Concerning the low level of nitrogen, it could be linked to its use in the synthesis of amino acids, moreover, Fabaceae are known for their richness in proteins. There is a significant variability

Table 2: Results of mineral composition of *Anthyllis barba-jovis* leaves.

Chemical components	Contents (mg/ 100 g of DM)
Total nitrogen (N)	12
Total phosphorus Total (P)	14.64
Iron (Fe ²⁺)	4.2
Calcium (Ca ²⁺)	107
Magnesium (Mg ²⁺)	38.9
Sodium (Na ⁺)	610
Potassium (K ⁺)	252

in the content of mineral elements in leaf tissue depending on the organs analyzed, species, and environmental conditions.¹⁵ The mineralogical study shows that the leaves of this species is very poor in minerals compared to leaves of other fabaceae as *Genista* species¹² and *Cerantonia siliqua*.¹⁴

CONCLUSION

This study has allowed us to know several important aspects of *Anthyllis barba-jovis*, which will be used to develop the culture of this species to better exploit its many qualities both ecological and medicinal. The mineralogical study shows that the leaves of this species cannot be considered as a source of minerals but it would be interesting to explore the mineral content in the seeds.

Disclosure Statement

There is no actual or potential conflict of interest in relation to this article.

Authorship Contributions

- Bouzata Chouhaira performed the harvesting of the plant, the phytochemical screening and the final elaboration of the manuscript.
- Touil Wided and Boutabia Lamia collaborated in the analysis of the minerals.
- Bennadja Salima translated the manuscript into English.

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