



Chemical analysis of the antioxidants from the aerial parts of wild *Polygonum equisetiforme* from Tunisia



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ABSTRACT

The antioxidant capacities of 11 populations of *P. equisetiforme* collected from the Saharan, arid, and semi-arid bioclimatic zones in Tunisia were investigated. Total phenolic content varied from 31 ± 5 to 113 ± 4 mg GAE/g dw. Flavonoid content varied from 29 ± 2 to 130 ± 10 mg QRE/g dw and condensed tannins ranged between 8 ± 1 and 33 ± 2 mg CTE/g dw. *P. equisetiforme* showed a high antioxidant potential, with the total antioxidant capacity varying from 10 ± 2 to 71 ± 3 mg GAE/g dw. The DPPH scavenging activity ranged from 12 ± 1 to 51 ± 6 mM TRE/g dw and the EC₅₀ of reducing power ranged between 68 ± 5 and 210 ± 20 µg/mL. Plants collected from the Saharan climate showed the highest phytochemical and antioxidant activity. LC–ESI-MS analysis allowed identification of 19 compounds, of which quinic acid, gallic acid, (+)-catechin, epicatechin, quercetin-3-O-galactoside, quercetin-3-O-rhamnoside, and cirsiol were identified as major compounds. High quantitative and qualitative variability in the phenolic acid and flavonoid fractions between the studied populations were observed. Overall, *P. equisetiforme* could be considered as a prospective source of useful natural antioxidants.

1. Introduction

Due to their high amounts of phytochemical compounds, several species of the *Polygonum* genus are widely used in folk medicine around the world to treat a wide range of diseases such as dermatitis haemorrhoids, diarrhoea, heart diseases, skin infections, bacterial infections, dysentery, snake-bite, insomnia, and influenza (Chen et al., 2012; Narasimhulu, Reddy, & Mohamed, 2014). It has been shown that these wild plants are sources of potential pharmacological activities. The potential medicinal value of these plants has been the subject of various studies, and many chemical constituents, such as phenols, flavonoids, tannins, stilbenes, anthraquinones, glycolipids, terpenes, and polysaccharides, have been identified (Yang, Zou, Ye, Bao, & Ding, 2003). The biological activities of those chemical constituents have been investigated including antioxidant, antibacterial, antifungal, anti-inflammatory, anticancer, antiviral, lipid-regulating, estrogenic, and neuroprotective activities (Narasimhulu, 2014; Wang, Zhang, & Yang, 2006).

In Tunisia, the genus *Polygonum* comprises 4 wild species including *P. aviculare*, *P. balansae*, *P. maritimum* and *P. equisetiforme* which are found in much of the country. *P. equisetiforme* is widely distributed on the active sand dunes of the Saharan zone desert (FAO, 1988). *P. equisetiforme* seems to be well liked by domesticated animals in the Tunisian desert for grazing and browsing, offering important economic benefits to the rural populations (Gamoun & Hanchi, 2014). On the other hand, heavy grazing negatively affects the species 'population dynamics' and has led to the disappearance of several *P. equisetiforme* populations (Gamoun, Belgacem, Hanchi, Neffati, & Gillet, 2012). Showing the value of this threatened species could be used to promote the conservation of these wild plants.

No specific mention of toxicity has been found for *P. equisetiforme*, in contrast to the other species of the genus *Polygonum*, allowing extensive use of this species in health care and self-medication. The plant is used as a flavoring for tea (Facciola, 1990). *P. equisetiforme* is also used as a herbal medicine in the treatment of sore throat, cold and cough (Khafagi & Dewedar, 2000). In the south of Tunisia, the plant is

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