Evaluation of the Antioxidant Capacity of the Various Extracts of Dracocephalum apolychaetum

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ABSTRACT

The purpose of this study was to evaluate the antioxidant effect, total phenolic content of the ethanol, methanol and aqueous extract Dracocephalum polychaetum in flowering stage. The total phenolic content of the plant was measured colorimetrically. Antioxidant capacity of the plant extract was evaluated by DPPH method. In the present study, the highest antioxidant effect was to the extract of methanol, ethanol and aqueous, respectively. IC50 values in extracts of ethanol, methanol and water were respectively 11.89, 8.07 and 24.04. This value was obtained 0.86 µg/ml for BHT. The maximum level of phenol was to methanol, ethanol and aqueous extract respectively. Positive correlation was seen between the value of phenol and antioxidant capacity. The results show the various extracts of D. polychaetum have an antioxidant effect and could be considered as a potential source of natural antioxidants for the treatment of some diseases.

INTRODUCTION

Oxidative stress, caused by an imbalance between ROS and the anti-oxidative defense systems is considered to be a major etiological or pathogenic agent of cardiovascular and neurodegenerative diseases, cancers, Alzheimer’s, diabetes and aging. Because they inhibit or delay the oxidative process by blocking both the initiation and propagation of oxidizing chain reactions, antioxidants for the treatment of cellular degenerations are beginning to be considered (Jang et al., 2010). In general, antioxidants are substances present in low concentrations (compared to the oxidizable substrate), which significantly delay or inhibit oxidation. The radicals formed from antioxidants do not propagate the lipid oxidative chain reaction mentioned above, but are neutralized by reaction with other radicals to form stable products, or recycled by other antioxidants. Recently, there have been great efforts to find safe and potent natural antioxidants from various plant sources. As harmless sources of antioxidants, edible fruits have been investigated for their antioxidant properties (Riberio et al., 2008; (Kubola and Siriamornpun, 2008).

Dracocephalum polychaetum Bornm belonging to Lamiaceae family (Oliveira et al., 2009). It is one of the endemic species of Dracocephalum genus in Iran (Rechinger, 1982). Recently, much attention has been paid to the Dracocephalum genus and its chemical constituents because of their diverse activities, such as anticancer, antioxidant, antihypoxic, and immuno modulatory activities (Wannse et al. 2010). The plants used in traditional medicine in Kerman (Iran) for nice odor and indigestion, colic and stomachache. Its local name is mafaroo. The aerial part of D. polychaetum yielded 1.3% of pale yellowish oil, which contained perilla aldehyde (69.60%) and limonene (16.55%). Two flavons apigenin and luteolin were isolated from this plant (mehrabani et al., 2014). The antioxidant power of acetone oleoresin (AO), deodorized acetone extract (DAE) and methanol extract (ME) isolated from Moldavian dragonhead (Dracocephalum moldavica L.) leaves and flowering parts was tested by Povilaityté et al., 2001). Very few articles deal with antioxidant properties of Dracocephalum polychaetum, Therefore, as a part of our ongoing antioxidant research an aqueous, ethanol and methanol extract of the plant was investigated for its antioxidant properties in a battery of in vitro assays.
MATERIALS AND METHODS

Plant materials

Aerial parts containing leaves, stems and flowers of *D. polychaetum* were collected from Hezar mt., Kerman province at altitude 3400 m in July 2013. The taxonomic identity of the plants was confirmed by a botanist from the department of biology in Kerman branch, Islamic Azad University.

Extraction

Total extract was prepared from 100 g dried plant using maceration method. Amount of 500 g of the plant was extracted with methanol 80%, ethanol 80%, and water by maceration method. Total extract were concentrated in the vacuum to dryness. Dried samples were stored at -20°C until experimentation.

DPPH assay

The ability of the plant extracts to scavenge DPPH* free radicals was assessed in studies II, III and IV by the method described by Gyamfi et al. (1999). Briefly, a 50 µL aliquot of dissolved extract was mixed with 450 µL Tris-HCl buffer (50 mM, pH 7.4) and 1.0 mL (0.1 mM) DPPH dissolved in methanol. After a 30 min reaction period, the resultant absorbance was recorded at 517 nm. The percentage inhibition was calculated using Eq. 2 and the concentration of the extract at which it exhibits 50% inhibition (IC50) was estimated using a non-linear regression algorithm.

\[
\text{Inhibition rate} = \left( \frac{A_{\text{blank}} - A_{\text{sample}}}{A_{\text{blank}}} \right) \times 100
\]

Statistical Analysis

Data were presented as mean values ± 95% confidence interval. Analysis of variance was performed using ANOVA procedures. Significant differences between means were determined by Tukey’s pairwise comparison test at a level of P<0.05.

RESULTS AND DISCUSSION

*Dracocephalum polychaetum* Bornum, as a plant of Iran, in particular Kerman, is being used among the people of Kerman for overcoming the digestive side effects and the swelling of stomach. Based on the various studies in this field, two flavonoid luteolin and tannins were available in this plant. Antioxidant effects of aqueous, ethanol and methanol extracts were evaluated in this study.
methanol extracts of D. polychaetum was obtained by DPPH method based on linear regression equation. The dose is able to scavenge 50% of the free radical DPPH, was recorded as IC50. As seen in Figure 1, IC50 values in extracts of ethanol, methanol and water were respectively 11.89, 8.07 and 24.04. This value was obtained 0.86 µg /ml for BHT. In these circumstances, antioxidant property will be higher in Lowest IC50 value. In consequence, the highest antioxidant activity was to methanol extract > ethanol extract > aqueous extract.

The results of measuring the plant phenol content are given in Figure 3. Significant difference was found between the amounts of phenol in the three extracts. The highest amount of phenol was to methanol, ethanol and aqueous extracts, respectively. Based on the results, there was a positive correlation between phenolic compounds and antioxidant activity. IC50 values decreased with the increase of phenolic compounds and consequently, antioxidant activity increased. The phytochemicals which might be responsible for the scavenging activity in this species is phenolic and flavonoid constituents.

The obtained chemical information about D. palmatum herb allows characterizing the isolated phenolic compounds as responsible factors stipulated the antioxidant properties of the total extract. Earlier, the expressed antioxidant activity of the aglycone and glucosides of luteolin and apigenins as well as derivatives of caffeic acid (Heimet al., 2002; Rice-Evans et al., 1996), have been shown by various researchers.
CONCLUSION

The plant extract demonstrated the ability to scavenge DPPH in this study. Metanolic extract revealed the higher activity compared than ethanolic and aqueous extract. The extract was less active than the positive controls which may be due to the fact that antioxidant components in the extract are present at lower concentrations compared to antioxidant positive controls. The same trend in DPPH has been observed in other Lamiaceae plants. Based on the DPPH scavenging data, the extract may have the ability to scavenge free radicals generated during oxidative stress.

REFERENCES


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