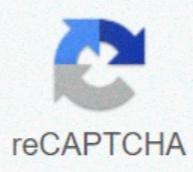




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Dracocephalum kotschy. Dracocephalum kotschy common name. Dracocephalum thymiflorum. Dracocephalum multicaule.

Objectives: *Dracocephalum* has over 60 species and is found mainly in the temperate regions of Asia and Europe. One of these species, i.e., *Dracocephalum kotschy* Boiss, is known to have a number of medicinal properties and active ingredients in many parts of the world. Despite being an endemic wild-flowering plant of great importance, the plant is currently considered endangered in Iran. Besides, there is paucity of information on the significance of the medicinal properties and active constituents of *D. kotschy* among the Iranian people. On that account a systematic review of studies reporting on the medicinal properties and active ingredients and its significance to human and animal health was conducted and the existing knowledge gaps were identified. Methods: The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used in the search for published articles on medicinal properties and active ingredients of *D. kotschy* and its significance on humans and animals in Iran. The search was confined to scientific articles from repositories of popular data bases and search engines among them PubMed, Web of Science, Google Scholar, Science Direct, SpringerLink, and Scopus. The search narrowed down on scientific journals, books, and book chapters focusing on the medicinal properties of *D. kotschy* in Iran for the period between 1970 and 2018. Results: A total of 1158 scientific articles were sourced from the various databases, out of which 38 met the search criteria and qualified for this review. The studies were conducted in only 9 of the 31 provinces of Iran, with a large proportion in Isfahan province, central Iran. The studies showed that all plant parts (roots, aerial parts, flowers, and leaves) had active constituents. Essential oils and aerial plant parts were the main components studied. Nevertheless, the most frequently reported constituents were xanthomicrol, limonene, luteolin, geranial, apigenin, and calycopterin. A number of medicinal properties were reported among them antioxidant, antibacterial, anticancerous, anticonceptive, antihyperlipidemic, antispasmodic, cytotoxic, and immunomodulatory effects. The plant was also reported to be a remedy for inflammatory pain, headaches, congestion, liver disorders, ulcer, fever, renal pain, dyspepsia, stomach ache, abdominal pain, joints pains, muscle spasm, congestion, bloating, and wound healing effects, among others. Conclusion: This review has shown that *D. kotschy* is an important medicinal plant with a large number of active constituents and great potential to safeguard human and animal health in Iran. However, over utilization of the *D. kotschy* plant is already endangering its existence. Nevertheless, more studies need be conducted across the country. 1. Hooper D., Field H. Useful Plants and Drugs of Iran and Iraq. Vol. 9. Field Museum of Natural History, Botanical Series no. 3; 1937. [CrossRef] [Google Scholar]2. Kinghorn A.

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RESEARCH ARTICLE

Trichomes and Regeneration by Direct Organogenesis of Medicinal Plant *Dracocephalum kotschy* L. Using Shoot Tips (Lamiaceae)

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Abstract

The present study describes the procedure for micro-propagation of *Dracocephalum kotschy* L. using shoot tips from in vitro-grown plants. The best response was observed for shoot tips on MS medium containing 5 mg 6-benzylaminopurine L and 0.2 mg 1-naphthaleneacetic L acid. Reproduction for other types of the explant hypocotyls and cotyledons did not show satisfactory results so that the explants did not develop into normal shoots and in turn developed into the calli after 12 days of culture. Histological analysis showed that only the shoot tip revealed a direct induction of more teratological phenomena to arise around the cut end of the explant. The regenerated plants were rooted on MS medium containing 5 mg 6-benzylaminopurine L + 0.2 mg 1-naphthaleneacetic acid and shoot tips on same medium of elongation. After hardening, the rooted plants were transferred to the greenhouse where they grew, matured, and flowered normally with a survival rate of 95%. We concluded that the present protocol can be efficiently used for mass propagation of *Dracocephalum kotschy*.

Key words: *Dracocephalum kotschy*, organogenesis, regeneration, trichomes

Abbreviations

BAP: 6-benzylaminopurine; KIN: kinetin; NAA: 1-naphthalene acetic acid; IB/A: indole-3-butyric acid

Introduction

Many species of Lamiaceae are aromatic and often used as herbs and spices in medicine as well as cosmetics. In Iran (Werker et al. 1985). The *Dracocephalum kotschy* L. a wild-growing flowering plant belonging to the family Lamiaceae, is best known for the medicinal and cosmetic uses of many members of the family (Koush et al. 2008). Many constituents and active essential oils have been isolated from various members of the family in southwestern Asia. *D. kotschy* has been used as a medicinal herb for several years in Iran as a folk medicine for its anti-inflammatory, antiseptic properties (Koush et al. 2008). Anti-hyperlipidemic (Sajjadi et al. 1998) and immunomodula-

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Original Research Paper

Phytochemical screening and evaluation of antioxidant activities of *Dracocephalum kotschy* and determination of its luteolin content

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Luteolin

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Abstract
Objective: *Dracocephalum kotschy* (Lamiaceae family) has been used traditional medicine for stomach and liver disorders, headache and congestion. In the present study, we have investigated the antioxidant activity of methanol, dichloroethane, ethyl acetate and methanol extracts of *D. kotschy*.
Material and Methods: Antioxidant activities of extracts were evaluated using the integration of HPLC-DPPH and ferric reducing antioxidant power (FRAP) methods. In addition the highest antioxidant activity was determined.
Results: The highest antioxidant activity was observed for the methanol extract (among the three tested extracts) showing 50% DPPH radical scavenging at 1.2 mg/ml. The IC₅₀ was 1.2 mg/ml hydroxy tolone (BHT) and ascorbic acid (3.00 µg/ml, 0.97 µg/ml). Also, luteolin was detected in methanol extract; it was identified by HPLC and compared with standard luteolin with standard and it was one of antioxidant components of this plant. In addition, the antioxidant activity of methanol extract was higher than BHT. FRAP method showed that the IC₅₀ was in the range of 11.62–22.29 mg Gallic acid/gm of dry extract and flavonoid content was in the range of 3.97–0.042 mg Quercetin/ gm of extract. The IC₅₀ was 1.2 mg/ml acetyl salicylic acid. The quantity of luteolin in *D. kotschy* was found to be 1081.005 µg/g of dried plant.
Conclusion: The results of this investigation indicated that luteolin plays major role in the antioxidant activity of the plant.

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