Hypolipidemic activity of Dracocephalum kotschyi involves FOXO1 mediated modulation of PPARγ expression in adipocytes

Shima Aslan and Razieh Yazdanparash*

Abstract

Background: Dracocephalum kotschyi, as a wild-growing flowering plant (from Lamiaceae family), is locally prescribed for its various health-promoting properties including hypolipidemic and hypoglycemic effects. To evaluate the scientific basis of the traditional use of Dracocephalum kotschyi extract (DKE), we aimed to disclose its mode of action with main focus on white adipose tissue of diabetic rats.

Methods: Streptozotocin-induced diabetic rats were exposed to different doses of DKE for 28 days followed by the determination of the sera biochemical factors. The oxidative stress status of the diabetic versus nondiabetic rats' adipose tissue under the influence of DKE were also evaluated in terms of malondialdehyde (MDA) and some of antioxidant enzymes (superoxide dismutase, SOD and catalase). Furthermore, we explored 3T3-L1 cells to DKE and then evaluated both the extent of cells differentiation to adipocytes and measured the expression levels of some of the key signaling elements involved in adipogenesis and lipogenesis with main focus on PPARγ.

Results: Our results indicated that DKE administration attenuated the levels of TG (triglycerides), TC (total cholesterol), LDL and blood glucose by 5.4, 40, 54 and 25%, respectively and enhanced the levels of HDL, catalase and SOD by 45, 74 and 56%, respectively. In addition to profound adipogenic and lipogenic effects on 3T3-L1 cells, DKE significantly enhanced p-AKT, p-FOXO1, PPARγ and SREBP-1 expressions while that of p-JNK was quenched parallel to effect of pioglitazone, an antidiabetic agent, used in our investigation as the positive control drug.

Conclusions: Besides of confirming the hypolipidemic action of the plant, our results provided documents on at least one mode of action of DKE with profound effect on lipid metabolism in adipose tissue. Regarding our results, further investigation on DKE, as a new potential hypolipidemic alternative drug is warranted.

Keywords: Adipose, Diabetes, Dracocephalum kotschyi, Lipogenesis, PPARγ, SREBP-1

*Correspondence: yazdanparash@uinet.ac.ir

Institute of Biochemistry and Biophysics, University of Tehran, PO Box 12345-1384, Tehran, Iran

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Availability of data and materials
The dataset supporting the conclusions of this article is included within the article and its additional... are available from the corresponding author on reasonable request.

Authors' contributions
Both authors have made substantial contributions to the following: conceiving and designing the study; acquiring, analyzing, and final approval of the review to be submitted.

Ethics approval and consent to participate
All procedures performed in studies involving animals were approved by Ethics Committee of University of Tehran.

Consent for publication
The authors declare that they agree to publish the paper.

Competing interests
The authors declare that they have no competing interests.

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