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Assessment of effects of phenolic fractions from leaves and petals of dandelion in selected components of hemostasis

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ABSTRACT

Aerial parts and roots of *Taraxacum officinale* (dandelion) have been found to be rich sources of polyphenols, including cinnamic acid derivatives, flavonoids and triterpenoids, which exert different biological activities, such as anti-inflammatory, anticancer and antimicrobial. Additionally, the whole plant is recognized as safe and well tolerated by humans, with no reported adverse effects. Nowadays, dandelion is a commonly available dietary supplement and a component of pharmaceutical preparations used for the treatment of bladder, liver, and spleen. Nevertheless, the effect of dandelion on blood platelets and plasma – components of hemostasis involved in the functioning of a cardiovascular system and linked with various cardiovascular diseases, has not been studied yet. Thus, the main objective of our *in vitro* experiments was to examine the anti-platelet and antioxidant properties of four standardized dandelion phenolic fractions, *i.e.* leaves 50% and 85% methanol fractions, and petals 50% and 85% methanol fractions, in blood platelets. Additionally, aforementioned plant preparations were investigated for hemostatic activity in plasma, using three selected hemostatic parameters: the activated partial thromboplastin time (APTT), prothrombin time (PT) and thrombin time (TT). None of the studied dandelion fractions, caused the damage of human blood platelets, at the whole tested range. The inhibition of lipid peroxidation in platelets treated with H_2O_2/Fe (the donor of OH·) was observed for two fractions: leaves and petals 50% fractions, both at the dose 50 μg/mL. Analysis of the effect on the coagulation activity of human plasma demonstrated that three fractions: petals 50% fraction, and leaves and petals 85% fractions, significantly prolonged the thrombin time, at the whole tested range. On the contrary, none of the fractions changed the APTT and the PT. The obtained results demonstrate that dandelion preparations, based on aerial parts, especially rich in hydroxycinnamic acid derivatives (leaves and petals 50% fractions) are promising plant materials exerting both antioxidant and anticoagulant activities of the hemostatic system that is beneficial in the prevention and treatment of cardiovascular diseases.

1. Introduction

A number of completed and ongoing studies, based on both *in vitro* and *in vivo* experiments, provide evidence that plant extracts and plant based food products, such as jams and juices; and phytopharmacological preparations, rich in phenolic compounds can reduce risk of cardiovascular disease (Chong, Macdonald, & Lovegrove, 2010; McEwen, 2014). In the last two decades, several investigations aimed at cognition of chemical composition and bioactivity of dandelion (*Taraxacum officinale*) have been conducted (Hu & Kitts, 2005; Yarnell & Abascal, 2009; Gargouri et al., 2012; Tettey, Ocloo, Nagajyothi, & Lee, 2014; Hassan, El-Kholy, & Galal, 2015; Martinez et al., 2015). As a result, the aerial parts of dandelion have been characterized as rich in phenolic compounds, especially hydroxycinnamic acid derivatives and flavonoid glycosides (Chen, Inbaraj, & Chen, 2012; Hudec et al., 2007; Jedrejek, Kontek, Lis, Stochmal, & Olas, 2017; Kim et al., 2008; Schütz, Kammerer, Carle, & Schieber, 2005; Williams, Goldstone, & Greenham, 1996). Due to exerted bioactivities, and no reported adverse effects in humans (Martinez et al., 2015; Sweeney, Vora, Ulbricht, & Basch, 2005; Yarnell & Abascal, 2009), the plant is commonly available food ingredient and component of medical preparations. Moreover, extracts from dandelion organs and derived products, such as teas, honey and tinctures, are listed on the US Food and Drug Administration list of foods and supplements generally recognized as safe (E-CFR, 2015). For

Abbreviations: APTT, activated partial thromboplastin time; DMSO, dimethylsulfoxide; H_2O_2, hydrogen peroxide; GSH, glutathione; GRAS, generally recognized as safe; HDL, high density lipoprotein; LDH, lactate dehydrogenase; LDL, low density lipoprotein; MDA, malonyldialdehyde; O_2^{-}·, superoxide anion; PT, prothrombin time; TBA, thiobarbituric acid; TBARS, thiobarbituric acid reactive substances; TT, thrombin time; VLDL, very low density lipoprotein

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