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Review

A review of the health benefit potentials of herbal plant infusions and their mechanism of actions

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ABSTRACT

Nowadays, there has been a universal propensity to application of natural phytochemicals accessible in diverse intrinsic rich sources such as fruits, leaves, branches as well as roots of different plants because of existence of substituents with bioactive potentials, well-being advantages and functional ingredients. The preservative consequence of many herbs and spices are proposing the existence of compositions with varied remedial specifications in their structures. Plants are classified by geographical status and inharmonious territory that created further than several thousands herbages with various advantages. The various superiority of herbaceous infusions, such as antidiabetic, anti-carcinogenic, antimicrobial and antioxidant are appeared in diverse functions. Phenolic as well as secondary metabolite components have been reported as the major components having health superiority, and follow this, superb relationship between those advantages and various measured antioxidant values, such as reducing power, scavenging and inhibition capability of free radicals, and metal gelation activity are observed. Hence, the current review intends to debate the effectual fragments of medicinal plants with vulnerary potentials and explains their mechanism of functions.

Contents

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1. Introduction

Plants with medicinal potentials and their secondary metabolites have been identified and applicated in dishes from the earliest annals of human habitancy; herbal medicine in ancient systems as well as advanced medicine has created one of the most important science bases for security in various lands of the mankind. For many of years, herbal plants have been used for distinct goals. Herbal plants are generally defined as one year gramineous herbs with not any strict contexture. Dependent on the type of plants, one part including (flowers, leaves, branch or roots) or whole sectors (aerial parts or roots) could be accomplished in treatment of acute and chronic diseases, food products and nutritional improvement. After entering herbs into digestive systems, body starts consuming them and stave off the waste as well as free radicals bounded to the fibres of the herbs and in general purify useful contents into body cells. Because of unending advantages and their considerable benefits, plants with medicinal potentials are anticipated to be applied widely in human nutrition to improve not only the healthiness of human's body cells but also ensure the psychological health. Unlike chemical medicines that act with negative physical and sometimes mental side effects, herbal treatments have shown minimal side effects or probably no losses. There is a global tension in the application of recognized potent herbal plants as a food ingredient, regarding the fact; plants are wide applicable for treatment of diseases. Antioxidative properties of the extracts usually are expressed, not only by some recognized compounds such as carotenoids, flavonoids or polyphenols available, but also by secondary metabolic agents through several mechanisms. The two main mechanism of actions of flavonoids are that they expose UV protection and express metal chelation effects (Aleksic and Knezevic, 2014), Polyphenols are included in a large variety and contain various compounds depending on the types of the target plants, such as rosemarinic acid (in rosemary). Anti-inflammatory properties of some herbal plants are indicated as one of their anticancer potentials as well. The relevant compounds decrease the inflammatory leg which betides as a proof of dermal ageing (Aleksic and Knezevic, 2014), However, the application of herbs against diseases are not widely public as well as it might have been expected. The institute of national cancer researches has diagnosed more than about 30,000 herbs with anticarcinogenic potentials (Kaliora et al., 2014). The reputed plants with diagnosed medicinal properties appertain to the clan as follow: *Compositae*, *Umbelliferae*, *Labiatae* (*Lamiaceae*), *Myrtacae*, and *Lauracae*. Carcinogenics have generally been individualized in the complex and multistage functions involved in causing breaking out in the ruined cells (Franco et al., 2008). Former findings have shown that the medical properties of the explored herbal herbages are often created by the availability of phenolic compounds. The examined infusions are often discussed the extent of in *vitro* assays for characterization of antioxidant activities, including the reduction of Fe^{3+} and Fe^{2+}, the capability to scavenge $DPPH^{\cdot -}$ and inhibit $ABTS^{\cdot +}$ radicals and conservation against Fe^{2+} inducing lipid peroxidation or metal chelating potentials. Therefore, this work discusses the antioxidative activity and the most potent components of different herbal plant species commonly used in different communities and elucidate their mechanism functions against disorders attacking human bodies.

2. Principle of the extraction by solvent

The foundation, warp and woof of the process of extraction by solvent is investigated in various inquiries (Carvalho et al., 2011; Kaliora et al., 2014). Concisely, the performance of the extraction considerably depends on the nature of the sample matrix, the target type to be extracted and manner of the target compounds within the matrix. Presented flow of extraction of inharmonic samples by a model, pointed the sample particles are permeable and inscribed by an organic stratum. The target compounds extraction have been composed by multiple steps: Initially, to separate the target from the extraction locus, the compound is first absorbed from its primal site into the sample matrix, in second stage is dispersed from organic tissue to enclose to the matrix-fluid juncture. Then, target proceeds into the extraction disposition, where is distributed within the lenticels, thereby reaching the leg of the extraction that is impressed by relocation. The ultimate step of the extraction procedure is the locality and circumstances of the target within the sample structure. Thereupon, the extraction flow includes several stages as follows: (1) absorption to the similitude of the matrix; (2) dissolving in a solvent hole or absorption on the surface; (3) dissolving in a matrix micro hole and chemically bounded to the matrix; (4) dissolving in solvent (Pawliszyn, 2003). The specification of matrix has a focal impress in the extraction procedure. (Camel, 2001) introduced extraction method of targets, and solubilization as most important stages in herbal plant infusions in fact determination the type of solvent is a critical leg in this subject. Application organic solvent, such as ethanol, methanol and acetone as well as boiling water, might extract some officious compounds (toxic compounds in case of existence); therefore, for the solvent extraction procedure, application of water at low temperature is more nominated than organic solvent and boiling water, due to the feasibility to eliminate or diminish toxic components in the final obtained infusions. Thus, the applications of the obtained extracts in the final products have more advantages as well as the minimal negative side effects.

3. Antioxidant activity

The most reputed groups of combinations with antioxidant efficacy in herbs are presented known vitamins, such as vitamins E and C, polyphenols, flavonoids as well as pigments amongst carotenoids and anthocyanins. Antioxidants, even in low compactness, significantly retard or prevent oxidation reactions of susceptible ingredients like lipids. In addition, antioxidant actuality is associated with decreased DNA damages and lipid peroxidation, which level the immune performance and reduces virulent metamorphosis of the cells (Torbeyns, 2012–2013). Several studies have introduced, phenolic compounds as the major bioactive phytochemicals with antioxidant activity and health advantages (Javanmardi et al., 2003), also existence highly strong relationship between phenolic compounds and various determined antioxidative activity parameters of several sectors of plants has been proved (Qingming et al., 2010). The TPC quantity in 23 variety of *Ocimum* accession infusions from Iran were determined and expressed that total phenolic content varied in multiple accessions, also this study showed, central parts plants are demonstrating the higher quantity of TPC than other parts; furthermore, total antioxidant activity (TAA) (Y) and total phenolic contents of Iranian basils offered a good linear correlation coefficient ($R^2 = 0.71$) (Fig. 1) (Javanmardi et al., 2003). Some researchers also proposed that Iranian *Ocimum accessions*, which often are incorporated in Iranian diet daily, are strong free radical scavengers and could be announced as wealthy sources of innate antioxidants for pharmaceutical aspects as important as nutraceutical and commercial goals. Regarding, existence immense range of various indigenous antioxidant involving phenolics in Iranian *Ocimum accession*, specification and evaluation of those compounds with contrast the contents of each species necessitates more investigations (Javanmardi et al., 2003). Due to availability of various contents of antioxidant compounds, diverse plants offer different bioactive activities. Each plant usually contains different