



Hesperidin Flavonoids from Orange Peel Show Benefits for Human Health



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Abstract

The orange peel, as well as that of other fruits, contains substances with antioxidant properties that are highly beneficial to humans. Among these, the hesperidin and its aglycone form hesperetin, which can block free radicals, have antidepressant, antiangiogenic, anti-oxidative stress effects and can act as a preventive for neurodegenerative diseases. The present review will highlight the benefits of hesperidin and hesperetin that have great benefits to human health, especially for the central nervous system. These substances are easy to extract and of low cost.

Keywords: Orange peel; Hesperidin; Hesperetin; Antioxidant

Introduction

Studies have shown that several phytochemicals, due to their antioxidant properties, have the ability to neutralize the production of pure free radicals (reactive oxygen species, ROS). Research in the search for new low-cost drugs is a major breakthrough in alternative medicine. Citrus fruits like tangerine, orange, lime, lemon, and grapefruit, have been recognized as having a high content of bioactive compounds [1]. The present review will highlight the benefits of flavonoids, in particular hesperidin and hesperetin extracted from orange peel.

Orange has been studied as an important source of bioactive compounds. Among these bioactives are flavonoids, whose benefits to human health have been emphasized and can be found mainly in aromatic plants such as mint and teas, as well as fruits, vegetables, and red wine [2,3]. Different authors report that fruit and vegetable intake is associated with reduced risk of cancer, cardiovascular disease [4-6] as well as antiallergic effect [7].

Important concentrations of folic acid, vitamin C, dietary fiber, and bioactive compounds, such as flavonoids, can be found in the pulp and skin of various fruits. Included in the flavonoids are hesperidin and hesperetin, these can be extracted by different techniques [8]. Studies report that citrus flavonoids induce the darkening of white adipocytes, reduce plasma lipid levels, improve glucose tolerance, reduce obesity, and can be used to

prevent postprandial hyperglycemia [9]. According to Wang et al., [10] in rats, hesperidin reduced levels of fatty liver, fatty tissue, liver weight, total serum cholesterol and retinol-binding protein (RBP). In another study, hesperidin (HSD), hesperetin (HST), and nobiletin have been cited as an alternative in the treatment of metabolic disorders [11], in addition to good action in the Central Nervous System [12].

Interestingly, cases of depression reveal high levels of neuroinflammatory cytokines, such as interleukin 1 beta (IL-1 β), tumor necrosis factor- α (TNF- α) and IL-6, however, both HSD and HST have demonstrated antidepressant action, with a mechanism of action considerably different from psychiatric medications [13].

The study by Gaur and Kumar [14], with laboratory animals, suggested that hesperidin has a protective effect on cognitive dysfunction induced by cerebral I / R (ischemic / reperfusion) injury and the protective effect of hesperidin may be due to its NO mechanism. Within this context, both HSD and HST, being fat-soluble, cross the blood-brain barrier and demonstrate important benefits in various disorders of the central nervous system. Maekawa et al. [15], reported that hesperidin may have a potential effect as a therapeutic supplement to protect the retina against damage associated with excitotoxic injury, as occurs in glaucoma and diabetic retinopathy.

Serious neurodegenerative diseases, such as ALS (amyotrophic lateral sclerosis), Alzheimer, Parkinson, which involve progressive impairment of neurodegeneration and memory impairment have been the subject of different studies, within this context, hesperetin, as well as hesperidin, demonstrated an important neuroprotective effect in experimental models of neurodegenerative diseases and oxidative stress [16,17].

Among the various benefits reported by the action of hesperidin, there is a reduction in blood glucose levels in diabetes mellitus, demonstrating its important hypoglycemic effect [18,19].

Conclusions

Hesperidin, as well as hesperetin, are flavonoids extracted from orange peel that have many benefits for human health, including neurodegenerative diseases, memory, cancer, oxidative stress, depression, and other chronic inflammatory morbidities. To date, most studies reporting beneficial properties of these flavonoids have been developed in laboratory animals. Studies of its benefits in humans are definitely necessary.

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