CRIMSON PUBLISHERS
Wings to the Research

Approaches in Poultry, Dairy & Veterinary Sciences

ISSN: 2576-9162

Mini Review

Flavonoids as a Potent Anti-Oxidant in Nutrition: A Mini-Review

Kalantar M[1]*, Ahmadipour B[2] and Kalantar MH[3]

[1]*Department of Animal Science, Qom Agriculture and Natural Resources Research and Education Center, Iran*

[2]*Department of Animal Science, Shahrekord University, Iran*

[3]*Student Research Committee, Arak University of Medical Science, Iran*

***Corresponding author:** Kalantar Majid, Department of Animal Science, Qom Agriculture and Natural Resources Research and Education Center, AREEO, P.O. Box 195, Iran

Submission: June 05, 2018; **Published:** June 26, 2018

Abstract

Flavonoids are an important class of phytochemicals products known as polyphenols. They belong to a class of low-molecular-weight phenolic compounds that are widely distributed in the plant origin foods. They are powerful antioxidants with anti-inflammatory and other beneficial effects. Flavonoids play a variety of biological activities in both plants/animals and bacteria. The amount of flavonoids present in foods and feeds has little importance unless dietary flavonoids are absorbed and become available to target cells within the body. According to the literature, food rich in flavonoids are associated with cancer, neurodegenerative and cardiovascular disease prevention. However, it is not yet clear whether the flavonoids themselves are responsible. Flavonoid naturally secondary metabolite exist in most of herbs and plants are important anti-oxidative agents that participate to elimination of oxygen-derived free radical, improve blood pressure and vascular function, as well as control of cardiac disorders. However, the bioavailability of flavonoids is low due to limited absorption, extensive metabolism, and rapid excretion. Further studies are needed to confirm that the usefulness of flavonoids in the diet could be improved for better animal health.

Keywords: Anti-oxidant; Flavonoids; Nutrition

Introduction

Flavonoids are an important class of phytochemicals products found in most of herbs, fruits, vegetables and certain beverages [1,2]. Flavonoids belong to a class of plant secondary metabolites having a polyphenolic structure. They have the general structure of a 15-carbon skeleton, which consists of two phenyl rings and heterocyclic ring [3]. Also they are responsible for the beamy colors in fruits and vegetables [2,4]. Flavonoids are the largest group of plant secondary products, with more than 6,000 types [1]. Some of the best-known flavonoids are quercetin and kaempferol. They can be classified into three classes including:

1) Flavonoids or bioflavonoids,

2) Isoflavonoids, and

3) Neoflavonoids [1,5].

Due to the widespread distribution of flavonoids, high diversity and their relatively low toxicity compared to other active plant compounds such as alkaloids leads to ingest considerable quantities by animals and humans, in their diet [3,4].

Biological activities and benefits of flavonoids

Flavonoids have been presented positive effects on human and animal health, disease therapy and chemoprevention [4-6]. Flavonoids are related to a broad spectrum of health-promoting effects and are an essential component in a variety of functional food, pharmaceutical, medicinal and cosmetic applications [7-9]. This is because of their antioxidative, anti-inflammatory, anti-mutagenic and anti-carcinogenic properties associated with their potential to modulate key cellular enzyme functions. They are also known to be powerful inhibitors for several enzymes, such as Xanthine Oxidase (XO), Cyclo-Oxygenase (COX), lipoxygenase and phosphoinositide 3-kinase [5,8,10]. Flavonoid naturally secondary metabolite exist in plant origin compounds show important anti-oxidative effect that participate to elimination of oxygen-derived free radical [10-12] improve blood pressure and vascular function [1,8], as well as control of PHS and cardiac disorders in animals [7].

The bioavailability of flavonoids

The bioavailability of flavonoids is generally low due to limited absorption, extensive metabolism, and rapid excretion [4,5,13]. Thought is flavones are to be the most bioavailable of all flavonoid subclasses, while anthocyanins and galloylated catechins are very poorly absorbed [3,5,9]. The wide difference in structures within subclasses, it is difficult to generalize the absorbability and bioavailability of flavonoids [5,14].

Antioxidant activity

Flavonoids are effective scavengers of free radicals [7,14,15]. However, it is well demonstrated that even with very high flavonoid intakes, plasma and intracellular flavonoid concentrations in humans are more lower than concentrations of other antioxidants, such as ascorbate (vitamin C), uric acid, and glutathione [11,14,15]. Moreover, most circulating flavonoids are actually flavonoid metabolites, some of which have lower antioxidant activity than the others [5,14,16].

Conclusion

It is clearly demonstrated that the presence of different bioactive compounds such as flavonoids is responsible for the pharmacological effects of some medicinal plants. Flavonoids have received much attention in the literature over the past years. But the study of flavonoids is difficult because of the heterogeneity of the different molecular structures in different type of flavonoids and the scarcity of data on their bioavailability. Therefore, further studies are needed so that the usefulness of flavonoids in the diet could be improved for better animal health.

References

1. Kumar S, Pandey AK (2013) Chemistry and biological activities of flavonoids: an overview. Scientific World Journal. Volume 2013, Article ID 162750, 16 pages.
2. Manach C, Scalbert A, Morand C, Remesy C, Jimenez L (2004) Polyphenols: food sources and bioavailability. Am J Clin Nutr 79(5):727-747.
3. Xiao J, Kai G, Yamamoto K, Chen X (2013) Advance in dietary polyphenols as α-glucosidases inhibitors: a review on structure-activity relationship aspect. Crit Rev Food Sci Nutr 53(8): 818-836.
4. Panche AN, Diwan AD, Chandra SR (2016) Flavonoids: an overview. J Nutr Sci 5: e47.
5. Manach C, Williamson G, Morand C, Scalbert A, Remesy C (2005) Bioavailability and bioefficacy of polyphenols in humans. I. Review of 97 bioavailability studies. Am J Clin Nutr 81(1 Suppl): 230S-242S.
6. Kao E, Wang C, Lin W, Yin Y, Wang C, et al. (2005) Anti-inflammatory potential of flavonoid contents from dried fruit of Crataegus pinnatifida in vitro and in vivo. J Agric Food Chem 53(2): 430-436.
7. Ahmadipour B, Kalantar M, Hosseini SM, Yang LG, Kalantar MH, et al. (2017) Hawthorn (Crataegus Oxyacantha) Extract in the Drinking Water of Broilers on Growth and Incidence of Pulmonary Hypertension Syndrome (PHS). Brazilian Journal of Poultry Science 19(4): 639-644.
8. Brixius K, Willms S, Napp A, Tossios P, Ladage D, et al. (2006) Crataegus special extract WS 1442 induces an endothelium-dependent, NO-mediated vasorelaxation via eNOS-phosphorylation at serine 1177. Cardiovascular Drugs and Therapy 20(3): 177-184.
9. Williamson G (2004) Common features in the pathways of absorption and metabolism of flavonoids. In: Meskin MS, R. BW, Davies AJ, Lewis DS, Randolph RK (Eds.), Phytochemicals: Mechanisms of Action. CRC Press, Boca Raton, Florida 21-33.
10. Metodiewa D, Kochman A, Karolczak S (1997) Evidence for antiradical and antioxidant properties of four biologically active N,N, diethylaminoethyl ethers of flavanoneoximes: a comparison with natural polyphenolic flavonoid (rutin) action. Biochem Mol Biol Int 41(5): 1067-1075.
11. Chun OK, Kim DO, Lee CY (2003) Superoxide radical scavenging activity of the major polyphenols in fresh plums. J Agric Food Chem 51(27): 8067-8072.
12. Gonzales GB, Smagghe G, Grootaert C, Zotti M, Raes K, et al. (2015) Flavonoid interactions during digestion, absorption, distribution and metabolism: a sequential structure-activity/property relationship-based approach in the study of bioavailability and bioactivity. Drug Metab Rev 47(2): 175-190.
13. Barros L, Carvalho AM, Ferreira IC (2011) Comparing the composition and bioactivity of Crataegus monogyna flowers and fruits used in folk medicine. Phytochem Anal 22(2): 181-188.
14. Williams RJ, Spencer JP, Rice-Evans C (2004) Flavonoids: antioxidants or signalling molecules? Free Radic Biol Med 36(7): 838-849.
15. Heijnen CG, Haenen GR, van Acker FA, van der Vijgh WJ, Bast A (2001) Flavonoids as peroxynitrite scavengers: the role of the hydroxyl groups. Toxicol In Vitro 15(1): 3-6.
16. Lotito SB, Zhang WJ, Yang CS, Crozier A, Frei B (2011) Metabolic conversion of dietary flavonoids alters their anti-inflammatory and antioxidant properties. Free Radic Biol Med 51(2): 454-463.