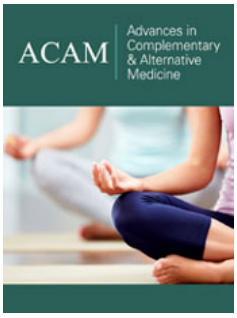
Crimson Publishers
Wings to the Research

Mini Review

Diversity of Phytochemical Composition of the Content of Cranberry Fruits (*Vaccinium Macrocarpon* L., Ericaceae) Depending on Growing Regions

ISSN: 2637-7802



***Corresponding author:** Dušica P Ilić, University of Niš, Faculty of Electronic Engineering, Aleksandra Medvedeva 14, 18115 Niš, Serbia

Submission: May 25, 2022
Published: June 29, 2022

Volume 7 - Issue 2

How to cite this article: Dušica P Ilić. Diversity of Phytochemical Composition of the Content of Cranberry Fruits (*Vaccinium Macrocarpon* L., Ericaceae) Depending on Growing Regions. Adv Complement Alt Med. 7(2). ACAM.000657.2022.
DOI: 10.31031/ACAM.2022.07.000657

Dušica P Ilić*

University of Niš, Faculty of Electronic Engineering, Serbia

Abstract

This work is devoted to scientific research carried out to investigate the content of cranberry fruits (*Vaccinium macrocarpon* L., Ericaceae). To evaluate the influence of composition on anti-inflammatory activity, cranberry fruits were collected from eight Serbia growing regions. Eight extracts from these fruits were prepared. Extracts were analyzed for phytochemical composition and evaluated for their anti-inflammatory effects in human monocytes (THP-1 cells). All were able to reduce Lipopolysaccharide (LPS) -induced production of pro-inflammatory cytokine interleukin 6 (IL-6) at 50μg/mL, with inhibition ranging between 10.09-42.7%. The research results show phytochemicals present in varying quantities in cranberry fruits a role in the anti-inflammatory effects of cranberry extracts on human monocytes.

Keywords: Cranberry; Anti-inflammatory; Antioxidant; Cytokines; Polyphenols; Phytochemicals; Monocytes

Introduction

Cranberry (*Vaccinium macrocarpon* L., Ericaceae) has become the subject of interest of the food industry in the last two decades due to the increased awareness of consumers about functional food and its preventive and positive effects on human heal [1]. Cranberry is a rich of valuable phytochemicals, including phenolic compounds and vitamins [2,3]. Earlier research showe screening of bioactive components found in cranberry juice and as well the determination of its antibacterial and antioxidant activities [1]. Cranberry fruits (*Vaccinium macrocarpon* L., Ericaceae) can have different the secondary metabolite content of can vary with environmental factors. To evaluate the influence of composition on anti-inflammatory activity, cranberry fruits were collected from eight Serbia growing regions. Eight extracts from these fruits were prepared.

Results and Discussion

This study suggests that cranberry juice has the potential to be used as a natural preservative formulation in pharmaceutical and cosmetic applications [1]. There is great interest in understanding the relationship between cranberries' phytochemical constituents and their potential health beneficial effects. In cranberry polyphenols and triterpenoids have been linked to its antioxidant, anti-inflammatory and anti-cancer properties [4]. The major polyphenols in cranberry fruit are A-type Proanthocyanidin oligomers (PACs), flavonol glycosides including quercetin-3-O-galactoside (hyperoside) as the most abundant one and anthocyanins (such as cyanidin and peonidin glycosides). Among the polyphenols, PACs content is by far the highest [5]. PACs vary widely among cultivars fruit [6], similarly as well as the content of anthocyanins and dry weight depending on factors including cultivar, harvest date, and growing region [6,7]. The major non-phenolic compound in the peel of cranberry fruit is ursolic acid, a pentacyclic triterpenoid. They show with antiproliferative and anti-inflammatory

effects depending on cultivar and growing region [8]. In cranberries other triterpenoids identified are oleanolic acid [8] and corosolic acid [8]. Corosolic acid and maslinic acid are present in lesser quantities than ursolic and oleanolic acid [8]. Previous studies reported that cranberry extracts can reduce inflammation in various enzyme-based and cellular models [9]. Polyphenols cranberries exert anti-inflammatory effects in periodontal models [10].

Treatment with a polyphenol-rich cranberry juice isolate containing approximately 65% PACs reduced the production of pro-inflammatory cytokines including IL-1β, IL-6, IL-8, and TNF-α in macrophages stimulated with LPS derived from oral bacteria [11]. Phytochemical constituents in whole cranberries may mitigate inflammation in colon tissue, suggesting that cranberry extracts rich in these compounds (polyphenols or ethyl-acetate soluble non-polyphenol constituents) may have the potential to mediate chronic inflammation-related diseases [12]. The anti-inflammatory effects of cranberry are influenced by multiple phytochemical constituents including triterpenoids and polyphenols. This study is to invest whether the content of the major phytochemicals in extracts of whole cranberry fruit influences their anti-inflammatory effects [13].

Conclusion

Together, data with previous studies of the polyphenols and triterpenoids in cranberry fruit and other plant sources suggest that inflammatory signaling pathways in differentiated THP-1 monocytes may be modulated by the mixture of secondar metabolites found in cranberry. Demonstrated that the response of THP-1 cells to treatment with cranberry extracts prepared from fruits of different origins varies significantly. Anthocyanins, total polyphenols, ursolic acid or corosolic acid were the most capable of reducing pro-inflammatory signaling in these cells. Further studies are warranted to elucidate the mechanisms of action and fully examine the agricultural factors that affect secondary metabolite content in the fruit. As cranberry fruit and products vary significantly in content of these phytochemicals, information on their contributions towards anti-inflammatory and immune-modulatory properties can be helpful in guiding product development and adds to understanding of cranberry as a functional food.

Acknowledgment

Funding was provided according to the Program for financing scientific research work, number 451-03-68 / 2022-14 / 200102 (Research Groups III 44006) from the Republic of Serbia (Ministry of Education, Science and Technological Development).

References

1. Blumberg JB, Camesano TA, Cassidy A, Kris-Etherton P, Howell A, et al. (2013) Cranberries and their bioactive constituents in human health. Adv Nutr 4(6): 618-632.
2. Bodet C, Chandad F, Grenier D (2006) Anti-inflammatory activity of a high-molecular-weight cranberry fraction on macrophages stimulated by lipopolysaccharides from periodontopathogens. J Dent Res 85(3): 235-239.
3. Brown PN, Murch SJ, Shipley P (2012) Phytochemical diversity of cranberry (*vaccinium macrocarpon* aiton) cultivars by anthocyanin determination and metabolomic profiling with chemometric analysis. J Agric Food Chem 60(1): 261-271.
4. Caligiani A, Malavasi G, Palla G, Marseglia A, Tognolini M, et al. (2013) Simple GC–MS Method for the screening of betulinic, corosolic, maslinic, oleanolic and ursolic acid contents in commercial botanicals used as food supplement ingredients. Food Chem 136(2): 735-741.
5. Czank C, Cassidy A, Zhang Q, Morrison DJ, Preston T, et al. (2013) Human metabolism and elimination of the anthocyanin, Cyanidin-3-glucoside: A 13C-tracer study. Am J Clin Nutr 97(5): 995-1003.
6. Haytowitz D, Wu X, Bhagwat S (2018) USDA database for the proanthocyanidin content of selected foods.
7. Ilic DP, Troter DZ, Stanojević LJP, Zvezdanović JB, Vukotic DD, et al. (2021) Cranberry (*Vaccinium macrocarpon* L.) fruit juice from Serbia: UHPLC-DAD-MS/MS characterization, antibacterial and antioxidant activities. LWT 146: 111399.
8. Joseph SV, Edirisinghe I, Burton-Freeman BM (2014) Berries: Anti-inflammatory effects in 500 humans. J Agric Food Chem 62(18): 3886-3903.
9. Kim E, Cordero AS, Graf TN, Brantley SJ, Paine MF, et al. (2011) Isolation and identification of intestinal CYP3A inhibitors from cranberry (*vaccinium macrocarpon*) using human intestinal microsomes. Planta Med 77(3): 265-270.
10. La VD, Howell AB, Grenier D (2010) Anti-porphyromonas gingivalis and anti-inflammatory activities of a-type cranberry proanthocyanidins. Antimicrob Agents Chemother 54(5): 1778-1784.
11. Liu J, Zhao J, Dai Z, Lin R, Wang G, et al. (2014) Pair of new antioxidant phenolic acid stereoisomers isolated from danshen injection (lyophilized powder). Molecules 19(2): 1786-1794.
12. Manayi A, Nikan N, Nobakht HN, Mohammad A (2018) Advances in the anticancer value of the ursolic acid through nanodelivery. Curr Med Chem 25(37): 4866-4875.
13. McKay DL, Chen CYO, Zampariello CA, Blumberg JB (2015) Flavonoids and Phenolic acids from cranberry juice are bioavailable and bioactive in healthy older adults. Food Chem 168: 233-240.