

Health Benefits of Cranberries: An In-Depth Overview

Dr. Shashank Tiwari^{1*}, Shreya Talreja²

Abstract

Cranberries (*Vaccinium macrocarpon*), small red berries with a distinctive tart flavour, have captivated human attention for centuries due to their potential health benefits and culinary versatility. This abstract provides a concise overview of the comprehensive exploration of cranberries, including their nutritional composition, bioactive compounds, health-promoting properties, potential therapeutic applications, and culinary uses.

Cranberries boast a rich nutritional profile, containing essential vitamins, minerals, dietary fiber, and an array of bioactive compounds such as antioxidants, anthocyanins, and proanthocyanidins. These compounds contribute to the antioxidant and anti-inflammatory effects of cranberries, potentially reducing the risk of chronic diseases and supporting overall well-being.

One of the standout qualities of cranberries is their impact on urinary tract health. The presence of proanthocyanidins inhibits bacterial adhesion to urinary tract walls, offering protection against urinary tract infections. Additionally, cranberries may have positive effects on cardiovascular health, diabetes management, oral health, and more. While research on these potential therapeutic applications is on-going, cranberries' diverse benefits have piqued scientific interest.

Culinary enthusiasts have harnessed the unique flavour of cranberries in an array of dishes. From classic cranberry sauces to innovative desserts, these berries infuse dishes with color, taste, and nutritional value. As our understanding of cranberries deepens, their role as a functional food that bridges the gap between health and taste becomes more evident.

In conclusion, cranberries hold a special place in both the realm of nutrition and culinary artistry. Their potential to promote health, prevent ailments, and elevate gastronomic experiences makes them a jewel in nature's bounty. Through this comprehensive exploration, we uncover the myriad facets of cranberries, celebrating their role as a source of both wellness and flavour.

Keywords: Cranberries; *Vaccinium Macrocarpon*; Bioactive compounds; Health benefits; Antioxidants; Urinary tract health; Cardiovascular health; Culinary uses; Potential therapeutic applications; Nutrition; Functional food; Proanthocyanidins; Anthocyanins; Flavonoids; Tartness; Culinary versatility

Received: 03 Sep-2023, Manuscript No. Iphsj-23-14047; **Editor assigned:** 05- Sep -2023, Pre-QC No. Iphsj-23-14047(PQ); **Reviewed:** 19- Sep-2023, QC No. Iphsj-23-14047; **Revised:** 23-Sep-2023, Manuscript No. Iphsj-23-14047 (R); **Published:** 30-Sep-2023, DOI: 10.36648/1791-809X.17.9.1057

Introduction

Cranberries (*Vaccinium macrocarpon*) are more than just vibrant red berries; they are a testament to the harmonious fusion of taste and wellness that nature has to offer. Revered by indigenous cultures for centuries and embraced by modern research, cranberries have journeyed from traditional remedies to the forefront of health-conscious diets. This introduction


sets the stage for a comprehensive exploration of cranberries, delving into their nutritional composition, bioactive compounds, health benefits, culinary versatility, and potential therapeutic applications.

Cranberries are an embodiment of nature's artistry, captivating the eye with their rich red hue and the palate with their unique blend of tartness and sweetness. Beyond their sensory appeal,

- 1 Professor Director Academics & Research India
- 2 Assistant Professor Department of Pharmaceutical Chemistry Lucknow Model College of Pharmacy, Lucknow, UP, India

*Corresponding author:

Dr. Shashank Tiwari

 shashank6889@gmail.com

Professor Director Academics & Research, India

Citation: Tiwari S, Talreja S (2023) Health Benefits of Cranberries: An In-Depth Overview. Health Sci J. Vol. 17 No. 9: 1057.

cranberries boast a nutrient profile that rivals their visual allure. Packed with vitamins, minerals, and bioactive compounds such as antioxidants, flavonoids, and proanthocyanidins, these berries offer a wealth of potential health benefits.

Their role as a guardian of urinary tract health, potential contributions to cardiovascular well-being, and intriguing therapeutic applications make cranberries a subject of scientific investigation and culinary exploration. From classic cranberry sauces that adorn festive tables to innovative culinary creations that utilize their dynamic flavours, these berries have secured their place in kitchens around the world.

As we embark on this journey through the realm of cranberries, we uncover their intricate layers - from their humble beginnings as a staple in Native American diets to their present-day status as a super food of interest. This exploration not only celebrates the culinary versatility of cranberries but also reveals the potential they hold to enhance our health and well-being. Through the following sections, we will unveil the nutritional treasures hidden within cranberries, examine their bioactive compounds and health benefits, consider their possible therapeutic applications, and savour the creative culinary possibilities they offer [1-3].

In an era where the pursuit of holistic well-being is paramount, cranberries present themselves as a tantalizing option for those seeking both flavour and nourishment. As we delve deeper into the realm of cranberries, we invite you to discover the intricate interplay of taste, health, and culinary innovation that these remarkable berries bring to our lives (Figure 1).

Nutritional composition of cranberries

Cranberries (*Vaccinium macrocarpon*) are small, round, vibrant red berries known for their distinct tart flavour and potential health benefits. These berries are not only low in calories but also offer an array of essential nutrients, vitamins, minerals, and bioactive compounds that contribute to their nutritional value and potential health-promoting properties [4].

Macronutrients

Cranberries are primarily composed of water, making up about 87-90% of their weight. The macronutrient content in a 100-gram serving of raw cranberries includes:

- Calories: Approximately 46 kcal
- Carbohydrates: About 12.2 grams
- Dietary Fiber: Around 4.6 grams
- Sugars: Approximately 4 grams
- Protein: Approximately 0.4 grams
- Fat: Less than 0.2 grams

Vitamins

Cranberries are a good source of various vitamins, particularly vitamin C (ascorbic acid), which is known for its antioxidant properties. Other vitamins present in cranberries include:

- Vitamin E: A fat-soluble antioxidant that plays a role in maintaining healthy skin and immune function.
- Vitamin K: Essential for proper blood clotting and bone health.
- Vitamin A: Important for vision, immune function, and skin health.
- Vitamin B-complex: Including B1 (thiamine), B2 (riboflavin), B3 (niacin), B5 (pantothenic acid), B6 (pyridoxine), and B9 (folate), which collectively support energy metabolism, cellular processes, and overall health.

Minerals

Cranberries contain several essential minerals that contribute to their nutritional value and health benefits. Some of the prominent minerals in cranberries include:

- Potassium: Important for maintaining fluid balance, nerve function, and muscle contractions.
- Manganese: Involved in bone health, metabolism, and antioxidant defense [5].
- Copper: Required for various enzymatic reactions and the formation of connective tissues.
- Calcium and Magnesium: Both essential for bone health and various physiological functions.

Phytochemicals and antioxidants

Cranberries are rich in bioactive compounds that contribute to their potential health benefits. These compounds include:

- Flavonoids: Quercetin, myricetin, and kaempferol, which possess antioxidant and anti-inflammatory properties.
- Phenolic acids: Including hydroxycinnamic acids and ellagic acid, which contribute to the overall antioxidant capacity of cranberries?
- Proanthocyanidins (PACs): These compounds are particularly known for their role in preventing urinary tract infections by inhibiting bacterial adhesion to urinary tract walls.
- Anthocyanins: Responsible for the vibrant red color of cranberries and possess antioxidant and anti-inflammatory properties [6].

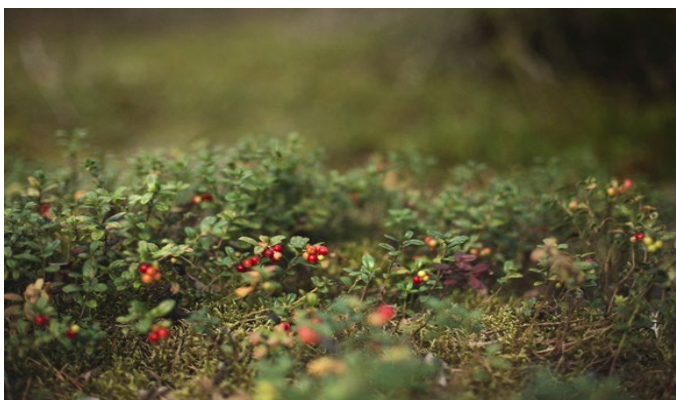


Figure 1 Image of cranberries (*Vaccinium macrocarpon*).

Other bioactive compounds

Cranberries also contain unique compounds with potential health benefits

- A-type proanthocyanidins: Responsible for the anti-adhesive properties that prevent certain bacteria from adhering to cell surfaces, such as in the urinary tract.
- Organic acids: Citric acid and quinic acid contribute to the tart taste of cranberries and may have potential health benefits.

Cranberries stand out as nutritionally rich fruits, offering a wide array of vitamins, minerals, and bioactive compounds that contribute to their potential health benefits. Incorporating cranberries into the diet can provide antioxidants, support urinary tract health, contribute to cardiovascular well-being, and offer other health-promoting effects. As part of a balanced diet, cranberries can be a valuable addition to support overall health and vitality.

Bioactive compounds of cranberries

Cranberries (*Vaccinium macrocarpon*) are renowned for their remarkable health benefits, largely attributed to their rich content of bioactive compounds. These compounds, often found in plants, exhibit various physiological effects that contribute to the potential positive impact of cranberries on human health. Below, we delve into the key bioactive compounds found in cranberries and their potential health-promoting properties:

Proanthocyanidins (PACs)

Proanthocyanidins are flavonoid compounds found abundantly in cranberries [7-14]. They possess strong antioxidant properties and have been linked to various health benefits, including:

Urinary tract health: A unique characteristic of cranberry PACs is their ability to prevent bacterial adhesion to the urinary tract lining, reducing the risk of urinary tract infections (UTIs) by inhibiting the attachment of *E. coli* bacteria.

Anthocyanins

These pigments are responsible for the vibrant red color of cranberries and are potent antioxidants. Anthocyanins have been associated with:

Antioxidant effects: They help protect cells from oxidative stress, potentially reducing the risk of chronic diseases such as cardiovascular diseases, neurodegenerative disorders, and certain cancers.

Anti-inflammatory properties: Anthocyanins may contribute to mitigating inflammation, which is linked to various health conditions.

Flavonoids

Cranberries contain various flavonoids, including quercetin, myricetin, and kaempferol. Flavonoids offer numerous health benefits:

Antioxidant activity: Flavonoids help neutralize harmful free

radicals in the body, reducing cellular damage.

Anti-inflammatory effects: They may assist in managing inflammation, which is a common factor in chronic diseases.

Phenolic acids

Cranberries contain hydroxycinnamic acids and ellagic acid. Phenolic acids contribute to the overall antioxidant capacity of cranberries and offer:

Antioxidant protection: These acids play a role in scavenging free radicals, supporting cellular health.

Organic acids

Cranberries contain organic acids, including citric acid and quinic acid. These compounds contribute to the characteristic tart taste of cranberries and have potential health benefits:

Urinary Health: Organic acids create an acidic environment in the urine, which can help prevent the growth of certain bacteria in the urinary tract [15].

Vitamin C

Vitamin C (ascorbic acid) is an essential nutrient present in cranberries. While not a unique compound to cranberries, its presence adds to the health benefits:

Antioxidant support: Vitamin C is a potent antioxidant that aids in protecting cells from oxidative damage and supports the immune system.

Fiber

Although not a traditional bioactive compound, dietary fiber is abundant in cranberries and offers digestive benefits:

Digestive Health: Fiber supports regular bowel movements, aids in digestion, and contributes to a feeling of fullness.

Unique A-type PACs

Cranberries also contain A-type proanthocyanidins, which contribute to their anti-adhesive properties, preventing certain bacteria from adhering to surfaces in the body, such as the urinary tract.

Harnessing the health benefits of cranberries

Cranberries (*Vaccinium macrocarpon*) are celebrated not only for their tart flavour but also for the array of health benefits they offer. Packed with essential nutrients and bioactive compounds, cranberries have gained attention for their potential to promote well-being and combat various health challenges. Let's delve into the significant health benefits associated with cranberries:

Urinary tract health

Cranberries are perhaps best known for their role in supporting urinary tract health. The presence of proanthocyanidins (PACs) in cranberries inhibits the adherence of bacteria, primarily *E. coli*, to the walls of the urinary tract. This property may help prevent urinary tract infections (UTIs) and reduce the frequency of their recurrence [16, 17].

Antioxidant defense

Cranberries are a rich source of antioxidants, including vitamin C, anthocyanins, and flavonoids. Antioxidants play a crucial role in neutralizing harmful free radicals, which are linked to cellular damage and the development of chronic diseases. Regular consumption of cranberries can contribute to overall oxidative stress reduction.

Cardiovascular support

Cranberries may contribute to heart health due to their potential to:

Lower blood pressure: Some studies suggest that cranberries could help reduce blood pressure, a significant risk factor for cardiovascular diseases.

Improve lipid profiles: The bioactive compounds in cranberries might have a positive impact on cholesterol levels by increasing "good" HDL cholesterol and reducing "bad" LDL cholesterol.

Anti-inflammatory properties

Inflammation is associated with various chronic diseases. The bioactive compounds in cranberries, such as anthocyanins and flavonoids, exhibit anti-inflammatory effects, potentially contributing to the management and prevention of inflammatory conditions.

Digestive health

The dietary fiber content of cranberries supports digestive health by promoting regular bowel movements and aiding in digestion. Fiber also helps maintain a healthy gut environment and supports the growth of beneficial gut bacteria.

Oral health

Cranberries' bioactive compounds may play a role in promoting oral health

Reducing plaque formation: Some research suggests that cranberry compounds could hinder the adhesion of oral bacteria to teeth, potentially reducing plaque formation and the risk of cavities.

Gum Health Cranberries' anti-inflammatory properties may also contribute to gum health by reducing inflammation in the mouth.

Potential diabetes management

Emerging research indicates that cranberries may play a role in managing diabetes:

Blood sugar regulation: Cranberries' bioactive compounds might contribute to stabilizing blood sugar levels, benefiting individuals with diabetes or those at risk.

Cognitive health

Antioxidant-rich foods, including cranberries, have been associated with improved cognitive function and a reduced risk of neurodegenerative disorders, such as Alzheimer's disease.

Cancer prevention: Some studies suggest that the antioxidants and bioactive compounds in cranberries might have anticancer

properties by inhibiting the growth of cancer cells and reducing oxidative stress.

Weight management: Cranberries are low in calories and rich in fiber, making them a satisfying and nutrient-dense snack that can support weight management goals.

Cranberries stand as a remarkable example of nature's gifts, offering a diverse range of health benefits. Whether it's their unique ability to support urinary tract health, their antioxidant-rich profile, or their potential to aid in managing various health conditions, cranberries have earned their place as a super food with potential preventive and therapeutic properties. Incorporating cranberries into a balanced diet can be a delicious and rewarding way to support overall well-being.

Potential therapeutic applications of cranberries

Cranberries (*Vaccinium macrocarpon*) are not only popular for their culinary versatility and vibrant flavor but also for their potential therapeutic properties. Emerging research suggests that the bioactive compounds in cranberries could have a positive impact on various health conditions. While further studies are needed to fully validate these applications, here are some potential therapeutic uses of cranberries:

Tract infections (UTIs) prevention

Cranberries are widely recognized for their potential to prevent and manage urinary tract infections. The presence of proanthocyanidins (PACs) in cranberries hinders the adherence of *E. coli* bacteria to the urinary tract walls, reducing the risk of infection. Cranberry products, such as juice or supplements, might be beneficial in preventing recurrent UTIs, particularly in individuals prone to such infections [17].

Cardiovascular health

Cranberries' antioxidant and anti-inflammatory properties may contribute to cardiovascular health:

- **Reduced Cardiovascular Risk:** Regular consumption of cranberries may help lower blood pressure and improve lipid profiles, reducing the risk of heart disease.
- **Endothelial Function:** Some studies suggest that cranberries could enhance endothelial function, promoting healthy blood vessel function.

Diabetes management

Cranberries' potential to regulate blood sugar levels and improve insulin sensitivity may offer benefits for individuals with diabetes or those at risk of developing the condition.

Oral health

Cranberries' bioactive compounds might have applications in oral health:

Cavity prevention: Cranberries could inhibit the adherence of oral bacteria to teeth, potentially reducing the formation of cavities.

Gum health: Anti-inflammatory properties might contribute to improved gum health by reducing inflammation and risk of periodontal disease.

This article is available in: <https://www.itmedicalteam.pl/health-science.html>

Cancer prevention

While research is preliminary, some studies suggest that the antioxidant and anti-inflammatory properties of cranberries might have a role in preventing certain types of cancer by inhibiting the growth of cancer cells and reducing oxidative stress.

Gastrointestinal health

Cranberries' fiber content and anti-inflammatory properties could potentially benefit individuals with gastrointestinal disorders by supporting regular bowel movements and alleviating inflammation.

Cognitive function

The Antioxidants in Cranberries Might Have a Positive Impact on Cognitive Health, Potentially Reducing the Risk of Neurodegenerative Disorders like Alzheimer's disease.

Anti-Inflammatory effects

Cranberries' bioactive compounds have the potential to mitigate inflammation, which is a common factor in many chronic diseases.

Immune support

The antioxidants in cranberries, including vitamin C, can contribute to a strengthened immune system, supporting the body's defense against infections.

Skin health

Antioxidants and other bioactive compounds in cranberries might promote skin health by combating oxidative stress and inflammation, contributing to a healthier complexion.

Cancer therapy support

Emerging studies suggest that cranberries might enhance the effectiveness of certain cancer therapies, potentially minimizing treatment side effects and improving overall outcomes. However, more research is needed in this area.

Conclusion

In the world of nutrition and gastronomy, cranberries (*Vaccinium macrocarpon*) stand as a shining example of nature's bounty. From their vibrant red hue to their potential health benefits, cranberries have captured the attention of both culinary

enthusiasts and health-conscious individuals alike. This review has explored the multifaceted aspects of cranberries, shedding light on their nutritional composition, bioactive compounds, health benefits, potential therapeutic applications, and culinary versatility.

Cranberries are more than just a fruit; they are a rich source of vitamins, minerals, fiber, and an array of bioactive compounds. Their antioxidant properties, conferred by compounds like anthocyanins, flavonoids, and proanthocyanidins, make them potent defenders against oxidative stress and its associated health risks. Additionally, their role in urinary tract health, cardiovascular well-being, diabetes management, and potential cancer prevention positions them as functional foods with far-reaching implications.

In the realm of culinary artistry, cranberries shine brightly. From their classic role in cranberry sauces and baked goods to their creative integration in salads, beverages, and desserts, they add a burst of flavor, color, and texture. Their tangy and slightly sweet profile can turn an ordinary dish into an extraordinary culinary masterpiece.

However, it's important to note that while cranberries offer a plethora of potential benefits, their consumption should be part of a balanced diet, complementing a range of nutrient-rich foods. Additionally, individual responses to cranberries may vary, and consultation with healthcare professionals is advised, especially for those with specific health conditions or concerns.

In conclusion, cranberries embody a harmonious blend of nutrition, taste, and potential wellness benefits. As our understanding of these vibrant berries continues to grow through ongoing research, we are reminded of the beauty of nature's offerings and the journey to harness their benefits for our health and enjoyment. So, whether you're savoring a spoonful of cranberry sauce, relishing a cranberry-infused dessert, or embracing the potential health benefits, cranberries prove themselves as a true culinary and nutritional treasure.

Acknowledgement

The author would like to thank all his mentors. The notes compiled here are collected over a period of time and may have been reproduced verbatim. Apologize to all researchers if inadvertently failed to acknowledge them in the references.

References

- 1 Vercauteren J (2009) Compositions of stilbenic polyphenolic derivatives, their preparations, and their use in the treatment of disease and aging. *Demande* 2923717 AL.
- 2 Wang M, Li J, Shao Y, Huang T-C, Huang M-T et al. (2000) Antioxidative and cytotoxic components of high bush blueberry (*Vaccinium corymbosum* L. in phytochemicals and phyto pharmaceuticals. Champaign, IL: AOCS Press 271-277.
- 3 Weiss EI, Lev-Dor Kashman Y (1998) Inhibiting interspecies coaggregation of plaque bacteria with cranberry juice constituent. *J Amer Den Assoc* 129: 1719-1723.
- 4 S Yoo, RM Murata, S Duarte (2011) Antimicrobial Traits of Tea- and Cranberry-Derived Polyphenols against *Streptococcus mutans*. *Caries Res* 45: 327-335.
- 5 Puupponen-Pimia R, Nohynek L, Meier C, Kahkonen M, Heinonen A et al. (2001) Hopia and K.-M. Oksman-Caldentey. Antimicrobial properties of phenolic compounds from berries. *J Applied Mic* 90: 494-507.
- 6 Roopchand DE (2013) Food-compatible method for the efficient extraction and stabilization of cranberry pomace polyphenols. *J Food Chem* 141: 3664-3669.
- 7 Sovak M, Seeram NP, Adams LS, Hardy ML, Heber D (2001) Total cranberry extract vs. its phytochemical constituents: ant proliferative and synergistic. Grape extract, resveratrol, and its analogs: a review. *J Med Food* 4: 93-105.
- 8 Dohadwala MM, Holbrook M, Hamburg NM, Shenouda SM, Chung WB et al. (2011) Effects of cranberry juice consumption on vascular function in patients with coronary artery disease. *Am J Clin Nutr.* 93:934-940.
- 9 Tiwari S, Talreja S (2020) An overview on coronil drug. *J Global Trends in Pharm Sci* 8242-8247.
- 10 Flammer AJ, Martin EA, Gossel M, Widmer RJ, Lennon RJ (2013) Polyphenol-rich cran-berry juice has a neutral effect on endothelial function but decreases the fraction of osteocalcin-expressing endothelial progenitor cells. *Eur J Nutr* 52:289-296.
- 11 Wilson T, Luebke JL, Morcomb EF, Carrell EJ, Leveranz MC (2010) Glycemic responses to sweetened dried and raw cranberries in humans with type 2 diabetes. *J Food Sci* 75:H218-23.
- 12 Reed JD, Krueger CG, Vestling MM (2005) MALDI-TOF mass spectrometry of oligomeric food polyphenols. *Photochemistry* 66:2248-2263.
- 13 Saura-Calixto F (2012) Concept and health-related properties of nonextract-able polyphenols: the missing dietary polyphenols. *J Agric Food Chem* 60: 11195-200.
- 14 Saura-Calixto F, Serrano J, Goni I (2007) Intake and bio accessibility of total polyphenols in a whole diet. *Food Chem* 101: 492-501.
- 15 Perez-Jimenez J, Fezeu L, Touvier M, Arnault N, Manach C (2011) Dietary intake of 337 polyphenols in French adults. *Am J Clin Nutr* 93: 1220-8.
- 16 Sharma D, Tiwari S (2012) Use of cranberry in Urinary Tract Infection of *E coli* Int *J of Pharm & Life Sci.(IJPLS)* 3: 1784-1786.
- 17 Shashank T, Shreya T (2020) Human immune system and importance of immunity boosters on human body: a review. *J Global Trends in Phar Sci* 8641-8649.