

Bioactive Food Compounds in Cardiovascular Disease

| Chapter | First Online: 01 June 2026

| pp 305–324 | [Cite this chapter](#)



Bioactive Food Ingredients in Managing Inflammatory Diseases

Shubhrat Maheshwari, Aditya Singh, Amita Verma, Vaseem A. Ansari & Bhupendra G. Prajapati

 Part of the book series: [Food Bioactive Ingredients](#) ((FBC))

 14 Accesses

Abstract

Cardiovascular diseases (CVDs) remain a major global health burden, driven by modifiable risk factors such as sedentary behavior, hypertension, obesity, smoking, poor diet, and chronic stress. Among the various preventive strategies, dietary modulation through the intake of plant-food-derived bioactive compounds has garnered substantial attention. Bioactive food compounds (BFCs) such as polyphenols, flavonoids, carotenoids, alkaloids, phytosterols, and omega-3 fatty acids exhibit a range of cardioprotective effects including antioxidant, anti-inflammatory, antihypertensive, lipid-lowering, and antithrombotic actions. This chapter highlights the physiological and molecular mechanisms through which these compounds exert their benefits, such as modulating nitric oxide production, improving endothelial function, inhibiting LDL oxidation, and reducing systemic inflammation.

 This is a preview of subscription content, [log in via an institution](#)  to check access.

Access this chapter

[Log in via an institution](#) →

Subscribe and save

✓ Springer+

from €37.37 /Month

- Starting from 10 chapters or articles per month
- Access and download chapters and articles from more than 300k books and 2,500 journals
- Cancel anytime

[View plans](#) →

Buy Now

^ Chapter

EUR 29.95

Price includes VAT (India)

- Available as PDF
- Read on any device
- Instant download
- Own it forever

[Buy Chapter](#) →

✓ eBook

EUR 192.59

✓ Hardcover Book

EUR 229.99

Tax calculation will be finalised at checkout

Purchases are for personal use only

[Institutional subscriptions](#) →

Explore related subjects

Discover the latest articles, books and news in related subjects, suggested using machine learning.

[Fats](#)

[Fatty acids](#)

[Natural Products](#)

[Nutrition](#)

[Proteins](#)

[Sterols](#)

References

1. Teodoro AJ. Bioactive compounds of food: their role in the prevention and treatment of diseases. *Oxidative Med Cell Longev*. 2019;2019:3765986.
2. Sharifi-Rad J, Rodrigues CF, Sharopov F, Docea AO, Can Karaca A, Sharifi-Rad M, Kahveci Karıncaoglu D, Gülseren G, Şenol E, Demircan E, Taheri Y. Diet, lifestyle and cardiovascular diseases: linking pathophysiology to cardioprotective effects of natural bioactive compounds. *Int J Environ Res Public Health*. 2020;17(7):2326.
3. Din SR, Saeed S, Khan SU, Kiani FA, Alsuhaibani AM, Zhong M. Bioactive compounds (BACs): a novel approach to treat and prevent cardiovascular diseases. *Curr Probl Cardiol*. 2023;48(7):101664.
4. Sindhu RK, Goyal A, Algin Yapar E, Cavalu S. Bioactive compounds and nanodelivery perspectives for treatment of cardiovascular diseases. *Appl Sci*. 2021;11(22):11031.
5. Coelho MS, Fernandes SS, de las Mercedes Salas-Mellado M. Association between diet, health, and the presence of bioactive compounds in foods. In: *Bioactive compounds*. Woodhead Publishing; 2019. p. 159–83.
6. Nasirian F, Menichetti G. Molecular interaction networks and cardiovascular disease risk: the role of food bioactive small molecules. *Arterioscler Thromb Vasc Biol*. 2023;43(6):813–23.
7. Chung S, Hwang JT, Park SH. Physiological effects of bioactive compounds derived from whole grains on cardiovascular and metabolic diseases. *Appl Sci*. 2022;12(2):658.
8. Kamiloglu S, Capanoglu E, Jafari SM. An overview of food bioactive compounds and their health-promoting features. In: *Retention of bioactives in food processing*. Springer; 2022. p. 3–6.
9. Samtiya M, Aluko RE, Dhewa T, Moreno-Rojas JM. Potential health benefits of plant food-derived bioactive components: an overview. *Foods*. 2021;10(4):839.
10. Cho CH, Lu YA, Kim MY, Jeon YJ, Lee SH. Therapeutic potential of seaweed-derived bioactive compounds for cardiovascular disease treatment. *Appl Sci*. 2022;12(3):1025.

11. Zhou DD, Li J, Xiong RG, Saimaiti A, Huang SY, Wu SX, Yang ZJ, Shang A, Zhao CN, Gan RY, Li HB. Bioactive compounds, health benefits and food applications of grape. *Foods*. 2022;11(18):2755.
12. Pelczyńska M, Moszak M, Wesołek A, Bogdański P. The preventive mechanisms of bioactive food compounds against obesity-induced inflammation. *Antioxidants*. 2023;12(6):1232.
13. Frąk W, Wojtasińska A, Lisińska W, Młynarska E, Franczyk B, Rysz J. Pathophysiology of cardiovascular diseases: new insights into molecular mechanisms of atherosclerosis, arterial hypertension, and coronary artery disease. *Biomedicine*. 2022;10(8):1938.
14. Jankowski J, Floege J, Fliser D, Böhm M, Marx N. Cardiovascular disease in chronic kidney disease: pathophysiological insights and therapeutic options. *Circulation*. 2021;143(11):1157–72.
15. Levett JY, Raparelli V, Mardigyan V, Eisenberg MJ. Cardiovascular pathophysiology, epidemiology, and treatment considerations of coronavirus disease 2019 (COVID-19): a review. *CJC Open*. 2021;3(1):28–40.
16. Severino P, D'Amato A, Pucci M, Infusino F, Adamo F, Birtolo LI, Netti L, Montefusco G, Chimenti C, Lavalle C, Maestrini V. Ischemic heart disease pathophysiology paradigms overview: from plaque activation to microvascular dysfunction. *Int J Mol Sci*. 2020;21(21):8118.
17. Mensah GA, Roth GA, Fuster V. The global burden of cardiovascular diseases and risk factors: 2020 and beyond. *J Am Coll Cardiol*. 2019;74(20):2529–32.
18. Aggarwal R, Yeh RW, Maddox KE, Wadhera RK. Cardiovascular risk factor prevalence, treatment, and control in US adults aged 20 to 44 years, 2009 to March 2020. *JAMA*. 2023;329(11):899–909.
19. Jacobs DR Jr, Woo JG, Sinaiko AR, Daniels SR, Ikonen J, Juonala M, Kartiosuo N, Lehtimäki T, Magnussen CG, Viikari JS, Zhang N. Childhood cardiovascular risk factors and adult cardiovascular events. *N Engl J Med*. 2022;386(20):1877–88.
20. Teo KK, Rafiq T. Cardiovascular risk factors and prevention: a perspective from developing countries. *Can J Cardiol*. 2021;37(5):733–43.

21. Ciumărnean L, Milaciu MV, Negrean V, Orășan OH, Vesa SC, Sălăgean O, Iluț S, Vlaicu SI. Cardiovascular risk factors and physical activity for the prevention of cardiovascular diseases in the elderly. *Int J Environ Res Public Health*. 2021;19(1):207.
22. Minzer S, Losno RA, Casas R. The effect of alcohol on cardiovascular risk factors: is there new information? *Nutrients*. 2020;12(4):912.
23. Nikiphorou E, de Lusignan S, Mallen CD, Khavandi K, Bedarida G, Buckley CD, Galloway J, Raza K. Cardiovascular risk factors and outcomes in early rheumatoid arthritis: a population-based study. *Heart*. 2020;106(20):1566–72.
24. Guo L, Wang C. The effect of exercise on cardiovascular disease risk factors in sedentary population: a systematic review and meta-analysis. *Front Public Health*. 2025;13:1470947.
25. Sukatemin S, Muhalla HI, Muarrofah M, Utari DA, Fitriani VY. Sedentary lifestyle and the threat of obesity among young people. *J Acad Sci*. 2025;2(1):232–40.
26. Rahman M, Alatiqi M, Al Jarallah M, Hussain MY, Monayem A, Panduranga P, Rajan R. Cardiovascular effects of smoking and smoking cessation: a 2024 update. *Glob Heart*. 2025;20(1):15.
27. Toldy-Schedel E, Montemurro V. Reducing the cardiovascular risks of smoking: insights from the European Society of Cardiology (ESC) Congress 2024 and two key opinion leaders. *EMJ*. 2024;12(3):2–10.
28. Joo YS, Yun HR, Kim HW, Koh HB, Jung CY, Chang TI, Park JT, Park SK, Hyun YY, Kim YH, Sung S. Smoking cessation and atherosclerotic cardiovascular events and mortality in chronic kidney disease. *Nephrol Dial Transplant*. 2025;40(6):1203–12.
29. Nikolic A, Sousa-Uva M, Arora RC, Milojevic M. Raising awareness of risks associated with smoking in cardiac surgery patients: a call to action. *Eur J Cardiothorac Surg*. 2024;65(6):eae238.
30. Câmara JS, Albuquerque BR, Aguiar J, Corrêa RC, Gonçalves JL, Granato D, Pereira JA, Barros L, Ferreira IC. Food bioactive compounds and emerging techniques for their extraction: polyphenols

as a case study. *Foods*. 2020;10(1):37.

31. Mondal S, Soumya NP, Mini S, Sivan SK. Bioactive compounds in functional food and their role as therapeutics. *Bioact Compd Health Disease*. 2021;4(3):24–39.
32. Chugh B, Kamal-Eldin A. Bioactive compounds produced by probiotics in food products. *Curr Opin Food Sci*. 2020;32:76–82.
33. Kurek M, Benaida-Debbache N, Elez Garofulić I, Galić K, Avallone S, Voilley A, Waché Y. Antioxidants and bioactive compounds in food: critical review of issues and prospects. *Antioxidants*. 2022;11(4):742.
34. Alu'datt MH, Alrosan M, Gammoh S, Tranchant CC, Alhamad MN, Rababah T, Zghoul RA, Alzoubi H, Ghatasheh S, Ghazlan K, Tan TC. Encapsulation-based technologies for bioactive compounds and their application in the food industry: a roadmap for food-derived functional and health-promoting ingredients. *Food Biosci*. 2022;50:101971.
35. Martirosyan D, Lampert T, Lee M. A comprehensive review on the role of food bioactive compounds in functional food science. *Funct Food Sci*. 2022;2(3):64–78.
36. More PR, Jambrak AR, Arya SS. Green, environment-friendly and sustainable techniques for extraction of food bioactive compounds and waste valorization. *Trends Food Sci Technol*. 2022;128:296–315.
37. Pereira JA, Casado N, Porto-Figueira P, Câmara JS. The potential of microextraction techniques for the analysis of bioactive compounds in food. *Front Nutr*. 2022;9:825519.
38. Mehta N, Kumar P, Verma AK, Umaraw P, Kumar Y, Malav OP, Sazili AQ, Domínguez R, Lorenzo JM. Microencapsulation as a noble technique for the application of bioactive compounds in the food industry: a comprehensive review. *Appl Sci*. 2022;12(3):1424.
39. Narayanankutty A, Famurewa AC, Oprea E. Natural bioactive compounds and human health. *Molecules*. 2024;29(14):3372.

40. Zhang Y, Bao X, Zhu Y, Dai Z, Shen Q, Xue Y. Advances in machine learning screening of food bioactive compounds. *Trends Food Sci Technol.* 2024;150:104578.
41. Martínez-Hernández GB, Taboada-Rodríguez A, Marin-Iniesta F. Plant bioactive compounds in foods and food packages. *Foods.* 2024;13(9):1419.
42. Zarei M, Forghani B, Ebrahimpour A, Abdul-Hamid A, Anwar F, Saari N. In vitro and in vivo antihypertensive activity of palm kernel cake protein hydrolysates: sequencing and characterization of potent bioactive peptides. *Ind Crop Prod.* 2015;76:112–20.
43. Sun YQ, Xin TA, Men XM, Xu ZW, Tian WA. In vitro and in vivo antioxidant activities of three major polyphenolic compounds in pomegranate peel: Ellagic acid, punicalin, and punicalagin. *J Integr Agric.* 2017;16(8):1808–18.
44. Virdee PS, Marian IR, Mansouri A, Elhussein L, Kirtley S, Holt T, Birks J. The full blood count blood test for colorectal cancer detection: a systematic review, meta-analysis, and critical appraisal. *Cancer.* 2020;12(9):2348.
45. Clarke LB, Smith IM. Management of residues from coal utilisation: an overview of FBC and IGCC by-products. *Stud Environ Sci.* 1991;48:81–9.
46. Grist G, Whittaker C, Merrigan K, Fenton J, Worrall E, O'Brien J, Lofland G. The correlation of fluid balance changes during cardiopulmonary bypass to mortality in pediatric and congenital heart surgery patients. *J Extra Corpor Technol.* 2011;43(4):215–26.
47. Abazari M, Gholoobi A, Derakhshan AR, Saeedinejat S, Yousefi M. The role of the most important fruits in the prevention and treatment of cardiovascular diseases in Persian traditional medicine. *Curr Tradit Med.* 2024;10(5):4–15.
48. Liu X, Chang Y, Li Y, Zhang X, Li F, Song J, Shi H, Chen X, Cui J. Prospective cohort study of broccoli consumption frequency and all-cause and cause-specific mortality risks. *Front Nutr.* 2024;10:1286658.

49. Ikram A, Rasheed A, Ahmad Khan A, Khan R, Ahmad M, Bashir R, Hassan Mohamed M. Exploring the health benefits and utility of carrots and carrot pomace: a systematic review. *Int J Food Prop.* 2024;27(1):180–93.
50. Illarionova K, Grigoryev S, Shelenga T, Rantakaulio T. Metabolomics approach in digital assessment of fatty acids profile of cottonseed for biological activity improvement of cotton oil. In: *IOP conference series: materials science and engineering*, vol. 940 (no. 1). IOP Publishing; 2020. p. 012077.
51. El-Din SB, Alfiky HA, Wahsh E, Badawy H, Seliem N, El Attar S, Mehanna MG, Farahat AM, Ibrahim MM, Hafiz WF, Ahmed MI. Effect of garlic on sodium fluoride-induced hypertension and elevated cardiac enzymes in male albino rats. *Immunopathol Persa.* 2025;11(2):e43763.
52. Hejazi N, Ghalandari H, Nouri M, Askarpour M. Onion supplementation and health metabolic parameters: a systematic review and meta-analysis of randomized controlled trials. *Clin Nutr ESPEN.* 2023;58:1–3.
53. Yu Y, Wu Y, Xie L, Chang C. The effect of water-soluble tomato concentrate on elevated serum cholesterol in the middle-aged and elderly Chinese individuals. *Front Nutr.* 2024;11:1410420.
54. Jafari Azad B, Daneshzad E, Azadbakht L. Peanut and cardiovascular disease risk factors: a systematic review and meta-analysis. *Crit Rev Food Sci Nutr.* 2020;60(7):1123–40.
55. Mohamad EA, Ahmed SM, Masoud MA, Mohamed FA, Mohammed HS. Cardioprotective potential of moringa oleifera leaf extract loaded niosomes nanoparticles-against doxorubicin toxicity in rats. *Curr Pharm Biotechnol.* 2025;26(2):289–301.
56. Zhou Z, Li M, Zhang Z, Song Z, Xu J, Zhang M, Gong M. Overview of Panax ginseng and its active ingredients protective mechanism on cardiovascular diseases. *J Ethnopharmacol.* 2024;334:118506.
57. Hossain MS, Wazed MA, Asha S, Amin MR, Shimul IM. Dietary phytochemicals in health and disease: mechanisms, clinical evidence, and applications—a comprehensive review. *Food Sci Nutr.* 2025;13(3):e70101.

58. Omachi DO, Fawole AO, Onuh JO. Bioactivities of phytochemicals in nutrition and health. In: Plant food phytochemicals and bioactive compounds in nutrition and health. CRC Press; 2024. p. 31–46.
59. Marianna L, Antonella DA. Advances in the astonishing world of phytochemicals: state-of-the-art for antioxidants—2nd edition. *Antioxidants*. 2025;14(5):582.
60. Muscolo A, Mariateresa O, Giulio T, Mariateresa R. Oxidative stress: the role of antioxidant phytochemicals in the prevention and treatment of diseases. *Int J Mol Sci*. 2024;25(6):3264.
61. Xavier JR, Sameer B, Gupta D, Mehta S, Chauhan OP. Bioactive compounds of foods: phytochemicals and peptides. *Food Hum*. 2024;3:100354.
62. Gao K, Xu D, Mu F, Zhao M, Zhang W, Tao X, Guo C, Wang J. Systems pharmacology to explore the potential mechanism of ginseng against heart failure. *Rejuvenation Res*. 2025;28(2):54–66.
63. Tsoupras A, Gkika DA, Markopoulos T, Curran R, Scallan C, Karali M, Kyzas GZ. Apple products (apple juice and cider) and by-products (apple pomace): bioactive compounds and biological properties. In: natural products in beverages: botany, phytochemistry, pharmacology and processing. Cham: Springer International Publishing; 2024. p. 1–42.
64. Muneer A, Awan AI, Hamza M, Babekir SA, Alhujaili WF, Naeem S, Saleem F. Exploring the cardio-protective effect of bioactive compounds present in ginger, garlic, and turmeric. *J Health Rehabil Res*. 2024;4(1):1706–12.
65. Hosseini A, Alavi MS, Toos MG, Jamialahmadi T, Sahebkar A. 6-Gingerol, an ingredient of *Zingiber officinale*, abrogates lipopolysaccharide-induced cardiomyocyte injury by reducing oxidative stress and inflammation. *J Agric Food Res*. 2024;15:101034.
66. Ghoreishi PS, Shams M, Nimrouzi M, Zarshenas MM, Lankarani KB, Fallahzadeh Abarghooei E, Talebzadeh M, Hashempur MH. The effects of ginger (*zingiber officinale roscoe*) on non-alcoholic fatty liver disease in patients with type 2 diabetes mellitus: a randomized double-blinded placebo-controlled clinical trial. *J Diet Suppl*. 2024;21(3):294–312.

67. Nyulas KI, Simon-Szabó Z, Pál S, Fodor MA, Dénes L, Cseh MJ, Barabás-Hajdu E, Csipor B, Szakács J, Preg Z, Germán-Salló M. Cardiovascular effects of herbal products and their interaction with antihypertensive drugs—comprehensive review. *Int J Mol Sci.* 2024;25(12):6388.
68. Pop RM, Boarescu PM, Bocsan CI, Gherman ML, Chedea VS, Jianu EM, Roşian ŞH, Boarescu I, Ranga F, Tomoiagă LL, Sîrbu AD. Anti-inflammatory and antioxidant effects of white grape pomace polyphenols on isoproterenol-induced myocardial infarction. *Int J Mol Sci.* 2025;26(5):2035.
69. Mohamed SM, Shalaby MA, El-Shiekh RA, Bakr AF, Rashad MM, Emam SR, El-Banna HA. *Vitis vinifera* L. seed standardized extract; a promising therapeutic against metabolic syndrome induced by high-fat/high-carbohydrate diet and streptozotocin in rats. *S Afr J Bot.* 2024;167:476–86.
70. Chedea VS, Tomoiagă LL, Macovei ŞO, Măgureanu DC, Iliescu ML, Bocsan IC, Buzoianu AD, Voşloban CM, Pop RM. Antioxidant/pro-oxidant actions of polyphenols from grapevine and wine by-products-base for complementary therapy in ischemic heart diseases. *Front Cardiovasc Med.* 2021;8:750508.
71. Li J, Xiong D, Hong L, Lim J, Xu X, Xiao X, Guo R, Xu Z. Tongue color parameters in predicting the degree of coronary stenosis: a retrospective cohort study of 282 patients with coronary angiography. *Front Cardiovasc Med.* 2024;11:1436278.
72. Lakshmikanthan M, Muthu S, Krishnan K, Altemimi AB, Haider NN, Govindan L, Selvakumari J, Alkanan ZT, Cacciola F, Francis YM. A comprehensive review on anthocyanin-rich foods: insights into extraction, medicinal potential, and sustainable applications. *J Agric Food Res.* 2024;17:101245.

Author information

Authors and Affiliations

Bioorganic and Medicinal Chemistry Research Laboratory, Department of Pharmaceutical Sciences, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Shubhrat Maheshwari & Amita Verma

Department of Pharmaceutics, Parul Institute of Pharmacy & Research, Faculty of Pharmacy, Parul University, Vadodara, Gujarat, India

Aditya Singh

Department of Pharmacy, Faculty of Pharmacy, Integral University, Lucknow, Uttar Pradesh, India

Vaseem A. Ansari

Department of Pharmaceutics, Parul Institute of Pharmacy, Faculty of Pharmacy, Parul University, Vadodara, Gujarat, India

Bhupendra G. Prajapati

Editor information

Editors and Affiliations

Animal Biotechnology, Jeju National University, Jeju, Korea (Republic of)

Md. Meraj Ansari

CBS Bio Platforms Inc., Calgary, AB, Canada

Nadeem Akhtar

Rights and permissions

[Reprints and permissions](#)

Copyright information

© 2026 The Author(s), under exclusive license to Springer Nature Switzerland AG

About this chapter

Cite this chapter

Maheshwari, S., Singh, A., Verma, A., Ansari, V.A., Prajapati, B.G. (2026). Bioactive Food Compounds in Cardiovascular Disease. In: Ansari, M.M., Akhtar, N. (eds) Bioactive Food Ingredients in Managing Inflammatory Diseases. Food Bioactive Ingredients. Springer, Cham. https://doi.org/10.1007/978-3-032-23814-6_13

[.RIS](#) [.ENW](#) [.BIB](#)

DOI

Published

01 June 2026

Publisher Name

Springer, Cham

https://doi.org/10.1007/978-3-032-23814-6_13

Print ISBN	Online ISBN	eBook Packages
978-3-032-23813-9	978-3-032-23814-6	<u>Biomedical and Life Sciences</u>
		<u>Biomedical and Life Sciences (R0)</u>

Keywords

- Cardiovascular diseases
- Hypertension
- Obesity
- Lipid-lowering
- And antithrombotic actions

Publish with us

Policies and ethics 

