

# Nutritional and Functional Role of Spices in Human Health and Diet

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## ABSTRACT

Spices are plant-based ingredients widely used in cooking to improve the taste, smell, and appearance of food, and they also provide important nutritional and health benefits. They contain many bioactive compounds, such as polyphenols, flavonoids, alkaloids, and essential oils, which together show strong antioxidant, anti-inflammatory, antimicrobial, and metabolism-supporting effects. Traditional medical systems, including Ayurveda and Traditional Chinese Medicine, have long used spices like turmeric, cinnamon, ginger, black pepper, and chili to manage digestive problems, infections, pain, and inflammatory conditions, and many of these uses are now supported by modern scientific studies. Experimental and clinical research indicates that spice-derived compounds such as curcumin, cinnamaldehyde, piperine, gingerol, and capsaicin can support cardiovascular health, improve blood sugar control in diabetes, modulate immune responses, and show promising anti-cancer effects by acting on key signaling pathways like NF- $\kappa$ B and MAPK. Spices also help digestion, influence gut microbiota, and may increase energy use through thermogenic actions. Their use in functional foods, nutraceuticals, and herbal beverages is increasing, although there are still challenges related to bioavailability, dose standardization, product quality, and the limited number of well-designed human

clinical trials. Overall, regular intake of a variety of spices in the daily diet represents a simple, low-cost approach to support public health, as long as issues of safety, processing, and standardization are properly addressed.

**Keywords:** spices; bioactive compounds; antioxidant activity; anti-inflammatory effects; functional foods; cardiovascular health; diabetes; immune modulation; anti-cancer potential; bioavailability.

## INTRODUCTION

Spices are parts of plants that people add in small amounts to make food taste better, smell nicer, and look more colorful. More than just cooking helpers, lots of science studies prove spices give key nutrition and healing powers. They hold many active plant substances like polyphenols, flavonoids, alkaloids, and essential oils. These help spices fight damage from oxygen, cut down body swelling, and stop diseases from starting. Lately, there is more focus on putting spices into health-boost foods. This happens because spices can change how the body works and brings better health results.

## HISTORICAL SIGNIFICANCE OF SPICES IN HUMAN DIET

Spices have been very important in human life for thousands of years. Old health ways like Ayurveda, Traditional Chinese Medicine, and Greco-Arab medicine used spices for flavor and to heal sickness. Spices such as turmeric, cinnamon, and ginger

treated gut problems, germs, and body swelling back then. Trading spices pushed people to explore the world and grow economies, showing their big place in culture and money matters.

### **CLASSIFICATION OF DIETARY SPICES**

Food spices get grouped by plant type, which plant part is used, and health uses:

#### **BASED ON PLANT PART:**

- o Seeds (cumin, coriander)
- o Bark (cinnamon)
- o Roots/rhizomes (ginger, turmeric)
- o Fruits (black pepper, chili)

#### **BASED ON FLAVOUR PROFILE:**

- o Pungent (pepper, ginger)
- o Aromatic (cardamom, cloves)

#### **BASED ON BIOACTIVE COMPOSITION:**

- o Phenolic-rich spices (turmeric, cloves)
- o Essential oil-rich spices (cinnamon, cardamom)

### **NUTRITIONAL COMPOSITION OF SPICES**

Spices go into food in small bits, but they add a good share of tiny nutrients. They have:

- Vitamins: Vitamin C (in chilli), vitamin A starters, and B-group vitamins
- Minerals: Iron, calcium, magnesium, and potassium
- Dietary fibre: Mostly in seed types
- Phytochemicals: Polyphenols and flavonoids

Studies find spices have top antioxidant strength from packed plant chemicals. Per gram, this often-tops fruits and veggies.

### **BIOACTIVE COMPOUNDS PRESENT IN MAJOR SPICES**

Health effects from spices come mostly from their active plant parts:

- Curcumin (turmeric) – fights swelling and oxygen damage
- Cinnamaldehyde (cinnamon) – kills germs and helps sugar control
- Piperine (black pepper) – boosts absorption in body
- Gingerol (ginger)—cuts swelling and stops sickness feeling

- Capsaicin (chili) – wakes up body energy use

These parts touch body cell messages. They change harm from oxygen, swelling, and food energy handling.

### **FUNCTIONAL PROPERTIES OF SPICES**

Spices bring many health benefits, like

- Antioxidant activity: Neutralization of free radicals
- Anti-inflammatory effects: Inhibition of pro-inflammatory cytokines
- Antimicrobial properties: Activity against bacteria, fungi, and viruses
- Digestive enhancement: Stimulation of digestive enzymes

These make spices great for food that stops sickness.

### **DIGESTIVE AND METABOLIC FUNCTIONS**

Spices do a lot to help food break down and energy use in the body. Parts like piperine and gingerol push out digestive helpers, make more bile, and help take in food nutrients. Some spices shift gut germs for better stomach health. Heat spices like chili also speed up body burn rate and use more energy.

### **ROLE OF SPICES IN HUMAN HEALTH CARDIOVASCULAR HEALTH**

Spices aid heart and vessel health by lowering oxygen harm, cutting bad fats, and fixing vessel walls. Tests on people and labs show garlic, cinnamon, and turmeric drop LDL cholesterol and blood pressure.

### **DIABETES MANAGEMENT**

Some spices lower blood sugar. Cinnamon helps the body use insulin better; fenugreek slows sugar uptake. Curcumin also shifts sugar handling and lessens diabetes side effects.

### **IMMUNE MODULATION**

Spices lift immune work with anti-damage and anti-swell actions. Active parts wake

immune cells and guide cytokine making, building stronger bodyguards.

### ANTI-CANCER POTENTIAL

Studies show spice parts fight cancer well. Curcumin, capsaicin, and gingerol halt tumor growth, kill bad cells, and stop spread. They shift paths like NF- $\kappa$ B and MAPK.

### SPICES IN TRADITIONAL MEDICINE SYSTEMS

Old health systems like Ayurveda and Traditional Chinese Medicine use spices a lot. They balance bodywork, help the gut, and block sickness. Science now checks these ways, linking old know-how to new finds.

### ROLE OF SPICES IN MODERN DIET AND FUNCTIONAL FOODS

Health foods now use more spices. They go into:

- Nutraceutical formulations
- Fortified foods
- Herbal beverages

Nature sources and health plus make them better than fake ads. Food makers test spice pulls and oleoresins for new goods.

### BIOAVAILABILITY AND SAFETY ASPECTS OF SPICES

The body's take-up of spice actives sets how well they work. Curcumin takes up little alone, but piperine helps it. Spices are safe for normal use, but too much brings gut bother or drug mixes.

### PROCESSING AND STABILITY OF BIOACTIVE COMPOUNDS

Prep steps like drying, grinding, and heating change active stay-power. Heat loses volatile oils, and long keeps break key bits. Wrap tech, like encapsulation, keeps them good longer.

### FUTURE PERSPECTIVES AND RESEARCH GAPS

Much spice study is done, but holes remain:

- Few people test for health plus
- Active mix changes by grow place

- No set dose or form
- Better check tools needed

Next work: people proof, set rules, and spice health foods.

### CONCLUSION

Spices boost daily food with big nutrition and health roles. Packed actives give anti-damage, anti-swell, and sickness-stop powers. Putting spices in meals and health goods helps all health. More study is needed for best use and health check.

### Declaration by Authors

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### REFERENCE

1. Yashin, A., Yashin, Y., Xia, X., & Nemzer, B. (2017). Antioxidant activity of spices and their impact on human health: A review. *Antioxidants*, 6(3), 70.
2. Peter, K. V. (Ed.). (2012). *Handbook of herbs and spices* (Vol. 2). Woodhead Publishing.
3. Embuscado, M. E. (2015). Spices and herbs: Natural sources of antioxidants – A mini review. *Journal of Functional Foods*, 18(Part B), 811–819.
4. Srinivasan, K. (2014). Antioxidant potential of spices and their active constituents. *Food Research International*, 44(9), 1835–1846.
5. Shahidi, F., & Ambigaipalan, P. (2015). Phenolics and polyphenolics in foods, beverages and spices: Antioxidant activity and health effects – A review. *Journal of Agricultural and Food Chemistry*, 63(4), 1026–1043.
6. Tapsell, L. C., Hemphill, I., Cobiac, L., Patch, C. S., Sullivan, D. R., Fenech, M., Roodenrys, S., Keogh, J. B., Clifton, P. M., Williams, P. G., Fazio, V. A., & Inge, K. E. (2006). Health benefits of herbs and spices: The past, the present, the future. *Medical Journal of Australia*, 185(4 Suppl), S4–S24.
7. Gruenwald, J., Freder, J., & Armbruester, N. (2010). Cinnamon and health. *Journal of Functional Foods*, 2(3), 254–269.
8. Khan, A., Safdar, M., Ali Khan, M. M., Khattak, K. N., & Anderson, R. A. (2003). Cinnamon improves glucose and lipids of

- people with type 2 diabetes. *Diabetes Care*, 26(12), 3215–3218.
9. Hewlings, S. J., & Kalman, D. S. (2017). Curcumin: A review of its' effects on human health. *Foods*, 6(10), 92.
  10. Aggarwal, B. B., Sundaram, C., Malani, N., & Ichikawa, H. (2007). Curcumin: The Indian solid gold. *Cancer Research*, 67(Suppl. 2), 425–431.
  11. Srinivasan, K. (2007). Black pepper and its pungent principle-piperine: A review of diverse physiological effects. *Critical Reviews in Food Science and Nutrition*, 47(8), 735–748.
  12. Mashhadi, N. S., Ghiasvand, R., Askari, G, Hariri, M., Darvishi, L., & Mofid, M. R. (2013). Anti-oxidative and anti-inflammatory effects of ginger and its main constituents. *Biomedicine & Pharmacotherapy*, 57(suppl 1), 46–54.
  13. Basu, S., Srivastava, P., & Vadhavkar, N. (2016). Therapeutic potential of capsaicin in pain and cancer. *Pharmacological Research*, 113(Part A), 1–11.
  14. Calder PC. Nutrition, immunity and COVID-19. *BMJ Nutr Prev Health*. 2020 May 20;3(1):74-92.
  15. Ghosh S, Banerjee S, Sil PC. The beneficial role of curcumin on inflammation, diabetes and neurodegenerative disease: A recent update. *Food Chem Toxicol*. 2015 Sep; 83:111-24.

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