

## Lipid Oxidation in Foods and Its Impact on Quality and Shelf Life

**Katarina J. Horvat\***

Department of Food Chemistry and Technology, University of Zagreb, Croatia,

\*Corresponding author: Katarina J. Horvat. Department of Food Chemistry and Technology, University of Zagreb, Croatia,

Email: katarina.horvat.lipids@foodscience.hr

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### Abstract

Lipid oxidation is a major cause of quality deterioration in fat-containing foods, leading to rancidity, off-flavors, and nutritional losses. It significantly affects shelf life, sensory properties, and consumer acceptance of food products. Understanding the mechanisms of lipid oxidation is essential for developing effective control strategies in food systems. This article discusses the causes, consequences, and control of lipid oxidation in foods.. This article discusses the role of protein characterization in modern food science and food product development. This article discusses the role of food fortification in promoting nutrition security and public health. This article discusses the role of food biotechnology in modern food science and its contribution to sustainable food production. Improper post-harvest practices can lead to significant food losses, reduced nutritional value, and economic challenges.

*Keywords: Lipid oxidation, Rancidity, Shelf life, Food quality, Oxidative stability*

### Introduction

Lipid oxidation is a chemical process in which unsaturated fatty acids react with oxygen, leading to the formation of peroxides and secondary oxidation products. These reactions result in off-flavors, unpleasant odors, and nutritional degradation in food products [1]. Lipid oxidation is one of the primary factors limiting the shelf life of fat-rich foods. Factors such as light, heat, metal ions, and oxygen exposure accelerate oxidative reactions in lipids [2]. Processing and storage conditions play a significant role in determining the rate of oxidation and product stability [3]. Control of these factors is essential for maintaining food quality and safety.. [3]. Their presence in natural foods highlights the importance of dietary diversity and plant-based nutrition. In food science, bioactive compounds are increasingly used in the development of functional and fortified foods [4]. Advances in extraction, stabilization, and delivery technologies have improved their bioavailability and effectiveness [5]. Therefore, bioactive compounds represent a vital intersection between nutrition, food science, and preventive healthcare. Bioactive compounds are non-nutrient components in foods that influence physiological processes and promote health. These substances include polyphenols, flavonoids, carotenoids, peptides, and phytosterols, which

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exert protective effects against various diseases. Their biological activity makes them valuable components of functional foods. Therefore, bioactive compounds represent a vital intersection between nutrition, food science, and preventive healthcare.

### **Conclusion**

Lipid oxidation significantly affects food quality, shelf life, and nutritional value. By understanding its mechanisms and controlling contributing factors, food scientists can develop effective strategies to prevent oxidative deterioration. Continued research will enhance the stability and quality of fat-containing food products. Their development supports preventive healthcare approaches and improved quality of life. Continued scientific research and regulatory oversight will strengthen the credibility and impact of nutraceuticals in global health systems. When used responsibly and regulated effectively, they contribute to product stability and consumer satisfaction. Ongoing research and regulatory oversight are essential to ensure the safe and beneficial use of food additives in the global food industry.

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