

Department of Food Technology

HEALTHY FOODS



Society of Food
Technocrats

2022

**Bhai Gurdas Institute of Engineering and
Technology, Sangrur-148001**

Message



Dr. Guninderjit Singh Jawandha
Chairman
Bhai Gurdas Group Of Institutions

I am delighted to have the opportunity to release "Society of Food Technocrats" , the annual college magazine. In this era of cut throat competition, apart study. One needs to have the holistic development of personality & this is our prerogative to chisel your thinking & persona here. The magazine will act as a platform for your creativity & writing aptitude & I intently believe that you would have an all-round development of your personality during your sojourn in this temple of learning. I congratulate the Director, staff & students for publishing "Society of Food Technocrats". I hope this issue would be meaningful, enjoyable & memorable in achieving its objectives.

Message



Prof. (Dr.) Tanuja Srivastava
Director
Bhai Gurdas Institute of Engineering and Technology

It is a matter of great pleasure for me to learn that Editorial Board is bringing out an issue of the College magazine 'Society of Food Technocrats'. I would like to appreciate those who have contributed articles for the college magazine as this shows the hard work, and the hidden potential of the students. I hereby congratulate those who contributed for the college magazine and welcome those who want to avail the opportunity next time.

Prof. (Dr.) Tanuja Srivastava
Director

Message



**Dr. Syed Insha Rafiq
Head of Department
Food Technology**

I am happy that department of Food technology is publishing yet another issue of “Society of Food Technocrats 2022” This magazine is by the student & for the Students. It aims at providing a platform to the students to explore their latent Capabilities & talent, to express their creativity and to develop their technical skills as you scan through the pages of the magazine, it will enlighten you with the important milestone the department has achieved this year. Beside, our budding talent have expressed their thoughts, ideas, hopes, feelings, aspirations & Convictions in a creative way.

I congratulate the editorial board for unleashing the hidden potential of the students & appreciate them for their effort in bringing out their issue.

Wishing the magazine a lasting success.

Dr. Syed Insha Rafiq
Head of Department
Food Technology

Message



Er. Swati Priyadarshi
Assistant Professor
Food Technology

It gives us great pleasure to bring you another issue of “Society of Food Technocrats”, the college magazine of Bhai Gurdas Institute of Engineering & Technology. The name and fame of an institute depends on the caliber and achievements of the students and teachers. The role of a teacher is to be a facilitator in nurturing the skills and talents of students. This magazine is a platform to exhibit the literary skills and innovative ideas teachers and students. Society of Food Technocrats presents the achievements of students and contributions of teachers. We would like to place on record our gratitude and heartfelt thanks to all those who have contributed to make this effort a success. We profusely thank the management for giving support and encouragement and a free hand in this endeavour. Last but not the least we are thankful to all the authors who have sent their articles. We truly hope that the pages that follow will make an interesting read.

Er. Swati Priyadarshi
Assistant Professor
Food Technology

Students Editor's

1. Simranjeet Kaur (FT 8th)
2. Mandeep Kumar (FT 8th)

Vision of the Department:

To create competent and skilled human resources involved in the improvement of quality and safety of the rapidly growing food processing sector.

Mission of the Department:

M1: To excel in teaching by offering technical/professional education imbuing ethical and moral values.

M2: To provide knowledge and skills in the areas of food processing, hygiene and safety of processed food products.

M3: To impart students with a vibrant technical knowledge to handle problems by collaborating with food industry.

M4: To promote the research and development activities of students to produce quality food products with the scope.

PEO's of the Department:

PEO1: To provide students with the basic knowledge, skills and use of latest technologies in food science that help in lifelong learning and self education.

PEO2: To acquire theoretical, practical knowledge and Industrial exposure of Food Processing Sector to become a qualified Food Technologist.

PEO3: To provide students with overall competency by inculcate skills, technical writing and communication skills as professionals.

CONTENTS

Sr. No.	ARTICLES
1.	Dietary fibers and gut microbiota.
2.	Artificial intelligence and ethics within the food sector.
3.	Soy protein isolates.
4.	Phytochemical properties of lemon peels.
5.	Extruded breakfast cereals.
6.	Pectinase Properties.
7.	Volatile organic compounds.
8.	Electronic tongue and electronic nose.
9.	Gelatin-based composite films.
10.	Curcumin and its uses in active and smart food packaging.

1. A critical review on interplay between dietary fibers and gut microbiota

Dietary fibers, as mainly complex carbohydrates, offer various health benefits via modulating gut microbiota composition and promoting short chain fatty acids (SCFAs) production. However, the modern dietary habits are altered by reducing dietary fiber consumption and increasing intake of fat, sugar, and animal protein, thus adversely affecting our gut microbiota. This deficiency of dietary fibers is usually associated with an increasing risk of chronic diseases such as type 2 diabetes, cardiovascular diseases, and colorectal cancer.

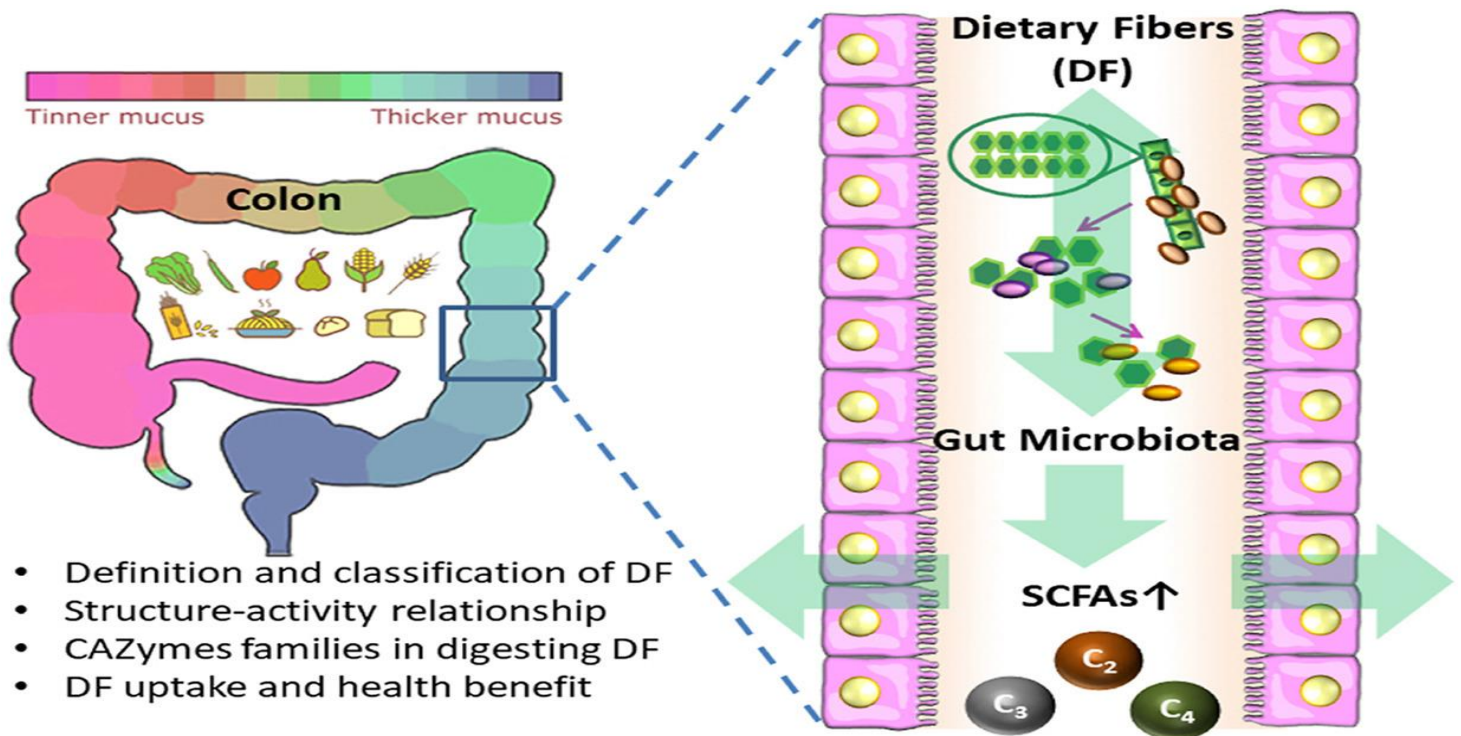


Fig 1.1 Interplay between dietary fibers and gut microbiota.

In this review, firstly we elaborately classified dietary fibers based on the definition by the European Food Safety Authority (EFSA), revealed the structure-activity relationship of dietary fibers, and up-dated carbohydrate active enzyme families (CAZyme). Furthermore, this review summarizes the available literature on the interaction between different types of dietary fiber, gut microbiota composition, and SCFA production, both *in vivo* and *in vitro*.

Dietary fiber-rich and whole grain (WG)-based diets offer a desirable nutritional intervention strategy by manipulating the composition and quality of microbiota to improve intestinal environment so as to promote host health.

2. Artificial intelligence and ethics within the food sector

The use of artificial intelligence (AI) is growing in food supply chains. The ethical language associated with food supply and technology is contextualised and framed by the meaning given to it by stakeholders. Failure to differentiate between these nuanced meanings can create a barrier to technology adoption and reduce the benefit derived.\

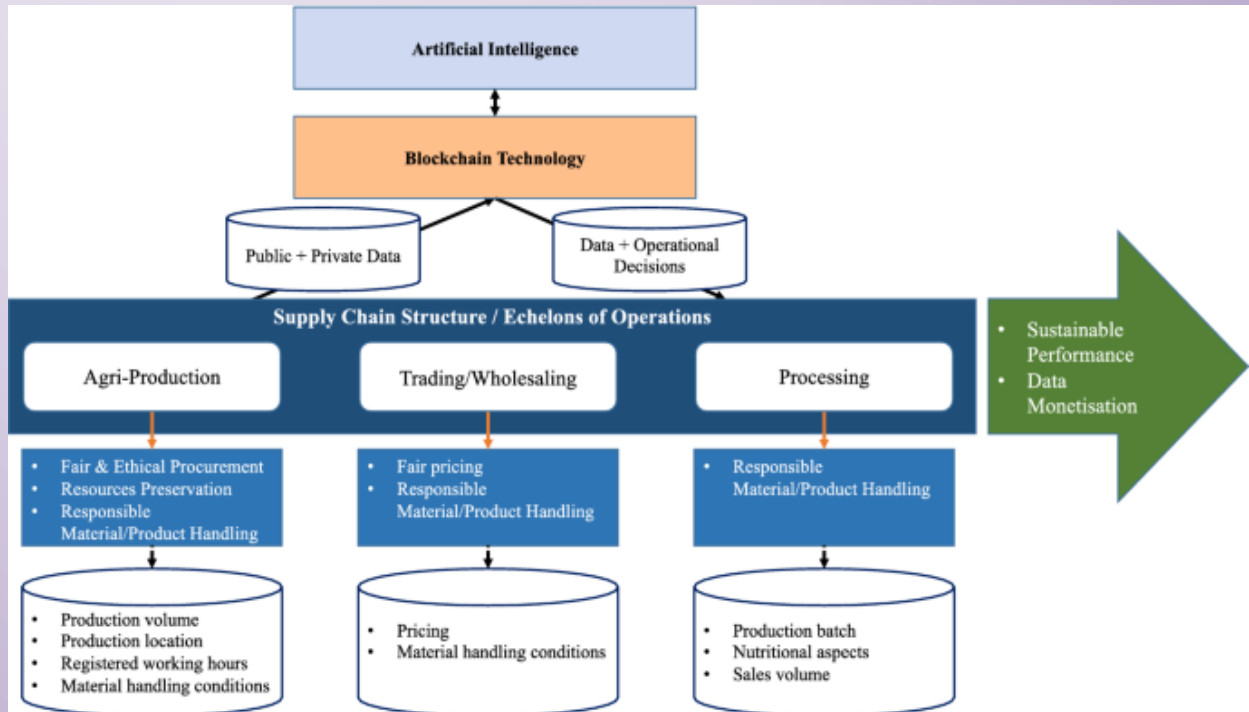


Fig 2.1 Artificial intelligence (AI) in food supply chain.

Whilst the nature of data within the food system is much broader than the personal data covered by the European Union General Data Protection Regulation (GDPR), the ethical issues for computational and AI systems are similar and can be considered in terms of particular aspects: transparency, traceability, explainability, interpretability, accessibility, accountability and responsibility. The outputs of this research assist in giving a more rounded understanding of the language used, exploring the ethical interaction of aspects of AI used in food supply chains and also the management activities and actions that can be adopted to improve the applicability of AI technology, increase engagement and derive greater performance benefits. This work has implications for those developing AI governance protocols for the food supply chain as well as supply chain practitioners.

3. Soy protein isolates: A review of their composition, aggregation, and gelation

The research and development of vegetable protein-based meat substitutes have become a major commercial activity, and the market is expanding to meet the growing consumer demand. Soy protein isolates (SPI) are often used as a raw material for vegetable meat substitutes because of their potential to form fiber structures. Although significant initial success has been achieved, it is still a challenge to explain how the composition and aggregation of SPI influence gel properties and the mechanism(s) involved.

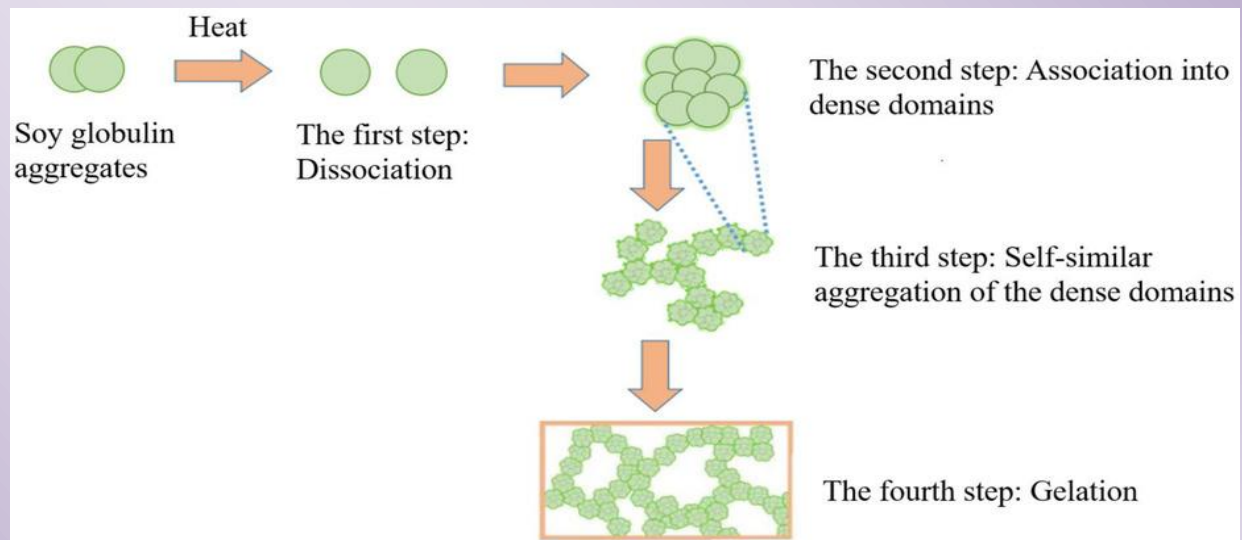


Fig 3.1 Relationship between the composition, aggregation, and gelation properties.

The relationship between the composition, aggregation, and gelation properties of SPI is based on a thorough literature search. It focused on the application of SPI in heat- and cold-induced gels, given the diversified market demands. The research on cold gel has helped expand the market. The methods to improve the properties of SPI gels, including physical, chemical, and biological properties, are reviewed to provide insights on its role in the properties of SPI gels. To achieve environmentally friendly and efficient ways for the food industry to use SPI gel properties, the research prospects and development trends of the gel properties of SPI are summarized. New developments and practical applications in the production technology, such as for ultrasound, microwave and high pressure, are reviewed. The potential and challenges for practical applications of cold plasma technology for SPI gel properties are also discussed. There is a need to transfer the laboratory technology to actual food production efficiently and safely.

4. An advance on nutritional profile, phytochemical profile, nutraceutical properties, and potential industrial applications of lemon peels

The last decade witnessed the rapid increase in the population worldwide, which fueled the development of food processing industry for fulfilling the daily demand for diversified food products. A massive amount of food by-products is simultaneously generated during the food processing. Generally, these by-products are discarded as food waste that results in adverse impacts on the environment and economics. Lemon peels are the main by-products generated by lemon processing. However, lemon peels contain abundant high value-added substances that demonstrate desirable nutraceutical properties and promise in industrial application.

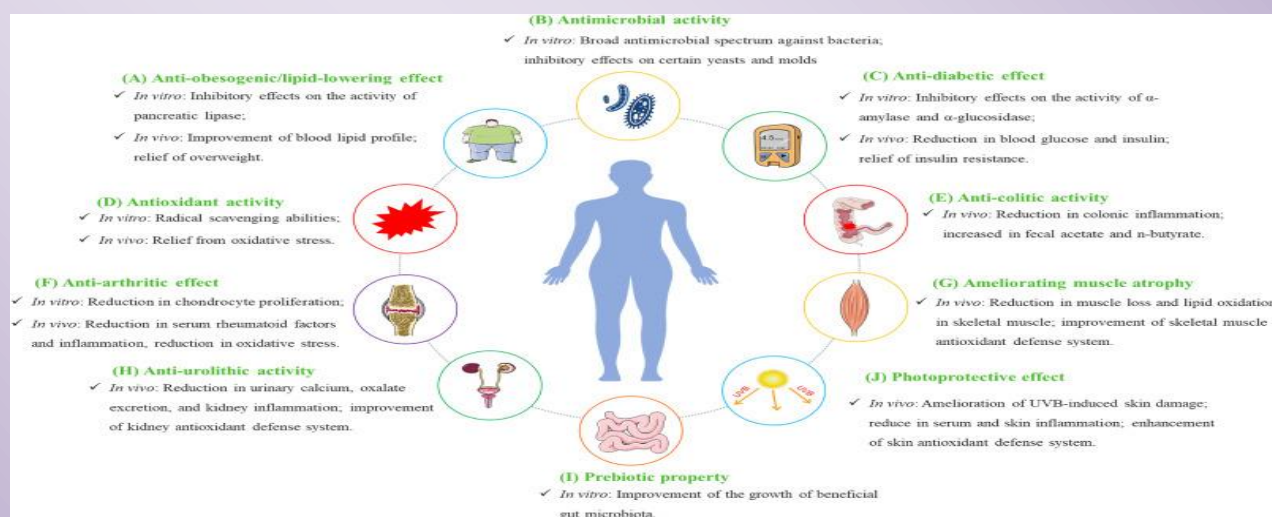


Fig 4.1 Phytochemical properties of Lemon peels.

Lemon peels are rich in nutritional substances, especially vitamin C, pectin and fibers, and phytochemical compounds with desirable properties predominantly comprising phenolic constituents and essential oils, which supported the potential industrial applications. It has been demonstrated that lemon peels hold great nutraceutical effects, including antioxidant, antimicrobial, antidiabetic, anti-obesogenic, lipid-lowering, anti-colitic, anti-arthritis, anti-urolithic, anti-fatigue, ameliorating disuse muscle atrophy, skin protection, and prebiotic properties. Lemon peels show great promise in the applications into food industry, including: 1) food ingredients with nutritional, antioxidant, and antibacterial properties; 2) film matrixes or active constituents for food packaging or edible coatings. Moreover, the application into bioremediation as removers for heavy metals and dyes and into aquaculture as beneficial

5. Potential nutritional and functional improvement of extruded breakfast cereals based on incorporation of fruit and vegetable by-products



Fig 5.1 Nutritional benefits of extruded breakfast cereals.

There is a need to improve the nutritional and functional characteristics of breakfast cereal products (BCP) consumed worldwide, namely by increasing the content and diversity of dietary fibre and enrichment in micronutrients and bioactive compounds. Considering the high amounts of fruit and vegetable by-products (FVB) generated by industrial processing, the associated environmental issues but also their richness in nutrients and phytochemicals, FVB show great potential for incorporation in BCP, thus improving the nutritional and functional aspects of these products.

The use of the FVB flours to create richer BCP in several types of fibre and phenolic compounds appears to be a promising strategy to create nutritionally valuable BCP. By simultaneously valorising FVB, this strategy also contributes positively to the food system sustainability from a circular economy point of view. The use of FVB flours may improve fibre, micronutrient, and bioactive compounds content. High fibre content reduces texture quality of products, but extrusion processing allows to adjust production variables to overcome the potential decrease in sensory quality.

6. A review on pectinase properties, application in juice clarification, and membranes as immobilization support.

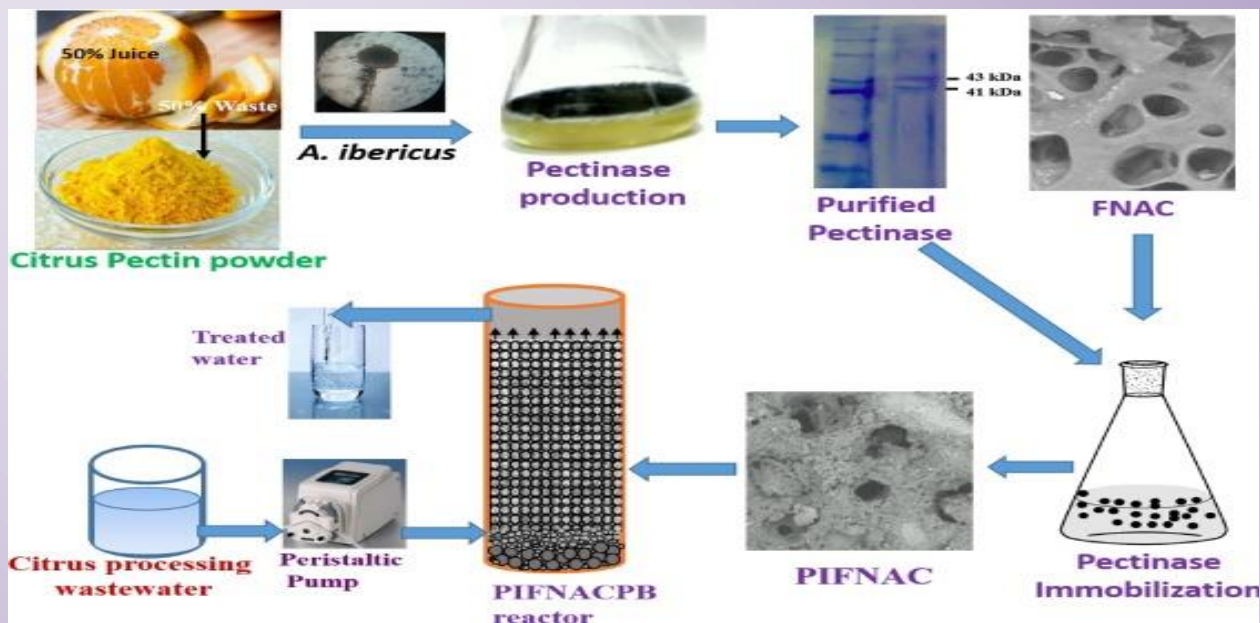


Fig 6.1 Pectinase immobilization from citrus pectin powder.

Pectic substances cause haziness and high viscosity of fruit juices. Pectinase enzymes are biological compounds that degrade pectic compounds. Nontoxicity and ecofriendly nature make pectinases excellent biocatalysts for juice clarification. However, the poor stability and nonreusability of pectinases trim down the effectiveness of the operation. The immobilization techniques have gained the attention of researchers as it augments the properties of the enzymes. Literature has reported the stability improvement of enzymes like lipase, laccase, hydrogen peroxidase, and cellulase upon immobilization on the membrane. However, only a few research articles divulge pectinase immobilization using a membrane. The catalysis-separation synergy of membrane-reactor has put indelible imprints in industrial applications. Immobilization of pectinase on the membrane can enhance its performance in juice processing. This review delineates the importance of physicochemical and kinematic properties of pectinases relating to the juice processing parameters. It also includes the influence of metal-ion cofactors on enzymes' activity. Considering the support and catalytic-separation facets of the membrane, the prediction of the membrane as support for pectinase immobilization has also been carried out.

7. Overview of advanced technologies for volatile organic compounds measurement in food quality and safety.

Food quality and nutrition have received much attention in recent decades, thanks to changes in consumer behavior and gradual increases in food consumption. The demand for high-quality food necessitates stringent quality assurance and process control measures. As a result, appropriate analytical tools are required to assess the quality of food and food products. VOCs analysis techniques may meet these needs because they are nondestructive, convenient to use, require little or no sample preparation, and are environmentally friendly.

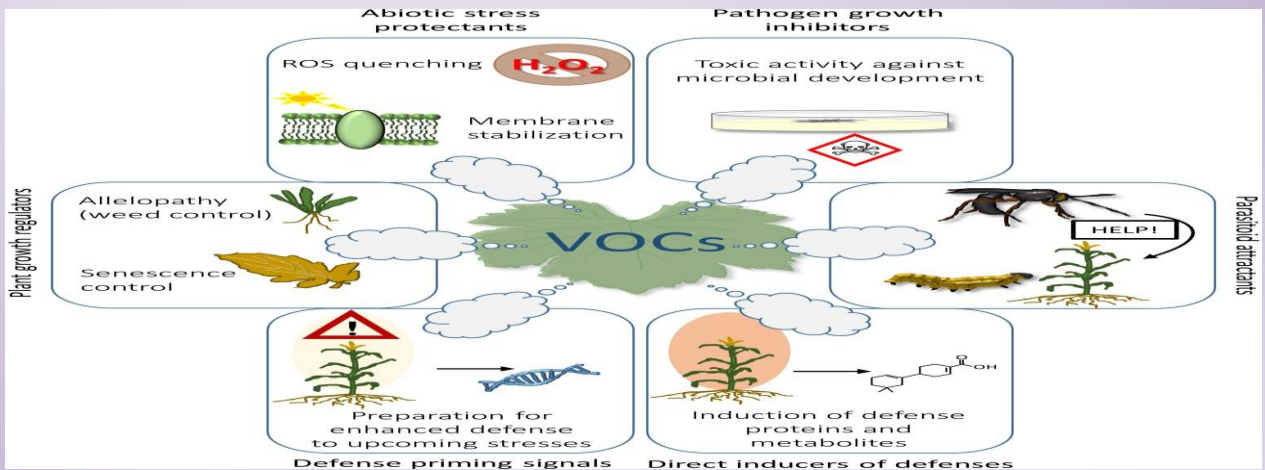


Fig 7.1 VOCs released from various foods during transportation, storage, and processing.

The main VOCs released from various foods during transportation, storage, and processing were reviewed. The principles of the most common VOCs analysis techniques, such as electronic nose, colorimetric sensor array, migration spectrum, infrared and laser spectroscopy, were discussed, as well as the most recent research in the field of food quality and safety evaluation. In particular, we described data processing algorithms and data analysis captured by these techniques in detail. Finally, the challenges and opportunities of these VOCs analysis techniques in food quality analysis were discussed, as well as future development trends and prospects of this field.

8. Electronic tongue and electronic nose for food quality and safety

For the needs of food producers and consumers, electronic tongue and electronic nose play many roles for food quality and safety in food production, food supervision and daily life. The principles and progresses of electronic tongue and electronic nose were elaborated. The core hardware namely electronic tongue sensors and electronic nose sensors, and the core software namely intelligent sensory algorithms were summarized. It was found that the proportion of electronic tongue and electronic nose employed in food quality control and monitoring in production was the highest. Electronic tongue and electronic nose with the prediction accuracy of 80–96 % accounted for a large proportion in the applications of food. The superposition operation of two or more intelligent sensory algorithms has become routine. In addition, the combination of electronic tongue and electronic nose was highlighted. It was resulted that the ability of food category recognition and quality prediction of the combined technology of electronic nose and electronic tongue showed an increase of 8–25 % compared with the single technology. The future challenges and expectations of electronic tongue and electronic nose were discussed.

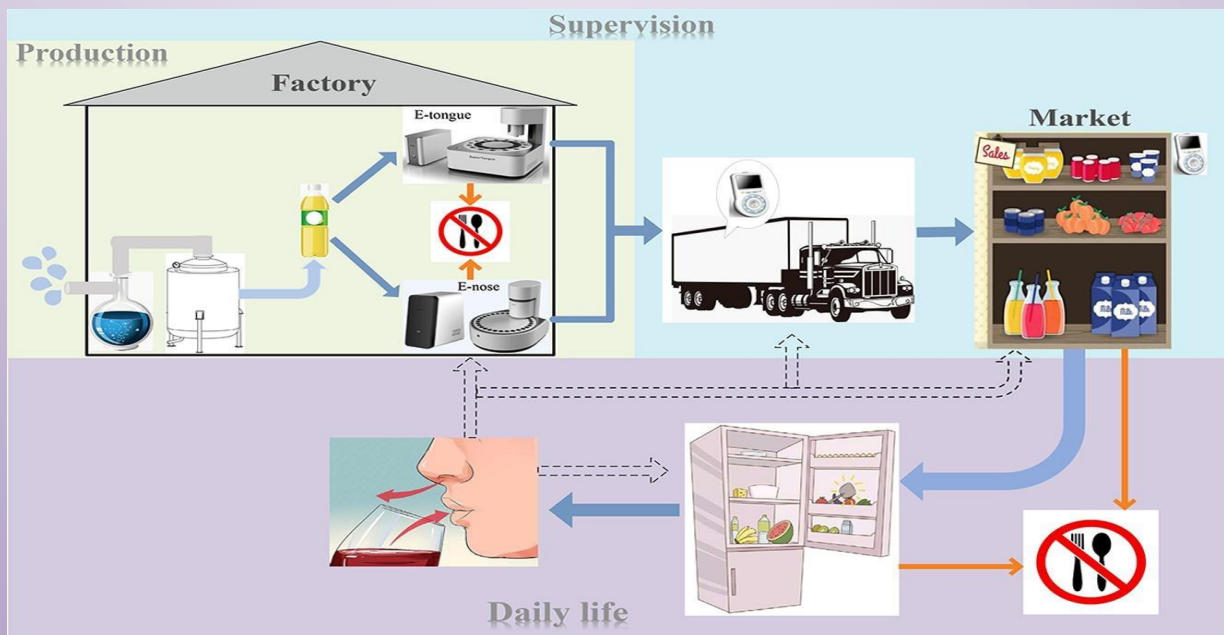


Fig 8.1 . Electronic tongue and electronic nose in food safety and quality.

9. Gelatin-based composite films and their application in food packaging

Gelatin is an important biopolymer that is extracted from collagen and is extensively used in the food industry because of its excellent functional properties. However, native gelatin films are moisture-sensitive and readily dissolve, swell, or split when they come in contact with water, which limits its use in food packaging. Various natural and synthetic materials are incorporated in gelatin films to improve their mechanical and thermal stability, elasticity, flexibility, and oxygen and light barrier properties. This review discusses various methods used for gelatin-based film production and modification approaches for improving their functional properties, including mechanical strength, thermal stability, water and light barrier ability, solubility and swelling, and antimicrobial properties. Moreover, gelatin-based films extend the shelf life of stored products due to their antioxidant and anti-microbial properties. The potential applications, challenges, and limitations of gelatin-based films in food packaging are also discussed. However, further research is required to prolong the modification of gelatin-based films using naturally available edible materials that are not commercially utilized. Further, studies about possible health hazards associated with the continuous use of gelatin-based packaging films should also be conducted in the future.

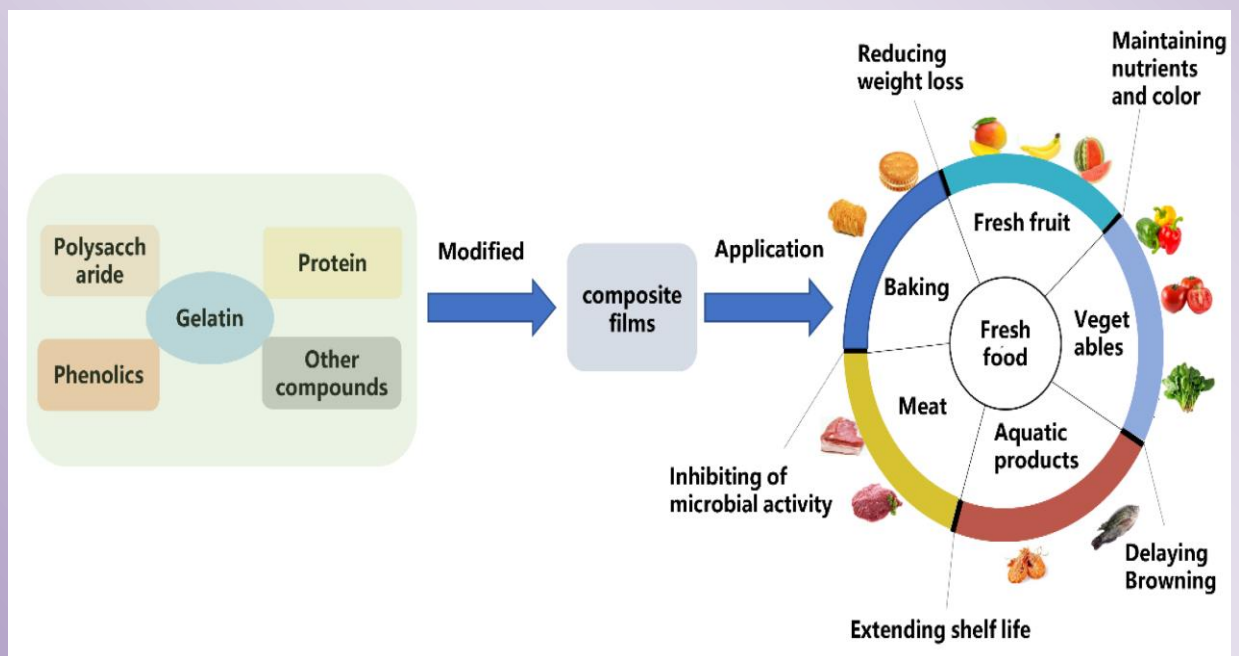


Fig 9.1 Gelatin-based composite films and their application.

10. Curcumin and its uses in active and smart food packaging applications

Active and intelligent food packaging is an innovative technology to prevent food contamination and ensure food quality and safety. Active packaging protects the food from microbial contamination, while smart or intelligent packaging enables monitoring the freshness of the food or quality change in real-time.

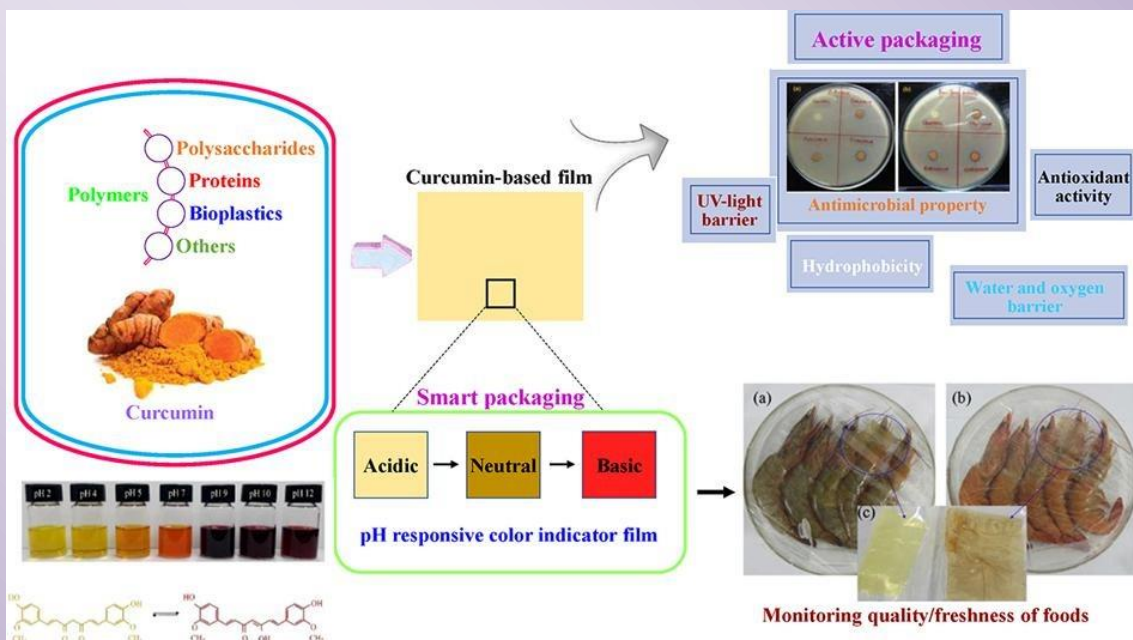


Fig 10.1 Curcumin as active and smart food packaging applications.

Curcumin, one of the most well-known natural colorants, has received a lot of attention for its excellent functional properties and ability to change color with changes in pH. Curcumin, the golden component of turmeric, a spice widely used in food since ancient times, is a cost-effective and abundant biomaterial with various biological properties such as antioxidant, antibacterial, antiviral, antitumor, and anti-inflammatory. Recently, active packaging or intelligent packaging systems have been actively developed using the functional properties of curcumin. In this review, we briefly reviewed curcumin's basic biological functions and discussed comprehensive and recent progress in using curcumin in various polymer-based active and smart food packaging applications.