PART 1 DETERIORATIVE PROCESSES AND FACTORS INFLUENCING SHELF LIFE

Microbiological spoilage of foods and beverages
G-J E Nychas and E Panagou, Agricultural University of Athens, Greece
- Introduction
- Spoilage of foods and beverages; a microbiological approach: microbes vs indigenous enzymes
- Factors affecting the rate of microbiological spoilage of foods and beverages
- Evaluating, monitoring and measuring microbiological spoilage of foods and beverages
- Predicting microbiological spoilage of foods and beverages
- Preventing microbiological spoilage of foods and beverages
- Future trends
- Sources of further information and advice
- References

Chemical deterioration and physical instability of foods and beverages
F Kong, University of California, Davis, USA, R P Singh, University of California, Davis, USA and Massey University, New Zealand
- Introduction
- Chemical deterioration and physical instability of foods and beverages
- Factors affecting the rate of quality loss due to chemical deterioration and physical instability
- Measuring chemical deterioration and physical instability of foods and beverages
- Predicting and monitoring chemical deterioration and physical instability of foods and beverages
- Preventing chemical deterioration and physical instability of foods and beverages
- Future trends
- Sources of further information and advice
- References

Moisture loss, gain and migration in foods
G Roudaut and F Debeaufort, University of Burgundy, France and IUT-Dijon, France
- Introduction: moisture loss, gain and migration in foods and quality deterioration
- Mechanism of the moisture transfers in food products
- Measuring, monitoring and predicting moisture loss, gain and migrations
- Moisture loss, gain and migration related to the shelf life
- Conditions for moisture migration and foods affected by moisture transfer
- References

Insect and mite penetration and contamination of packaged foods
C H Bell, Food and Environment Research Agency, UK
- Introduction
- Insects and mites contaminating stored food products
- Coleoptera
- Lepidoptera
- Pscoptera
- Other insects
- Mites
- Combating critical points in the food chain
The influence of ingredients on product stability and shelf life
N W G Young, Danisco A/S, Multiple Food Applications, Denmark and University of Chester, UK and G R O’Sullivan, Danisco A/S, Multiple Food Applications, Denmark
- Introduction to shelf life
- Methods of shelf life extension
- Movement of moisture in food systems
- Food spoilage due to water activity
- Edible moisture barriers
- Molecular mobility
- Preservation of foods by freezing
- Sweetener ingredients as humectants or cryoprotectants
- Ingredients for shelf life extension
- Future trends
- Sources of further information and advice
- Appendix

Processing and food and beverage shelf life
M Brown, MHB Consulting, UK
- Introduction
- Main quality change factors and their interaction with processing
- Shelf life and stability
- Product and process design
- Processing
- Unit operations
- Production of low and intermediate moisture foods
- Thermal processing
- Filling and packaging
- Novel processes
- Hygiene
- Future trends
- References and sources of further information and advice

Packaging and food and beverage shelf life
G L Robertson, University of Queensland and Food Packaging Environment, Australia
- Introduction
- Role of packaging in extending food and beverage shelf life
- Major packaging materials
- Key package properties related to shelf life
- Predicting shelf life of packaged foods and beverages
- Packaging migrants and food and beverage shelf life
- Future trends
- Sources of further information and advice
- References

Effects of food and beverage storage, distribution, display and consumer handling on shelf life
J Evans, London South Bank University, UK
- Introduction
- Overview of the cold chain
- Storage life
- Sectors of the cold chain and their influence on food quality and safety
- Future trends
Smart packaging for monitoring and managing food and beverage shelf life
P S Taoukis, National Technical University of Athens, Greece
- Introduction: smart packaging- time temperature integrators (TTI)
- Principles of (TTI) application for shelf life monitoring
- Requirements and selection of (TTI) for food and beverage products
- Use of (TTI) for shelf life management and optimization in the cold chain- case study
- Future trends
- Acknowledgements
- References

PART 2 METHODS FOR SHELF LIFE AND STABILITY EVALUATION

Food storage trials: an introduction
C M D Man, London South Bank University, UK
- Introduction
- Food deterioration and spoilage
- Storage trials
- Future trends
- References

Sensory evaluation methods for food shelf life assessment
D Kilcast, Consultant in Food and Beverage Sensory Quality, UK
- Introduction
- Principles of sensory evaluation
- Basic requirements for sensory analysis
- Discrimination tests
- Quantitative descriptive tests
- Consumer acceptability testing
- Operation of sensory shelf life tests
- Design of sensory shelf life tests
- Interpretation of sensory shelf life data
- Instrumental methods
- Standardisation in sensory shelf life testing
- Future trends
- Sources of further information and advice
- References
- Appendix

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F Kong, University of California, Davis, USA and R P Singh, University of California, Davis, USA and Massey University, New Zealand
- Introduction
- Assessing food appearance
- Measurement of relative humidity (RH), moisture, and water activity (aw)
- Texture evaluation
- Evaluation of rheological properties of liquid and semisolid foods
- Assessing lipid oxidation
- Electronic nose
- Electronic tongue
- Infrared (IR) spectroscopy
- Microbiological test
- Future trends
- Sources of further information and advice
- References

**Modelling microbiological shelf-life of foods and beverages**
*Amézquita, D Kan-King-Yu and Y Le Marc, Unilever R&D Colworth, UK*
- Introduction
- Classification of predictive models by microbial response
- Development of predictive models for microbiological safety and stability
- Modelling approaches, applications and opportunities for shelf life prediction
- Usage considerations and access to predictive microbiology electronic resources
- Future trends
- Acknowledgements
- References

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*J de Sousa-Gallagher, P V Mahajan and Z Yan, University College Cork, Ireland*
- Introduction
- Factors influencing the shelf life
- Development of mathematical models
- Predictive mathematical models
- Future trends
- References

**Accelerated shelf life testing of foods**
*Mizrahi, Technion-Israel Institute of Technology, Israel*
- Introduction
- Basic principles
- Initial rate approach
- Kinetic model approach
- Single accelerating factor
- Glass transition models
- Multiple accelerating factors
- Dynamic methods
- The ‘no model’ approach
- Combination of approaches
- Problems in accelerated shelf life tests
- Future trends
- References

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*Komitopoulou, Leatherhead Food Research, UK*
- Introduction: role of challenge testing in shelf life evaluation
- Basic principles
- Challenge testing-limitations
- Challenge testing and the use of mathematical models
- Future trends
- Sources of further information and advice
- References

**PART 3 THE STABILITY AND SHELF LIFE OF PARTICULAR PRODUCTS**

**Beer shelf life and stability**
*G Stewart and F G Priest, Heriot-Watt University, UK*
- Introduction
- Biological instability
- Physical instability
Shelf life of wine
R S Jackson, Brock University, Canada
- Introduction
- Factors affecting wine stability and shelf life
- Changes during the shelf life of wine
- Evaluating wine shelf life
- Preventing wine quality deterioration at or post-bottling
- Sensory significance of shelf life changes
- Future trends
- Sources of further information and advice
- References

The stability and shelf life of fruit juices and soft drinks
P Ashurst, Ashurst and Associates, UK
- Introduction
- Factors influencing the stability of fruit juices and soft drinks
- Ensuring product stability and extending shelf life
- Shelf life determination
- Future trends
- Sources of further information and advice

Practical uses of sensory evaluation for the assessment of soft drink shelf life
L L Rogers, Consultant, UK
- Introduction
- Using a risk based approach to shelf life for soft drinks
- Estimating shelf life
- Determining shelf life
- Monitoring shelf life
- Considerations before developing the shelf life plan
- Developing the sensory plan
- Case studies
- Future trends
- References and sources of further information and advice

The stability and shelf life of coffee products
L Manzocco, S. Calligaris and M C Nicoli, University of Udine, Italy
- Introduction
- Main critical events affecting the stability and shelf life of coffee products
- Ensuring stability and extending the shelf life of coffee
- Evaluating the shelf life of coffee
- Future trends
- Sources of further information and advice
- References

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M J de Sousa Gallagher and P Mahajan, University College Cork, Ireland
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- Extending the shelf life of fruit and vegetables
- Controlled and modified atmosphere packaging for longer shelf life
- Future trends
- References

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*S P Cauvain and L Young, BakeTran, UK*

- Introduction
- A brief overview of the manufacture of bakery products
- The key ‘fresh’ characteristics of bakery products
- Factors affecting the stability of bread and other bakery products
- Evaluating the shelf life of bread and other bakery products
- Ensuring stability and extending the shelf life of bread and other bakery products
- Future trends
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*G Talbot, The Fat Consultant, UK*

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- Mechanisms of oxidation and hydrolysis in fats and oils
- Factors affecting the stability and shelf life of fats and oils
- Evaluating the shelf life of fats and oils
- Ensuring stability and extending the shelf life of fats and oils
- Future trends
- Sources of further information and advice
- References

**The stability and shelf life of confectionery products**  
*P Subramaniam, Leatherhead Food Research, UK*

- Introduction
- Factors affecting shelf life
- Chocolate and chocolate products
- Sugar glass
- Toffee
- Gums and jellies
- Aerated confectionery
- Sources of further information and advice
- References

**The stability and shelf life of vitamin-fortified foods**  
*R Burch, Leatherhead Food Research, UK*

- Introduction
- Factors affecting the stability and shelf life of vitamin-fortified foods
- Ensuring stability and extending the shelf life of vitamin-fortified foods
- Evaluating the shelf life of vitamin-fortified foods
- Future trends
- Sources of further information and advice
- References

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*D D Muir, Consultant, UK*

- Introduction
- Chemical composition and principal reactions of milk
- Bacteria in milk and related enzyme activity
- Raw milk enzymes
- Control of the quality of short shelf life products
- Factors influencing the life of long shelf life products
- Control of the stability of long-life milk products
- Conclusions
- Dedication
- Bibliography

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F Toldrà, Institute of Agro-chemical Technology and food (CSIC), Spain and M Reig, Polytechnical University of Valencia, Spain
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- Microorganisms involved in seafood spoilage
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- Future trends
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- Future trends
- Sources of further information and advice
- References