Modern Technology on Food Preservation (2nd Edition)
<table>
<thead>
<tr>
<th>Code</th>
<th>ENI88</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format</td>
<td>Paperback</td>
</tr>
<tr>
<td>Indian Price</td>
<td>1275</td>
</tr>
<tr>
<td>US Price</td>
<td>125</td>
</tr>
<tr>
<td>Pages</td>
<td>528</td>
</tr>
<tr>
<td>ISBN</td>
<td>9788178330716</td>
</tr>
<tr>
<td>Publisher</td>
<td>Asia Pacific Business Press Inc.</td>
</tr>
</tbody>
</table>
Food Preservation has become an integral part of the food processing industry. There are various methods of food preservation; drying, canning, freezing, food processing etc. Food processing is one the method of food preservation which is the set of methods and techniques used to transform raw ingredients into food or to transform food into other forms for consumption by humans or animals either in the home or by the food processing industry. Canning is one of the various methods of food preservation in which the food is processed and then sealed in an airtight container. This process prevents microorganisms from entering and proliferating inside. Dehydration is the process of removing water or moisture from a food product. Food dehydration is safe because water is removed from the food. Freezing is also one of the most commonly used processes commercially and domestically for preserving a very wide range of food including prepared food stuffs which would not have required freezing in their unprepared state. Benefits of food processing include toxin removal, preservation, easing marketing and distribution tasks, and increasing food consistency. In addition, it increases seasonal availability of many foods, enables transportation of delicate perishable foods across long distances and makes many kinds of foods safe to eat by deactivating spoilage and pathogenic micro organisms. Nanotechnology exhibits great potential for the food industry. New methods for processing nanostructures are being developed having novel properties that were not previously possible. As such, due to the recent upgradation of preservation techniques, the preservation industry is also growing almost at the same rate as the food industry which is about 10 to 12% per year.

The purpose of this book is to present the elements of the technology of food preservation. It deals with the products prepared from various fruits and vegetables commercially. Relevant information on enzymes, colours, additives, flavours, adulteration, etc., has been given. This book also contains photographs of equipments and machineries used in food preservation.

This book will be very useful for new entrepreneurs, food technologists, industrialists, libraries etc.

Content:
1. Introduction of Food Technology
Source of Man's Food
Impact of Science and Technology

2. Acceptable Food to Eat
Nature's Seal of Quality
Food Flavors
Food Colors
Our Senses Can Fail Us
Excessive Heating Impairs Foods,
Moderate Heating May Improve Foods
Food Spoilage
Must Deter Natural Processes
Safe Food for Man
Food Poisoning
Food Intoxications
Food Infections
Sanitation and Health

3. The Refrigerated Storage of Perishable
Commodities
Temperature of Objects
Temperature Measurements
Metabolism a Function of Temperature
Energy Deficit of Ice
Creating Energy Deficits Mechanically
Keeping Fresh Foods Edible
Animals Foods
Plant Food
Temperature of Cold Storage Rooms
Humidity of Storage Chamber
Heat Evolved by Living Tissues
Specific Heat of Foods
Calculation of Refrigeration Load
Cold Injury of Fruits and Vegetables
Ammonia Injury to Refrigerated Fruits and Vegetables
Waxing Foods to Prevent Shrinkage
Effect of Cold Storage on Quality
Preserving Foods in a Micro-Environment
Packaging Materials Tests Which May Be Performed
Formed Container Tests
Disorders of Stored Foods

4. Principles of Food freezing
Development of a Frozen Food Industry
5. Principles of Food Preservation by drying

Drying a Natural Process
Dehydration-Artificial Drying
Dehydration vs. Sun Drying
Why Dried Foods
Dehydration Permits Food Preservation
Humidity-Water Vapor Content of Air
Air-The Drying Medium
Adiabatic Driers
Heat Transfer Through a Solid Surface
Criteria of Success in Dehydrated Foods
Freeze-Dehydration (Freeze Drying)
Triple Point of Water
Temperature Changes in Meat Freeze-Dehydration
Influence of Dehydration on Nutritive Value of Food
Influence of Drying on Micro-organisms
Influence of Drying on Enzyme Activity
Influence of Drying on Pigments in Foods
Dehydration of Fruits
Dehydration of Vegetables
Dehydration of Meat
Dehydration of Fish
Dehydration of Milk
Dehydration of Eggs
Packing of Dehydrated Foods
Influence of Drying on Food Acceptance

6. Principles of Food Preservation by Canning
The Art of "Appertizing"
Temperature vs. Pressure of Boiling Water
Spoilage of Food Caused by Micro-organisms
Evolution of Containers for Canning
Important Food Groups
Micro-organisms Associated with the Food Groups
Sources of Spoilage Organisms
Heat Resistance of Micro-organisms
Important in Canning
Factors Influencing the Heat Resistance of Spores
Influence of Food Ingredients on Heat Resistance of Spores
Heat Resistance of Enzymes in Food
Heat Penetration into Food Containers and Contents
General Method for Calculating the Process Time for Canned Foods
Inoculated Pack Studies
Adequacy of Heat Processes
Spoilage of Canned Foods
Microbial Spoilage
Failure of Glass Containers
Surface Markings on Broken Glass
Vacuum-pressure Relations in Canning Process
Storage of Canned Foods
External Corrosion of Cans
Coding the Pack
Influence of Canning on the Quality of Food
Colour
Flavor and Texture
Protein
Fat and Oil
Carbohydrates
Vitamins
Misconceptions Relating to Canned Foods
Improvements in Canning Technology

7. Principles of Food Preservation by Fermentation and Pickling
Life with Micro-organisms
Fermentation of Carbohydrates
Industrially Important Organisms in Food Preservation
Order of Fermentation
Types of Fermentations of Sugar
Fermentation Controls
Sources of Salt
Wine and Beer
Salted-Fermented Foods
Deterioration of Fermented and Pickled Products
Nutritional Value of Pickled Products
Future Trends

8. Preservation of Food as Sugar Concentrates
Concentrated but moist
High solids high acid foods
Jelly
Jam
Fruit Butter
Marmalade
Pectin and gel formation
Invert Sugar
Jelly Making
Other Fruit Preserves
Candied and Glacéed Fruits
Maraschino Cherries
Sweetened Condensed Milk
Future Trends

9. Preservation of Foods with Chemical additives
Introduction
Definition of Chemical Additive
Importance of Chemical Additives
Legitimate Uses in Food Processing
Undesirable Uses of Additives
Safety of a Food Additive
Functional Chemical Additive Applications
Historical Significance
Specific Uses of Chemical Additives
Additives Permitted and Prohibited in the United States
Chemical and Use
Food Regulation and Compliance
Miller Pesticide Amendment of 1954
1958 Food Additives Amendment
1960 Color Additives Amendment
Chemical Preservatives
Preservatives (Antimycotics)
Specified Uses and Amounts
Preservatives (general)
Specified Use
Microbial Antagonists
10. Preservation of Food with Ionizing Radiations

A Place for Radiation Stabilized Foods

Discovery of Radioactivity

Alpha, Beta and Gamma Radiations

Dosimetry

Dose Distribution

Induced Radio-Activity in Treated Food

Mode of Action of Ionizing Radiations

Radiation Effects on Micro-organisms

Radiation Effects on Proteins

Radiation Effects on Enzyme Systems

Effects of Radiation on Amino Acids

Effects of Radiation on Vitamins

Radiation Effects on Carbohydrates

Radiation Effects on Lipids

Radiation Effect on Pigments

Radiation Effect on Parasites and Insects

Packaging of Radiation Stabilized Foods

General Methods for establishing Radiation Stabilization Process for Foods

The Food Product-Micro-organism Destruction

Dose Requirements for the Radiation Sterilization of Foods

Technological aspects of the Radiation Pasteurization of Foods

Radiation Resistant Organisms

Factors Influencing the Survival of Micro-organisms from a Radiation Process

The Influence of the Type of Radiation on the Inactivation of Micro-organisms

The Influence of Dose Rate on the Inactivation of Micro-organisms

The Influence of Environmental Conditions on the Survival of Micro-organisms from a Radiation Process

Combination Processes

Conditions after Irradiation Affecting Survival and Recovery of Micro-Organisms
The Food Product-Enzyme Destruction
Process for Radiation Sprout Inhibited White Potatoes
Process for Insect De-infestation of White Flour by Irradiation
The Process for Food Stabilization
Process-Heat Inactivation of Enzymes plus Radiation Destruction of Micro-organisms
Process and Product Specifications
Process for Radiation-Pasteurized Plant Tissues (Fruits)
Process for Radiation-Pasteurized Animal Flesh (Sliced Bacon)
Process for Radiation-Sterilized Meat (Chicken), Fish and Vegetables
Non-Heat Method for Controlling Enzymes in Meat
Design of Radiation Processing Food Plants
Wholesomeness of Radiation Stabilized Foods
Some Public Health aspects of the Microbiology of Irradiated Foods
Acceptability of Radiation Stabilized Foods
Quality Control with Radiation Stabilized Foods
Ionizing Radiations as a Unit Operation in the Food Industry

11. Preservation of Semi-moist Foods
Introduction
Canned white bread
Storage stability
Sponge and Dough
Filling and Proofing
Processing
Finished Product
Fungistatic and fungicidal agents
Sorbic acid
Polyethylene
Semi-moist Pet Foods
Process for Semi-moist Pet Foods
Marbled, Textured Product
Water Activity
Production of Semi-moist Products Growing
Semi-moist Human Foods
Coarse Ground Beef and Beef Cubes
Other Products being developed

12. Principles and Preservation of Bakery Products
Introduction
13. Storage Stability of Preserved Foods

Introduction

Relationships of Product Qualities and Storage conditions

Objective Tests of Quality of Stored Foods

Objective Odor Measurements

Mechanical Texturemeter

Long-term Storage of Preserved Foods

Temperature of Storage

Nutrients

Containers for Long-Term Storage

Storage Costs

Storage Stability of Selected Frozen Foods

Result

The Future

14. Food Preservation Using Ozone

Introduction

Physicochemical Properties of Ozone

Use of Ozone in Storage and Packing Facilities

Extension of Storage Life with Ozone

Ozonation to Sanitize packing Line Process Water

The Commercial Production of Ozone

Importance of Ozone in Fishing Industry

Future Perspectives

15. Food Preservation by Smoking Process

Introduction

Types of Smoking

The Difference between Curing and Smoking

Meat Curing and Smoking

Types of Smokers

16. Thermal Food Preservation

Introduction

Effect of Preservation Temperatures

Effect of Processing on Nutrients in Foods

Thermal Preservation Methods

17. Machinery & Equipments (Photographs)

Directory Section

Sample Chapter:
PRINCIPLES OF FOOD FREEZING

Development of a Frozen Food Industry

Freezing temperatures, once feared by mankind, have been turned to his great advantage by his inquiry into the phenomena. While ice-salt systems were used to freeze foods in the mid 1800's, and patents for freezing fish, for example, were granted in 1861 to Enoch Piper in Maine, and even earlier to H. Benjamin in England in 1842 the invention of mechanical refrigeration in the late 1800's provided the base for subsequent commercial exploitation of the process. Frozen foods have become important items of commerce (90 per cent of Iceland's export trade is frozen fish) and important in food preparation for dinner tables (Figs. 4.1 8s 4.2).

Clarence Birdseye fathered this revolution as a technologist by developing quick freezing processes and equipment, and successfully promoting consumer units of frozen foods. He overcame tremendous obstacles. In the 1920's there "were few mechanical refrigerators in homes in the United States. In the 1930's, as facilities for food freezing and retail distribution developed across the United States, frozen foods began to find their place in commerce. Yet, it was not until 1940 that they became important competitors of other consumer-type preserved foods. While Clarence Birdseye was a prime mover industrially, the frozen food industry had support in the scientific aspects of the development by men such as Dr. Donald K. Tressler, at Cornell, and Dr. C.R. Fellers at the then Massachusetts State College.

![Fig. 4.1: TREND IN THE CHANGING PATTERN OF SERVING JUICES IN THE UNITED STATES](image-url)
The present day finds competition between all methods of food preservation, and the competition is being resolved by consumers (Fig. 4.2). Those foods best preserved by freezing are largely frozen. Those foods highly acceptable as canned products continue as highly successful consumer goods. The economic struggle for survival between fresh commodities, canned foods, and frozen foods in a free market evidences itself in better foods at lower prices for consumers.

The Freezing Point of Foods
Living cells contain much water, often two-thirds or more of their weight. In this medium there are organic and inorganic substances, including salts and sugars and acids in aqueous solutions, and more complex organic molecules such as proteins which are colloidal suspension. To some extent gases are also dissolved in the watery solution.

The physical, chemical, and biological changes occurring during the freezing and subsequent thawing of foods are complex and not completely understood. Nevertheless it is useful to study the nature of these changes which have been recognized in order to design a successful freezing process for a food.

The freezing point of a liquid is that temperature at which the liquid is in equilibrium with the solid. A solution with a vapour pressure lower than that of a pure solvent will not be in equilibrium with the solid solvent is at normal freezing point. The system must be cooled to that temperature at which the solution and the solid solvent have the same vapour pressure. The freezing point of a solution is lower than that of a pure solvent. The freezing point of food is lower than that of pure water.

When a liquid evaporates the escaping molecules exert a pressure known as the vapour pressure. The total pressure of a system will be equal to the sum of the partial pressures of the system. The addition of a non-volatile solute (sugar) to water lowers the vapour pressure of the water solution of sugar, and the freezing point of the water solution will be lower than that of pure water (Table 4.1).

Because of the high content of water in most foods, most of them freeze solidly at temperatures between 32°F and 25°F (Fig. 4.3). The temperature of the food undergoing freezing remains relatively constant until the food is mostly frozen, after which time the temperature approaches that of the freezing medium.
Quick freezing has been defined, by those who adhere to rapid crystallization theory, as that process where the temperature of the food passes through the zone of maximum ice crystal formation (32° to 25°F.) in 30 minutes or less. The basic principle of all rapid freezing methods is the speedy removal of heat from food. These methods include freezing in cold air blasts, by direct immersion of the food in a cooling medium, by contact with refrigerated* plates in a freezing chamber, and by freezing with liquid air, nitrogen, or carbon dioxide. Freezing in still air is the poorest method of all. By circulating cold air, the freezing rate is greatly accelerated, as will be explained.
NIIR Project Consultancy Services (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. Its various services are:
Pre-feasibility study, New Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Preparation of Project Profiles and Pre-Investment and Pre-Feasibility Studies, Market Surveys and Studies, Preparation of Techno-Economic Feasibility Reports, Identification and Selection of Plant and Machinery, Manufacturing Process and or Equipment required, General Guidance, Technical and Commercial Counseling for setting up new industrial projects and industry. NPCS also publishes various technology books, directory, databases, detailed project reports, market survey reports on various industries and profit making business. Besides being used by manufacturers, industrialists and entrepreneurs, our publications are also used by Indian and overseas professionals including project engineers, information services bureau, consultants and consultancy firms as one of the input in their research.

NIIR PROJECT CONSULTANCY SERVICES
106-E, Kamla Nagar, New Delhi-110007, India.
Tel: 91-11-23843955, 23845654, 23845886, +918800733955
Mobile: +91-9811043595
Email: npcs.ei@gmail.com ,info@entrepreneurindia.co
Website: www.entrepreneurIndia.co