

Handbook on Drying, Milling and Production of Cereal Foods (Wheat, Rice, Corn, Oat, Barley and Sorghum Processing Technology)2nd Revised Edition

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Cereals, or grains, are members of the grass family cultivated primarily for their starchy seeds (technically, dry fruits). Cereal grains are grown in greater quantities and provide more food energy worldwide than any other type of crop; they are therefore staple crops. Oats, barley, and some food products made from cereal grains. They are used for both human and animal food and as an industrial raw material. India produces cereals like wheat, rice, barley (jau), buckwheat, oats, corn (maize), rye, jowar (sorghum), pearl millet (bajra), millet (ragi), Sorghum, Triticale, etc.

India is the world's second largest producer of Rice, Wheat and other cereals. The huge demand for cereals in the global market is creating an excellent environment for the export of Indian cereal products. India is not only the largest producer of cereal as well as largest exporter of cereal products in the world. India have been offering incredible opportunities as they have an abundant amount of raw materials and a wide availability of cheap labor.

The book provides comprehensive coverage of the Drying, Milling and information regarding production method of Cereal Foods .It also covers Plant Layout, Process Flow Sheets and photographs of plant & Machinery with supplier's contact details.

Some of the fundamentals of the book are origin of wheat classification of wheat, endeavors to find industrial uses for wheat, criteria of wheat quality, botanical criteria of quality, milling principles, extraction rate and its effect on flour composition, grain structure as affecting grinding, definition of flour extraction stone milling: yields of products, roller milling: flour extraction rates, rice production and utilization, origin of rice, comparison of rice with other cereal grains, composition of rice and cereal, breeding rice varieties with specific, industrial uses for rice and rice by products, caryopsis and composition of rice, gross structure of the rice caryopsis and its milling fractions etc.

This book is essential for those who are interested in cereal areas can find the complete information from manufacture to final uses of Cereal Foods. The present time is an era of information, one should know about what is happening in the world to be able to compete effectively. It will be very informative and useful to consultants, new entrepreneurs, startups, technocrats, research scholars, libraries and existing units.

1. Wheat

Origin of Wheat

Classification of Wheat
Moisture Consideration
Comparison of Nutrient Values
The Concept of Wheat Quality
Feed Uses For Wheat
Endeavors to Find Industrial Uses for Wheat
Criteria of Wheat Quality
Botanical Criteria of Quality
Species
Varieties
Physical Criteria of Quality
Weight Per Unit Volume
Kernel Weight
Kernel Size and Shape
Kernel Hardness
Vitreousness
Color
Damaged Kernels
Impurities
Milling Quality
Chemical Criteria Of Quality
Moisture Content
Alpha-amylase Activity
Fat Acidity
Crude Fiber and Ash
Wheat-Grading Systems
Composition of Wheat
Proteins
Carbohydrates
Lipids
Minerals
Vitamins
Fiber
Pigments
Enzymes
Milling Principles
Extraction Rate and its Effect on Flour Composition
Grain Structure as Affecting Grinding
Definition of Flour Extraction
Stone-milling: Yields of Products
Roller-milling: Flour Extraction Rates
Extraction Rate and Flour Color
Some Factors Determining Commercial Extraction Rates
Changes in Ash, Thiamine, and Color with Increasing Extraction Rate
General Composition of Flours of different Extraction Rates
Effect of Increasing Extraction on Baking Quality
Roller-Milling Process
Breaking Process
Reduction Process
Grouping of Flour Streams According to
Composition: Effect of Change in Extraction Rate
Some Recent Developments
Characteristics of Individual Flour Streams in Milling of White Flour

Proportions and Ash Contents.
Reduction Flours
Minerals
Phosphorus
Other Minerals
Flour Streams
Gluten
Protein Peptization, Proteolysis, Viscosity
Fat
Sugars and Maltose Figure
Sugars
Maltose Figure
B-Vitamins
Thiamine
Riboflavin
Niacin
Pentosans
Loaf Crumb Color
Baking Quality
Water-Absorption
Bread
Cookies (Biscuits)
Dry-cleaning of Wheat
Wheat Conditioning, Moisture Movement,
 Temperature Effects
Washing
Pick-up of Water by Wheat in Washing
Penetration Into Endosperm
Conditioning In Practice
Cold-Conditioning
Warm-Conditioning
Hot Conditioning
Steam-Treatment
Rolling Temperatures
Protein Displacement
Air Classification
Special Grinding of Flour
Usefulness of Products
Damage to Starch Granules in Milling
Factors In Individual Reductions
Coarse Particle (A) Reduction
Fine Particle Reduction
Effects With Successive Reductions
Effect of Wheat Type
The Breaking System
Quantitative Assessments
Germ in Milling
Path of the Germ in Milling
Contribution to Oil of Flour
Endosperm Structure as Affected by Milling
Endosperm Cells
Cell Walls
Experimental Milling

Criteria of Flour Quality
Definition of Flour Quality
Flour Quality and Strength
Components of Quality
Protein Content
Flour Viscosity
Enzyme Content
Amylase
Protease
Lipase
Absorption
Ash and Flour Color
Granulation Or Particle Size
Response to Additives
Color-Removing Agents
Maturing Agents
Enzyme Supplementation
Starch Damage
Methodology
Microbiology
Summary
Wheat Pigments and Flour Colour
Chemical Nature of Wheat Pigments
Xanthophyll
Carotene
Flavones
Pigments in Wheat and Flour
Pigments in the Developing Grain
Determination of the Total of Yellow Pigments
 In Flour Expressed as Carotenoids
Flour Color
Sources of Flour Colour
Methods of Measuring Flour Color
Technology of Flour Color
2. Rice
Production and Utilization
Origin of Rice
Comparison of Rice with Other Cereal Grains
Composition of Rice and Cereals
Breeding Rice Varieties With Specific
 Industrial Uses for Rice and Rice by-Products
Caryopsis and Composition of Rice
Gross Structure of the Rice Caryopsis and its Milling Fractions
Gross Structure
Pericarp and Tegmen
Aleurone Layer
Embryo
Starchy Endosperm
Milling Fractions
Changes In Structure During Grain Development
Structure and Composition
Structure of the Rice Kernel
Important Components

Proteins
Starch
Lipids
 Vitamins
Minerals
Other Constituents
Criteria of Rice Quality
Objective Versus Subjective Measurements of Criteria
Varieties
Grain Size, Shape, Weight, and Uniformity
Color and Translucence
Test Weight
Moisture Content
Impurities and Damaged Rice
Dockage
Damaged Kernels
Chalky Grains
Red Rice
Seeds or Kernels
Odours
Milling Quality
Milling Yield
Degree of Milling
Physicochemical Tests
Rice Drying
Harvesting Methods
Optimum Harvest Time
Preharvest Chemical Drying
Rice-Drying Terminology and Fundamentals
Kinds of Rice
Milling Yields
Weights
Moisture Content
Equilibrium Moisture Content
Drying-Rate Computation
Drying Methods
Forced-Air Drying
Deep-bed Driers
Supplemental Heat
Materials-Handling for Bin Driers
Continuous-flow, Heated-Air Driers
Tempering
Combination System of Drying
Batch Driers
Other Drying Methods
Commercial Rice Drying
Types of Enterprise
Receiving and Storing Undried Rice
Method for Increasing Drier-Facility Capacity
Sun and Shade Drying
Threshing and Winnowing
Mechanical Drying
Seed Rice

Rice Milling Technology
Removal of Foreign Matter from Rough Rice
Removal of Hulls
Removal of Bran
Sizing of Milled Rice
Solvent Extractive Rice Milling
The X-m Concept
The Development of X-M
Process Description
X-M Products
X-M Milled Rice
X-M Bran
X-M Rice Oil
Rice Milling Yields
Technology Expansion Prospects
Rice Storage
Deterioration of Stored Rice by Fungi
Fungi Associated with Rice Deterioration
Effect on Economic Value
Effect on Nutritive Value
Mycotoxins
Factors Influencing Deterioration
Storage Technology
Rice Storage Structures
Turning
Aeration
Aeration-System Design
Measuring Airflow
Operation for Dry Rice
Operation for Undried Rice
Pest Control
Stored-grain Insects
Other Pests
3. Barley
Genetics and Breeding
Inheritance and Heritability
Biotechnology
Breeding
Population Breeding Methods
Hybrid Barley
Plant
Spike
Kernel
Soil and Climatic Requirements
Rotations
Planting
Fertilizing and Water Use
Harvesting
Pest Control
Diseases
Weeds
Insects
Chemical Composition

- Carbohydrates
 - Starch
 - Soluble Sugars
 - Nonstarch Polysaccharides
- Protein
- Fats
- Minerals
- Vitamins
- Phenolic Compounds
- Processing and Utilization
 - Feed and Food Barley
 - Animal
 - Human
 - Malting Barley
- Uses
- Marketing
- Classification and Prices Received
- Storage

4. Corn

- Anatomical Structure, Composition, and Properties
- Corn Types and Their Compositions
- Corn Quality and Grading Standards
- Corn Utilization
 - Corn as Livestock Feed
 - Direct Utilization of Corn as Food
 - Alkali-Cooked Corn-based Foods
 - Sweet Corn
 - Popcorn, the Original Snack Food
- Separation of Corn Into its Component Fractions
- Dry Corn Milling
 - The Tempering-Degerming Milling Process
 - Products from the Tempering-Degerming Process
- Wet Corn Milling
 - The Wet-Milling Process
 - Wet Corn Mill Products
 - Conversion of Raw Fractions into Value-Added Ingredients and Chemicals
- Modified Starches
- Corn Sweeteners
- Furfural Production from Corncobs

5. The Millets

- Introduction
- Structure and Physical Properties
- Composition
 - Polyphenols and Antlnutritional Factors
- Postharvest Technology
 - Milling
 - Wet Milling
 - Food Uses
 - Nutritional Value
 - Feed Use
 - Nutritional Value
 - Human Studies
 - Effect of Decortication on Nutritional Value

6. Oats

History

Origin of Cultivated Oats

Genetics and Breeding

Cytogenetic Relationship of Species within Avena

Genetic Markers

Utilization of Germplasm Resources

Breeding

Breeding Objectives

Breeding Procedures

The Oat Plant

The Mature Grain

Chemical Composition

Protein

Protein Content and Distribution

Solubility Classification

Amino Acid Composition and Distribution

Lipids

Lipid Content and Distribution

Lipid Composition

Polysaccharides

Starch

B-glucan

Minerals

Vitamins

Processing and Utilization

Utilization

Processing

Cleaning

Drying and Cooling

Hulling

Cutting and Flaking

Oat Flour

7. Rye

Rye Breeding

Morphology and Kernel Characteristics

Growing Conditions

Rye Storage and Rye Grain Reserves and Disappearance

Rye Milling

Rye Flours

Nutrient Composition of Rye

Antinutritional Factors in Rye

Food Uses of Ryes

Industrial Uses of Rye

Rye As Animal Feed

8. Sorghum

Introduction

Origin

Structure and Physical Properties

Appearance of Sorghum Grain and its Genetics

Composition

Tannins and Polyphenols: Effects on Sorghum

Quality and Nutritional Value

- Industrial Utilization
 - Wet Milling
 - Sorghum Starches
 - Dry Milling
 - Alcohol Production
 - Use of Sorghum for Beer and Malt
 - Lager Beer
 - Sorghum Malt
 - Clear Sorghum Beer
 - Sour, Opaque Beer
 - Processing For use in Feeds
 - Processing for Food
 - Traditional Food Systems
 - Sorghum in Baked and Pasta Products
 - Sorghum Syrup, Molasses, and Sugar
 - Nutritional Value
 - Nutritional Value of Sorghum as Livestock Feed
 - Human Digestibility Studies
 - Effect of Processing

9. Triticale

- History
- General Characteristics
- Grain Development and Structure
- Genetics and Breeding
- Production
- Quality Factors
- Damaged Kernels
- Defects
- Dockage
- Foreign Material
- Heat-Damaged Kernels
- Other
- Shrunken and Broken Kernels
- Basis of Determination
- Ergoty Triticale
- Garlicky Triticale
- Light Garlicky Triticale
- Light Smutty Triticale
- Smutty Triticale
- Composition and Nutritional Factors
- Utilization
- Future

10. Photographs of Plant & Machinery with Supplier's Contact Details

11. Sample Plant Layout and Process Flow Sheets

About NIIR

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