

# Packaging for Horticultural Products

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Courtesy: S. K. Sarkar, Regional Head, INDIAN INSTITUTE OF  
PACKAGING, Kolkata

# Horticultural Products are Perishable and Consumed in **Great Volume**

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- Extremely Large loss due to above fact
- Horticulture products different in character from one piece to another
- Amount of Gas released after harvesting varies widely
- Sensitivity to Gas released by themselves also differ from one to another

# Factors affecting the **Freshness**

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- Temperature
- Humidity
- Gas Atmosphere
- Volatiles adsorption

# Temperature

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- Degree of influence varies from one to another
- Quality deteriorates with increase in Temperature
- Minimizing temperature rise in packages is a very important element for preservation of Quality of packaged Horticulture produce

# Humidity

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- Moisture Content of most products are 90% or more
- Loss of 5%MC will result extreme loss of commodity value
- Water Evaporation mechanism differs from one to another
- Amount & rate of water evaporation differs in different environments
- 5%MC loss is the maximum limit that can be tolerated in terms of commodity value
- Methods to keep MC within limit:
  - 1. Store in humid environment
  - 2. Keep in Polyethylene film

# Gas Atmosphere

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- Influence of Oxygen
- Normal respiration: Even when  $O_2$  concentration in the environment falls fairly
- Irregular respiration: Leads to Physiological disturbance-resulting in corruption, when  $O_2$  concentration is below the "Threshold Valued" it is related to the  $CO_2$  concentration. Threshold value varies from one to another
- Low  $O_2$  concentration but above "Threshold Valued" extends the storable period because of Respiration Suppressing Effects
- Adequate packaging with Inert gas substitution- effective preservation of freshness can be expected
- Correct selection of film is important & it should be adequately combined with freshness preservation agent to ensure adequate balance of  $O_2, CO_2, N_2$

# Influence of Carbonic Acid Gas:

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- High Carbonic Acid gas concentration- suppress Respiration- favourable effect on Storage
- Abnormality to metabolic physiology including respiration when the concentration reaches threshold level
- Threshold level varies from one to another
- Threshold level for Tomato 6-9%
- Detailed values for each have not been established yet

# Influence of Ethylene Gas:

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- Air mixed with Ethylene promotes Colouring
- It is believed 0.1ppm Ethylene in atmosphere causes ageing and colour change
- Removal of Ethylene will extend storage period



# Storage of Perishable

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- C A Storage
- Depressurized Storage
- Storage in Film package
- Freshness preserving agent-scavenger ( iron oxide & calcium hydroxide ), Ethylene Absorber

# Developments in Plastics

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- PE - LD, HD, HM-HD, LLD & Blends
- PP - TQPP, CPP, OPP, Metallised & Clear
- PS - HIPS, EPS
- PVC, PVDC, PVAc
- Polyester - Metallised & Clear
- Nylon, EVOH
- EAA

# Corrugated Fibre Board & Paper

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■ CFB Boxes	2771		
■ Test of CFB Boxes	7063		
■ Kraft Paper	1397		
■ Kraft Liner	9588		
■ Test of Paper	1060/4006		
■ Wrapping Paper	6615	Tissue	8460
■ Waxed Paper	3962		

# Thank you for your time and attention !

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- **For further details please contact:**
  - S.K.Sarkar, Deputy Director
  - Indian Institute of Packaging
  - Block CP, Sec. V, Salt lake, Kolkata 700 091
  - E-mail: [iipcal@cal.vsnl.net.in](mailto:iipcal@cal.vsnl.net.in)
  - Tel 2367 6016 / 0763 / 9561
    - Fax: +91-33-2367 9561
  - Website : URL-<http://WWW.iip-in.com>

# Developments in the field of Packaging

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- Metal can - continuous annealing, double cold reduction, beading, DRD, DWI, electrolytically coated, differentially coated, TFS, welded can, easy open ends
- Glass - light weight & PE coated
- Canning to aseptic system to irradiation
- Metal & Glass to Plastic
- HACCP, ISO 9000, ISO 14000

# WHY TEST ?

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- 1. To predict Performance in practice
- 2. To Control Quality
- 3. To obtain information to Modify, Improve or Reduce the cost of the Package

# Definitions of Packaging

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- Packaging may be defined as the means of ensuring the safe delivery of a product to the ultimate consumer in sound condition, at the minimum overall cost. **Packaging materials must be Environmental friendly.**
- Packaging must protect what it sales, and sell what it protects.

# Criteria for Packaging

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- **Appearance**
- Identification
- Instruction for use
- Information about contents in order to satisfy legal requirements
- Carry the Brand name
- Sales aid



# Protection

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## ■ **Chemical**

- **Product/Packaging material COMPATIBILITY**
- **Ingress of liquid & vapour**
- **Loss of liquid or vapour**
- **micro-organisms (BIOLOGICAL)**

## ■ **Physical**

- **Compression**
- **Impact**
- **Puncturing / vibration**
- **Effect of Temperature & Light**
- **Pilferage (BIOLOGICAL)**

# Function

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- Machine Performance
- End - use Performance
- Display
- Ease of Opening / Closing
- Dispensing
- Disposability
- Recycling

# Packaging - a very vital & dominant role in modern world

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- Urbanization, double-income nuclear families, improved living standard & higher disposable income
- Concern for health, requiring prevention of adulteration and providing hygienic products
- Movement of goods within and across countries from place of production to place of utilization
- Elimination of waste through preservation of perishable goods
- in short, packaging provides for Protection, Preservation and Promotion

# To predict Performance in Practice FOUR co-relations are Needed

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- **Between the “TESTS” carried out in the laboratory & the behaviour of the ‘PACKAGE’ in Practice.**
- \* **Field Performance of the Package & Laboratory Transport Simulation Tests.**
- \* **Laboratory Transport Simulation Test on Filled Package & Test on The Empty Container & on any Fittings or Components.**
- \* **Between the Strength & Other properties of the various Materials used in making the container & the tests on the Empty Container.**
- \* **Properties of the Packaging Materials & its Manufacturing Variables.**

# To Control Quality

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- \* Must be Relatively Simple
- \* Must also be capable of being carried out Rapidly
- \* Preferably they should give a Numerical results

# Eco safe Packaging

## ENVIRONMENTAL ISSUES

### **Packaging - a cause of Environmental Problem**

<b>Municipal Solid Waste (MSW)</b>	<b>20.8 %</b>
<b>Gaseous Emissions*</b>	<b>2.0 %</b>
<b>Water Consumption</b>	<b>1.5 %</b>
<b>Energy Consumption</b>	<b>3.7 %</b>

**\*Phosgene, Carbon monoxide, Sulphur dioxide,  
Nitrogen dioxide, Chlorine & Dioxin etc.**

Source OCED

# REGULATIONS / LEGISLATIONS

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- **New regulations / legislations have been introduced by countries like Germany, Netherlands, Denmark, France & many others.**
- **New legislations give more emphasis on INTRODUCING ECO-FRIENDLY / ECO-LABELLED Packages.**
- **Eco-friendly materials are generally defined as materials which do not pollute the Atmosphere. This is still a DEBATABLE ISSUE.**
- **The legislation yet does not list materials which CAN / CAN NOT be used.**

# GERMAN ORDINANCE ON PACKAGING WEST

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- **It is the liability of the exporter to bring back all Packaging materials from Germany - not Practical.**
- **German buyer to take responsibility to dispose Packaging materials in a suitable manner.**
- **Exporters can directly take Green Dot License, so that the organisations is responsible for collecting / segregating / sending for Recycling of Packaging materials.**
- **Fee is levied, depending on the type of Packaging material.**



# Eco-friendliness characteristics

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- \* Packaging material which will make no harm or less harm to the Environment.
- \* Environment - Compatible.
- \* Bio-degradability may be considered but not essential.

# HOW TO MAKE PACKAGE MORE ECO-FRIENDLY ?

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- **1. AVOIDANCE**
- **2. REDUCTION**
- **3. REUSABILITY**
- **4. RECYCLABILITY**
  - a. Selection
  - b. Segregation
  - c. Processing
- **ASTM D 5033-90 "STANDERED GUIDE FOR THE DEVELOPMENT OF STANDERDS RELATING TO THE PROPER USE OF RECYCLED PLASTICS**
- **IS : 2828 "GLOSSARY OF TERMS USED IN PLASTIC INDUSTRY"**
- **DOC:PCD 12(1170) GUIDELINES FOR RECYLING OF PLASTIC**
- **5. INCINERATION with possibility of ENERGY RECOVERY**
- **6. LAND FILL**

# **Environmental Management System (EMS) ISO 14000**

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- **Separate ISO designations assigned to each disciplines: 14001 to 14025 for various stages of consideration or adoption.**
- **Elements within 14001**
- **1. Environmental Commitment Policy**
- **2. Planning**
- **3. Implementation**
  - a) **Resources**
  - b) **Training**
  - c) **Communication**
  - d) **Record keeping**
- **4. Measurement & Evaluation**
- **5. Review & Improvement**
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# **Transport Packages**

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## **Evaluation**

# Criteria for Packaging

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- Packaging should arrive destination in an attractive condition
- Product will just call for unpacking and installation to be commissioned for usage
- There will be no need for replacement of damage parts
- There will be no mishap or malfunctioning of the equipment
- There will be no spillage of the contents leading to a loss or contamination of the Environment

# Developments

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Mono layer, Multi layer, Co-extrusion, Coating & Lamination.

# Developments in the field of Engineering Products

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- Skin / Blister Packaging
- Shrink Packaging
- Stretch wrapping
- VPI / VCI
- Use of Desiccant
- EPS / Plastic foam
- Corrugated Fibre Board

# Relevant Indian Standards

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- **Wooden Packaging**
- Specification of Timber 6662
- Packing Case 1503
- Crates 3071
- Terminology 6703 Code 10106
- Containers guidelines 10687
- Performance Test 8358
- Preservation 4973,218,6341,6791,10013,4833
- Specification of Ply-wood 303, Test 1734



# Packaging of HAZARDOUS/DANGEROUS Materials

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- All materials fall into two categories:  
Hazardous/Dangerous or General / Non-hazardous.
- Dangerous goods are articles which are capable of posing a significant risk to health, safety or to property when transported.
- Transportation of Dangerous goods need to comply the recommendation of United Nation Committee of Experts for the same.
- The International Maritime Dangerous Goods Code (IMDG Code) for the safety of life at Sea.
- UN tested and certified packages are mandatory for all international transport of dangerous goods. UN has standardized the test methods and levels of performance for all transport package.

# Classification of Dangerous Goods

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- Class 1 Explosives
- Class 2 Gases
- Class 3 Flammable Liquids
- Class 4 Flammable Solids
- Class 5 Oxidizing Substances / Organic Peroxides
- Class 6 Toxic and Infectious Substances
- Class 7 Radioactive Materials
- Class 8 Corrosives
- Class 9 Miscellaneous

# Packaging Type Code

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- 1 - Drum
- 2 - Wooden barrel
- 3 - Jerrican
- 4 - Box
- 5 - Bag
- 6 - Composite packaging

# Packaging Material Code

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- A – Steel
- B – Aluminium
- C – Natural wood
- D – Plywood
- F – Reconstituted wood
- G – Fibreboard
- H – Plastic material
- L – Textile

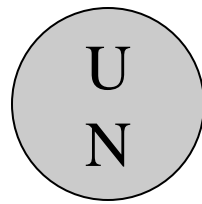
# Packing Group

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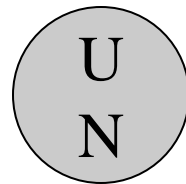
- Packing Group I(X) – High danger
- Packing Group II(Y) – Medium danger
- Packing Group III(Z) – Low danger

# Complete Code

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4G/Y114/S/0105  
IND(CA)/005115



1A1/X1.4/150/0205  
IND(CA)/003116