

Packaging for Horticultural Products

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

- 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**

- Temperature
- Humidity
- Gas Atmosphere
- Volatiles adsorption

Temperature

- 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

- 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

- 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:

- 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:

- 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

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

Developments in Plastics

- 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

■ 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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Developments in the field of Packaging

- 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 ?

- 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

- 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

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

Protection

■ **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

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

Packaging - a very vital & dominant role in modern world

- 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

- **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

- * 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

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

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

Source OCED

REGULATIONS / LEGISLATIONS

- **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

- **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

- * 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 ?

- **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

- **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

Evaluation

Criteria for Packaging

- 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

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

Developments in the field of Engineering Products

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

Relevant Indian Standards

- **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

- 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

- 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

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

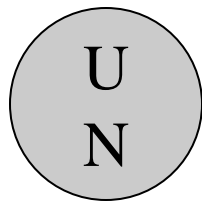
Packaging Material Code

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

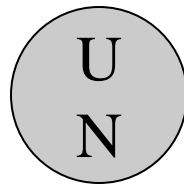
Packing Group

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

Complete Code



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



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