

Packaging; Package design and materials

Wachiraya Imsabai
Department of Horticulture, Faculty of Agriculture at KPS
Kasetsart University, Kamphaeng Saen Campus
agrwyi@ku.ac.th or wachiraya@gmail.com



Function of Packaging

- **Protection:** against damage during distribution and must maintain their shape
- **Preserve:** keep qualities for long period
- **Promotion:** give information and attractive to the consumer

Packages for horticultural crops are sized to be convenient units for marketing and distributing horticultural products.

Product Protection

Avoid mechanical injuries

Avoid water loss

Provide temperature maintenance

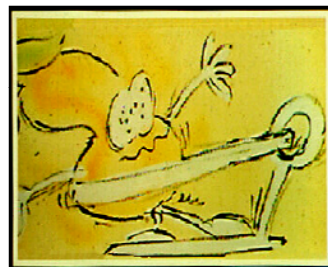
Packaging Considerations

- Mechanical injury
- Temperature management
- Water loss
- Special requirements
- Package selection
- Package management

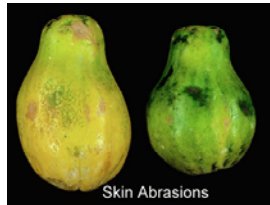
Mechanical Injury

- Vibration or abrasion damage
- Impact bruising
- Compression bruising

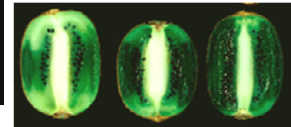
Vibration



Skin Abrasions



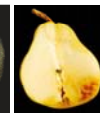
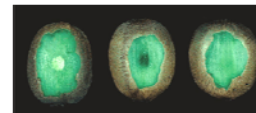
Vibration Bruising



Immobilize Product



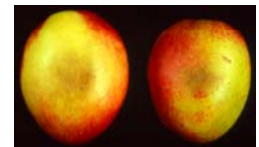
Impact Bruising



Cushion Product



Compression Bruising



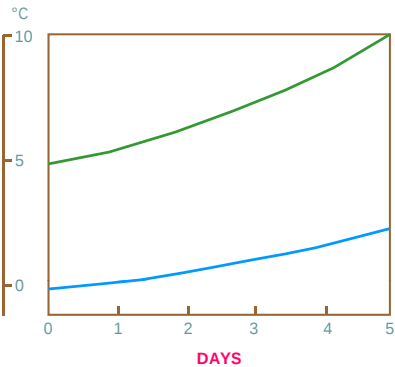
Avoid Compression

- Do not overfill
- Use strong packages
- Do not compress product

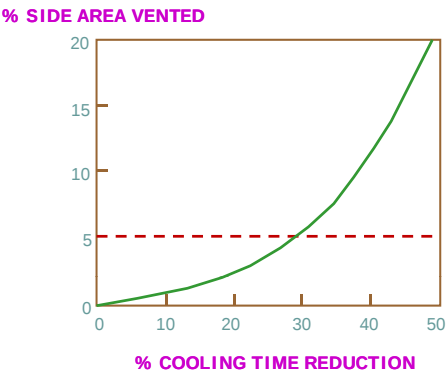
TEMPERATURE MANAGEMENT



Poor Air Circulation of Cherries in Transit

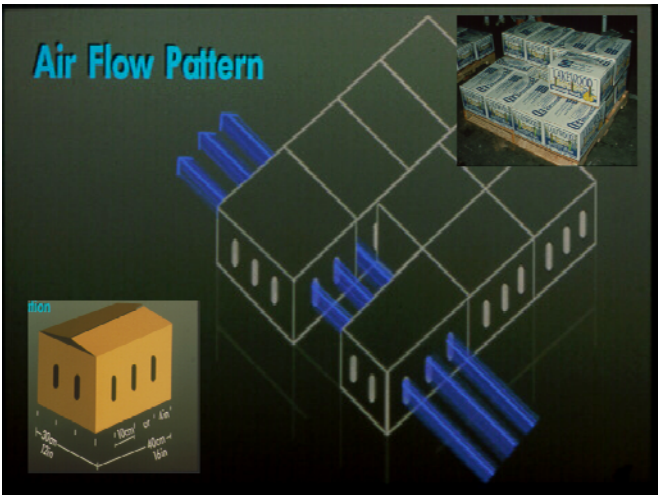


Area vented & Cooling



Area vented & Cooling

%Venting		Hours to Cool
5.9		14.5
5.8		20.0



WATER LOSS



Reduce Water Loss



High CO₂, low O₂ injury

SPECIAL REQUIREMENTS



SO₂
Fumigation

After Quarantine Treatment

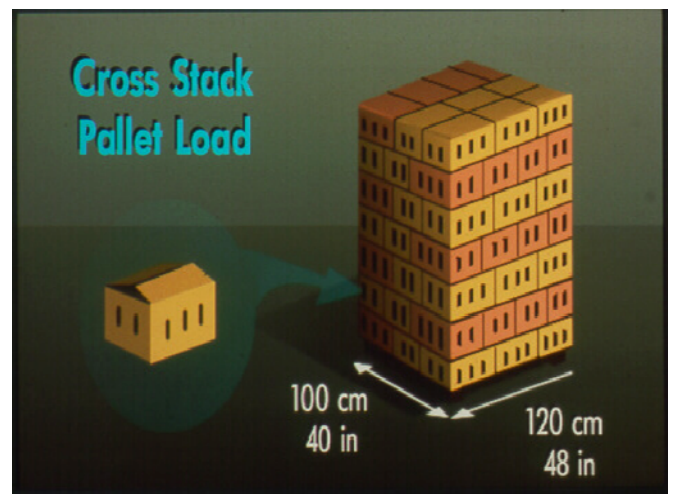


PACKAGE SELECTION



Stacking column or
Columnar stacking

Cross Stack Pallet Load

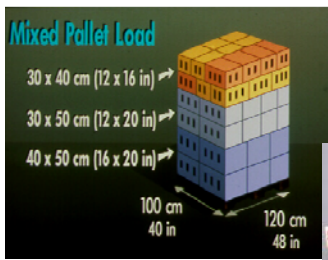


PACKAGE MANAGEMENT

Proper forming & closure

Stack for columnar strength

Avoid excess stack height



After The Common Footprint



Stacking



40" x 48" = 100 x 120 cm



A Standard in U.S.

www.EXPORT-PALLET.com

A Standard in Europe



Package Design Consider

- Adequate stacking strength
- Moisture resistance in package
- Moisture barrier for product
- Proper ventilation



Package Aid Marketing



Maintain appearance & shape

Facilitate product protection

Adapt to handling system

Type of Packaging



Consumer units

Transport packaging

Receiver packaging

Consumer Packaging



- weight 300 g – 1.5 kg
- polystyrene trays
- plastic film
- plastic or paper bags
- mesh bag (onions, potatoes 3-5 kg)



Improving appearance and attractive

Consumer Packaging



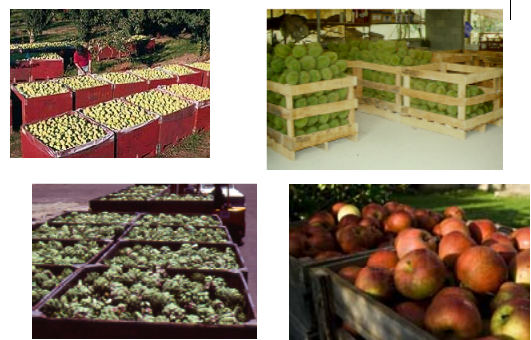
Transport Packaging



- weight 5 – 20 kg
- fiberboard or wooden or bag
- must be easy to handle, stackable
- dimensions fit to transport vehicles

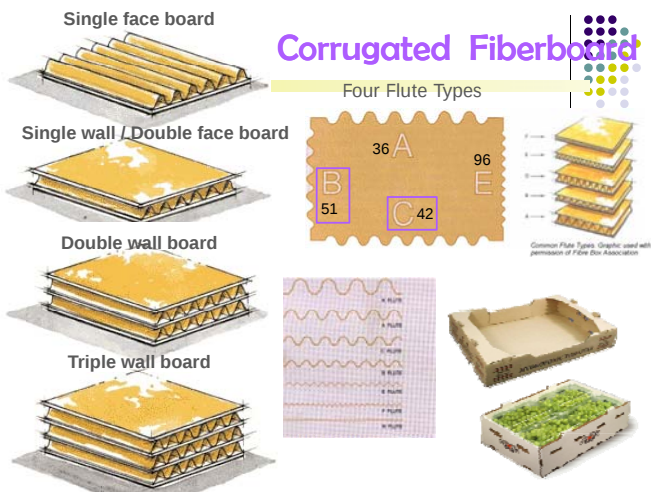


Receiver Packaging

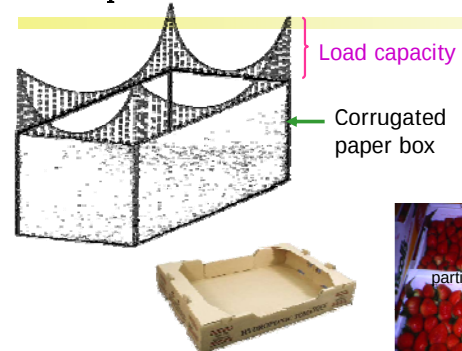


Packaging Materials

Wood/ Bamboo wood
Corrugated Fiberboard
Paper and Mesh Bags
Plastic Bags
Shrink Wrap/ Film Plastic
Rigid Plastic Packages



Vertical loading capacity of carton box at different positions



The American Society for Testing and Materials (ASTM)
The International Safe Transit Association (ISTA)



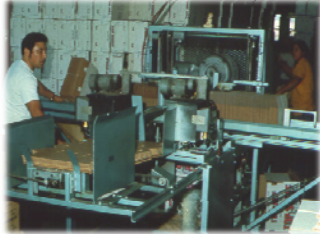
Success or Failure Corrugated Package

Amount & kind of fiber
Moisture resistance treatment
Vent size & location
Stacking for strength
Total load on package

Corrugated Package



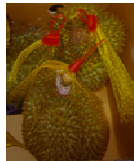
Corrugated Package



Corrugated Package



Paper and Mesh Bag



Some Types of Plastic

Polyethylene (PE)

Polypropylene (PP)

Polystyrene

Poly (vinyl chloride)

The properties of some plastic films (Paine and Paine, 1992 and Peleg, 1985)

Film name	Specific gravity approx.	Tensile strength kg/cm ²	Approx. elongation unit failure, %	Approx. heat shrink, %	Heat Shrink tunnel temp. range, C	Typical thickness range, mm	Water vapor transmission 38C, 90%RH g/m ² .d (25µm)	O ₂ transmission 23/25C, 50%RH cm ³ /m ² .d (25 µm)	Transparency
Polyethylene low density	0.90-0.93	100-150	200-600	20-50	150-230	0.025-0.050	16-24	7,100-7,800	Poor-fair
Polyethylene high density	0.945-0.965	200-500	20-400	-	-	0.010-0.015	4.7	2,100-2,900	Poor
Polypropylene	0.90-0.910	400-600	150-600	50-70	170-230	0.013-0.040	11	2,400-3,800	Fair
Polystyrene	1.04-1.07	600-850	10-70	40-70	130-160	0.025-0.040	110-160	3,900-5,500	Excellent
Polyvinyl chloride	1.16-1.40	300-1,000	10-500	50-70	120-170	0.010-0.035	80-500	80-9,000	Fair-good

Plastic Bag / Plastic Film



Rigid Plastic



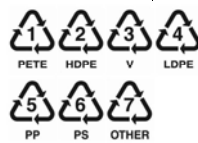
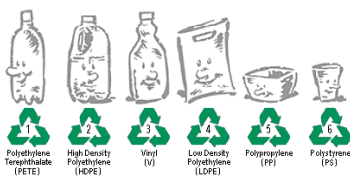
Advantage of Plastic



- well vented
- good ventilation



Recycle codes



<http://www.projectgreenbas.com/recycling-codes-on-plastics/>



Foam Box



Packing



Pad Packing



Tight-Fill Packing



Individual Packing



Automated Packing

Potato packing

<http://www.youtube.com/watch?v=3BH-6nS-jzq&feature=related>
<http://www.youtube.com/watch?v=vdyPEBpRGcY>

Romance lettuce packing

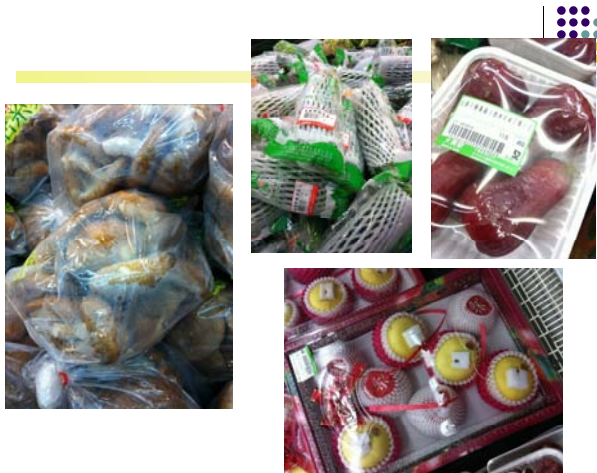
<http://www.youtube.com/watch?v=Eiefo9ILJ-s&feature=related>
<http://www.youtube.com/watch?v=jNq4oQiac-8&feature=related>
<http://www.youtube.com/watch?v=62nJzuKjUBc&feature=related>
<http://www.youtube.com/watch?v=2jpwZjRBahs&feature=related>

Individual Handling





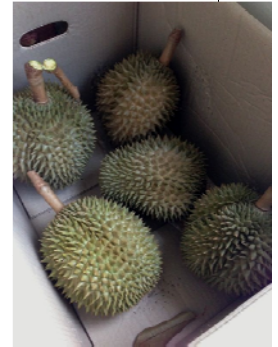
Vegetable Market in Taiwan



Farmer market in USA



Packaging for local transportation



Active Packaging

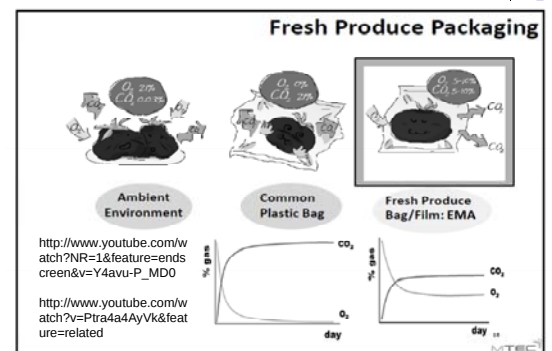
- Oxygen absorber
- Carbon dioxide absorber
- Ethylene absorber
- Humidity control



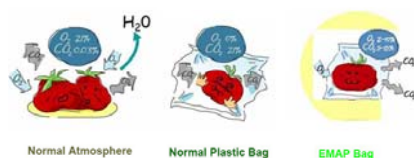
<http://www.youtube.com/watch?v=fkntg-L1AmA&feature=related>



Modified Atmosphere Packaging (MAP)



MAP



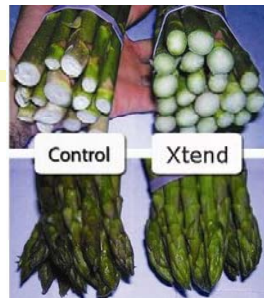
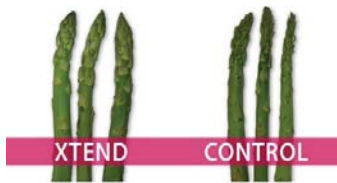
TPBI manufactures film for equilibrium modified atmosphere packaging (EMAP), which can extend the shelf life of produce such as fresh fruit and vegetables.

MAP

<http://www.youtube.com/watch?v=xaNq7kLbgBo#at=14>



MAP



Packing of asparagus in StePac's Xtend Modified Atmosphere/Modified Humidity Packaging is advantageous in that the modified atmosphere that develops within the packaging alleviates most of the physiological disorders indicated above including decay development. With Xtend MA/MH packaging the shelf life of green and white asparagus can be extended up to 33 and 45 days, respectively (28 and 40 days in transit at 0-2°C + 5 days shelf life at 10°C, respectively). StePac's Xtend MA/MH Packaging for asparagus includes various formats for white and for green Asparagus. Each format is tailor-made to provide the asparagus spears with the optimum conditions for prolonged storage and shipment.

http://www.freshplaza.com/news_detail.asp?id=106362



Smart Packaging



Interactive packaging



Bio-degradable Packaging



polylactic acid (PLA)

Corn starch, sugarcane

Bio-degradable Packaging



Bio-degradable Packaging



Carbon Footprint



Traceability: Barcode



Traceability: RFID



THANK YOU

