

# Packaging For Fresh Market Crops

What is the right package?

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## Choices in Master Containers

- Corrugated fiberboard
- Returnable plastic containers (RPC)
- Expanded polystyrene (EPS)
- Corrugated plastic
- Wood



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## Large Bags



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## Initial Cooling

- Plastic containers are well suited to hydro and ice cooling methods.
- Large vent areas (RPCs) may cause poor airflow distribution in FA coolers.
- FA coolers have poor air distribution when there is a mix of boxes with large and small vent areas.

	Corr.	RPC	EPS	Corr PI	Wood
Initial cooling	●	○	●	●	●

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## Long Term Storage Requirements

- Minimize moisture loss from product - should not absorb moisture.
- Maintain strength.
- Allow fumigation - should have good ventilation and not absorb fumigant.

	Corr.	RPC	EPS	Corr PI	Wood
Storage	○	○	●	●	○

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## Moisture Absorption

- Corrugated and wood absorb water, can equal 1% of product weight.
- Release small amounts of heat as they gain water.
- Plastic box liners or pallet covers reduce moisture loss, but interfere with fumigation and temperature management.

	Corr.	RPC	EPS	Corr PI	Wood
Moisture Absorption	○	●	●	●	○

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## Mechanical Damage Protection



	Corr.	RPC	EPS	Corr PI	Wood
Damage protection	○	●	●	●	●

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## Strength of Corrugated

- At 90% RH strength is 60% less than strength at 50% RH.
- Fatigue after 10 days of loading reduces strength by 35%.
- 10 days after packing strength may be 75% less than original.

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## Fumigation

- Wood and corrugated absorb some fumigants (SO<sub>2</sub>).

	Corr.	RPC	EPS	Corr PI	Wood
Fumigation	○	●	●	●	○

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## Weight

	Corrugated	RPC	EPS
Kg per 100 liters volume	2.2	3.3	0.97

	Corr.	RPC	EPS	Corr PI	Wood
Weight	○	○	●	●	○

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## Labeling



- Paper labels
- RFID

	Corr.	RPC	EPS	Corr PI	Wood
Labeling	●	○	○	○	○

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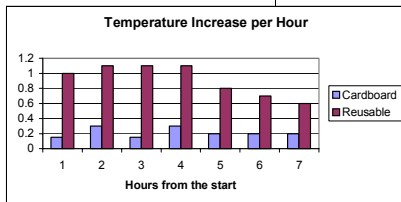
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## Rewarming

Netted oranges in corrugated or RPC boxes.



	Corr.	RPC	EPS	Corr PI	Wood
Rewarming	○	○	●	○	○

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## Package Storage Before Use

- Many corrugated designs are stored completely flattened.
- EPS is stored fully formed.
- RPCs are not stored but delivered folded down.
- Wood is delivered formed or can be nailed on site.

	Corr.	RPC	EPS	Corr PI	Wood
Storage	●	●	○	●	○

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## Recycle

- Corrugated is widely recycled.
- EPS and polystyrene can be recycled but there may not be a cost effective system available.
- Wood is not usually recycled.
- Damaged RPCs are recycled by owner.

	Corr.	RPC	EPS	Corr PI	Wood
Recycle	●	●	●	○	●

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## Reuse

- RPCs are designed and managed for washing and reuse.
- Other containers can not legally be reused in many countries.

	Corr.	RPC	EPS	Corr PI	Wood
Reuse	○	●	○	○	○

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# Cost

California for 2006 season

RPC	\$1.05
Corrugated fiberboard	\$1.25
Corrugated plastic	\$1.50
EPS	\$1.55
Wood	\$1.62

	Corr.	RPC	EPS	Corr PI	Wood
Cost	○	●	○	○	○

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# Interior Packaging

Pulp Tray

Plastic tray



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# Consumer Packs



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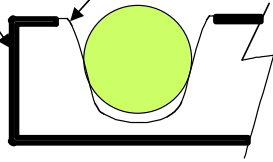
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## Hammock Pack

Clamshell package or corrugated master container

Suspended tray



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## Consumer Bags



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## Box Liners



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## Interior Packaging

- Slows initial cooling.
- Increases packaging costs.
- Reduces net product weight in master container.
- Reduces mechanical damage (usually!).
- May reduce handling at retail.
- Can be used for MA.

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## Modified Atmosphere Packaging

- MAP is usually more expensive than conventional packaging but can reduce weight loss and extend shelf life.



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## Vibration Damage



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## Vibration Damage Prevention

- Use air ride truck suspension.
- Pack in consumer bags or suspended tray.
- Do not stow vibration sensitive products on the rear of a highway trailer.

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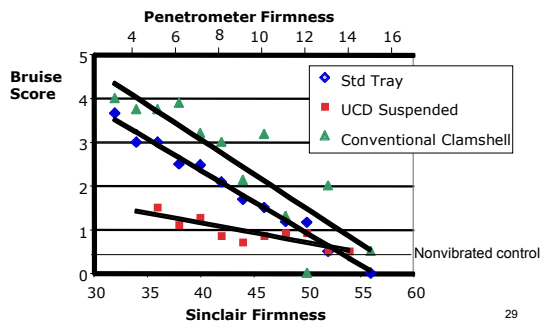
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## Vibration Damage Protection



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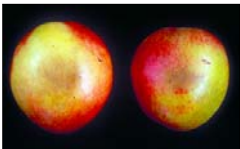
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## Compression Damage Prevention



- Do not over fill box.
- Use boxes strong enough to support weight above them.



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# Impact Damage Prevention



- Reduce hand palletizing and handling.
- Cost effective packaging is rarely effective in preventing impact damage.




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## Summary

	Corrugated	RPC	EPS	Corrugated plastic	Wood
Initial cooling	●	○	●	●	●
Long-term Storage	●	○	●	●	●
Moisture absorption	○	●	●	●	○
Damage protection	●	●	●	●	●
Fumigation	○	●	●	●	○
Weight	○	○	●	●	○
Labeling	●	●	○	○	○
Rewarming	○	●	●	○	●
Storage before use	●	●	○	●	○
Recycle	●	●	●	○	●
Reuse	●	●	●	●	●
Cost	○	●	○	○	●

- Best
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- Worst

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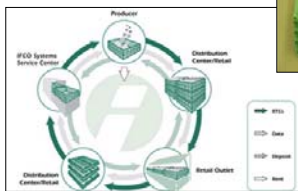
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## RPC's

Returnable Plastic (collapsible) Crates are approximately 12% of their open volume when packed flat



- RPC - RPC
- RPC - RPC
- RPC - RPC
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