

Fresh-cut Fruits and Vegetables



Juan L. Silva

Fresh-cut produce

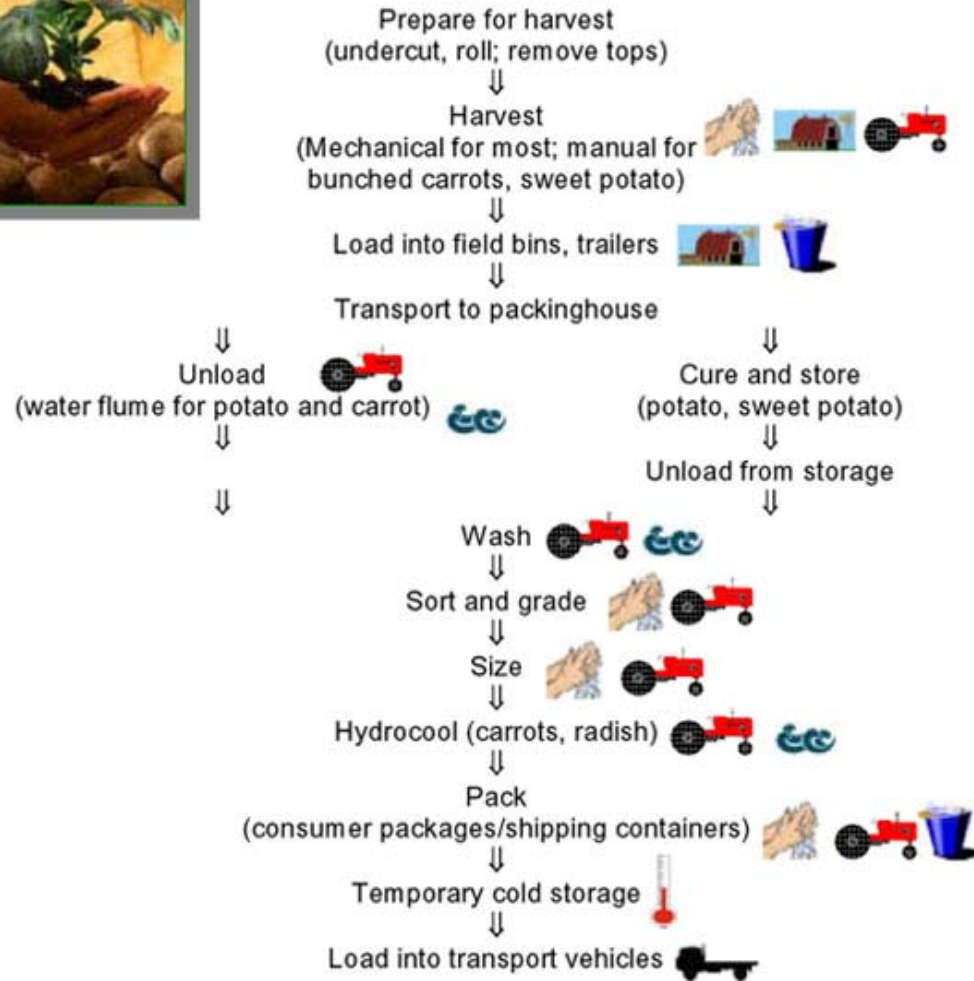
- "Fresh-cut produce" is defined as any fresh fruit or vegetable or any combination thereof that has been physically altered from its original form, but remains in a fresh state. Regardless of commodity, it has been trimmed, peeled, washed and cut into 100% usable product that is subsequently bagged or prepackaged to offer consumers high nutrition, convenience and value while still maintaining freshness.

The Fresh-cut Process

- Produce is **harvested** from the field and **put into large bins** for the processor.
- This bulk produce is **emptied into a trim-and-core** processing line to remove unusable parts such as the outer leaves, stems and peelings.
- The trimmed produce then goes through a **cutting machine** or is hand-cut, depending on the fruit or vegetable.
- An **inspection** is done to make sure all produce is uniform.
- The cut produce is then vigorously **washed as many as three times with refrigerated, sanitized water**.
- The washed produce is **dried** and **put into special packaging** to preserve its freshness.
- An average shelf-life of 10-14 days is stamped as a use-by code date on the package.



Handling root vegetables



Hazard Control Point



Field worker
hygiene



Equipment
sanitation



Temperature
control



Truck
sanitation



Field sanitation



Container
Sanitation



Water
sanitation



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www.producepackagingltd.com/company/tour.html

CUTTING ROOM





F&S Produce Company, Inc.

PO Box 17, 913 Bridgeton Ave. Rosenhayn, NJ 08352





QA Lab



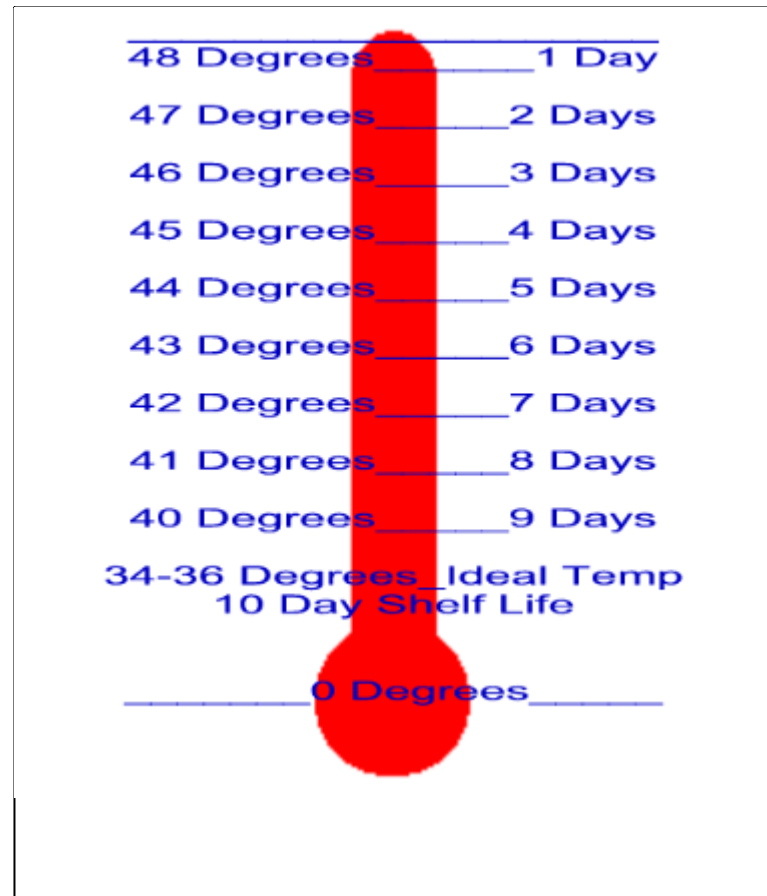
Office

PRE-CUT PRODUCE

COOLER TEMPERATURE EFFECTS SHELF LIFE

TEMPERATURE (Degrees)

SHELF LIFE (Days)



<http://pelleritofoods.com/doc8.htm>

WHAT WERE YOUR WEEKLY TEMPERATURES?

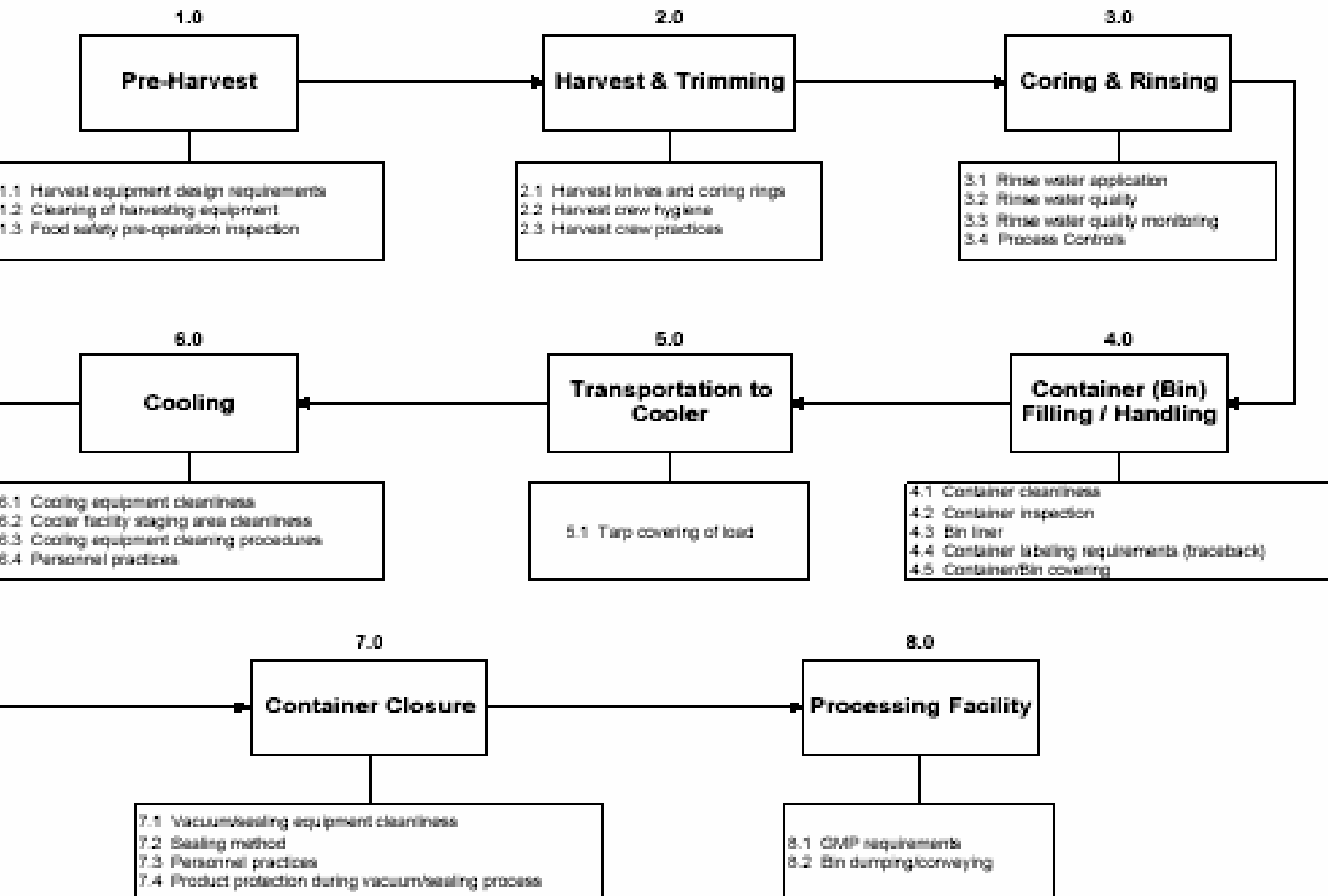
MON ___ TUE ___ WED ___ THU ___ FRI ___ SAT ___

FRESH-CUT VEGETABLES

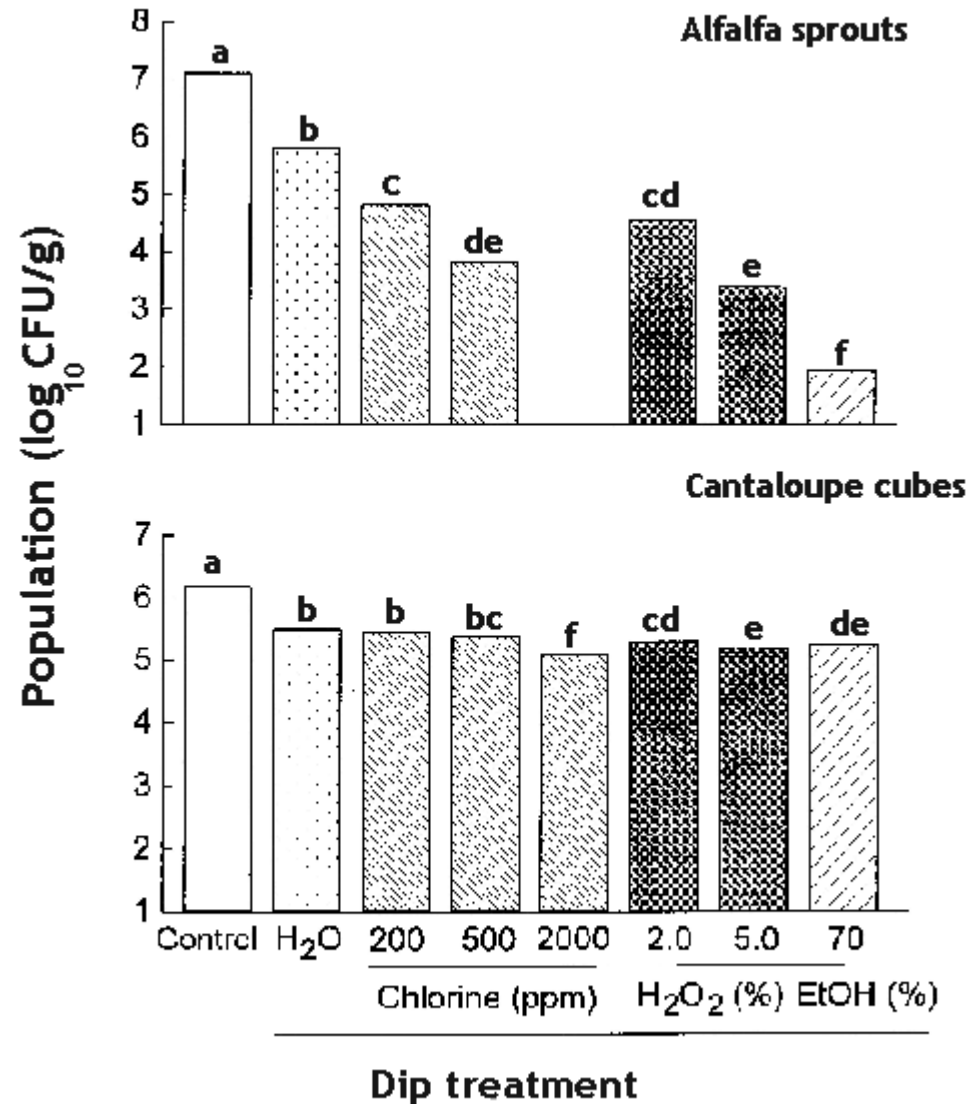
(DETAILED) HANDLING PROCEDURES

- **Handling Overview**
- - Store at 34 - 36 degrees, each degree higher reduced shelf life
- - Fresh-cut have higher respiration rates than intact
- - Maximize shelf life with proper refrigeration
- - Keep time out of refrigeration to a minimum
- - Store product in original bags or shipping cartons
- - Do not store product in direct air flow from cooler fans

Lettuce Harvest and Handling



Effect of Sanitation Treatment on Salmonella



Quality issues (defects) to watch for

- Defective pieces (grading, inspection)
- **Wetness in the bag** (transpiration: bag, temp.)
- **White/brown discoloration** (oxidation of edges: sealed bag, no O₂)
- **Off smell** (sweet, bitter, sour): anaerobiosis: bag, O₂

	<u>AEROBIC</u>	<u>ANAEROBIC</u>
Lettuce	pink, dry	wet, smelly, and brown
Cabbage	black	wet, smelly, and brown
Broccoli	black on cut stalk	smelly
	black mold on stalk	smelly
Cauliflower	Black	smelly

Hazard Analysis- Fresh-cut Carrots

PASO	PELIGRO	TIPO (B, Q, F)*	MEDIDAS PREVENTIVAS
Lavado	Predominio de bacterias patógenas	B	Uso de agua potable en el paso de lavado y cambiarla frecuentemente si no es un sistema continuo. Controlar la eficiencia del proceso de lavado
Clasificación del material	Presencia de material extraño (piedras, plástico, etc)	F	Inspección de la materia prima y remoción de objetos extraños
Clasificación del material	Contaminación microbiologica debido al manejo por el personal clasificador	B	Seguir las BPM's, entrenamiento de los empleados y uso de estaciones de saneamiento de manos
Clasificación de material	Contaminación debido al contacto con el equipo	B	Lavado y saneamiento del equipo siguiendo los procedimientos establecidos
Clasificación de material	Contaminación con material extraño por el personal clasificador	B, F	Seguir las BPMs en lo que se refiere a la remoción de joyas y otros accesorios que puedan caer en el producto
Cortado	Contaminación microbiologica por el equipo	B	Lavado y saneamiento del equipo siguiendo los procedimientos establecidos
Sanitizacion/ Desinfeccion	Predominio de bacterias patógenas	B, Q	Controle los niveles de cloro y pH en el agua de lavado. Filtrarla o cambiarla periódicamente para remover sólidos orgánicos

* B=Biológico, F=Físico y Q=Químico

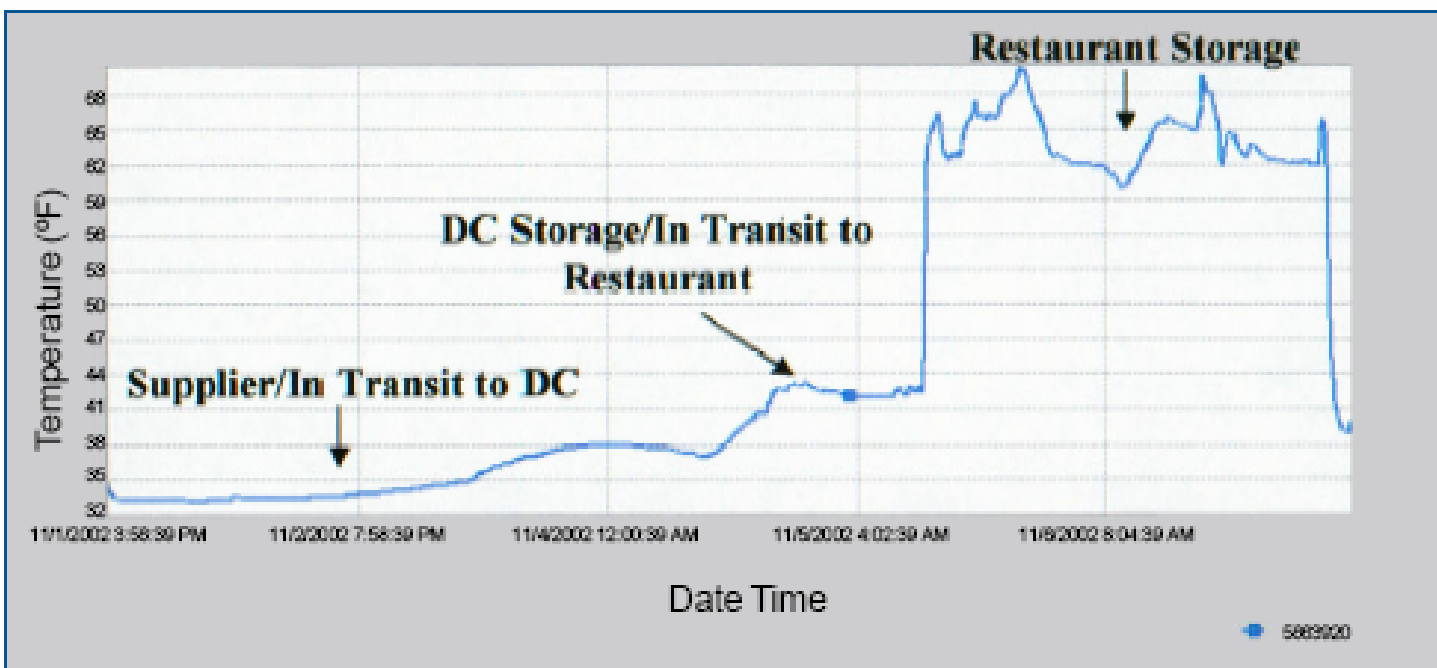
Muestra de Analisis de Peligros – Zanahorias cortadas

PASO	PELIGRO	TIPO (B, Q, F)*	MEDIDAS PREVENTIVAS
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Clasificación del material	Presencia de material extraño (piedras, plástico, etc)	F	Inspección de la materia prima y remoción de objetos extraños, SSOP
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DESINFEC CION	Predominio de bacterias patógenas	B, Q	Controle los niveles de cloro y pH en el agua de lavado. Filtrarla o cambiarla periódicamente para remover sólidos orgánicos, CCP

* B=Biológico, F=Físico y Q=Químico

Fresh Sliced Mushrooms

31°F -41°F, ideally 32°F



Graphic supplied by Sensitech, Inc.

The dramatic swings in cold chain experience are reflected in this time-temperature recording for fresh sliced mushrooms. The recommended temperature for this product is 31°F to 41°F, and ideally is 32°F. The chain breaks down after leaving the customer's DC, eventually experiencing extremes of 69.7°F. Overall, the product experienced an extended period of time well over the ideal 32°F and, more importantly, well over quality temperatures of 41°F while in the final stages prior to preparation and consumption.

A Summary of CA and MA Recommendations for Selected Fresh-cut Fruits and Vegetables

James R. Gorny
International Fresh-cut Produce Association
Davis, CA 95616 USA

Fresh-Cut Product	Temperature (°C)	Atmosphere		Efficacy
		%O ₂	% CO ₂	
Beets (Red), Grated, Cubed, or Peeled	0-5	5	5	Moderate
Broccoli, Florets	0-5	2-3	6-7	Good
Cabbage, Shredded	0-5	5-7.5	15	Good
Cabbage (Chinese), Shredded	0-5	5	5	Moderate
Carrots, Shredded, Sticks, or Sliced	0-5	2-5	15-20	Good
Jicama, Sticks	0-5	5	5-10	Good
Leek, Sliced	0-5	5	5	Moderate
Lettuce (Butterhead), Chopped	0-5	1-3	5-10	Moderate
Lettuce (Green Leaf), Chopped	0-5	0.5-3	5-10	Good
Lettuce (Iceberg), Chopped or Shredded	0-5	0.5-3	10-15	Good
Lettuce (Red Leaf), Chopped	0-5	0.5-3	5-10	Good
Lettuce (Romaine), Chopped	0-5	0.5-3	5-10	Good
Mushrooms, Sliced	0-5	3	10	NOT RECOMMENDED
Onion, Sliced or Diced	0-5	2-5	10-15	Good
Peppers, Diced	0-5	3	5-10	Moderate
Potato, Sliced or Whole-Peeled	0-5	1-3	6-9	Good
Pumpkin, Cubed	0-5	2	15	Moderate
Rutabaga, Sliced	0-5	5	5	Moderate
Spinach, Cleaned	0-5	0.8-3	8-10	Moderate
Tomato, Sliced	0-5	3	3	Moderate
Zucchini, Sliced	5	0.25-1	-	Moderate

Table 2. Fresh-cut Fruit.

Fresh-Cut Product	Temperature (°C)	Atmosphere		Efficacy
		%O ₂	% CO ₂	
Apple, Sliced	0-5	<1	4-12	Moderate
Cantaloupe, Cubed	0-5	3-5	6-15	Good
Grapefruit, Slices	0-5	14-21	7-10	Moderate
Honeydew, Cubed	0-5	2	10	Good
Kiwifruit, Sliced	0-5	2-4	5-10	Good
Mango Cubes	0-5	2-4	10	Good
Orange, Sliced	0-5	14-21	7-10	Moderate
Peach, Sliced	0	1-2	5-12	Poor
Pear, Sliced	0-5	0.5	<10	Poor
Persimmon, Sliced	0-5	2	12	Poor
Pomegranate, Arils	0-5	-	15-20	Good
Strawberry, Sliced	0-5	1-2	5-10	Good
Watermelon Cubes	0-5	3-5	10	Good

Source: Gorny, J.R. 2001. A summary of CA and MA requirements and recommendations for fresh-cut (minimally processed) fruits and vegetables. pp 95-145. Postharvest Horticulture Series No. 22A, University of California, Davis.

Developments in the industry



Source: PBI Dansensor

The key to shelf-life and quality for most fresh-cuts depends on achieving an optimum exchange of gases. Oxygen (O_2) must permeate the packaging film at one rate while carbon dioxide (CO_2) exits the package at a faster pace. Packaging films are commonly rated by their OTR (oxygen transmission rate). Moisture transmission rates are referred to as MVTR.



Source: Nestlé

Nestlé commercialized Sealed Air's oxygen absorbing film for its *Buitoni* brand pasta. Films help extend shelf-life by 50%.

2. Gas

Pac
pac
and
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mar
gas

Active Packaging

Senses changes in products and package atmospheres and reacts to modify, correct, or return to prescribed condition.

- Oxygen scavengers
- Gas exchange control
- Anti-microbials
- Moisture control
- Odor absorbers
- Self-venting films
- Preservative releasers



Source: River Ranch Fresh Foods

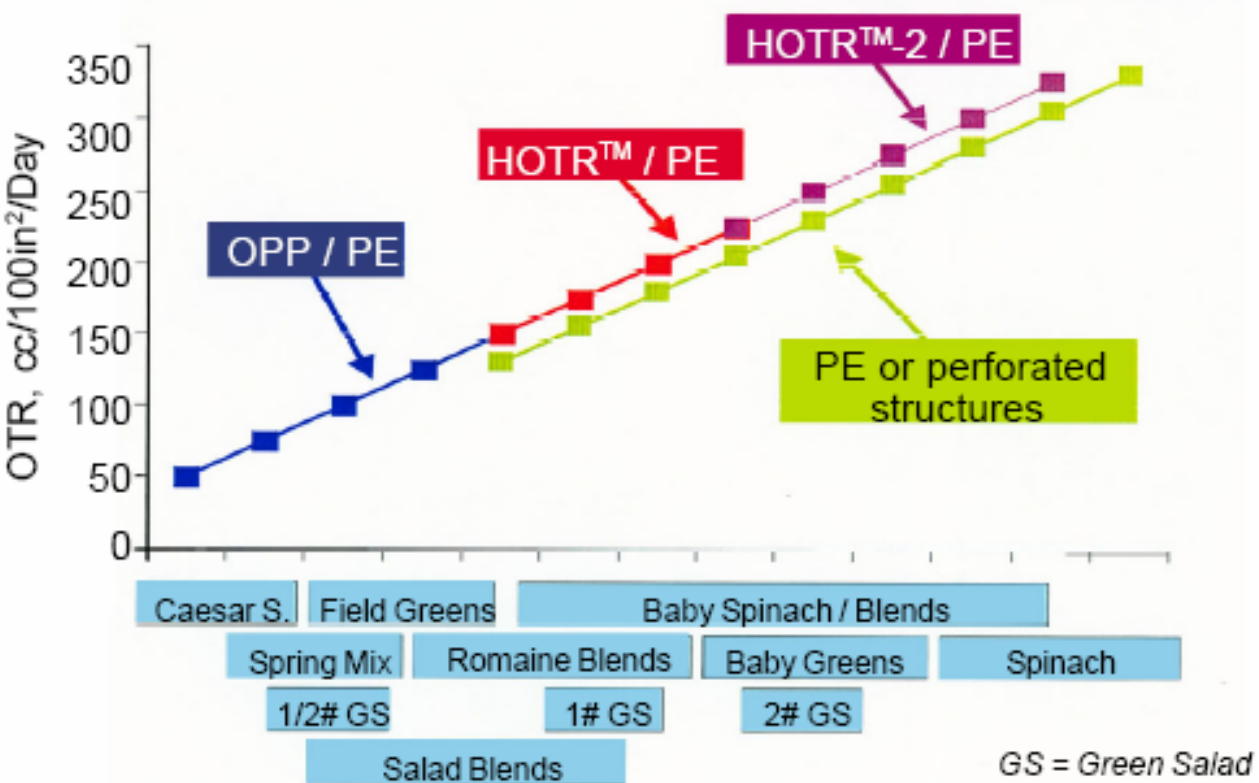
FreshHold breathable membranes control O₂ and CO₂ levels inside pouches and rigid packs.

Intelligent or Smart Packaging

Monitors changes in package/ product conditions and issues signal or alert. Does not take corrective action.

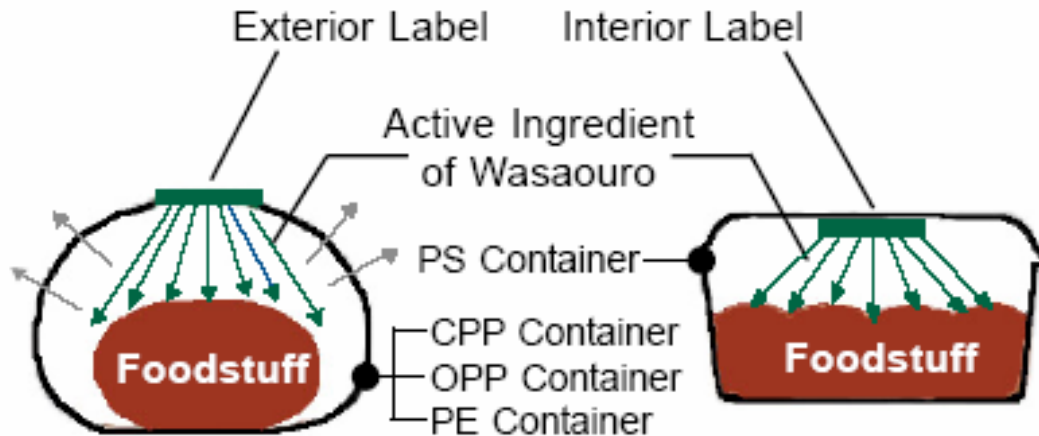
- Time-temperature indicators
- RFID tags, labels
- Thermochromic inks
- Moisture indicators
- Doneness indicators
- Microorganism indicators
- Freshness indicators

OPP Expands OTR Ranges



Source: AET Films

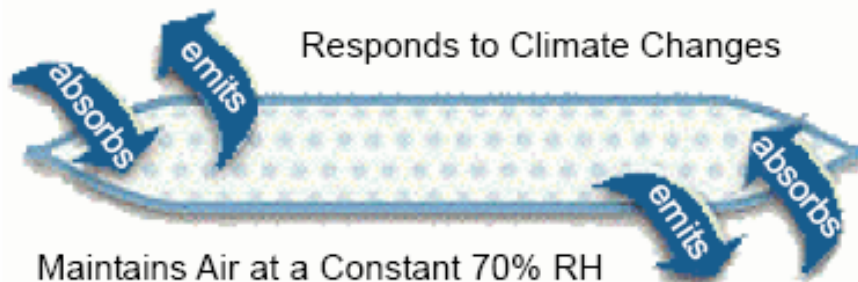
Using Wasaouro in Labels



Source: Carex, Inc.

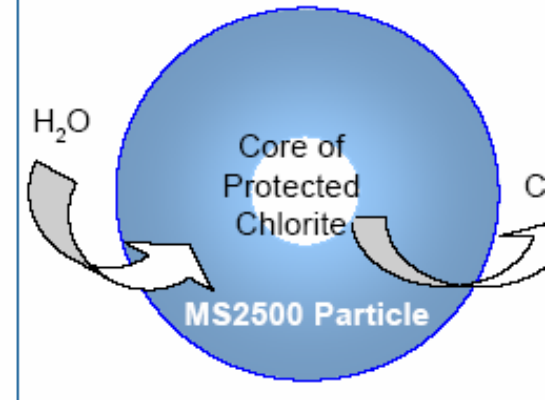
Antimicrobial

Two-way Humidity Control



Source: Humidipak, Inc.

MICROSPHERE[®] Particle Structure and Mode of Action



Source: Bernard Technologies

When humidity or moisture in the air is high, it diffuses into the Microsphere particles and initiates a reaction that produces chlorine dioxide which diffuses through the film. Microsphere particles are embedded in film and there is no free chlorite on the film surface.