

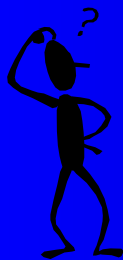
**What
MAP
Can & Can't
Do For You !**

Devon Zagory, Ph.D.



**Davis
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What Bag Do I Use for (blank) ?



- Empirical Approach
- System Approach

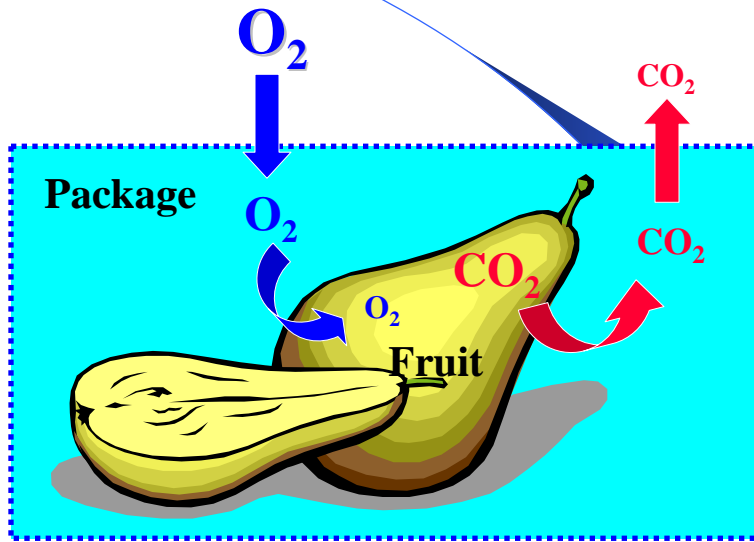
Why Use MAP ?

- I. Increased Shelf-life**
- II. Appearance Quality**
- III. Sensory Quality**
- IV. Increased Marketability**
- v. Will MAP Deliver These Benefits ?**

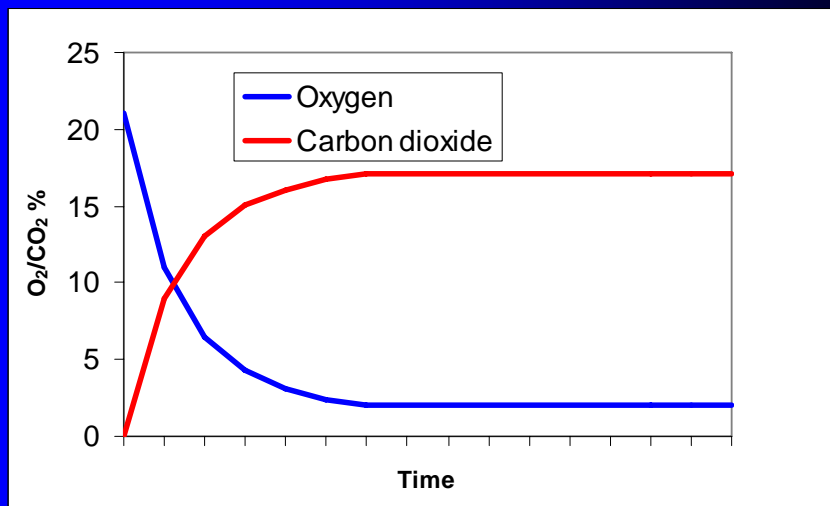
How Does MAP Work ?

- **Reduced Product Respiration**
- **Slows Ripening & Aging**
 - **Pigment Degradation**
 - **Softening or Toughening**
 - **Carbohydrate Conservation**
- **Slows Browning Reactions**
- **Altered Microbial Demographics**

MAP Fundamentals



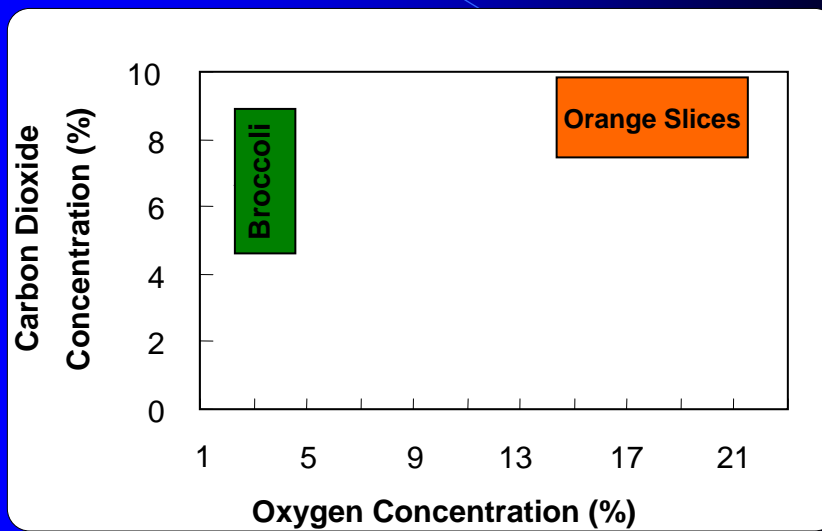
MAP Alters Package Oxygen & Carbon Dioxide Levels



What Atmosphere Will Deliver Benefits ?

- Oxygen
- Carbon Dioxide
- Relative Humidity

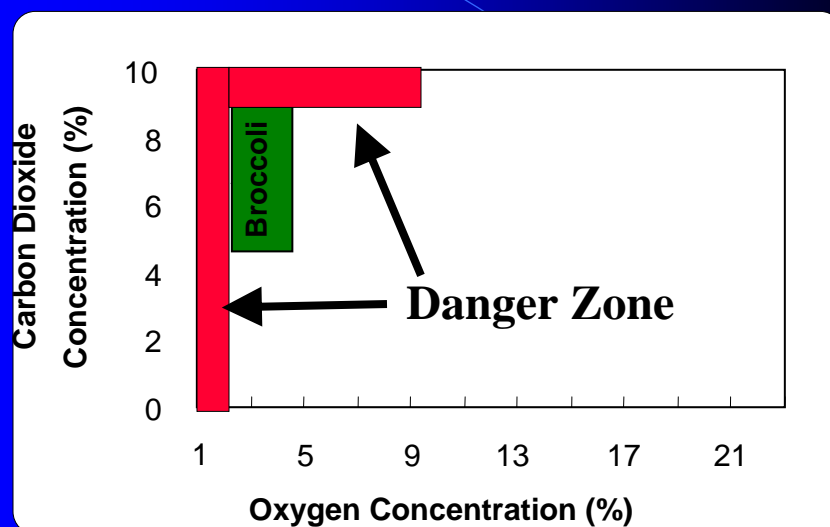
MAP Beneficial Windows of Opportunity



What Atmosphere(s) Will Induce Damage ?

- Fermentation
- Off Flavors & Odors
- Carbonation
- Accelerated Deterioration → Decay
- Water Condensation

MAP Danger Zones



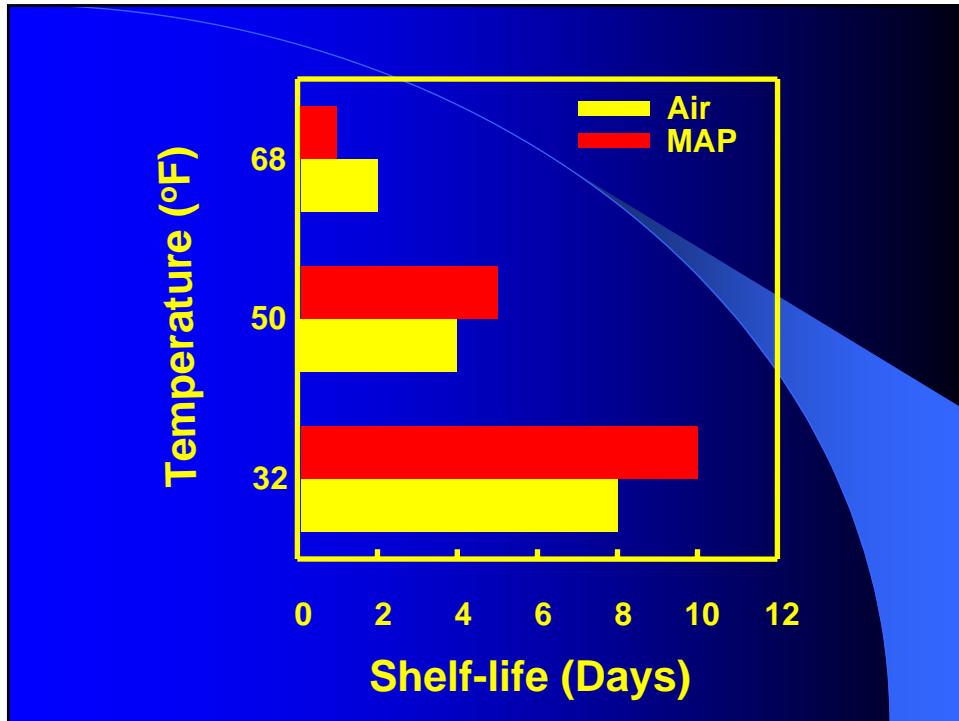
Sweet Cherries

Optimum Temp: 30-32°F

	<u>Reduced O₂</u>	<u>Increased CO₂</u>
Benefit Level:	3-7%	10-15%
Benefits:	Firmness Retention	Decay Control Green Stems
Potential for Benefit:	Moderate	Very Good
Injurious Level:	<1%	>30%
Injury Symptoms:	Skin Pitting Off Flavors	Brown Discolor. Off Flavors
Potential for Injury:	Moderate	Moderate

What Temperatures Will The Product be Exposed To ?

- Product Respiration Rate
- Equilibrium Atmosphere



What Bag Do I Use for (blank) ?

- Define Target Atmosphere
- Define Temperature = Respiration
- Define Product Weight
- Define Package Size
- Define Film Thickness

What OTR Film Do I Use for (blank) ?

$$\text{OTR} = \text{RR}_{\text{O}_2} \cdot t \cdot W/A \cdot (\text{O}_{2\text{atm}} - \text{O}_{2\text{pkg}})$$

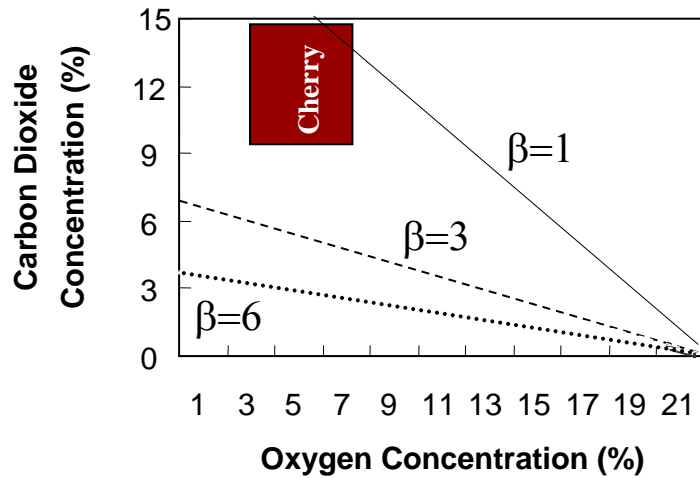
Where:

OTR	=	Film O₂ Permeability (OTR)
RR	=	Respiration Rate (O₂ Consumption)
t	=	Film Thickness
W	=	Product Weight
A	=	Film Surface Area
O_{2pkg}	=	Desired O₂ Concentration In the Pkg

What Materials Do I Use ?

- **Oxygen Transmission Rate (OTR) - Breathability**
- **Determination of Appropriate CO₂/O₂ Permeability ratio (β)**

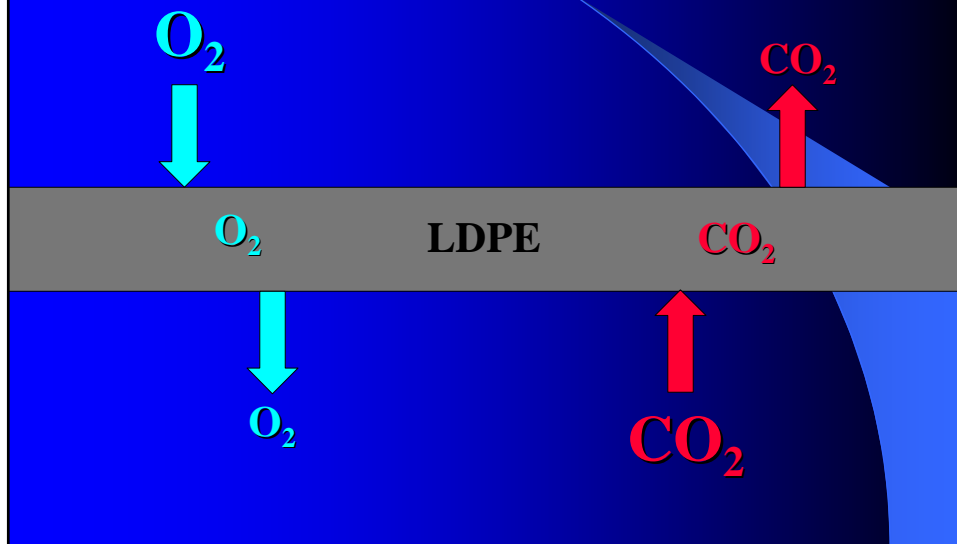
Effect of β Value on Material Choices



Common MAP Systems

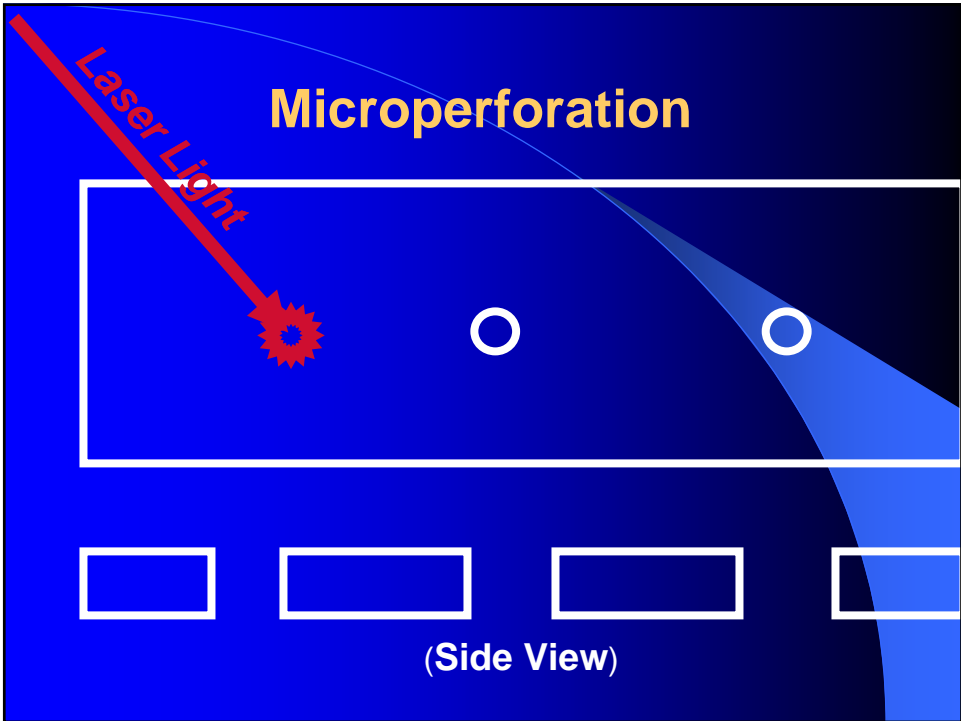
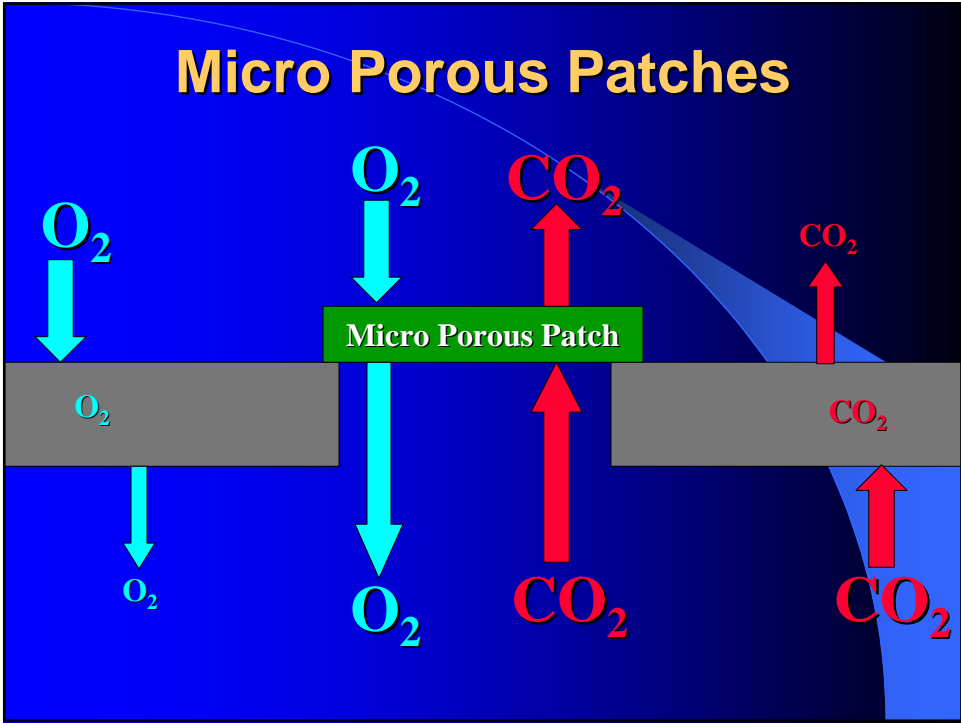
- Mono or Multiple Layer Films
- Patches or Membranes
- Micro or Macro Perforation

Monolayer or Laminate Films

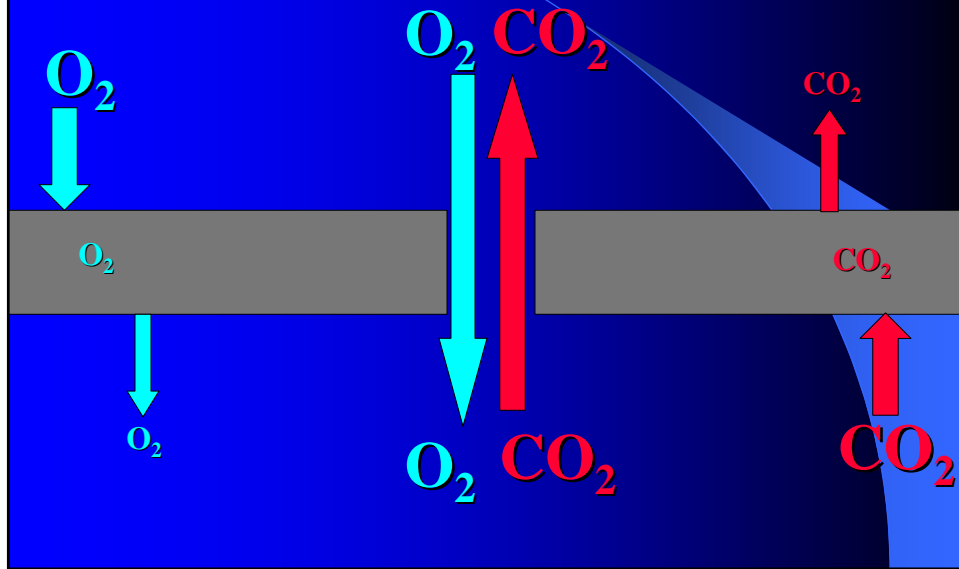


Micro Porous Patches





Macro or Micro Perforation



Other MAP Considerations

- Clarity
- Stiffness
- Sealability
- Machinability
- Printability

Gas Flushing & Vacuum Packaging

- Rapidly Delivers A Desired Atmosphere
- Does NOT Alter Equilibrium Atmosphere

MAP

Can

- Increase Shelf-life
- Slow Microbial Growth
- Maintain Nutritional Quality
- Slow Browning

Cannot

- Sub for Temp. Control
- Stop Microbial Growth
- Improve Quality



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