Development of Stone Fruit Flavor

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Queenstown, MD

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Overview

- My background
- Farcuh Lab research interests
- What is stone fruit flavor?
- Why is stone fruit flavor important?
- Factors affecting stone fruit flavor development
- Take-home messages/ Tips

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COSTA RICA
PANAMA
VENEZUELA
GUYANA
SURINAME
FRENCH GUIANA
COLOMBIA
ECUADOR
PERU
BRAZIL
BOLIVIA
PARAGUAY
CHILE
Santiago
ARGENTINA
URUGUAY

B.S., Agricultural Engineering
University of Chile, Santiago

2001-2005

M.S., Agricultural Sciences (Fruit Production)
University of Chile, Santiago

2005-2007

B.S., Agricultural Engineering
University of Chile
2001-2005

M.S., Agricultural Sciences (Fruit Production)
University of Chile
2005-2007

Research & Development Department
2007-2008

ChileAgro
Innovadores por Naturaleza

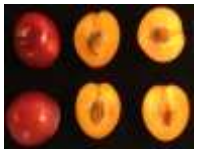
Research Associate
2008-2011

+ ASOEX ASOCIACION DE EXPORTADORES DE CHILE A.G. = consorcio tecnológico de la fruta

Ph.D., Hort. & Agronomy
UC Davis

2012-Sep 2017

vs.



'Santa Rosa' (SR) **'Sweet Miriam' (SM)**

Sugar Metabolism and Hormone Balance

Ph.D., Hort. & Agronomy
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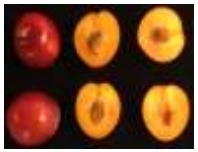

'Santa Rosa' (SR) **'Sweet Miriam' (SM)**

Sugar Metabolism and Hormone Balance

HM•CLAUSE
Limagrain

Postdoctoral Scholar
UC Davis

Jun 2017- Sep 2019

Texture and Flavor Improvement

Assistant Professor, Horticulture (Fruit)
Univ. of MD

Oct 2019- present

HM•CLAUSE
Limagrain

Postdoctoral Scholar
UC Davis

Jun 2017- Sep 2019

Texture and Flavor Improvement

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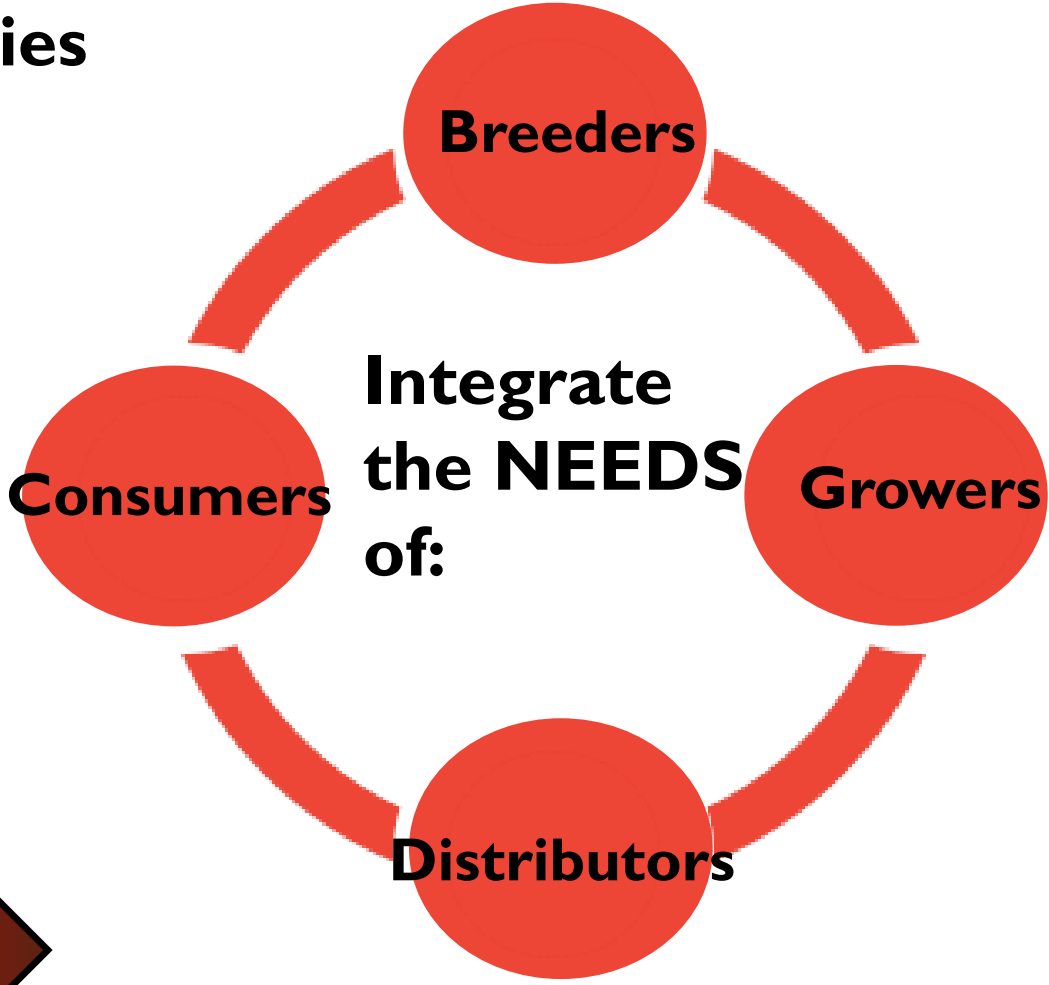
Farcuh Lab: What do we do?

Develop novel strategies for improving FRUIT:

Fruit Development | Harvest | Postharvest storage



Farcuh Lab: Research interests

- Assessing the impact of preharvest practices and environmental factors on fruit quality, nutritional

Please fill out the survey included in your Registration packet!!

- Interrelationships between fruit quality, microbial fruit safety and fungal pathogens.

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@FarcuhMacarena

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Stone fruit quality and consumer acceptance

Stone fruit quality and consumer acceptance

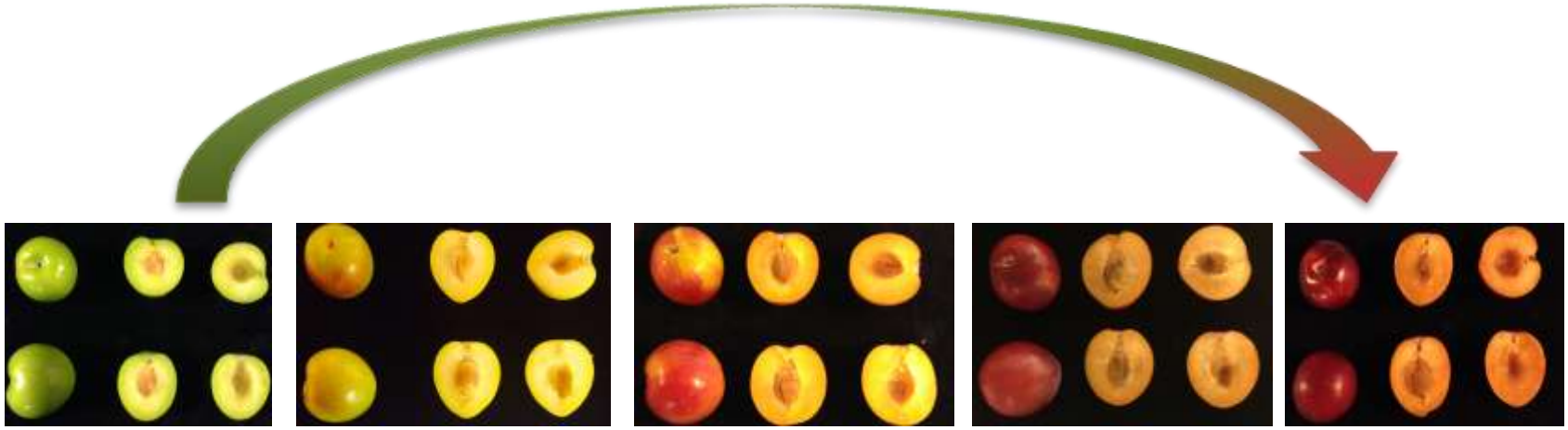
Color

Texture

Flavor

FRUIT QUALITY

Color



- Chlorophyll degradation
- Accumulation of non-photosynthetic pigments: Anthocyanins-Carotenoids

Texture

Fruit softening is crucial for fruit handling and postharvest potential:

- Cell wall modifications
- Turgor pressure
- Skin/cuticle composition

Flavor

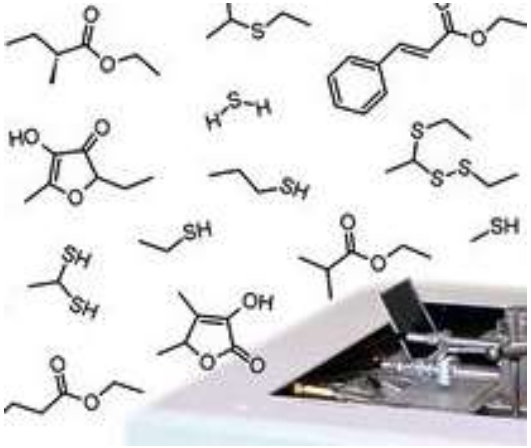
Highly complex trait:

TASTE + AROMA VOLATILES

Sweetness: SUGARS

Acidity: ORGANIC ACIDS

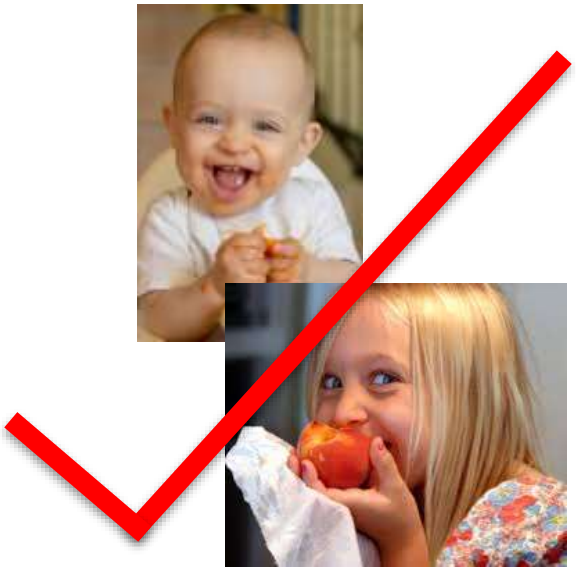
Production of **volatile** compounds



- Quantity
- Composition
- Balance

Fruit Flavor and Consumer Liking

Highly complex trait that contributes to liking:



Fruit flavor evaluation linked to consumer perception:

Sensory Science

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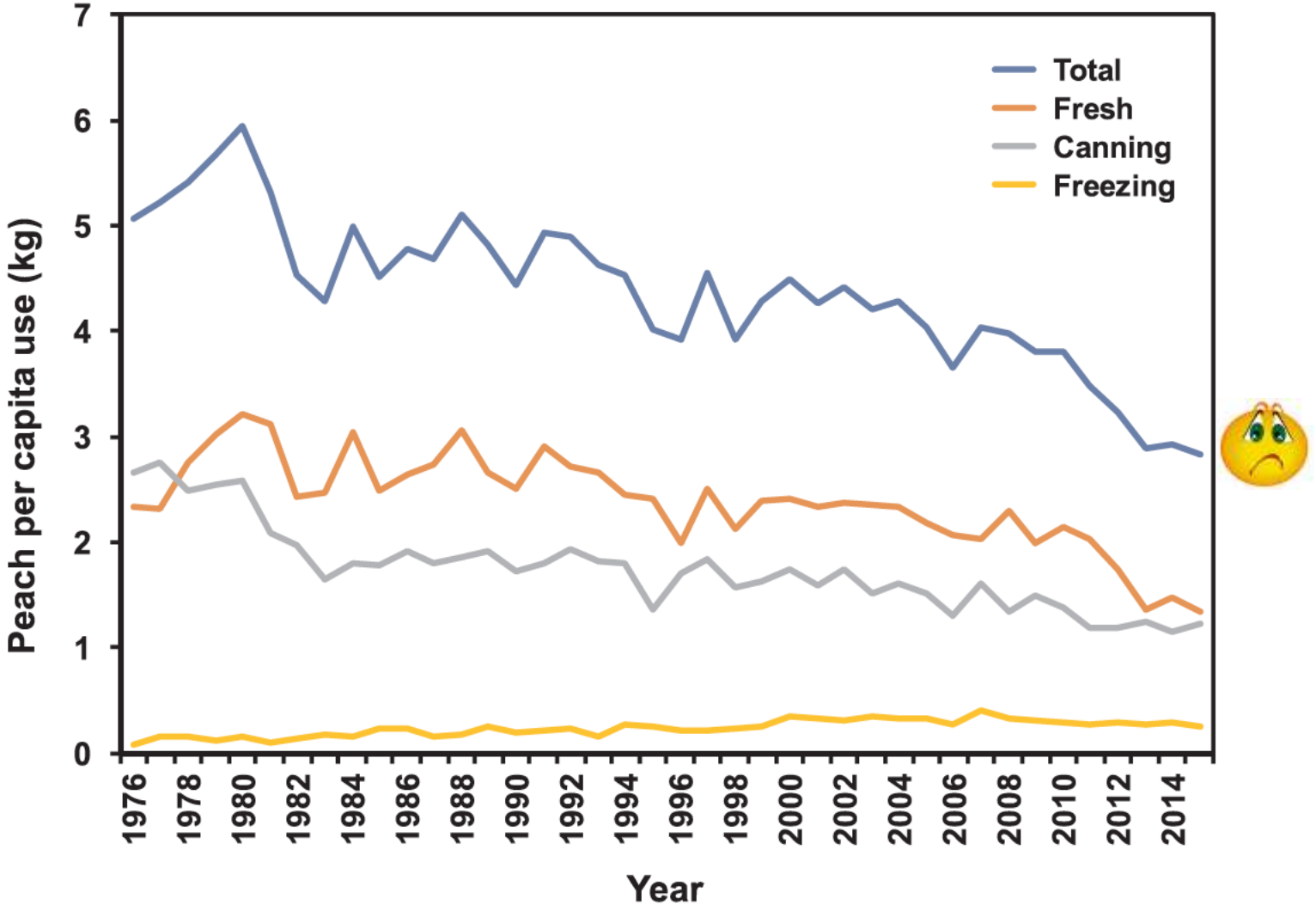
US Per Capita Peach Consumption



USDA, 2016

Stone fruit flavor and the supply chain

Breeders

Yield, size, disease resistance, long shelf-life, flesh firmness

Growers

Yield, fruit size, disease resistance, harvest in minimum picking intervals, appearance

Packers/Shippers/ Distributors

Long shelf-life, flesh firmness, texture, appearance, size

Consumers

Fruit flavor, health benefits, nutritional value

Stone fruit flavor and the supply chain

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Fruit flavor, health benefits, nutritional value

Stone fruit flavor and the supply chain

Focus on CONSUMERS:
<u>Fruit Flavor</u> presents a major opportunity to grow markets !!

Packers/Shippers/
Distributors

Long shelf-life, flesh firmness, texture, appearance, size

Consumers

Fruit flavor, health benefits, nutritional value

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Factors affecting Stone Fruit Flavor Development

1.- Genetic background
   - Cultivar selection
   - Rootstock Selection
2.- Environmental conditions
3.- Preharvest orchard management practices
4.- Maturity at harvest and harvest practices
5.- Postharvest practices

I.-Genetic Background: Cultivar Selection

Diversity of flavor profiles in different cultivars:

- Flesh color (yellow, white, red)
- Adherence of stone to flesh (freestone or clingstone)
- Texture (melting, non-melting or stony hard)
- Low acidity
- Shape (round or flat)

Freestone Melting

Preferred for fresh consumption

Clingstone Non-Melting

Burchell Nursery

I.-Genetic Background: Cultivar Selection

Diversity of flavor profiles in different cultivars:

- Flesh color (yellow, white, red)
- Adherence of stone to flesh (freestone or clingstone)

CRITICAL:

If genetic material has not been bred for flavor-related traits, these will not be developed in the field.

Preferred for flesh consumption

Burchell Nursery

I.-Genetic Background: Rootstock Selection

Rootstock selection can influence performance of flavor attributes of scion cultivar in *Prunus* sp. :

- Water relations
- Nutrition
- Tree vigor
- Bloom time
- Yield efficiency
- Ripening time and harvest maturity

Important to consider cultivar/ rootstock interactions in stone fruit flavor development.

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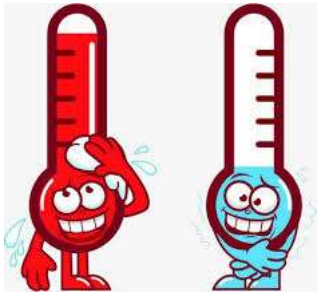
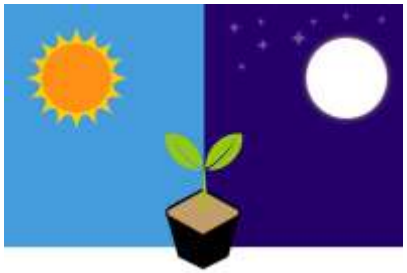
2.- Environmental Conditions





Stone fruit flavor profiles can be affected by:

- Growing seasons
- Growing locations
- Among trees within the orchard
- Within the same tree

Genotype/cultivar x environment interactions

2.- Environmental Conditions

Stone fruit flavor profiles can be

Stone fruit flavor development can vary according to environmental conditions

- Growing locations
- Among trees within the orchard
- Within the same tree

Genotype/cultivar x environment interactions

Factors affecting Stone Fruit Flavor Development

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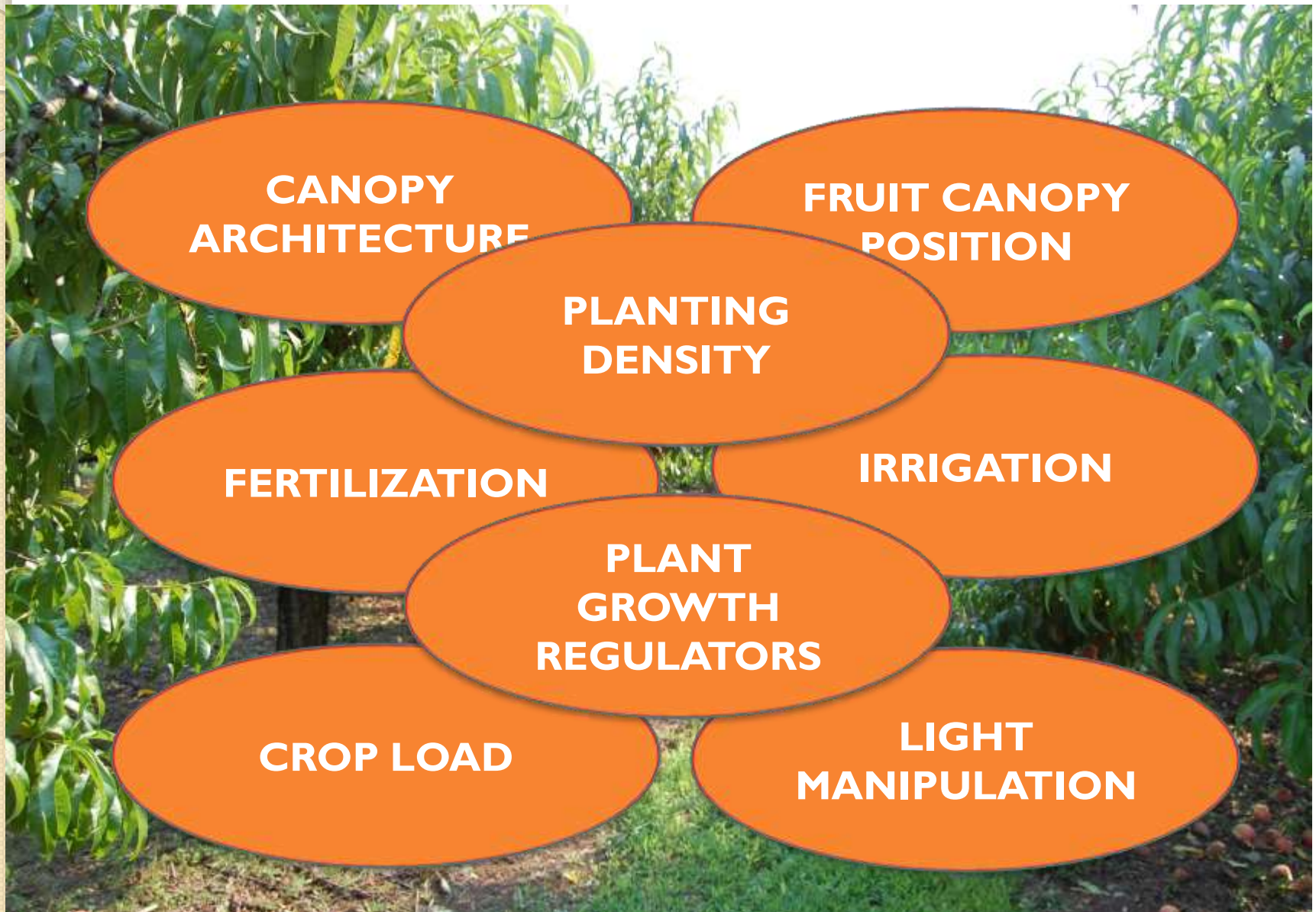
2.- Environmental conditions

3.- Preharvest orchard management practices

4.- Maturity at harvest and harvest practices

5.- Postharvest practices

3.- Preharvest Orchard Management Practices



3.- Preharvest Orchard Management Practices

Research needed to identify optimal cultural practices that maximize flavor quality:

- optimizing crop load
- avoiding excess nitrogen and water

Selection of optimal integrated crop management systems based not only on yield but also on flavor.

Optimizing cultural practices towards a balanced orchard.

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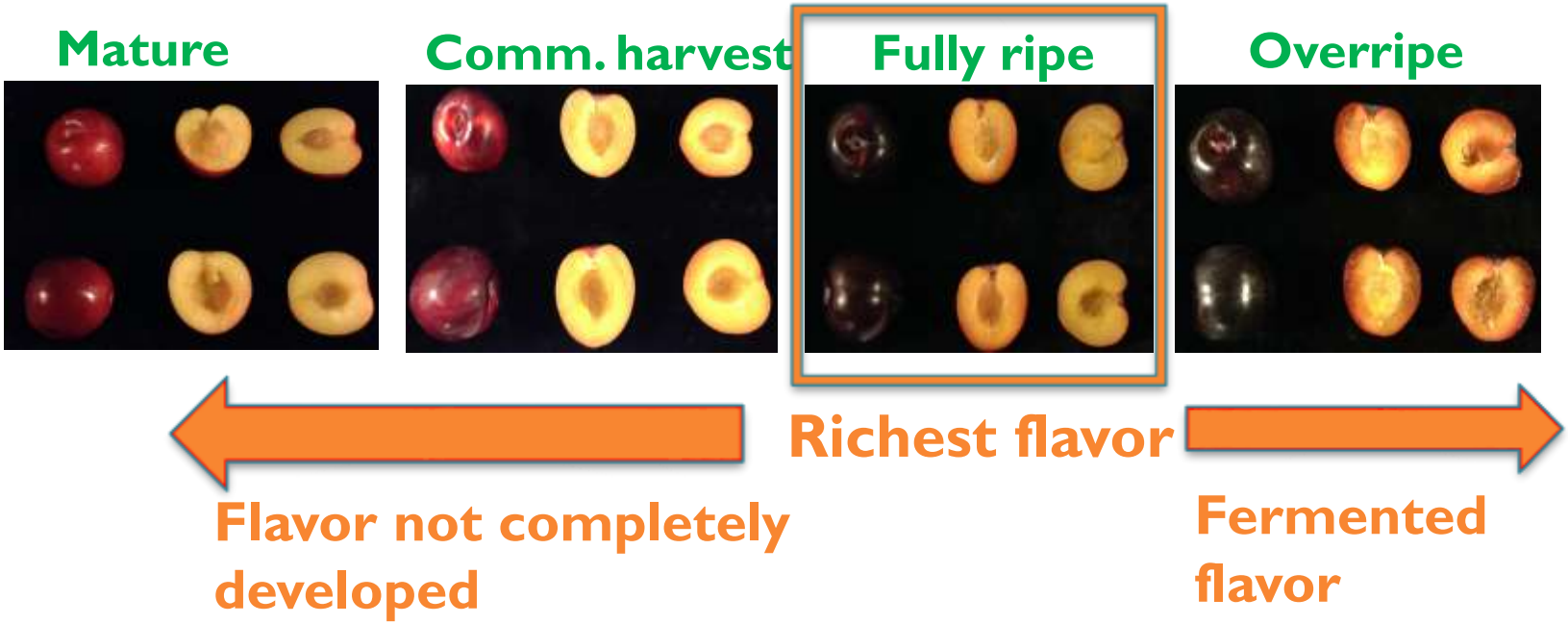
4.- Maturity and Harvest Practices

Stone Fruit Ripening Stages



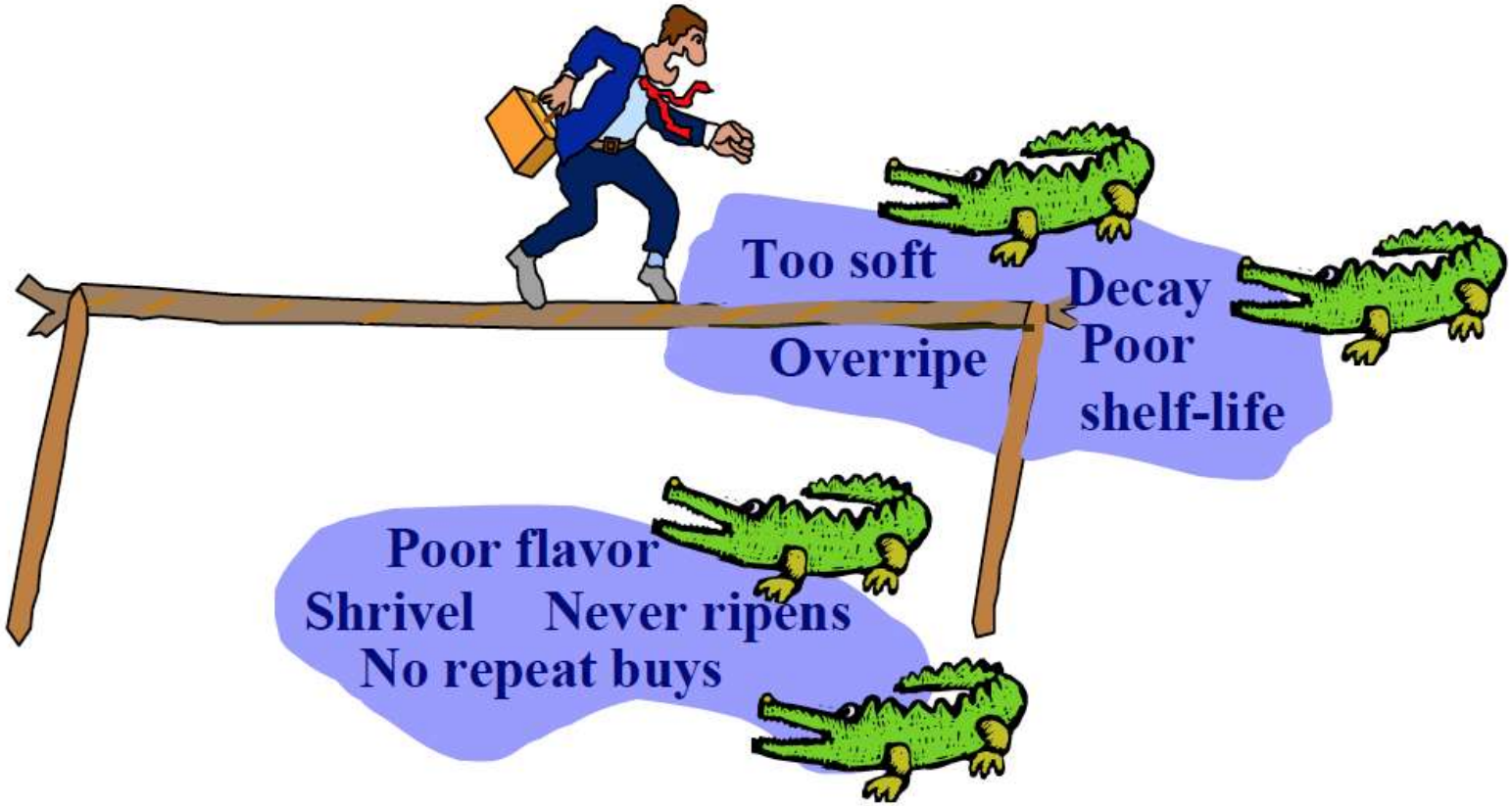
4.- Maturity and Harvest Practices

Japanese Plum Fruit Ripening Stages

Harvesting at the correct maturity stage is key for maximizing stone fruit flavor development

4.- Maturity and Harvest Practices

A balancing act…..



Slide from Dr. Marita Cantwell

Factors affecting Stone Fruit Flavor Development

1.- Genetic background
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   - Rootstock Selection

2.- Environmental conditions

3.- Preharvest orchard management practices

4.- Maturity at harvest and harvest practices

5.- Postharvest practices

5.- Postharvest practices

- Storage temperature x time:

  AVOID: 36°F to 46°F

  ↑ Chilling Injury symptoms:

  1) Loss of flavor/Development off- flavors
  2) Flesh Mealiness
  3) Flesh Browning

- **AVOID:** breaks in cold temperature chain
- Relative Humidity of 90-95%

5.- Postharvest practices

PRECONDITIONING: Maintain fruit flavor

- Fruits held at 68º F (24-48 hrs) **before** cold storage (32°**F**)
- Considerations:
  - Weight loss and softening

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TAKE-HOME MESSAGES/ TIPS

- **Fruit Flavor = Taste + Aroma Volatiles**
- Stone Fruit Flavor strongly associated to **consumer liking**
- Focus on **CONSUMERS**: Fruit Flavor presents a major opportunity to grow markets !!

TAKE-HOME MESSAGES/ TIPS

Factors affecting **Stone Fruit Flavor development**:

1.- Genetic background : selection of **cultivar** + **rootstock**

2.- Environment: setup small **trials**

3.- Preharvest orchard management practices: optimize practices towards a **balanced orchard**

4.- Maturity at harvest and harvest practices: avoid focusing on **appearance and shelf-life** at the **expense of flavor**

5.- Postharvest practices:

- Avoid **36°F and 46°F**
- **Favor** use of **preconditioning** + storage temperature **32°F**
- Avoid **breaks** in cold chain

THANKS FOR YOUR ATTENTION.

PLEASE FILL OUT THE SURVEY INCLUDED IN YOUR REGISTRATION PACKET!!!