Breeding for fruit quality: Phenotyping strategies and marker development

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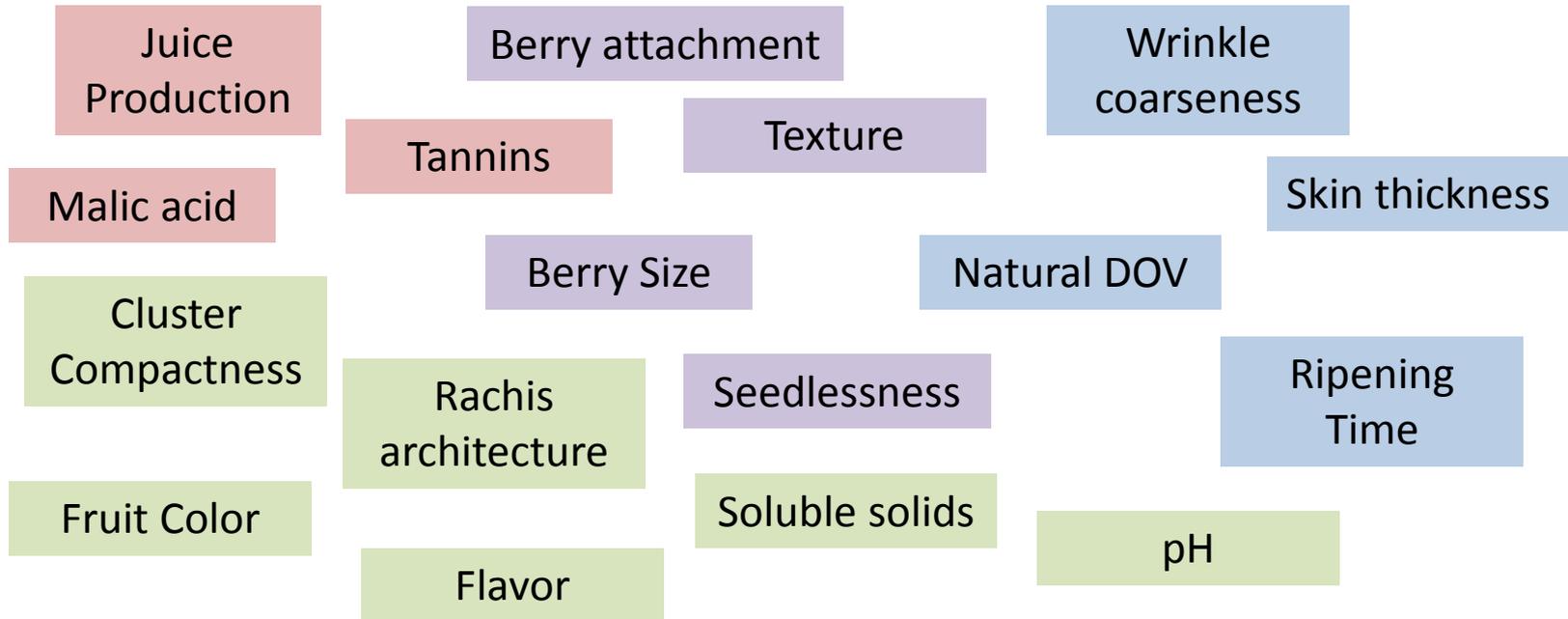# VitisGen2

- Improving Fruit Quality of Grape

    Research to improve our understanding of the traits and genetics underlying fruit quality and develop tools and methodologies to streamline the breeding process

What fruit quality characteristics?
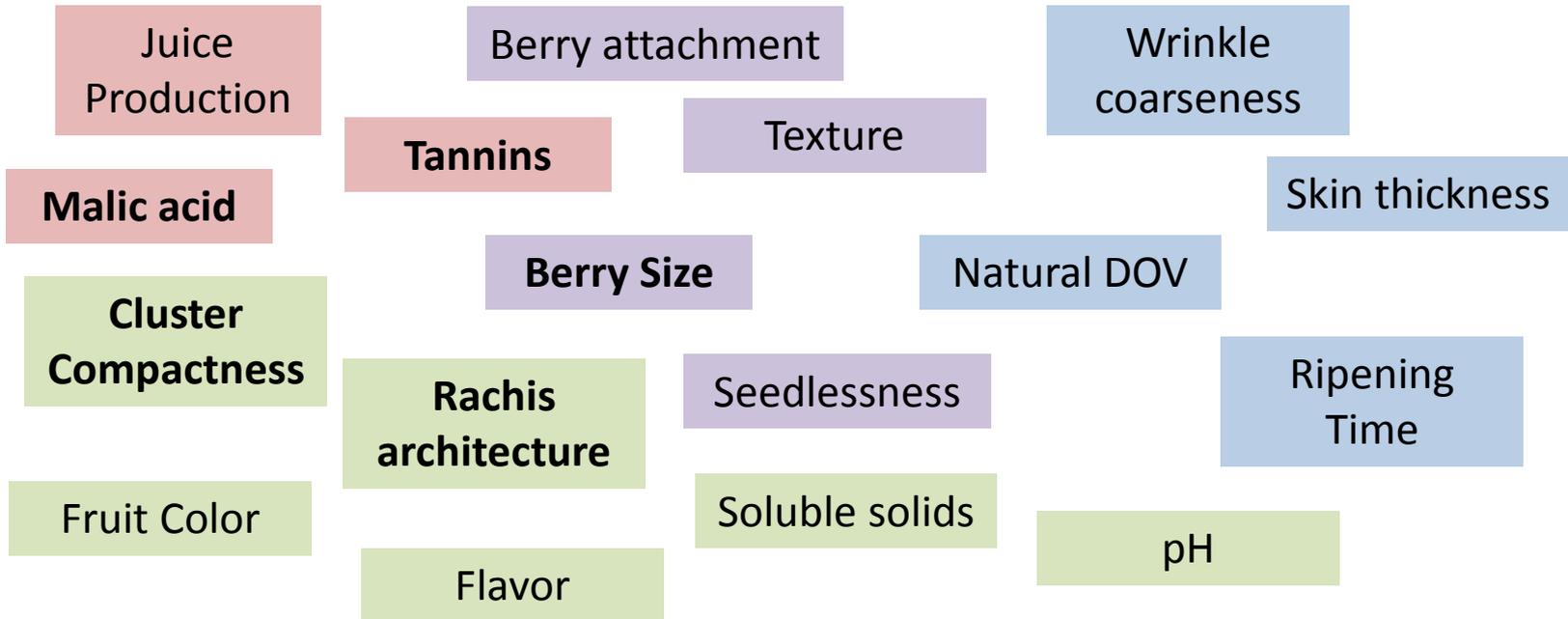
Wine • Table • Raisin

Juice Production

Berry attachment

Wrinkle coarseness

Tannins

Texture

Skin thickness

Malic acid

Berry Size

Natural DOV

Cluster Compactness

Rachis architecture

Seedlessness

Ripening Time

Fruit Color

Soluble solids

pH

Flavor

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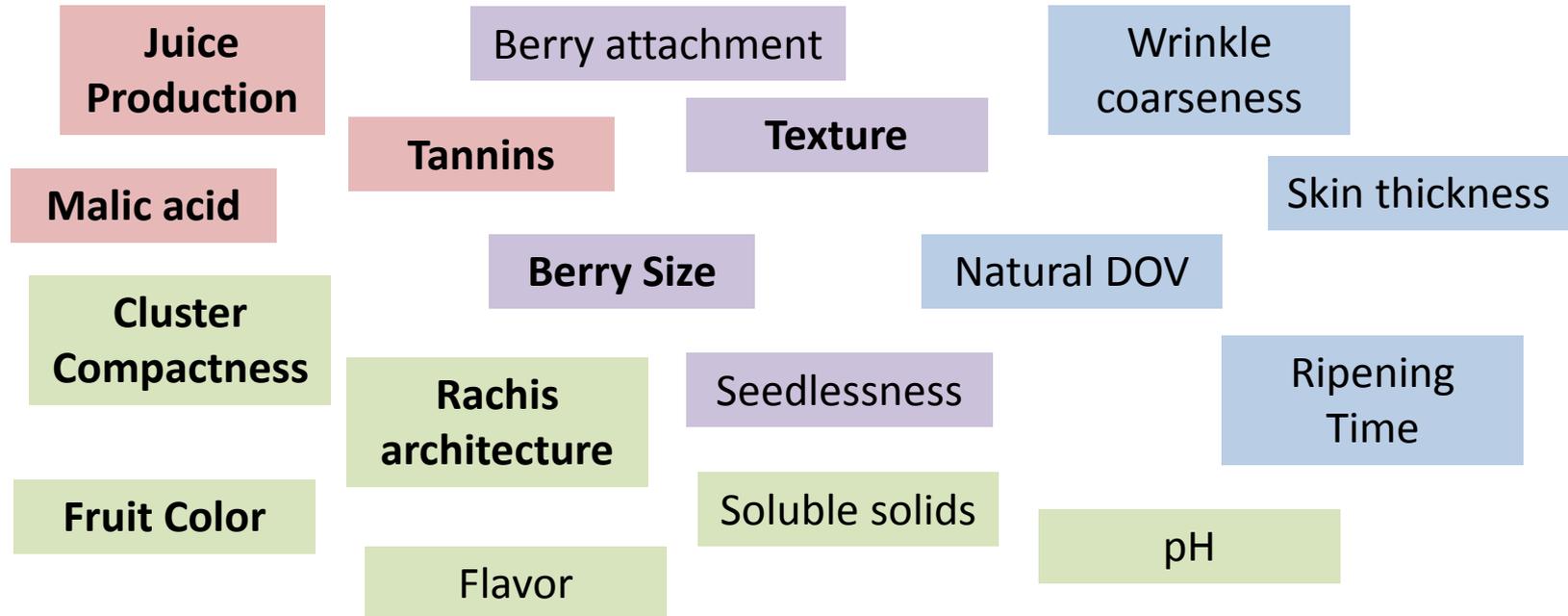
Flavor

Commercial Quality Cultivars

Traditional tools

- Automated titration systems (pH and Brix)

- Visual ratings (size/color)

- Metric based (scales and rulers)

- Panels (texture/flavor)

Limitations for mapping

- Automated titration systems (pH and Brix)
  - Labor intensive

- Visual ratings (size/color)
  - Highly subjective

- Metric based (scales and rulers)
  - Labor intensive

- Panels (texture/flavor)
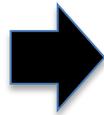 - Highly subjective

High-throughput reliable phenotyping

- Digital (images)

- Chemical (HPLC)

- Mechanical (texture analysis)

- Mathematical (predictive algorithms)
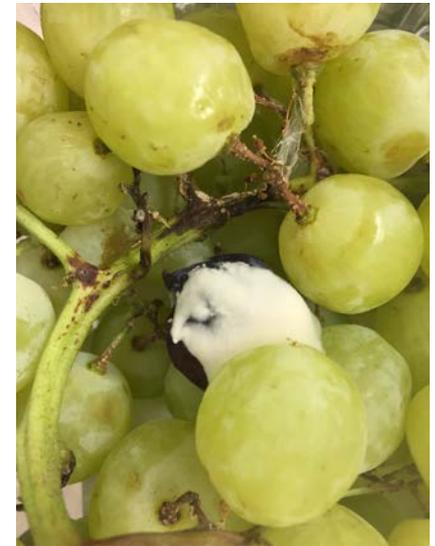
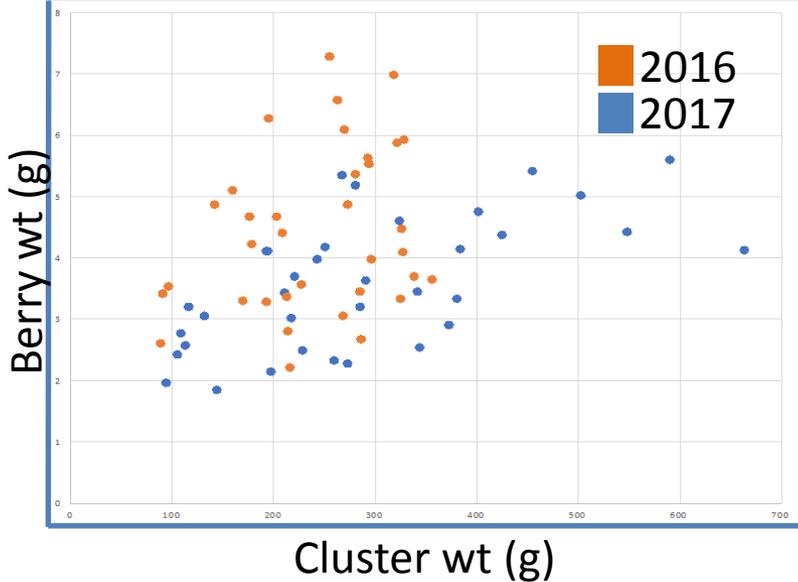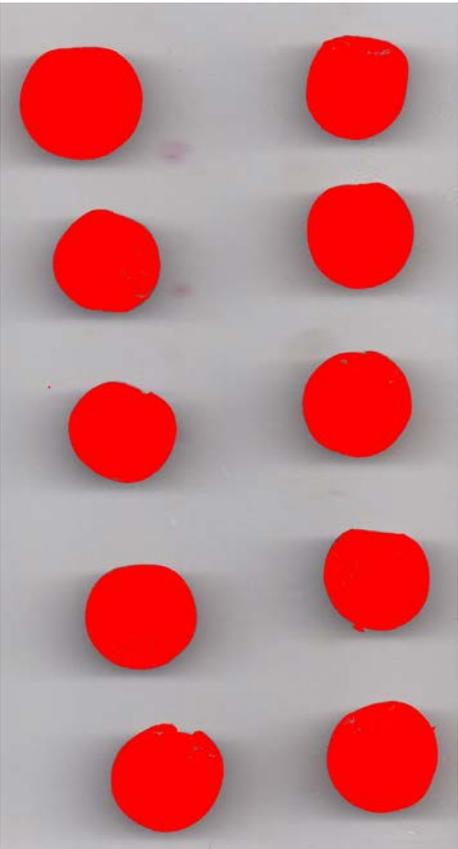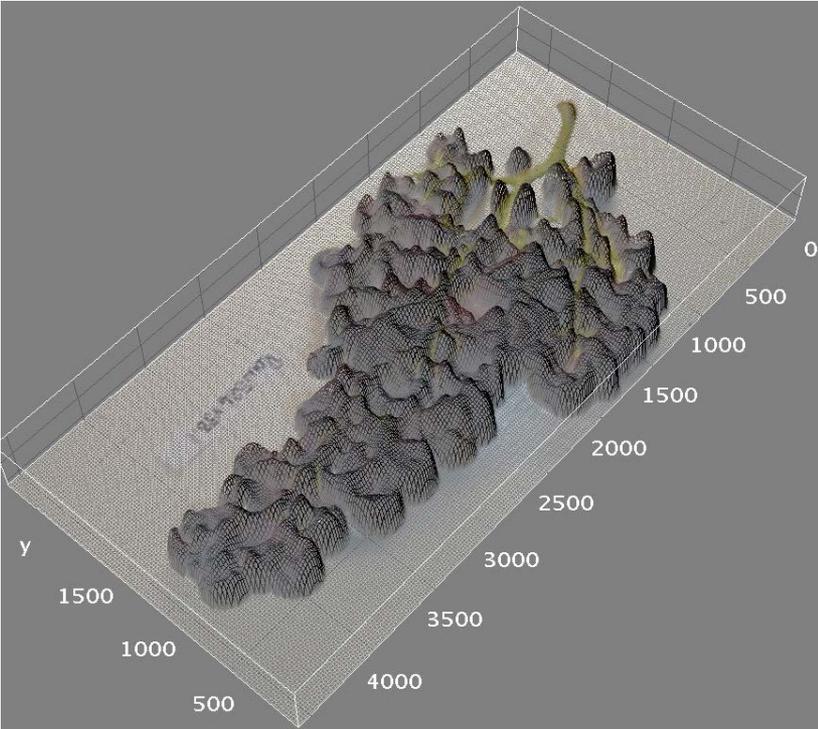# How do we measure fruit architecture?

Currently investigating digital-based high throughput methods for cluster evaluation

Imaging of clusters, rachis and berries

Combining digital images with traditional data (berry and cluster weights)

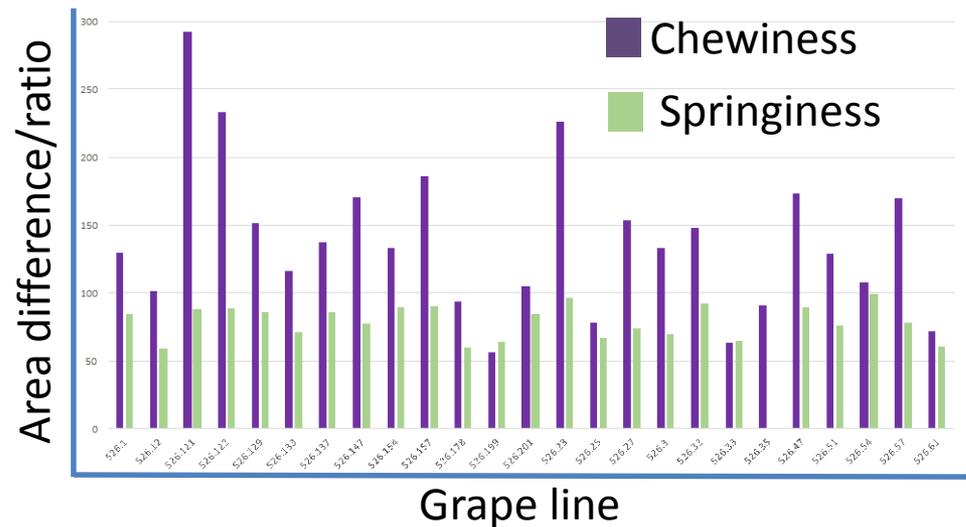Exploring algorithm-based analyses of images for cluster evaluations
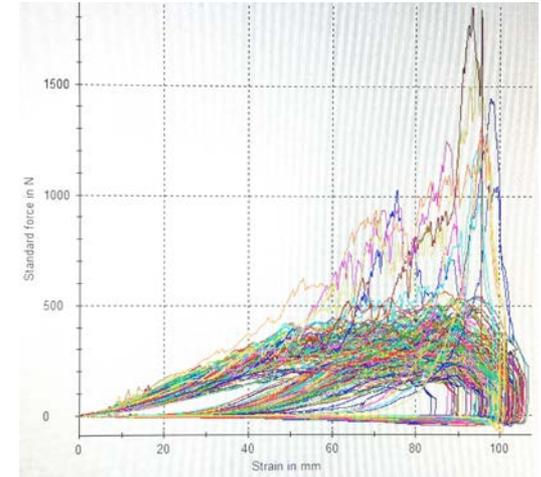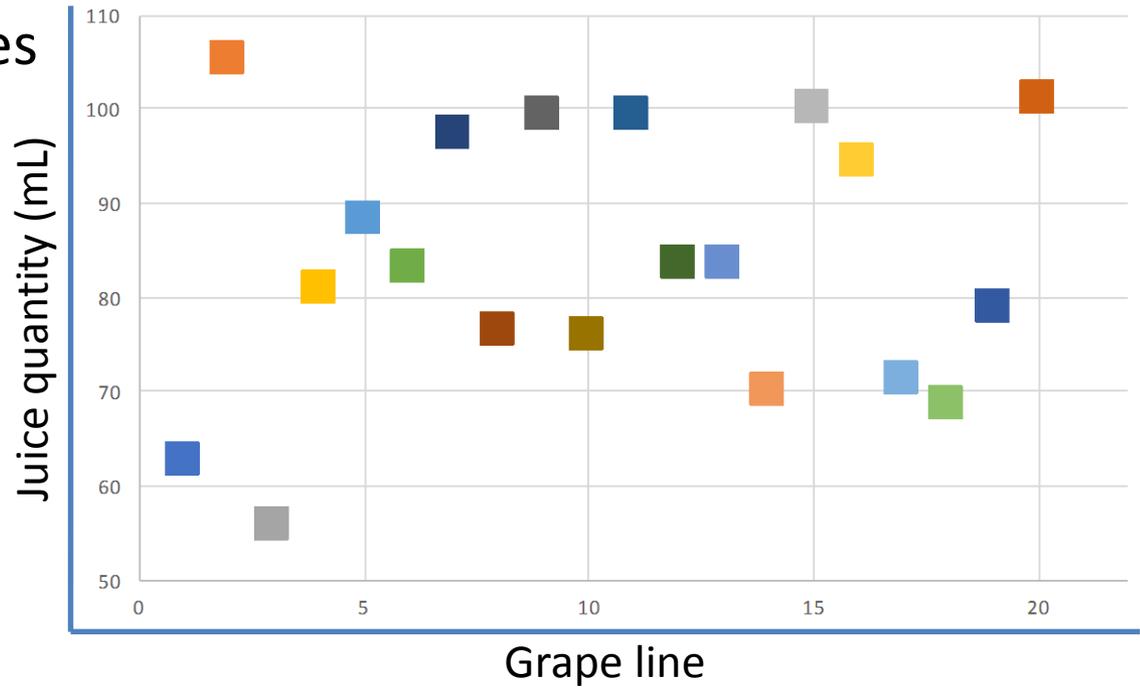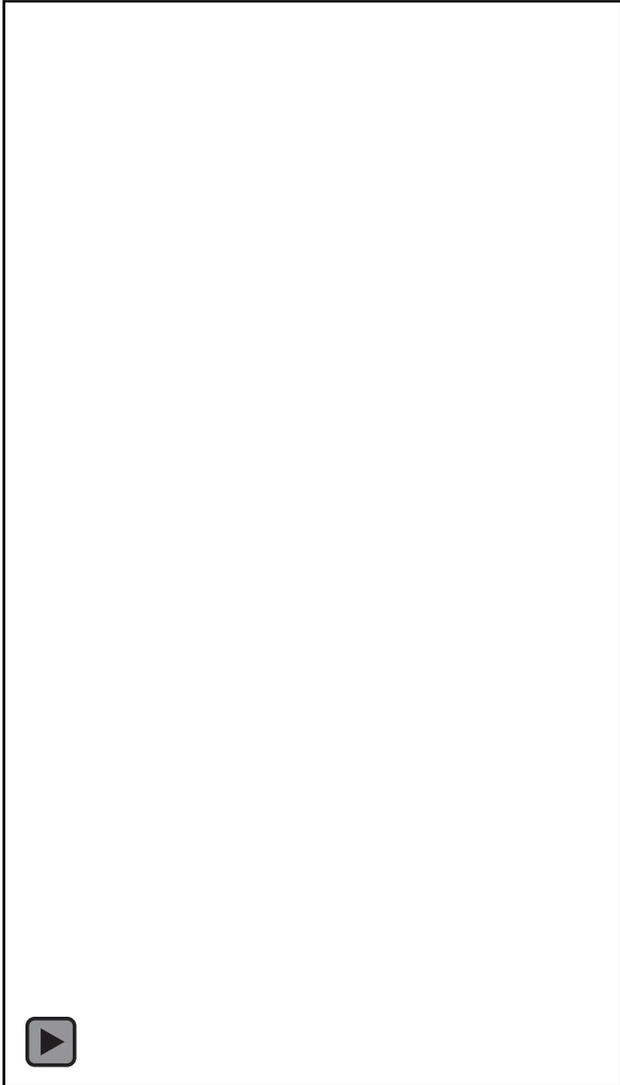

Drs. Dan Chitwood and Matt Clark

How do we measure fruit texture, and juice quantity?

Differences in texture are evident, but what is a meaningful quantitative measurement?

Juice production varied widely between grape lines

Juice amount correlated with the weight of the sample, but was not correlated with the number of berries in the sample or the springiness of the sample

At the end

- Aim to develop molecular markers or other predictive tools for:
  - Cluster architecture
  - Wine quality
  - Texture
  - Juice production

- To improve breeding efficiency and reduce the resources spent on undesirable material

New NDOV cultivar:

'Sunpreme'

Cultivar characteristics:

- Early ripening fruit

- Natural berry drying without cane-cutting

- Spur fruitful vines

- No resistance to PM

- Patented 22 Mar '16   PP26,527

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Slide courtesy of Dr. Craig Ledbetter

Thank you

Jenny Vasquez

Marcos Alvarez

Cameron Saunders

USDA

Gavin Sacks Anna Mansfield

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College of Agriculture and Life Sciences