

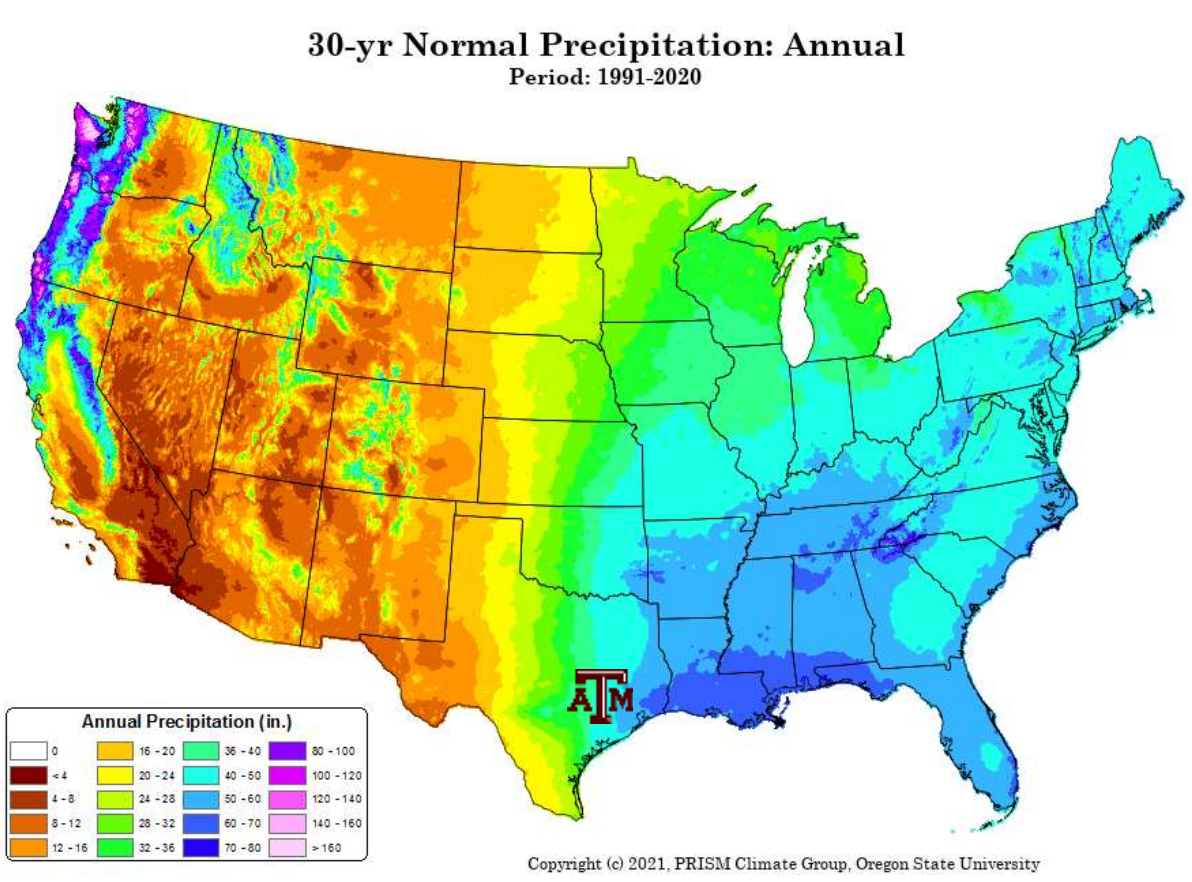
Growing Pierce Diseases Resistant Wine Grapes in the Southeast: Successes and Challenges

Justin Scheiner, Ph.D.

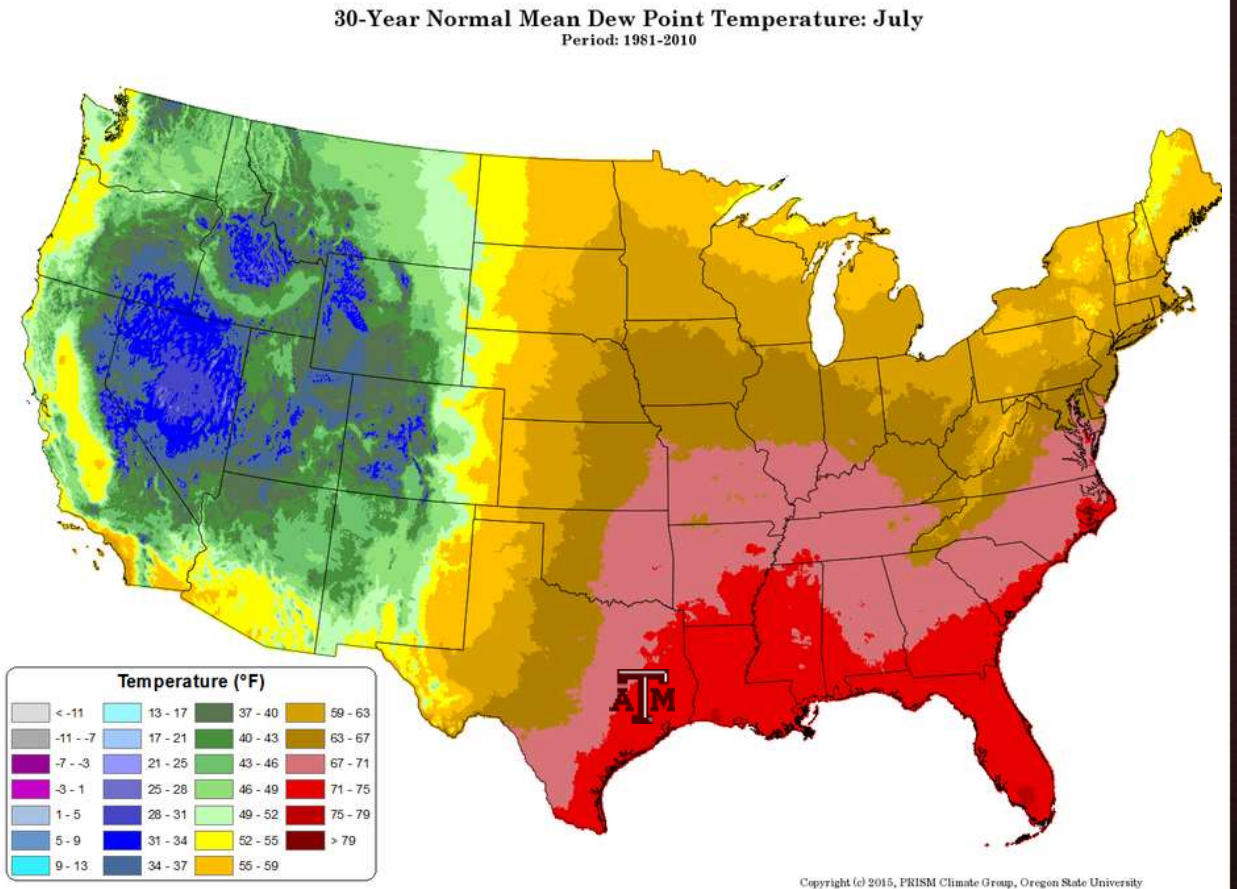
Dept. Horticultural Sciences, Texas A&M

TEXAS A&M UNIVERSITY

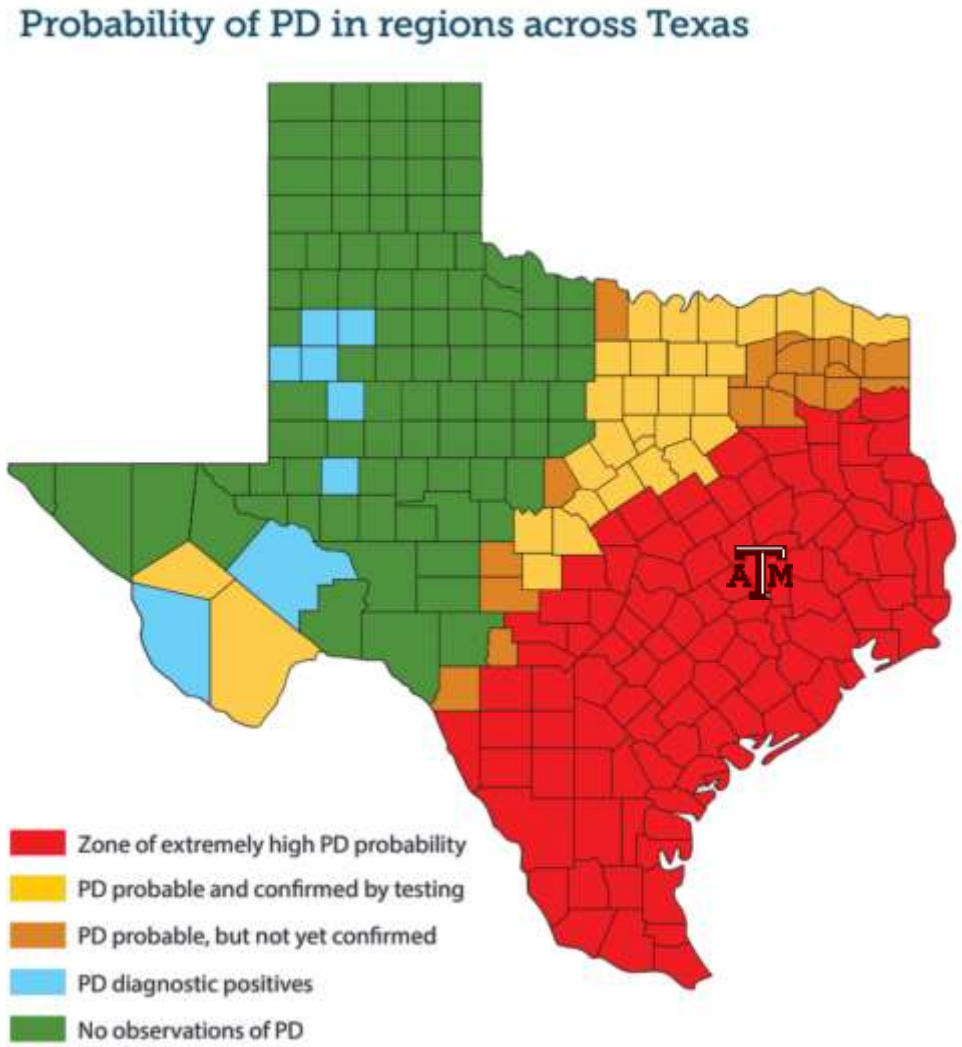
Rainfall



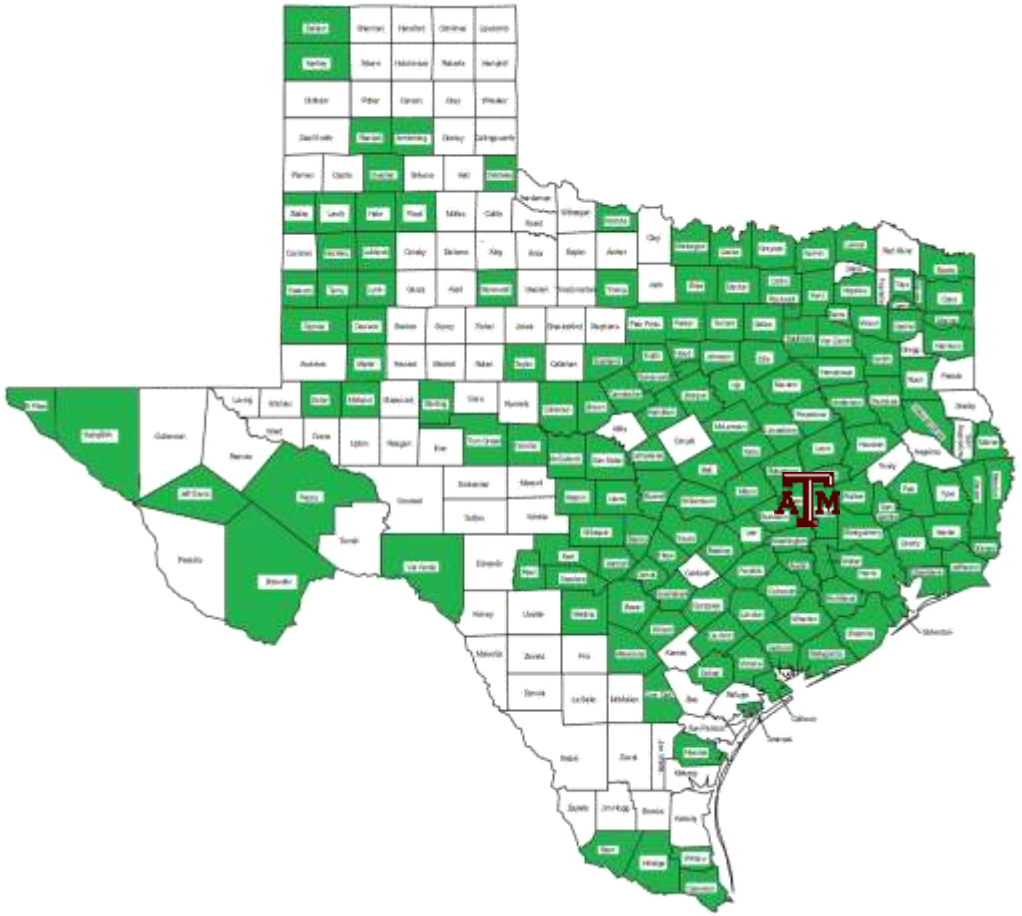
Humidity



Grape Growing in Texas



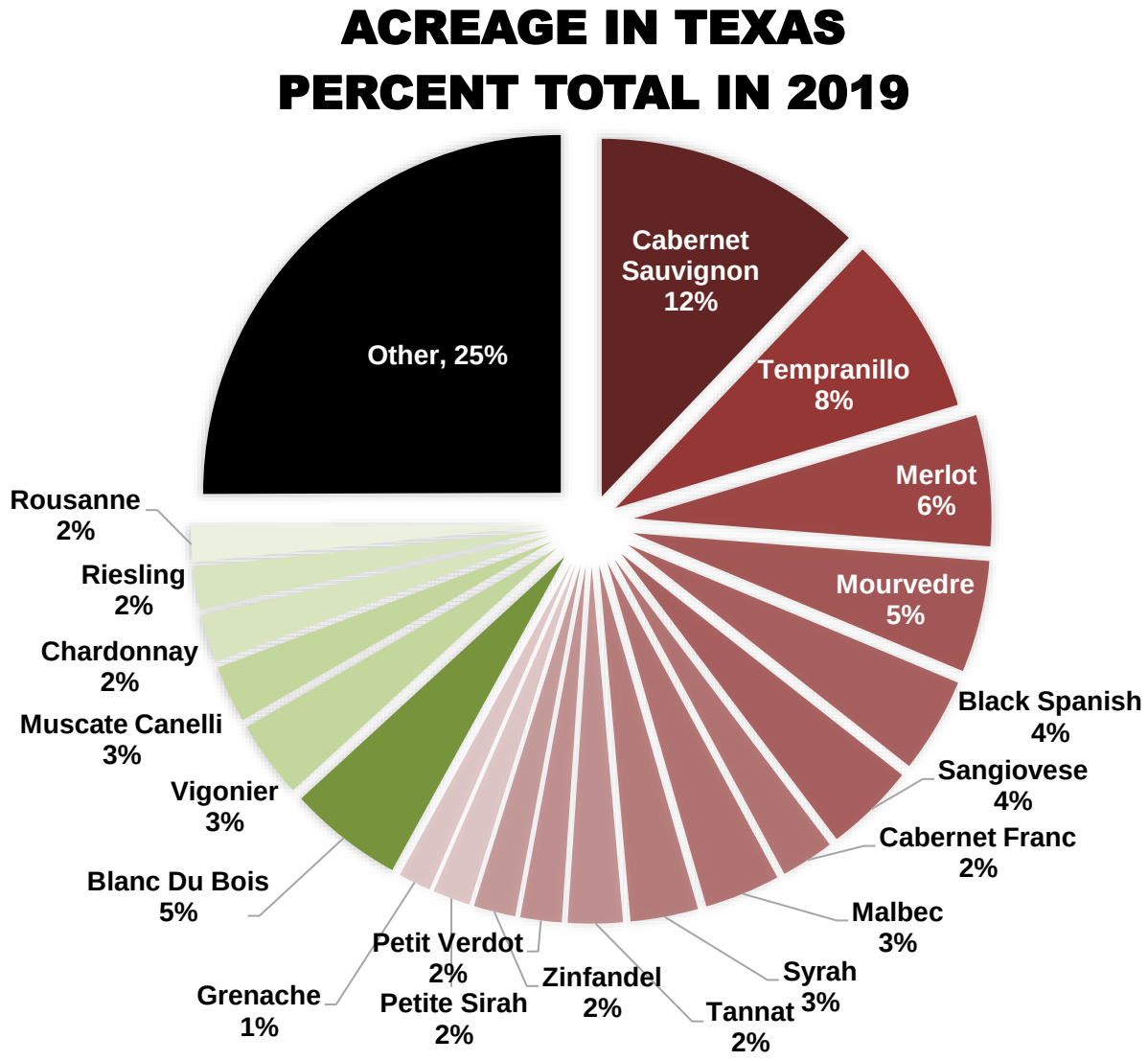
Counties with vineyards



TEXAS A&M AGRILIFE EXTENSION

Grape Production in Texas

- **Acreage:** 7,000 - 8,000 acres
- **Types:** European (*Vitis vinifera*) cultivars > Interspecific hybrids > muscadines
- **Most important characteristics:** disease resistance, quality potential, name recognition



Sources: USDA-NASS

Tropical Moisture

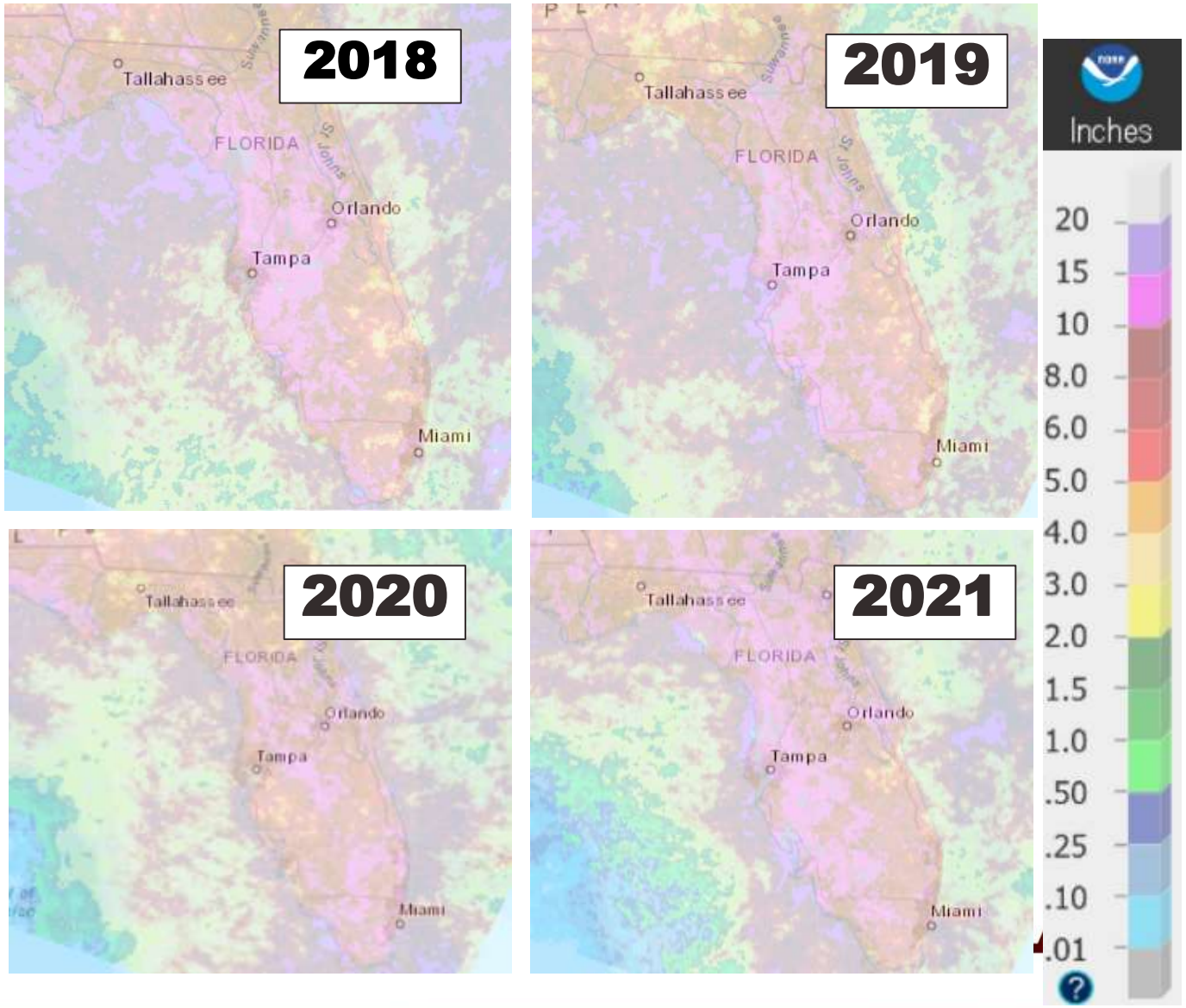
Planned, but Flexible Spray Program

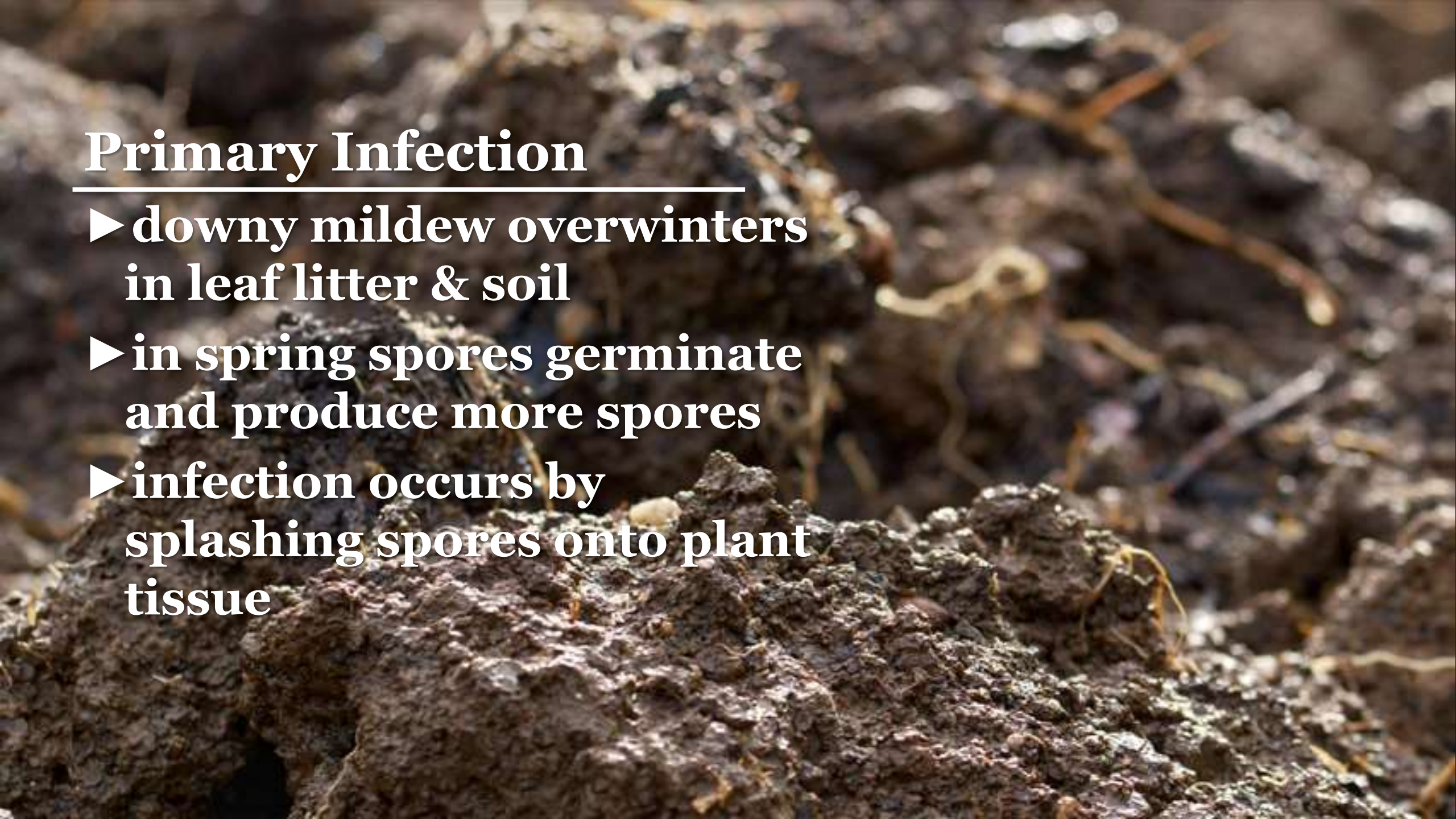
Every season is different
- ► Rainfall
- ► Humidity
- ► Cloud cover

Grapes vary in susceptibility
- ► Black Spanish = poster child for downy
- ► Tempranillo/Chardonnay = poster child for powdery
- ► Muscadines = tough as nails compared to bunch grapes

Pesticides vary widely
- ► Efficacy
- ► Price
- ► Mode of action
- ► REI's, PHI's, etc.

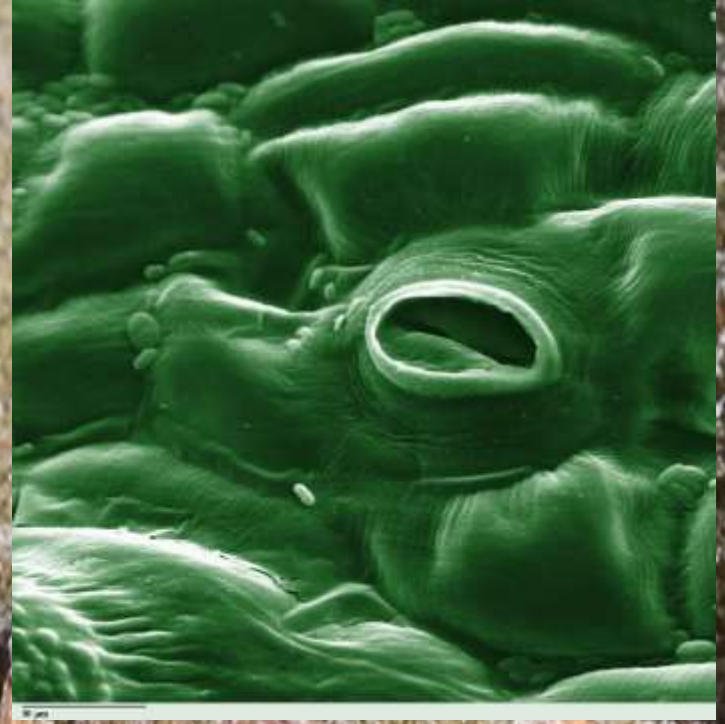
May Precipitation





Primary Infection

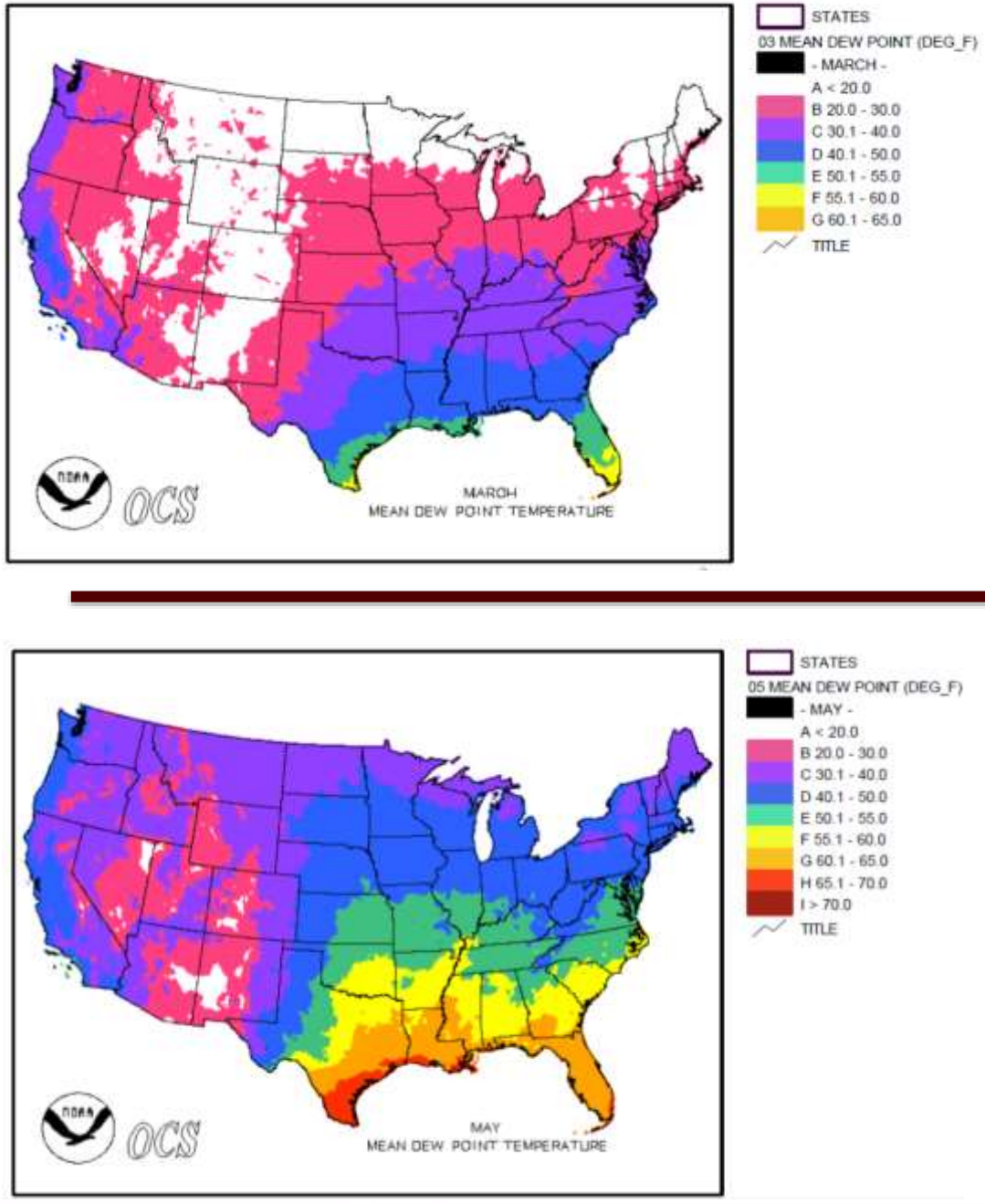
- downy mildew overwinters in leaf litter & soil
- in spring spores germinate and produce more spores
- infection occurs by splashing spores onto plant tissue

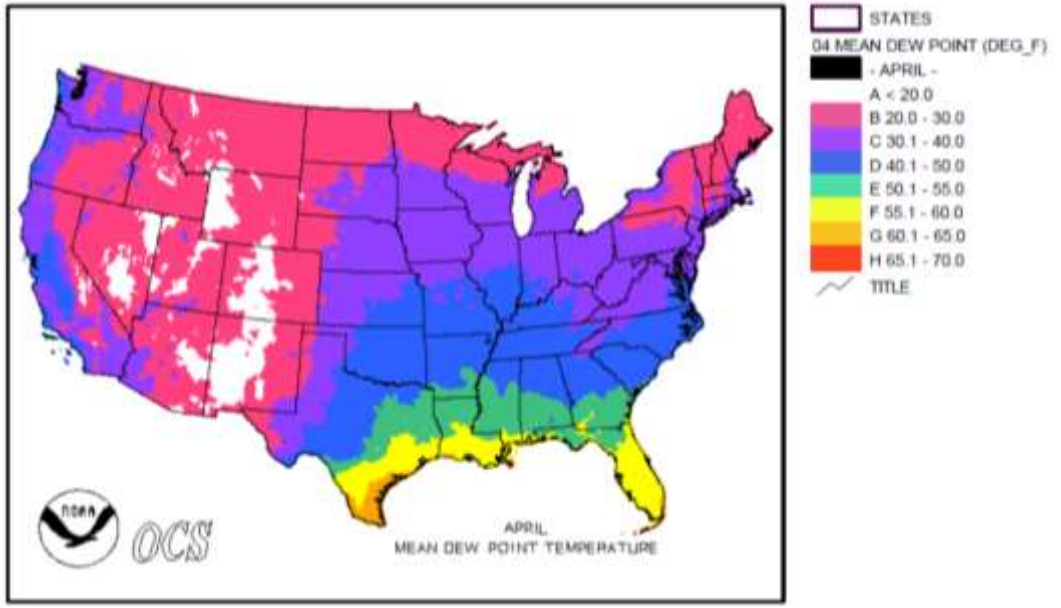


Secondary Infection

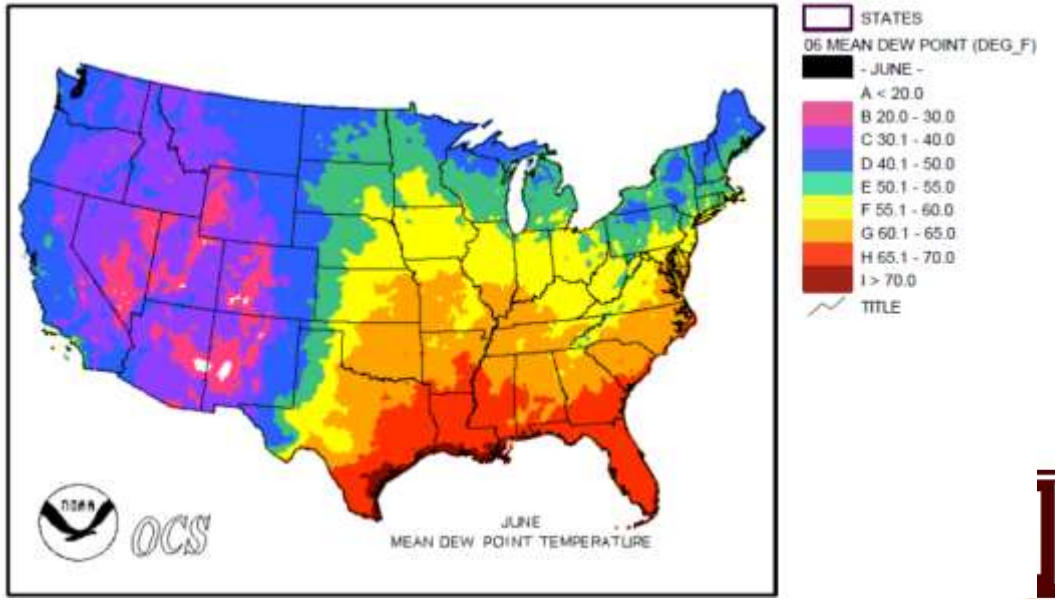
- ►At night with high humidity and temps above 55°F, DM sporulates
- ►spores are blown or splashed
- ►spores germinate with ≥2 hours of wetness at 77°F and up to 9 hours at 43°F

Leaf Wetness


STATES
03 MEAN DEW POINT (DEG_F)
- MARCH -
A < 20.0
B 20.0 - 30.0
C 30.1 - 40.0
D 40.1 - 50.0
E 50.1 - 55.0
F 55.1 - 60.0
G 60.1 - 65.0
TITLE
NOAA
OCS
MARCH
MEAN DEW POINT TEMPERATURE


STATES
04 MEAN DEW POINT (DEG_F)
- APRIL -
A < 20.0
B 20.0 - 30.0
C 30.1 - 40.0
D 40.1 - 50.0
E 50.1 - 55.0
F 55.1 - 60.0
G 60.1 - 65.0
H 65.1 - 70.0
TITLE
NOAA
OCS
APRIL
MEAN DEW POINT TEMPERATURE

STATES
05 MEAN DEW POINT (DEG_F)
- MAY -
A < 20.0
B 20.0 - 30.0
C 30.1 - 40.0
D 40.1 - 50.0
E 50.1 - 55.0
F 55.1 - 60.0
G 60.1 - 65.0
H 65.1 - 70.0
I > 70.0
TITLE
NOAA
OCS
MAY
MEAN DEW POINT TEMPERATURE


STATES
06 MEAN DEW POINT (DEG_F)
- JUNE -
A < 20.0
B 20.0 - 30.0
C 30.1 - 40.0
D 40.1 - 50.0
E 50.1 - 55.0
F 55.1 - 60.0
G 60.1 - 65.0
H 65.1 - 70.0
I > 70.0
TITLE
NOAA
OCS
JUNE
MEAN DEW POINT TEMPERATURE

Symptom progression

Oil-soaked lesion

Lesion takes on yellow color

Tissue dies and turns brown

Symptoms of infection become visible within 7-12 days after infection

Symptoms of Downy Mildew


Downy Mildew

Susceptibility to Downy Mildew

Black Spanish > **Blanc Du Bois** ? = **Camminare Noir** > **Blanc Du Soleil** **Lomanto**

V. vinifera

Downy Mildew

- Timing of control: first unfolded leaves through leaf drop in fall
  - critical period for fruit infections from 2 to 3 weeks pre-bloom through 6 weeks post-bloom (but rachis may be infected all season)
- Open canopy for air circulation and spray penetration

Symptoms can vary by variety, tissue, and tissue age.








Increasing Canopy Drying Time

1. Row orientation
2. Training system
3. Proper pruning
4. Vigor Management
5. Shoot positioning
6. Shoot thinning
7. Leaf removal

The other fun guys.

Black Rot

Anthracnose

Powdery Mildew

Phomopsis

Downy Mildew Fungicides

- Abound, Aframe, Satori - **azoxystrobin**
- Dithane, Koverall, Manzate, Penncozeb, Roper – **mancozeb**
- Gavel – **zoxamide + mancozeb**
- Kocide, others – **fixed copper**
- Pristine – **pyraclastrobin + boscalid**
- Rampart, Phostrol, ProPhyte, Aliette – **phosphorous acid**
- Reason – **fenamidone**
- Ridomil Gold MZ or Copper **- mefanoxam + mancozeb or copper**
- Revus, Revus Top – **mandipropamid**
- Tanos **- famoxadone + cymoxanil**
- Zampro **- ametoctradin + dimethomorph**

Fungicides Properties

- Efficacy
- Physical mode of action
- Biochemical mode of action
- Risk of resistance
- Active ingredient
- Mobility
- Rainfastness/wash-off
- Phytotoxicity
- Restricted entry interval
- Pre-harvest interval
- Compatibility (tank mix)
- Cost

Physical Mode of Action

Temporal activity of the fungicide

- **Protectant (forward activity)**
  - control disease if applied before fungus infects the plant (e.g., Mancozeb)
- **Post-infection (curative, backward activity)**
  - controls disease after the infection has occurred, but before symptoms appear (e.g., DMI fungicides)
- **Anti-sporulant**
  - significantly reduced sporulation when applied to infected tissues
- **Eradicant**
  - kills most or all of the fungal colony after symptoms appear (very few fungicides have this property (e.g., topical treatments)

Downy Mildew Fungicides With Protectant Activity

- Abound, Satori, Quadris Top
- Dithane, Roper, Koverall, Manzate
- Forum
- Gavel
- Kocide 3000
- Pristine
- Rampart, Phostrol, ProPhyte, OxiPhos, Alliete
- Ranman
- Reason
- Ridomil Gold Copper, Ridomil Gold MZ
- Zampro

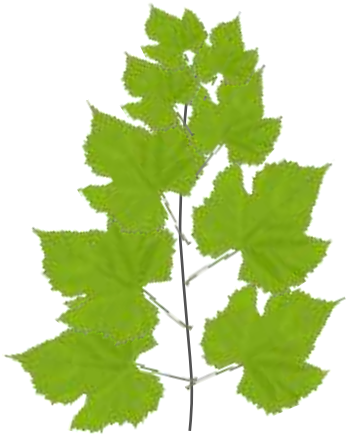
Downy Mildew Fungicides With Post-Infection Activity

- Gavel
- Rampart, Phostrol, ProPhyte, OxiPhos, Alliete
- Ranman?
- Reason
- Revus, Revus Top
- Ridomil Gold Copper, Ridomil Gold MZ
- Zampro?

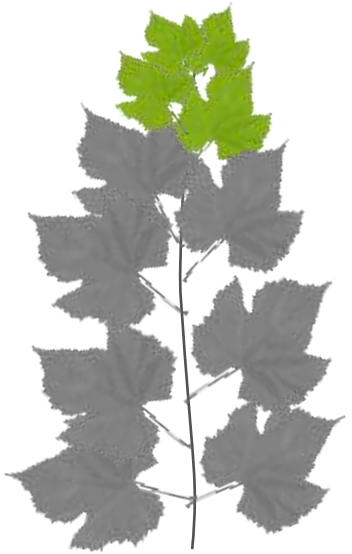
Fungicide Mobility

Surface active (contact)

- ► not absorbed by plant tissue
- ► most are broad spectrum (e.g., captan, mancozeb)



Leaves produced after application not protected



Downy Mildew Contact Fungicides

- Dithane, Roper, Koverall, Manzate
- Kocide 3000

Fungicide Mobility

Systemic

►enters and moves through the plant

►resistant to wash off (e.g., mefanoxam)

Locally systemic

►enters and short distances through the plant

Translaminar

►moves through the leaf and protects both sides

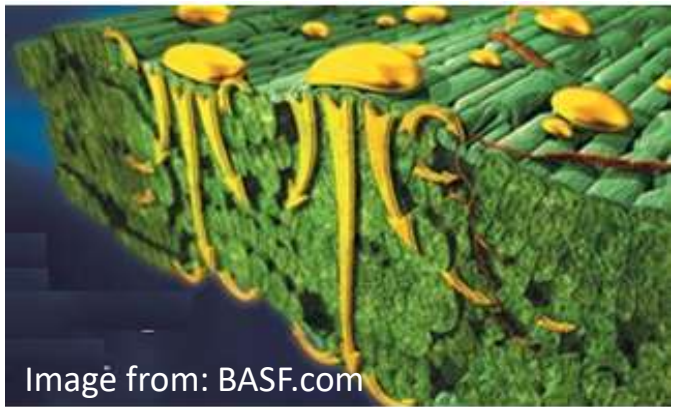


Image from: BASF.com

Downy Mildew Systemic Fungicides

- Abound, Satori, Quadris Top
- Forum
- Gavel
- Pristine
- Rampart, Phostrol, ProPhyte, OxiPhos, Alliete
- Ranman
- Reason
- Revus, Revus Top
- Ridomil Gold Copper, Ridomil Gold MZ
- Zampro

Summer Bunch Rots

Ripe rot

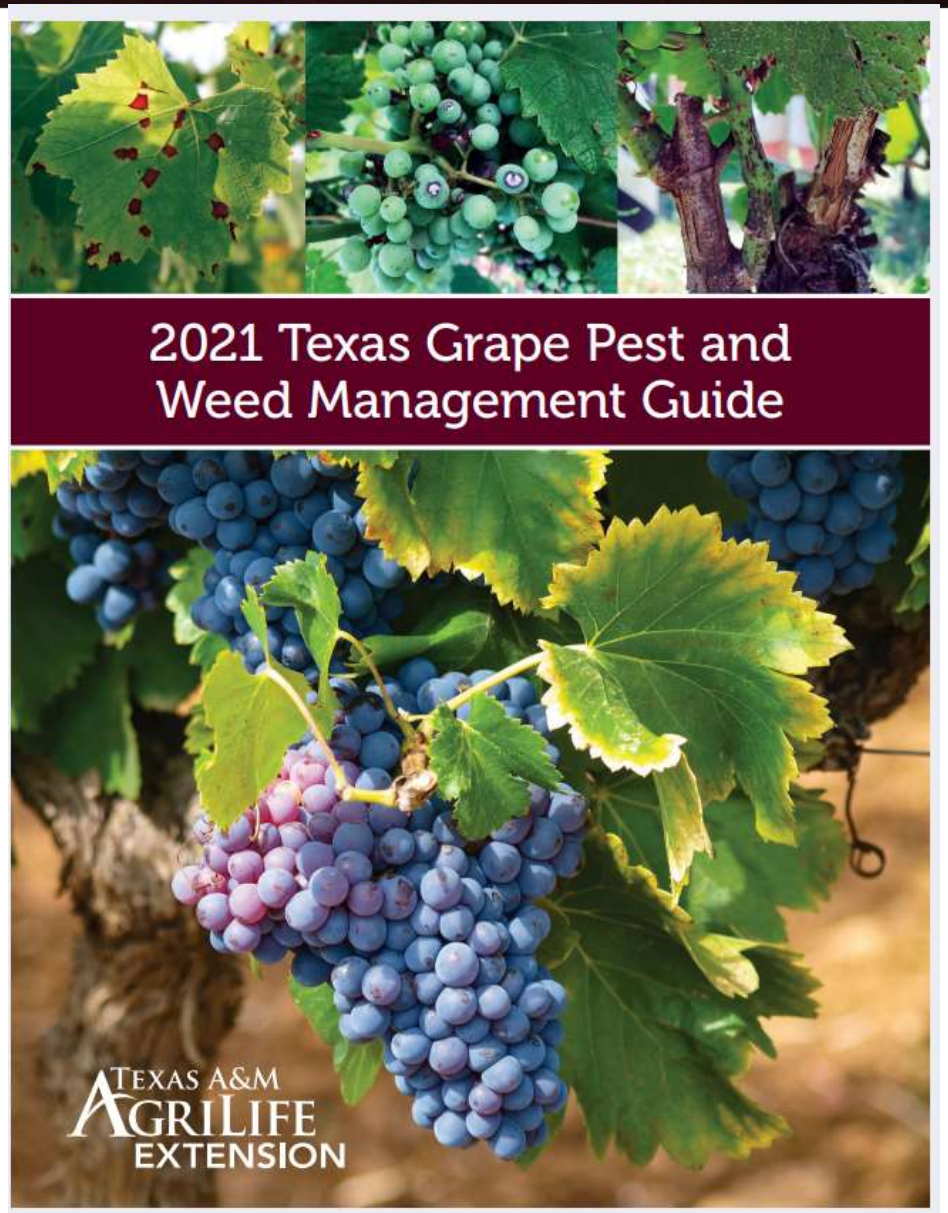
Botrytis

Bitter rot

Ripe rot



Cultivars with compact clusters are often more prone to fruit rots.



https://agrilifelearn.tamu.edu/s/product/2022-texas-grape-pest-and-weed-management-guide/01t4x000004P730

PD Tolerant Wine Grapes in Texas

Significant Acreage

- Blanc Du Bois
- Black Spanish/Lenoir
- Lomanto

Minor Acreage

- Champanel
- Norton/Cynthiana
- Crimson Cabernet
- Camminare Noir

Significant Interest

- Caminante Blanc
- Ambulo Blanc
- Errante Noir
- Paseante Noir
- Blanc Du Soleil

Texas A&M AgriLife Extension

UCDAVIS
INNOVATIONACCESS

PIERCE'S DISEASE RESISTANT WINEGRAPE
(VITIS VINIFERA)

CAMMINARE NOIR (UC Case No. 2020-049) (Selection 07355-075)

This red wine grape is 94% *V. vinifera,* makes wines with characteristics of both Cabernet Sauvignon and Petite Sirah and is resistant to Pierce's Disease. It is established in large test plots along the Napa River and commercial scale wines have been made from this plot. This selection is one of the earliest to break dormancy, and it also blooms and ripens early. The berries are relatively large and the well-filled clusters are medium in size. This selection has been repeatedly tested in a UC Davis greenhouse screen and is highly resistant to Pierce's Disease. It has ranked highly at numerous tastings of both Davis and Napa grown fruit. Tasting notes include: dark-red purple color, bright red fruit, raspberry, cherry, ripe, tannic, elegant rather than dense.

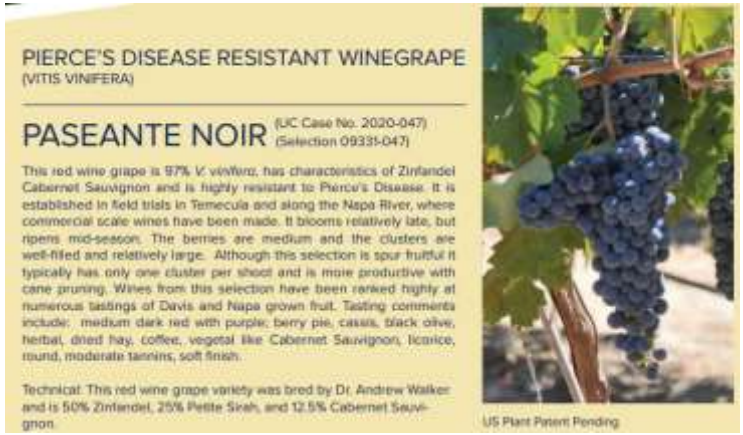
Technical: This variety was bred by Dr. Andrew Walker and is 50% Petite Sirah and 25% Cabernet Sauvignon.

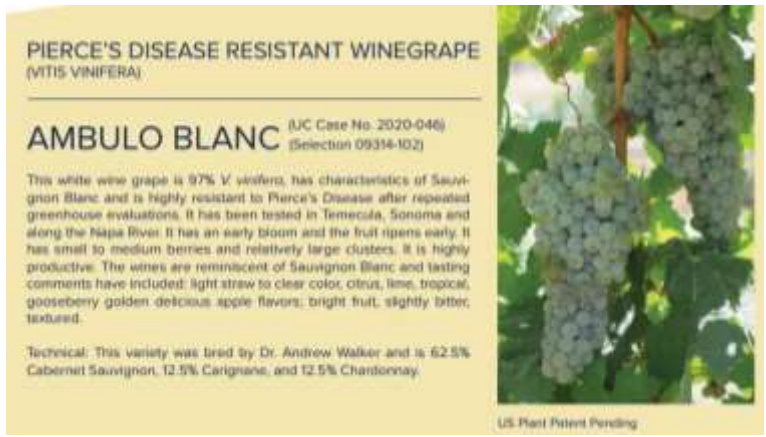
US Plant Patent Pending

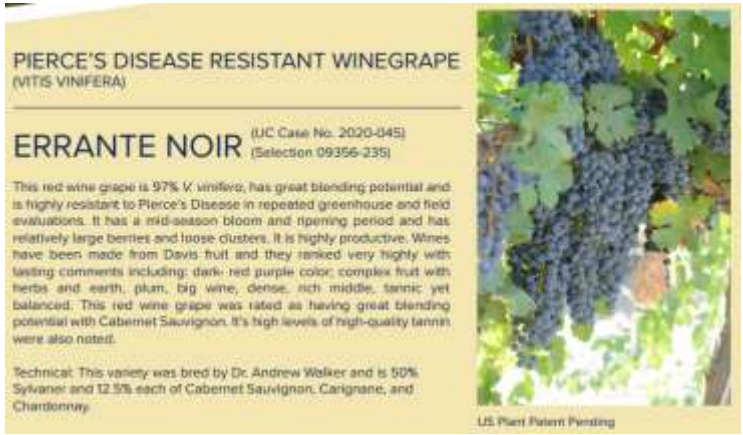
Dr. Andrew Walker
Geneticist and Professor of Viticulture and Enology
Louise Rossi Endowed Chair in Viticulture and Enology

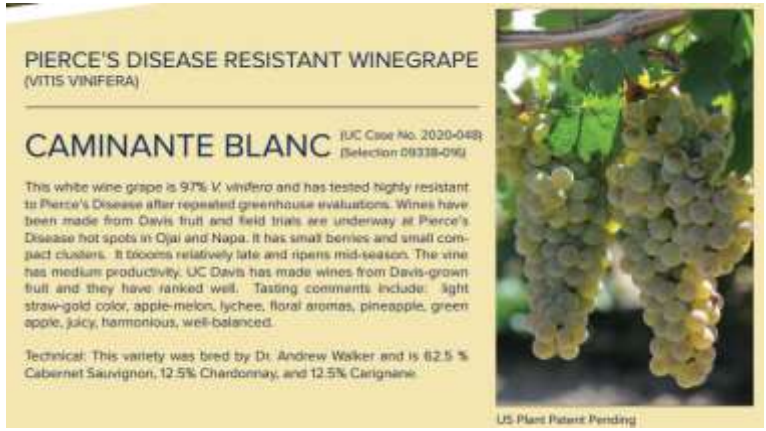
Other PD Resistant Releases from UC Davis

- ►97% *V. vinifera*
- ►No formal experience in TX
- ►Expected to have similar characteristics to V. vinifera cultivars









Texas A&M AgriLife Extension

A&M Variety Trials

- Austin Co.
- Blanco Co.
- Gillespie Co.
- Burleson Co.

Camminare Noir

- ►Early bud break
- ►Moderate yield potential
- ►Fungal disease resistance comparable to Blanc Du Bois
- ►Potential ripening issues: uneven ripening, poor color, relatively low soluble solids

Fruit Characteristics

Burleson Co., 2021

420A rootstock, 10’x 6’ spacing

- ►Cluster weight: 136.1 ± 4.2 g
- ►Yield: 4.25 ± 0.12 tons/acre

1103P rootstock, 10’ x 8’ spacing

- ►Cluster weight: 148.7 ± 5.3 g
- ►Yield: 3.48 ± 0.15 tons/acre
- ►Total soluble solids: 22.1%
- ►Juice pH: 3.71
- ►Titratable Acidity: 5.12 g/L

Other UC Davis Selections (88% V. vinifera) Trialed

Selection	Brix	pH	Yield (tons/acre)	Harvest Date
U0502-35	21.5	3.38	2.72	28-Jul
U0502-38	22.1	4.0	1.24	6-Aug
U0502-10	19.8	3.81	1.97	19-Aug
U05-02-20	18	3.42	2.35	6-Aug
U0502-26	19.1	3.80	2.44	19-Aug

Blanc Du Soleil

- ►PD tolerant white wine grape
- ►‘Stover’ x ‘Blanc Du Bois’ by Dr. Jiang Lu
- ►Released from Florida A&M in 2021
- ►Trial locations in TX: Austin, Burleson, Goliad Co.

Blanc Du Soleil

Characteristics:

- Early-mid bud break
- Intermediate growth habit
- Moderate yield potential
- Moderate vigor
- Excellent fungal disease resistance
- High wine quality potential (Pinot Gris-like)

Fruit Characteristics

Own-root, 10’x 6’ spacing

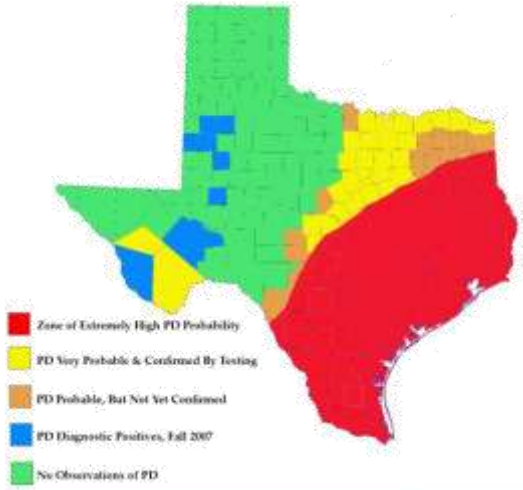
- Cluster architecture: moderately compact
- Berry weight: 2.02 ± 0.08 g
- Cluster weight: 90.4 ± 11.4 g
- Total soluble solids: 16.86 ± 0.15 %
- Juice pH: 3.04 ± 0.03
- Titratable Acidity: 9.01 ± 0.08 g/L
- Yield: 2.38 ± 0.14 tons/acre
- Budbreak to harvest (7 years):118 –125 days

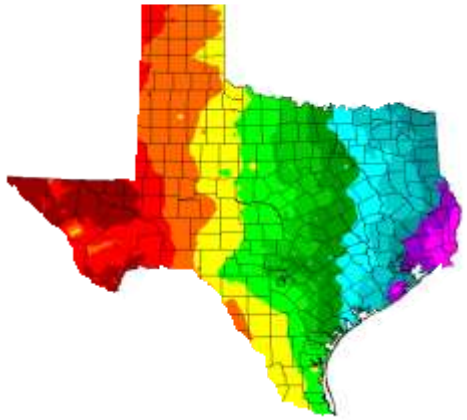
Availability

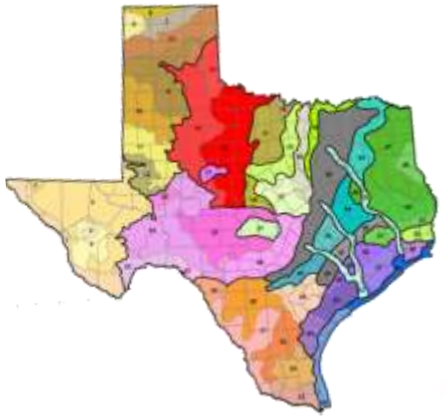
- UC Davis Cultivars: 2019, West Coast Nurseries
- Blanc Du Soleil: 2023, Double A Vineyards

Blanc Du Bois in Texas

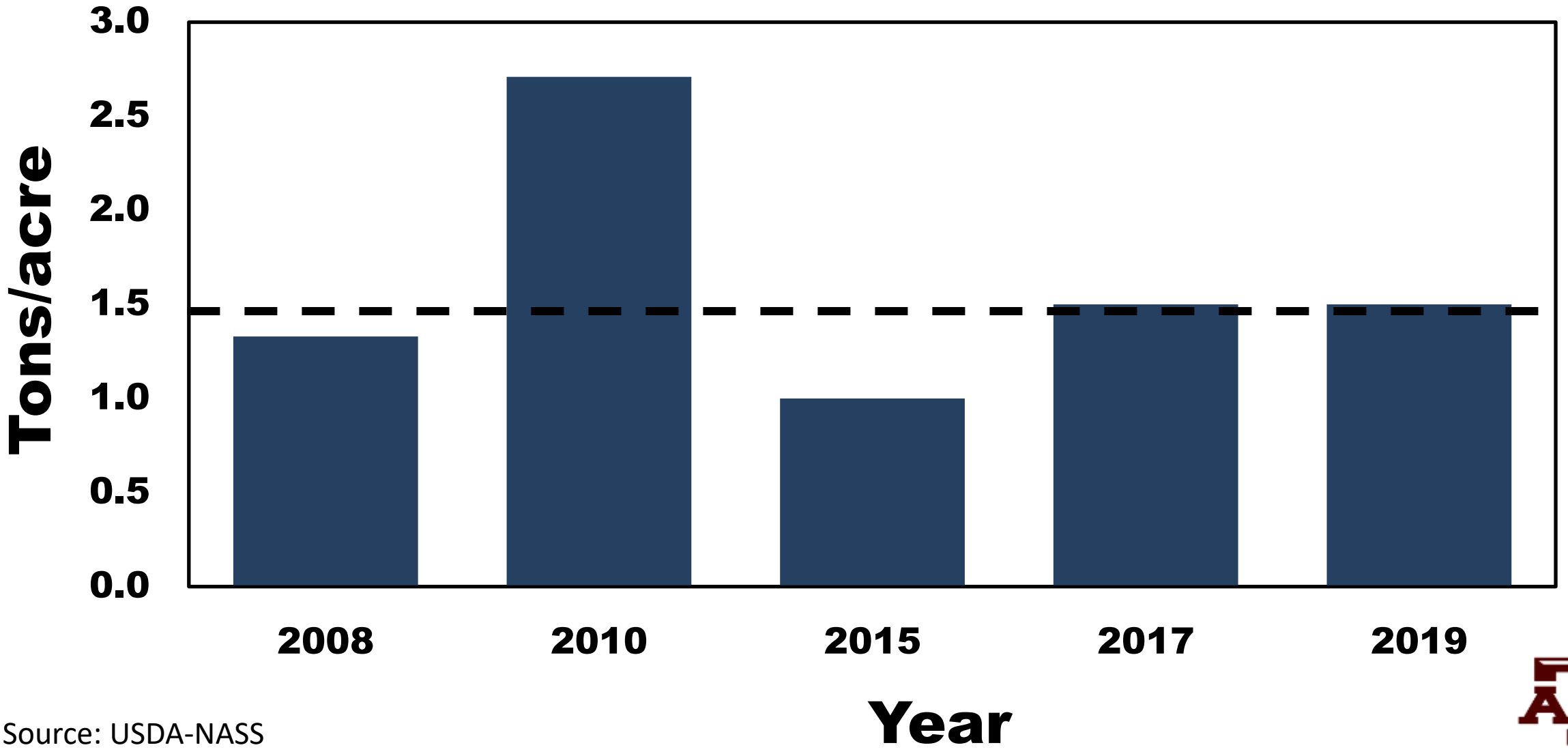
1. Moderately productive (poor fruit set is a common problem)
2. Highly susceptible to anthracnose and fruit rots, moderately susceptible to downy mildew and black rot
3. Wine quality potential rivals vinifera, but fruit does not typically accumulate high sugars (>20°Brix)
4. Vigorous grower, but poor alkaline soil tolerance
5. Virus has been recently observed







TX State Average Yield for Blanc Du Bois



Source: USDA-NASS


Downy Mildew

Blanc Du Bois Fruit Set Issues

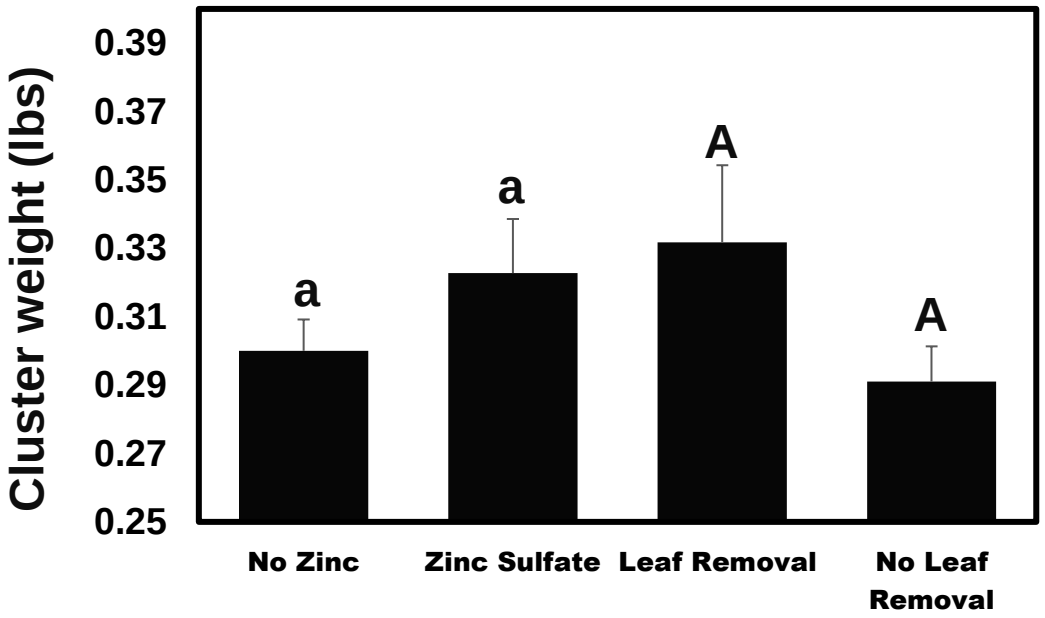
- Clusters can range from compact to very loose
- Poor fruit set is common, but not attributed to a single factor – nutrition, carbohydrate supply, bloom time weather, disease

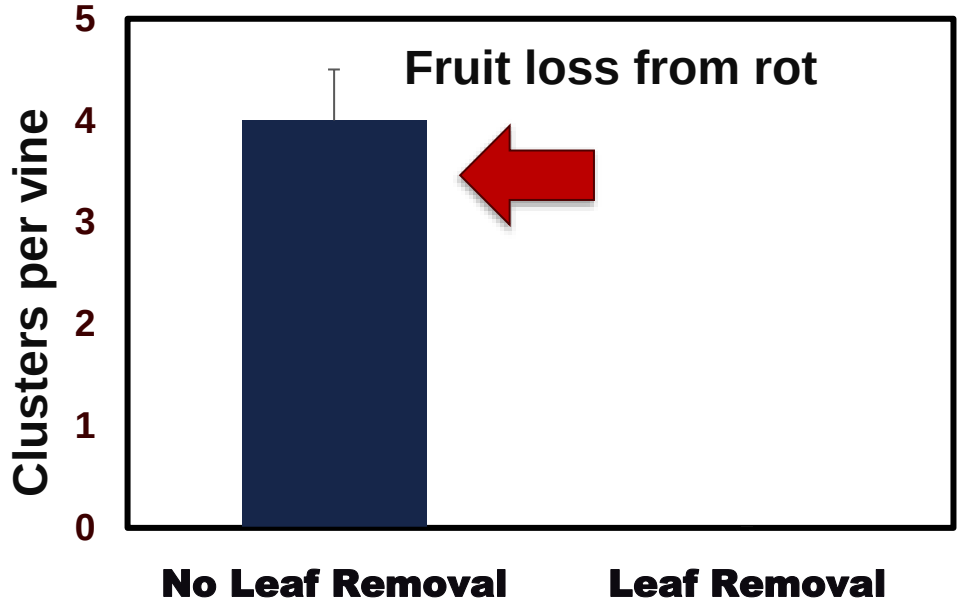




Studies on Fruit Set

1. Prebloom applications of zinc sulfate
2. Canopy management to increase light exposure





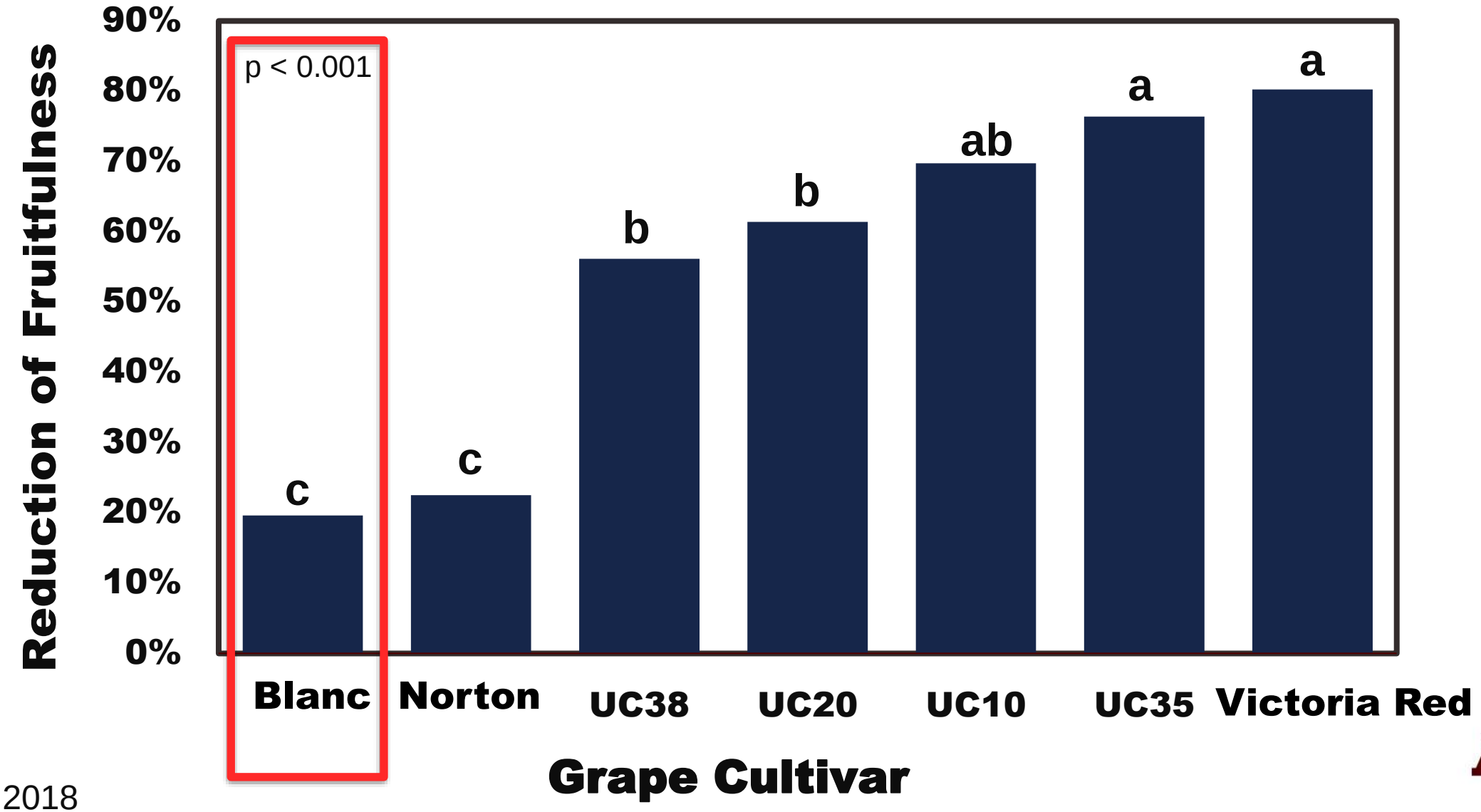
Other avenues to explore: virus, boron

F.M. Pontasch

Impact of delayed pruning on fruitfulness

- **Treatments:**
  - Final pruning at bud break
  - Final pruning at 3 weeks post-bud break

Impact of Delayed Pruning on Fruitfulness

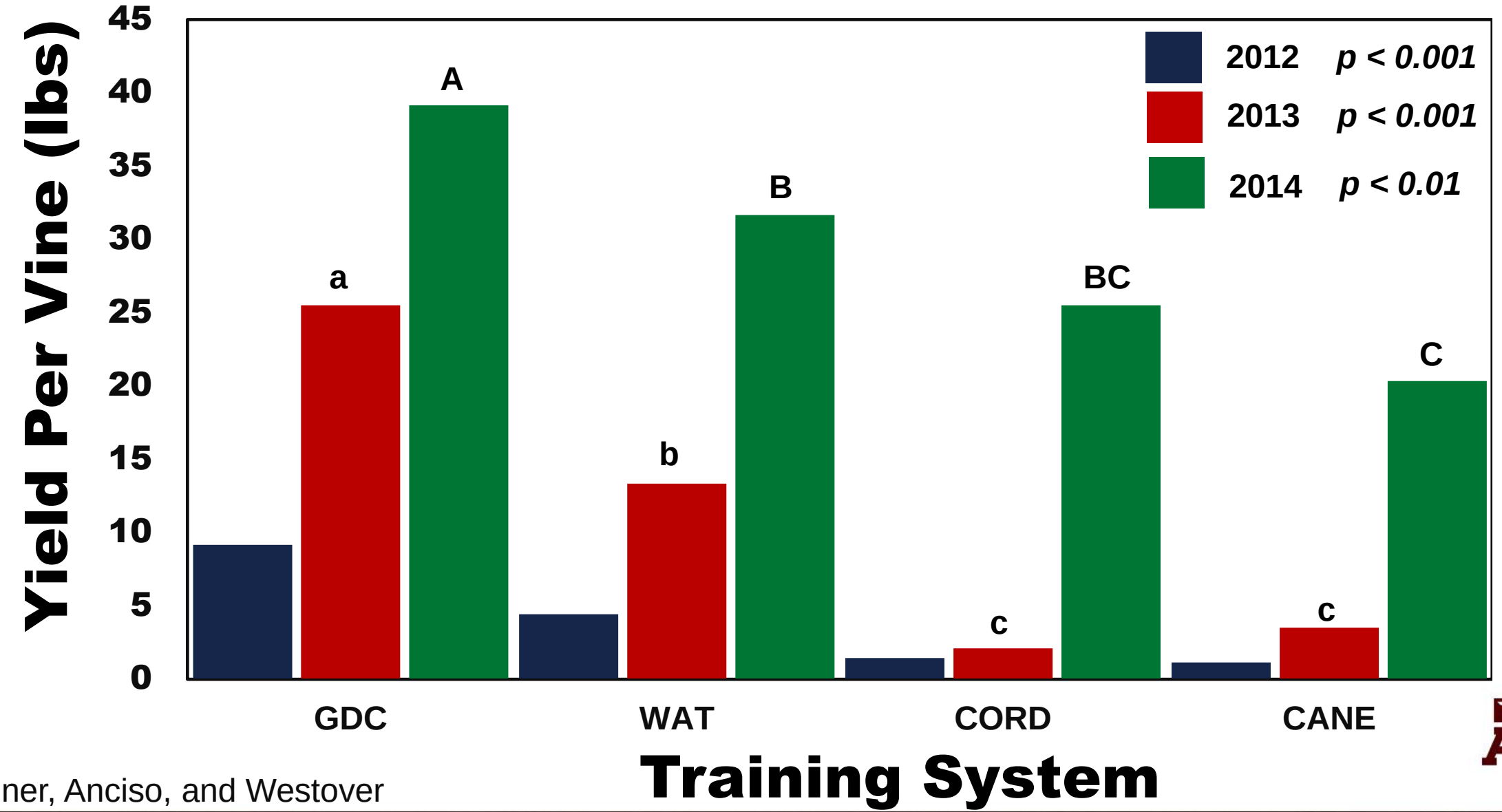


Y. Labay, 2018

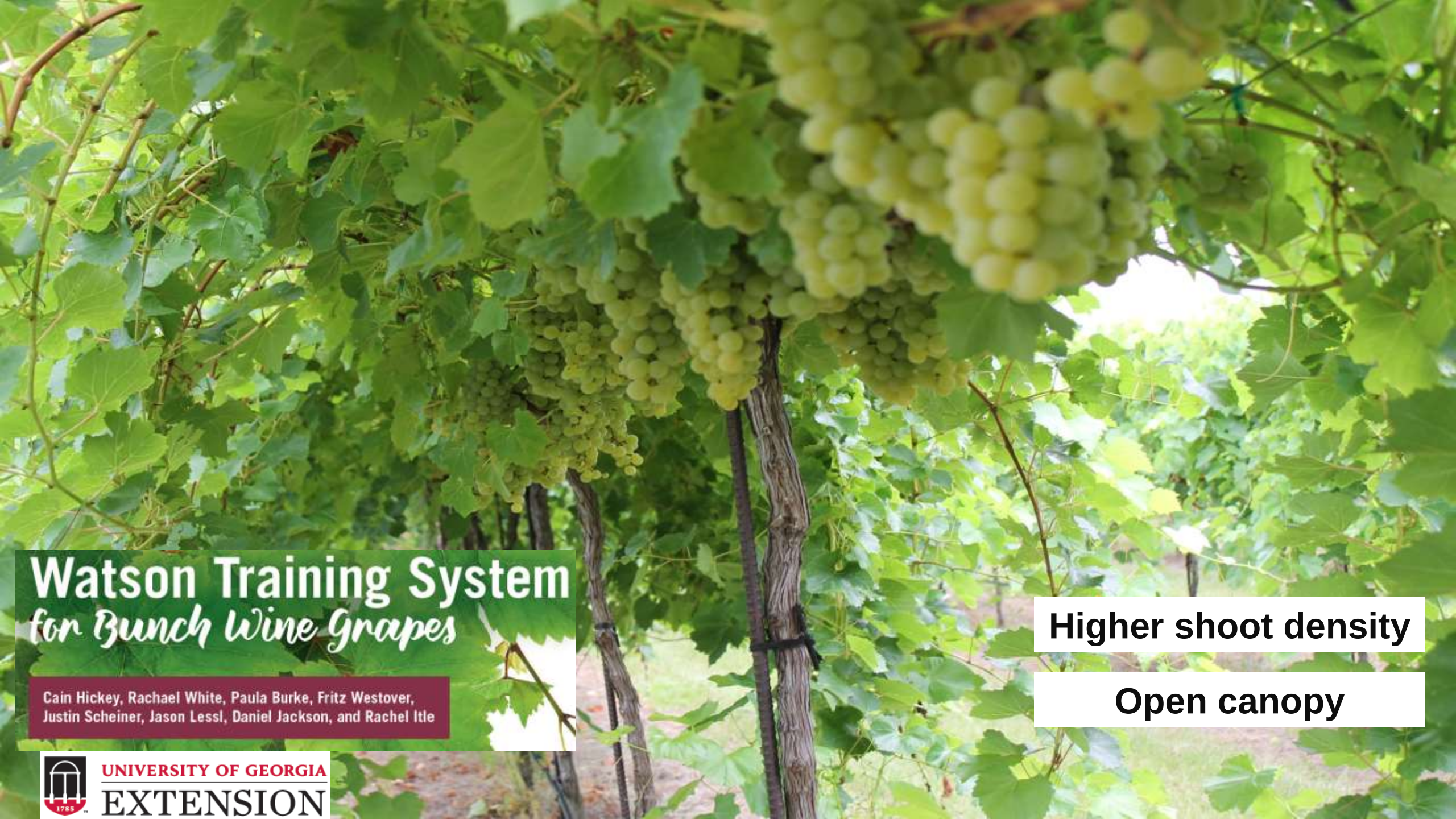
Pea-sized cluster

Inflorescence

Training System Trial



Scheiner, Anciso, and Westover



Watson Training System
for Bunch Wine Grapes

Cain Hickey, Rachael White, Paula Burke, Fritz Westover,
Justin Scheiner, Jason Lessl, Daniel Jackson, and Rachel Itle

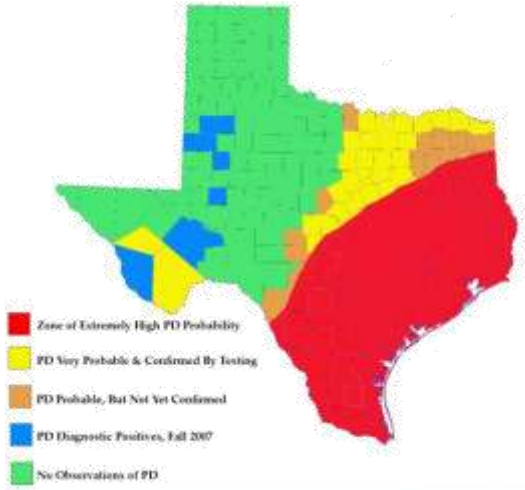
UNIVERSITY OF GEORGIA
EXTENSION

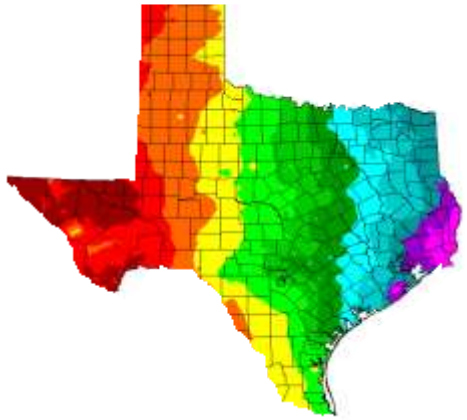
Higher shoot density

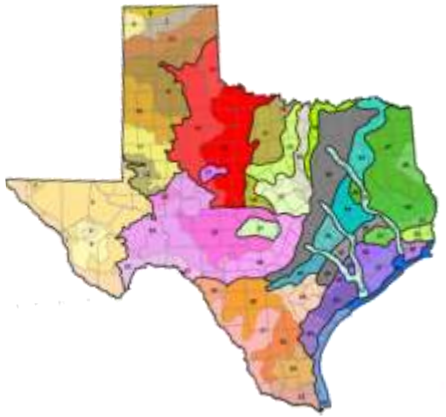
Open canopy

Blanc Du Bois in Texas

1. Moderately productive (poor fruit set is a common problem)
2. Highly susceptible to anthracnose and fruit rots, moderately susceptible to downy mildew and black rot
3. Wine quality potential rivals vinifera, but fruit does not typically accumulate high sugars (>20°Brix)
4. Vigorous grower, but poor alkaline soil tolerance
5. Virus has been recently observed







Blanc Du Bois is prone to bunch rots

- Extended hang-time can be a big problem


Ripe Rot


Bitter Rot


Sour Rot

Fungicides

- Captan (PHI = 0)
- Oxidate (PHI = 0)
- Switch (PHI = 7)
- Rovral (PHI = 7)
- Vanguard (PHI = 7)
- Pristine (PHI = 14)






Anthracnose

- Dormant lime sulfur is very effective
- Prune out diseased wood if possible
- Fungicides

MILLER®

LIME-SULFUR SOLUTION

Not for residential use or application to residential sites. This product may not be used in, on, or around any structure, vehicle, article, surface or area associated with the household, including non-agricultural outbuildings, non-commercial greenhouses, pleasure boats and recreational vehicles; in or around any preschool or day care facility or on humans or pets.

ACTIVE INGREDIENTS:	By Weight
Calcium Polysulfide	29.0%
OTHER INGREDIENTS	71.0%
TOTAL	100.0%

DENSITY:	
Baume at 60°F	31°
Lbs. Per Gallon at 68°F	10.6

Contains Calcium and Sulfur expressed as Gypsum - 3.0 lbs. per gallon. Other combined Sulfur - 1.9 lbs. per gallon.

The Other Fun Guys…

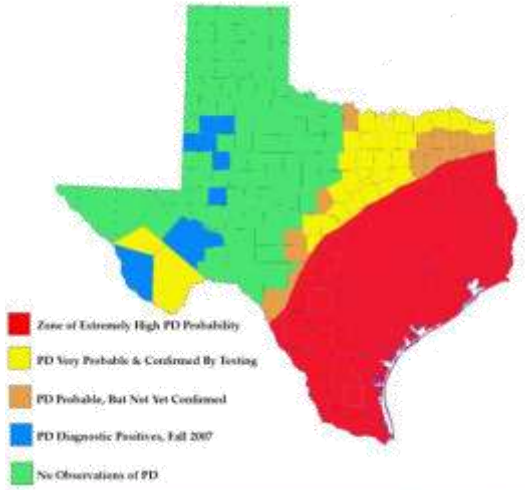
Black Rot

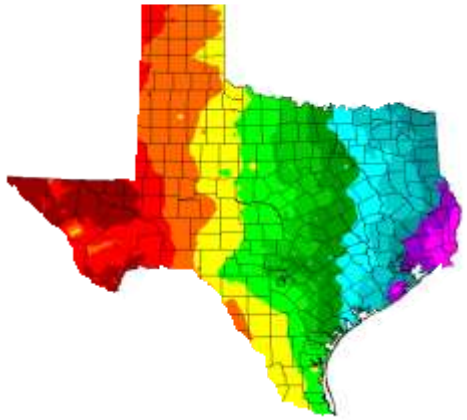
Phomopsis

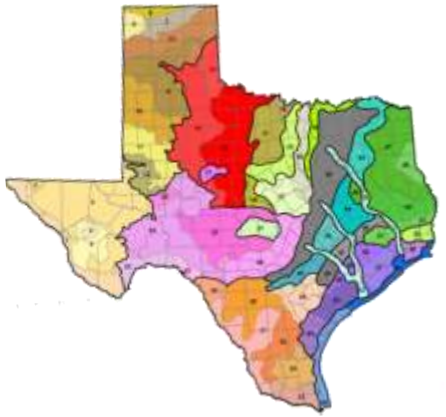
Trunk Disease

Blanc Du Bois in Texas

1. Moderately productive (poor fruit set is a common problem)
2. Highly susceptible to anthracnose and fruit rots, moderately susceptible to downy mildew and black rot
3. Wine quality potential rivals vinifera, but fruit does not typically accumulate high sugars (>20°Brix)
4. Vigorous grower, but poor alkaline soil tolerance
5. Virus has been recently observed



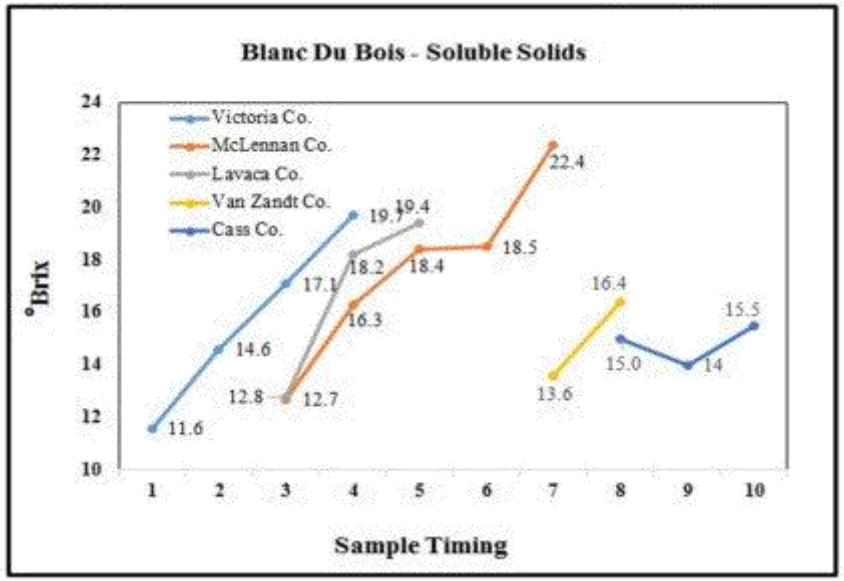


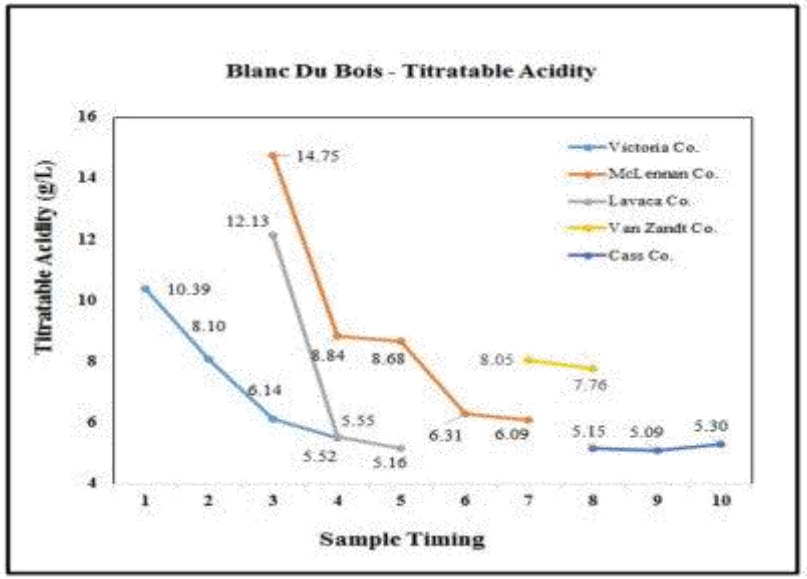


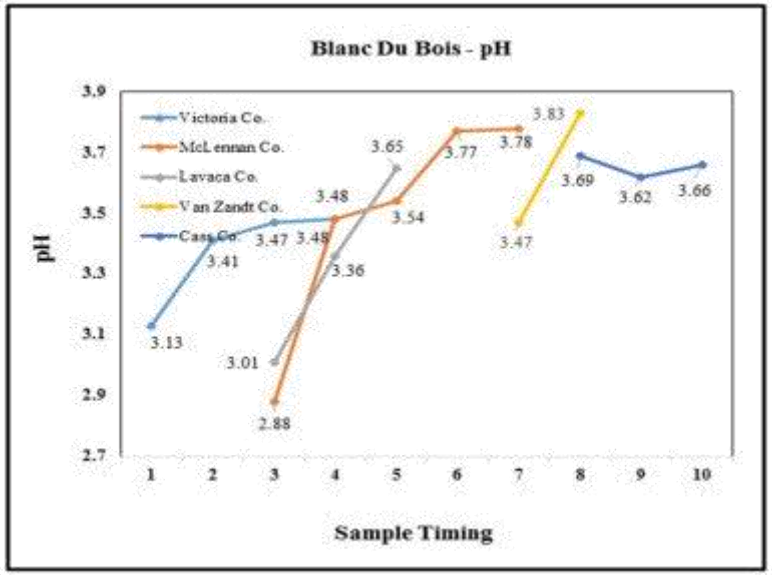
Mature Blanc Du Bois

Typically harvested between 17 and 20°Brix

- Sugar may plateau well before 20°Brix, but acidity continues to decline







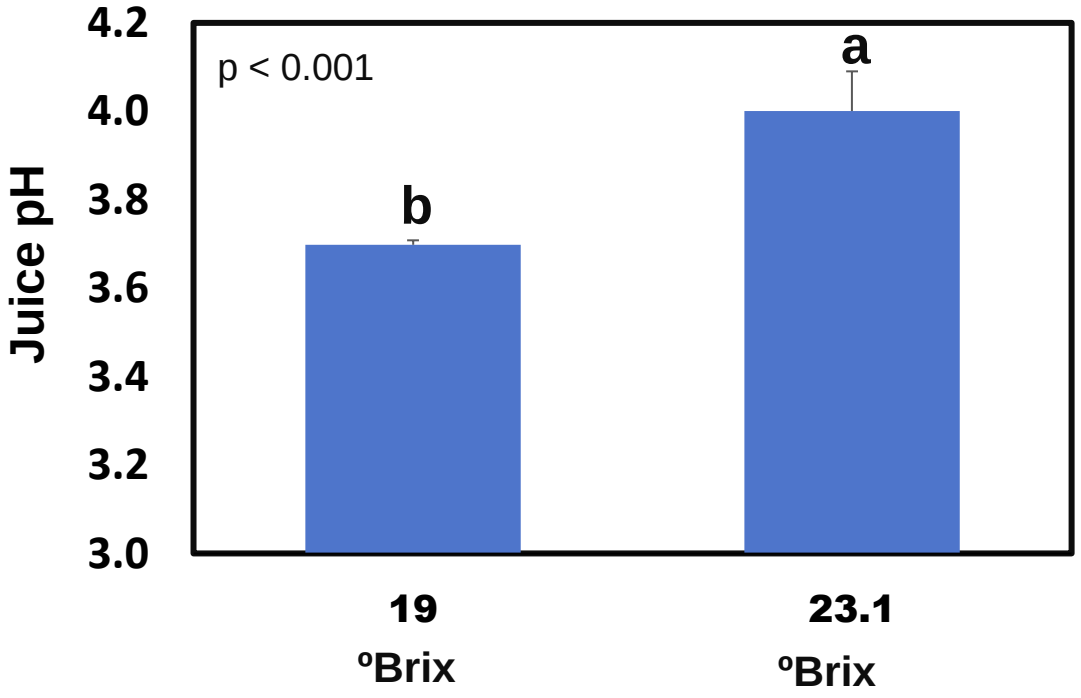
Harvest Timing Study

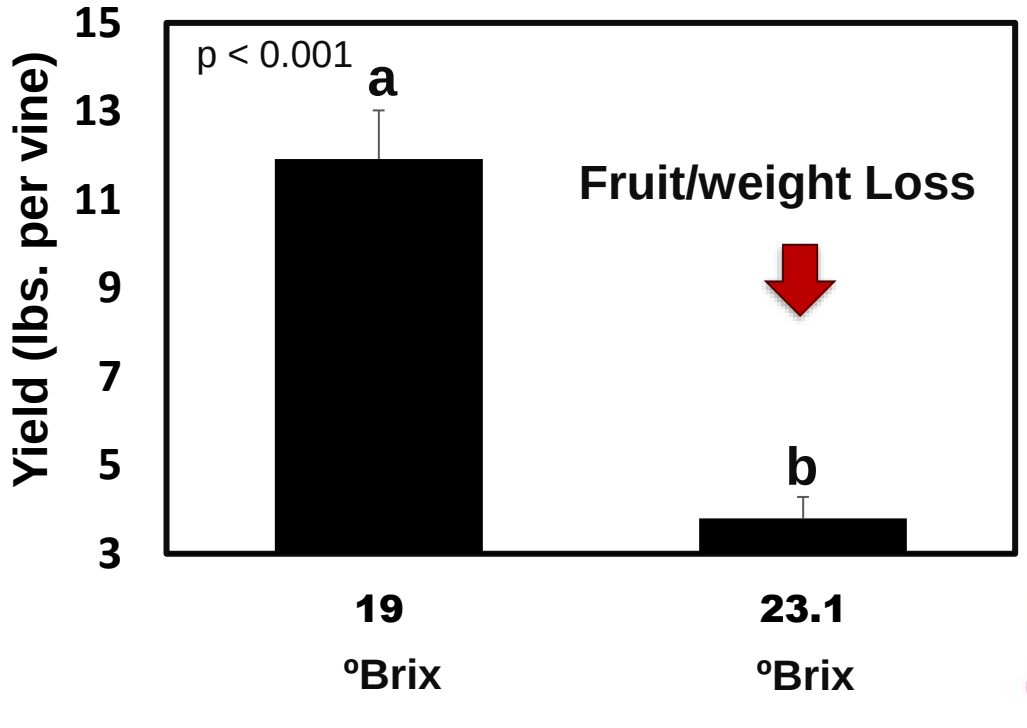
Harvest target 1: 18-19°Brix

Harvest target 2: 23-24°Brix

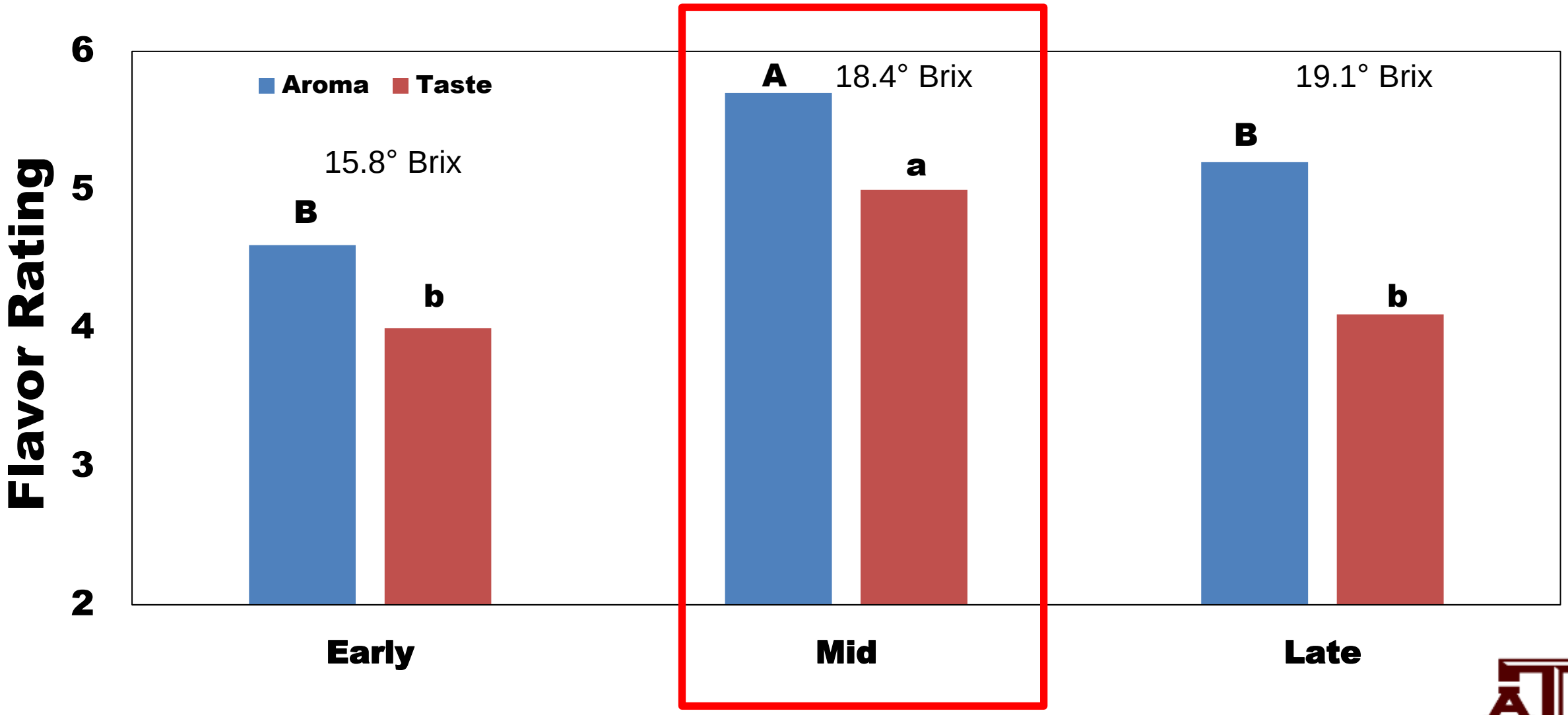
Harvest Timing Study

Extended hang-time resulted in significant fruit loss (birds, varmints, fruit drop) high pH, and overall poor wine quality.





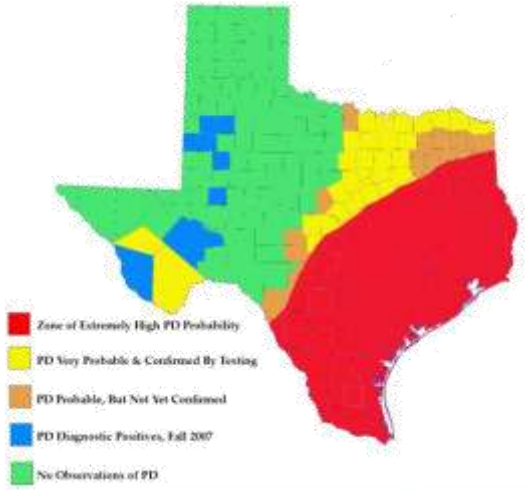
Wine Quality and Maturity – Vidal Blanc

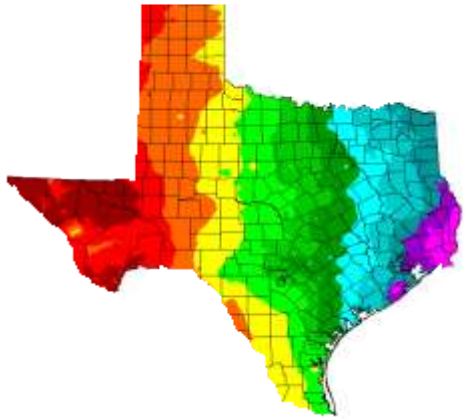


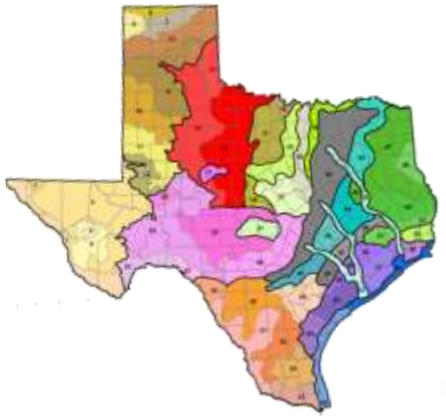
Reproduced from: Gallander, 1983

Blanc Du Bois in Texas

1. Moderately productive (poor fruit set is a common problem)
2. Highly susceptible to anthracnose and fruit rots, moderately susceptible to downy mildew and black rot
3. Wine quality potential rivals vinifera, but fruit does not typically accumulate high sugars (>20°Brix)
4. Vigorous grower, but poor alkaline soil tolerance
5. Virus has been recently observed



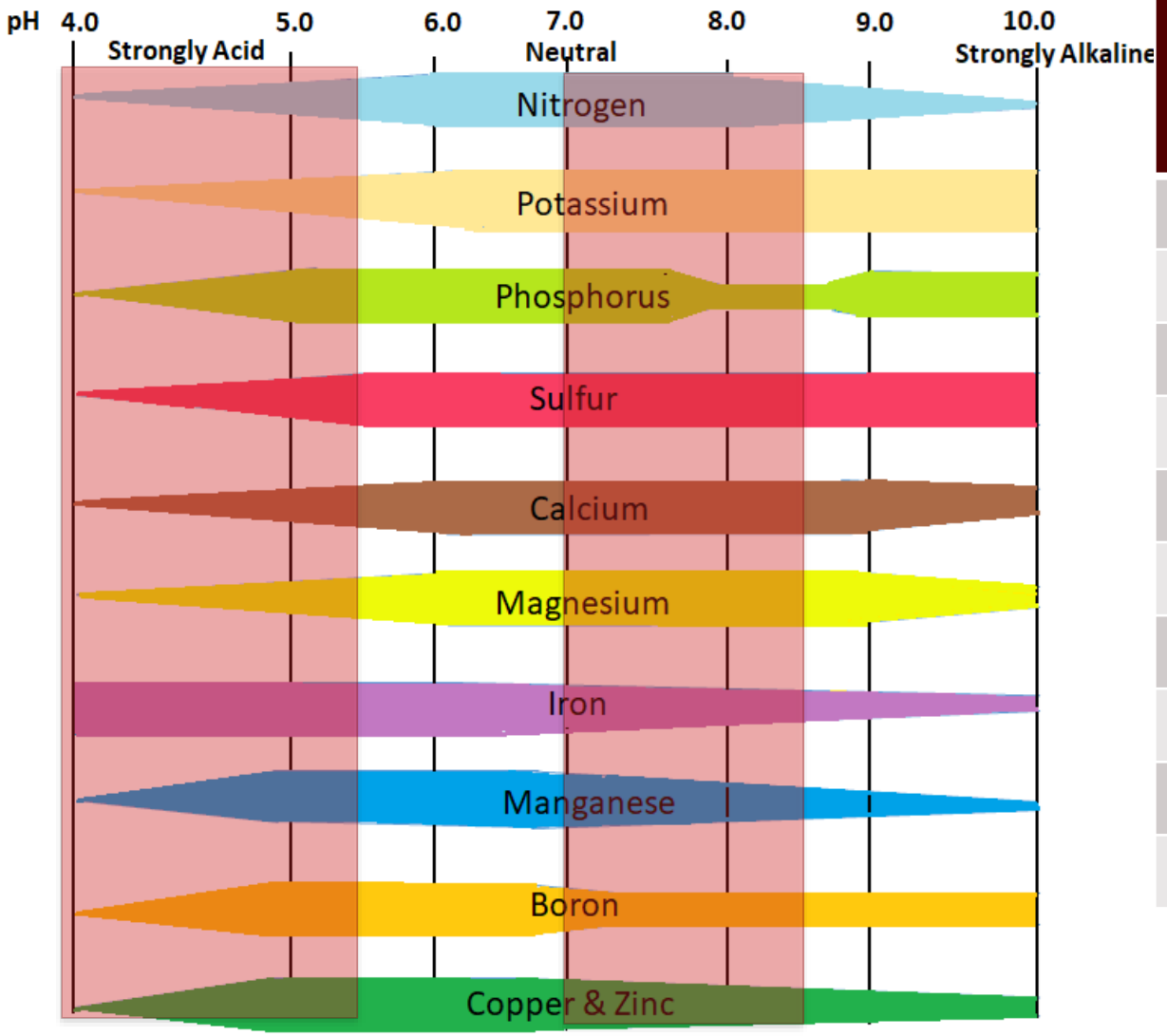




Industry, Texas

- Scion: *Vitis spp. cv. ‘Blanc Du Bois’*
- Soil pH: 8.2
- Planted in 2013

It may be in the soil, but is it available?

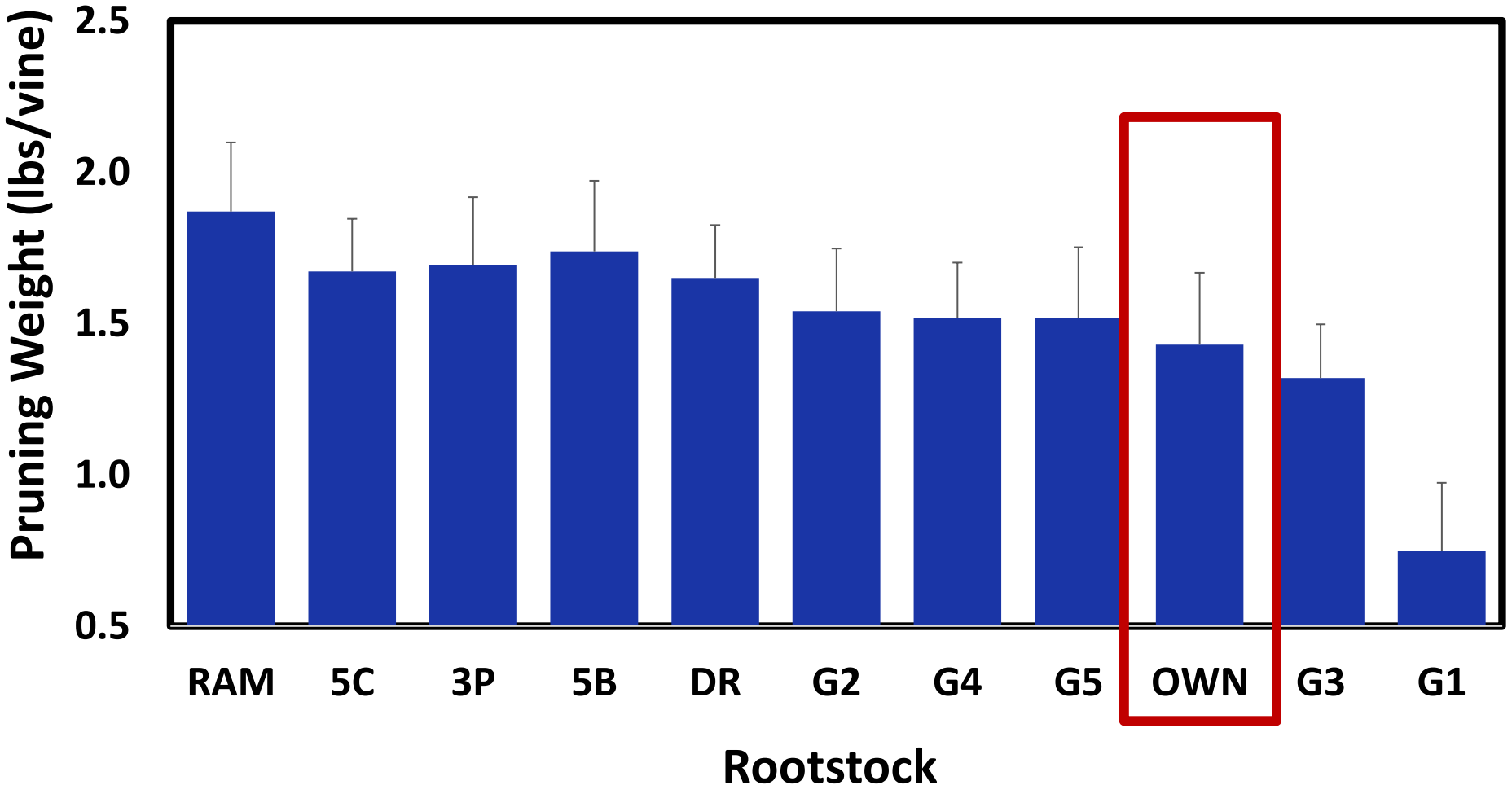


Nutrient	Target soil values (ppm)	Target soil values (lbs/acre)
Potassium (K)	75-100	150-200
Phosphorus (P)	20-50	40-100
Calcium (Ca)	500-2,000	1,000-4,000
Magnesium (Mg)	100-250	200-500
Boron (B)	0.3-2	0.6-4
Iron (Fe)	20	40
Manganese (Mn)	20	40
Copper (Cu)	0.5	1.0
Zinc (Zn)	2	4
Organic Matter	3-5%	-

Data collection from 2014-2017

- Bud break
- Pruning weight
- Tissue testing
- Chlorosis ratings
- Yield components
- Fruit composition

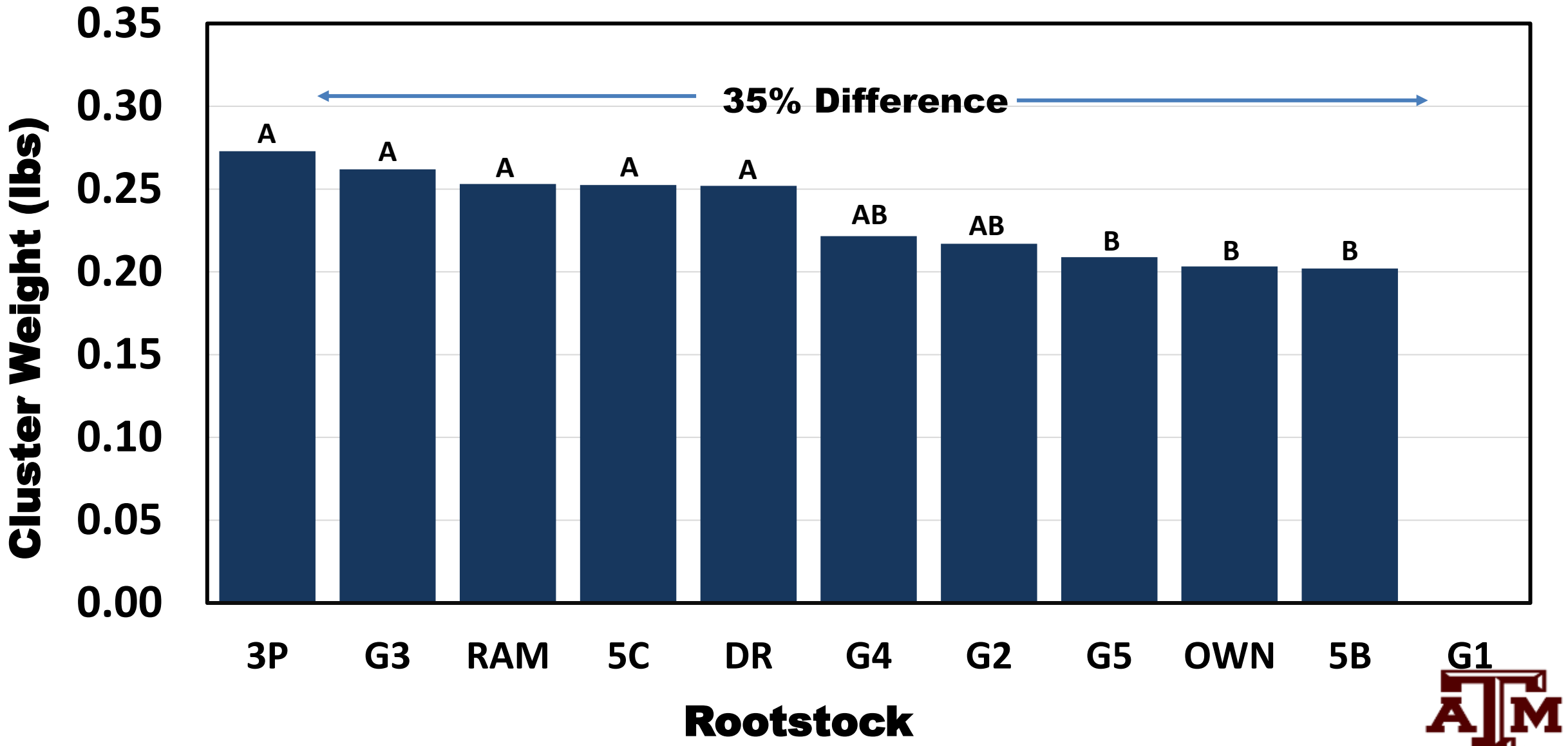
Average Pruning Weight 2014-2017



Magnesium Deficiency

- Christmas tree pattern in basal leaves first

Cluster Weight (2017)



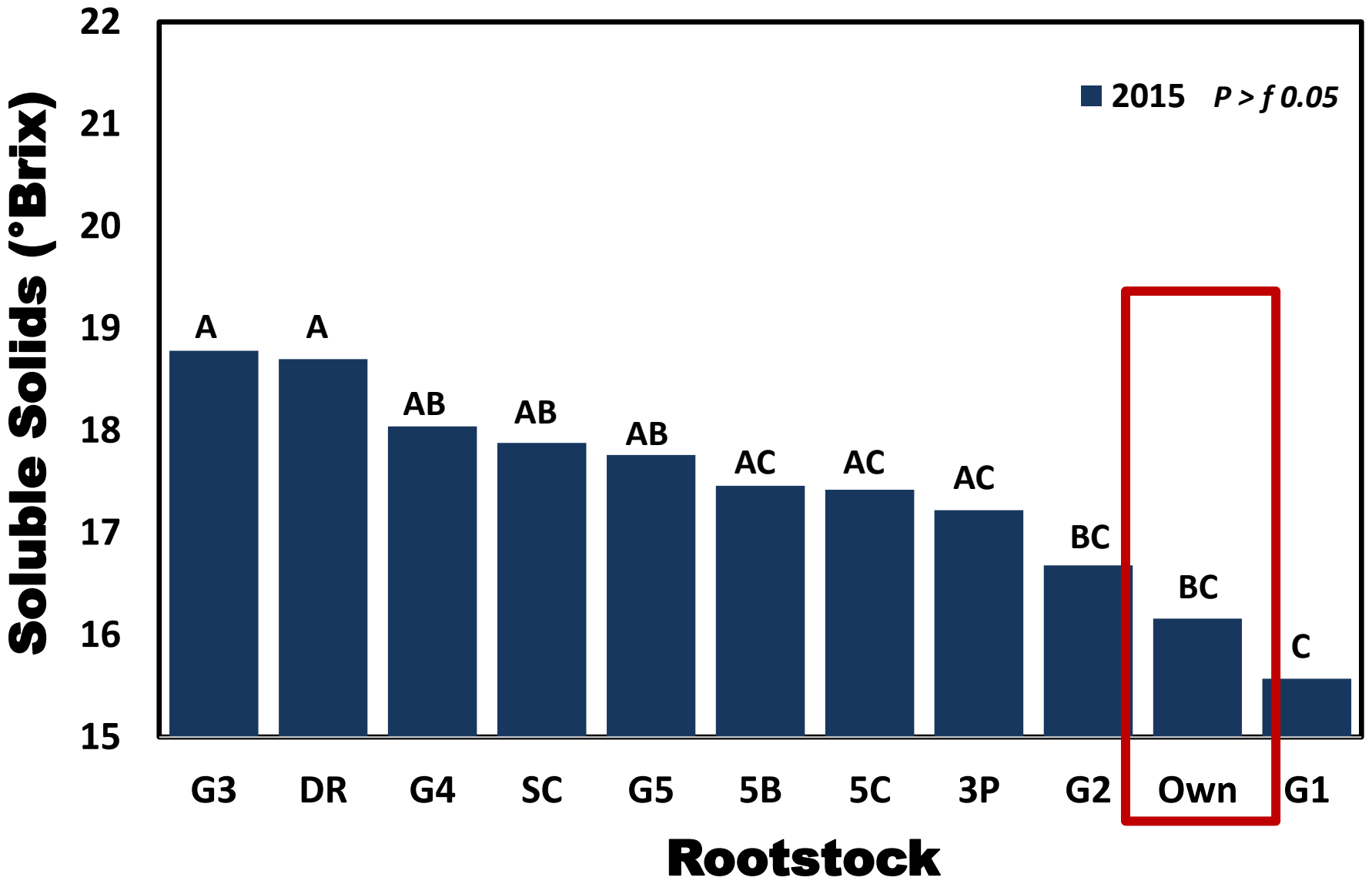
Overcropping



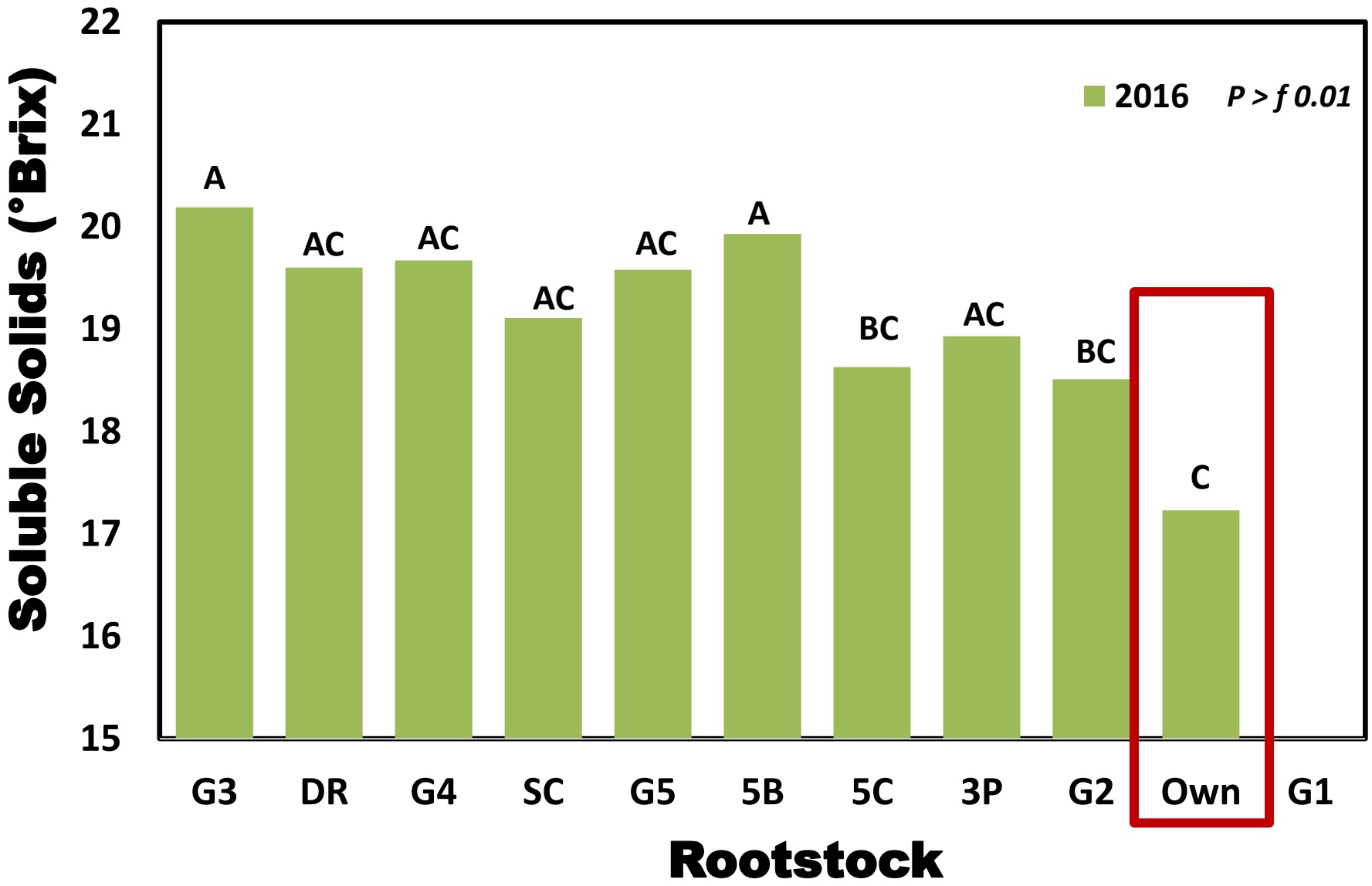
Blanc Du Bois is vigorous, but overcropping can be a problem on sites where growth is limited.

- pruning level, shoot thining, cluster thinning

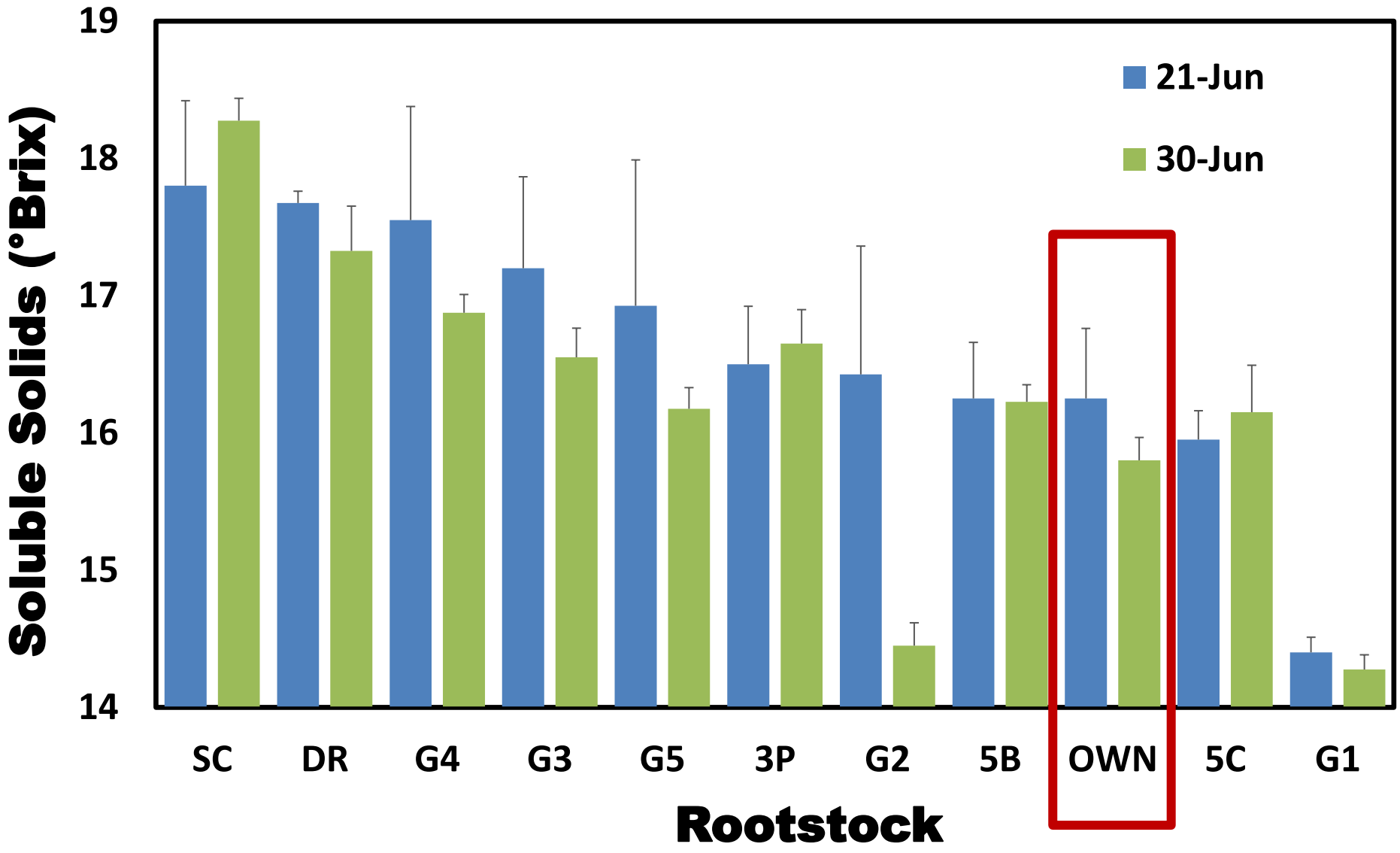
Soluble Solids (2015)



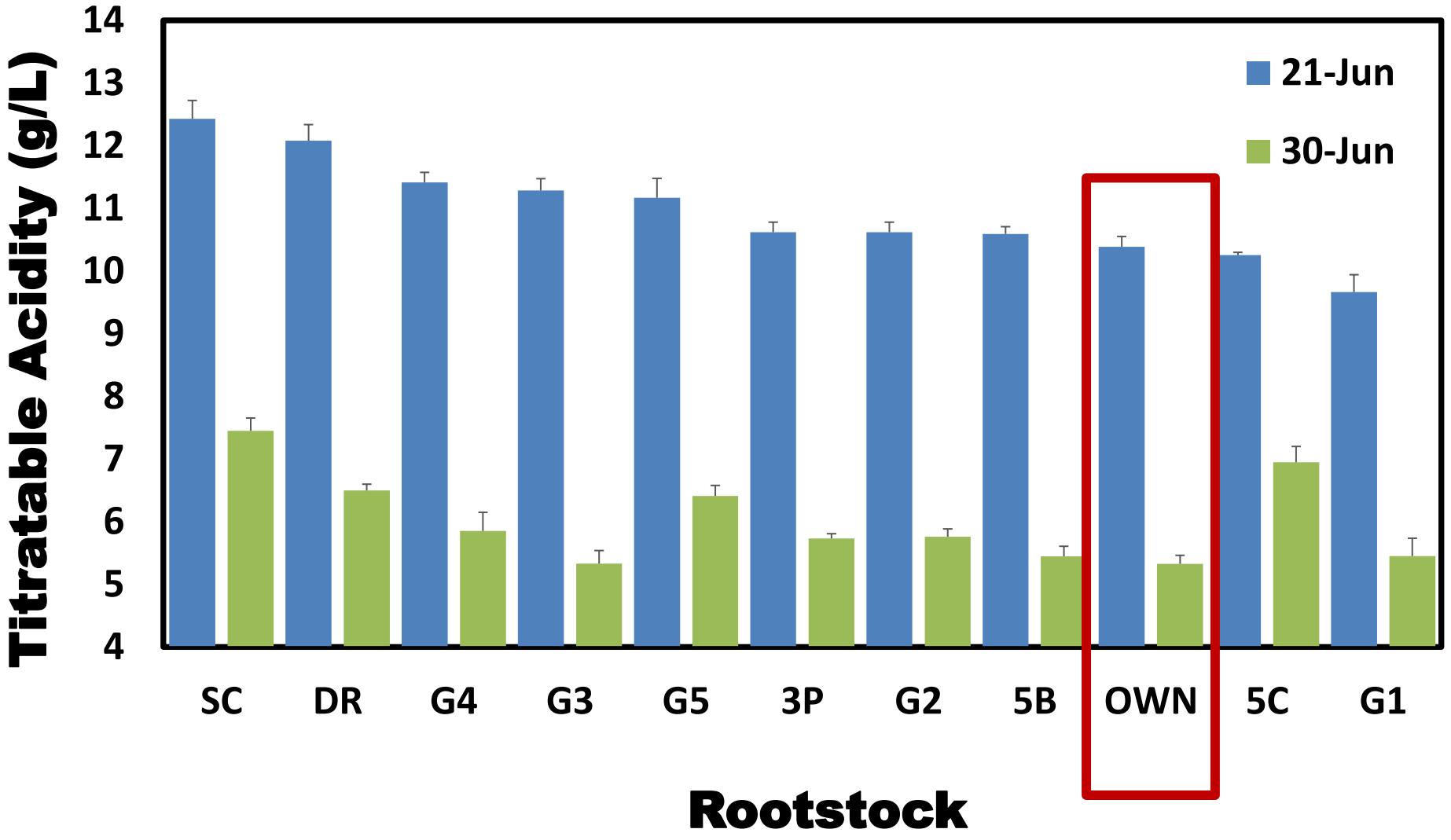
Soluble Solids (2016)



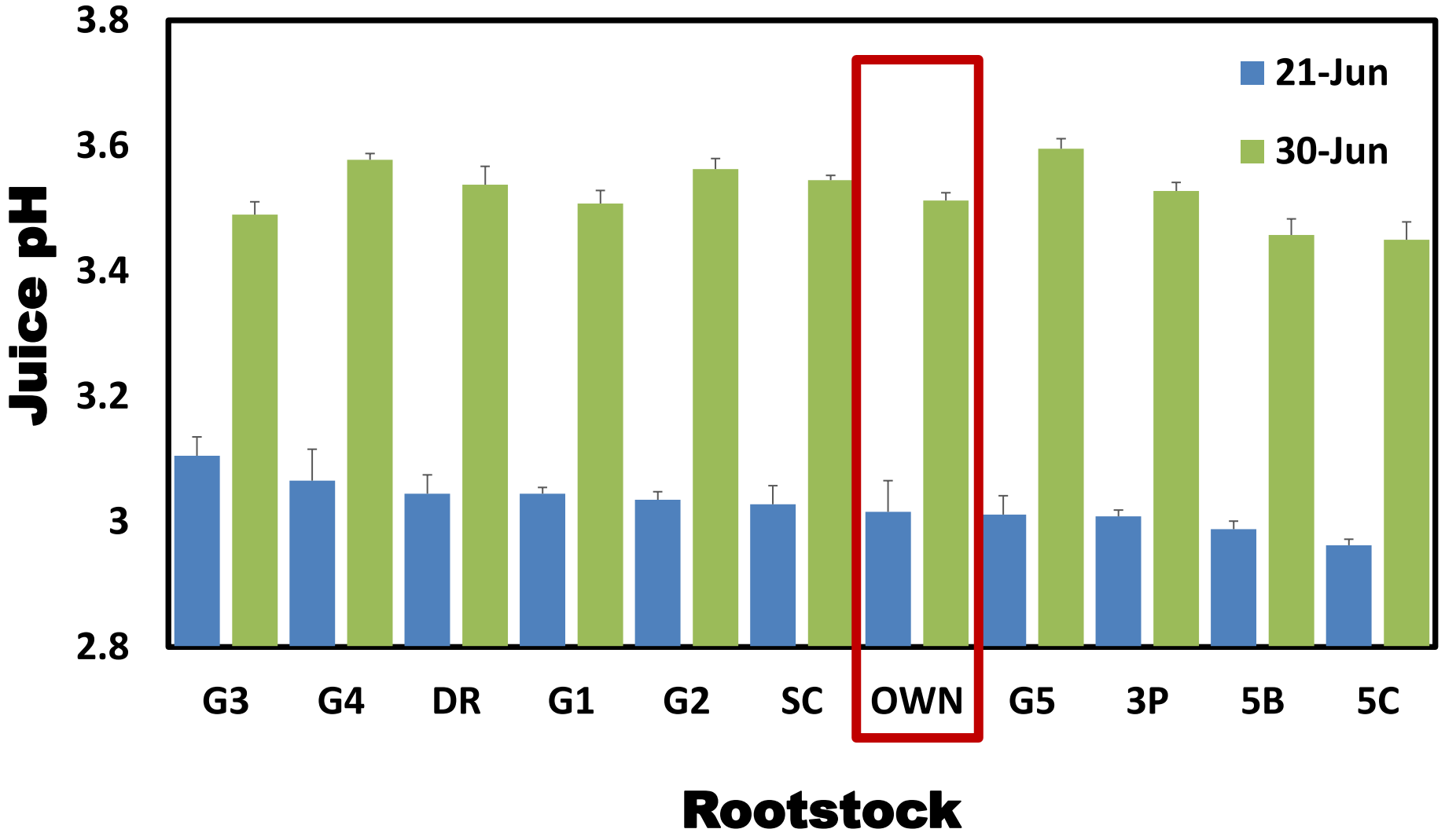
Blanc Du Bois Soluble Solids (2017)



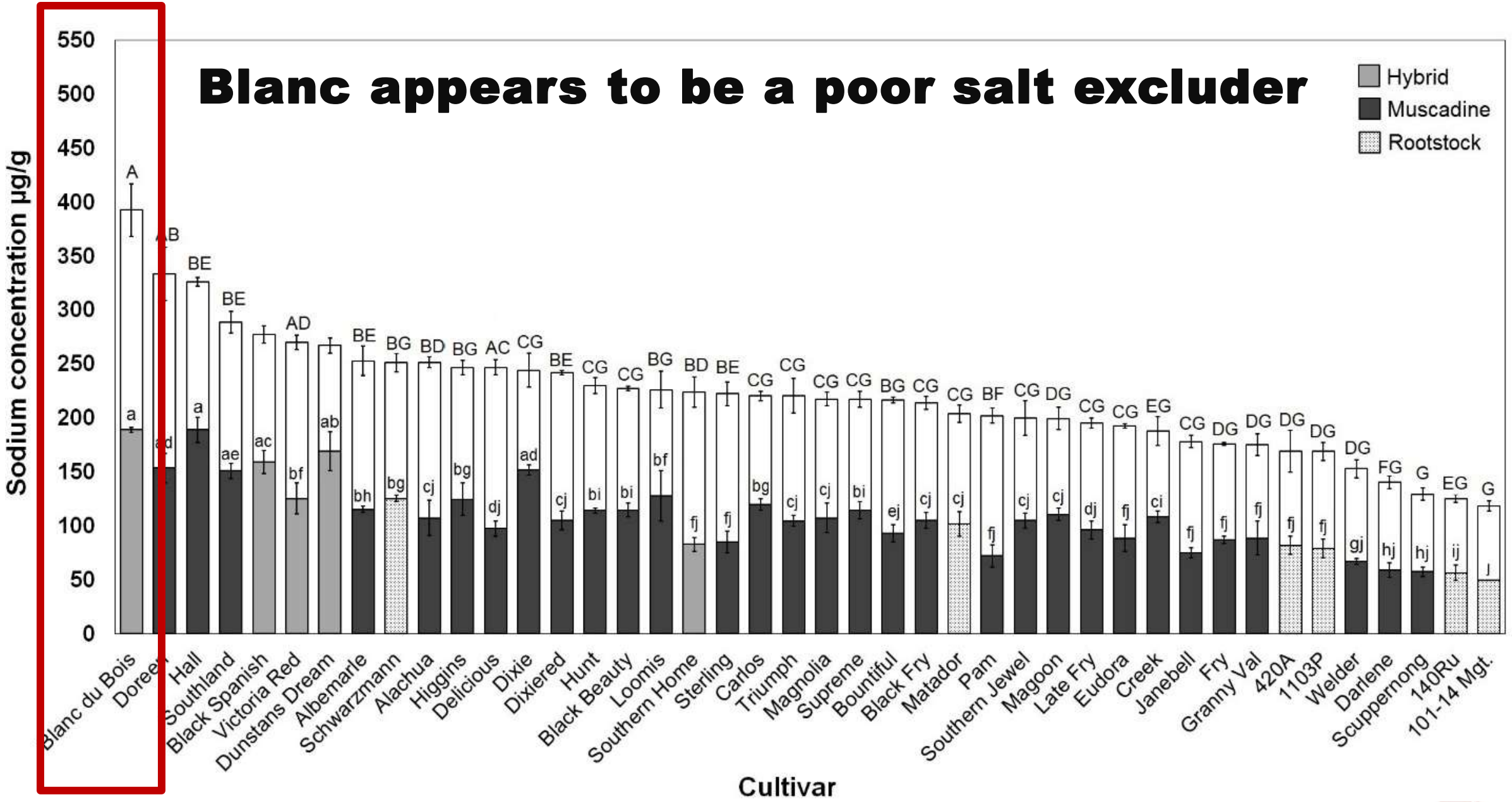
Blanc Du Bois Titratable Acidity (2017)



Blanc Du Bois Juice pH (2017)



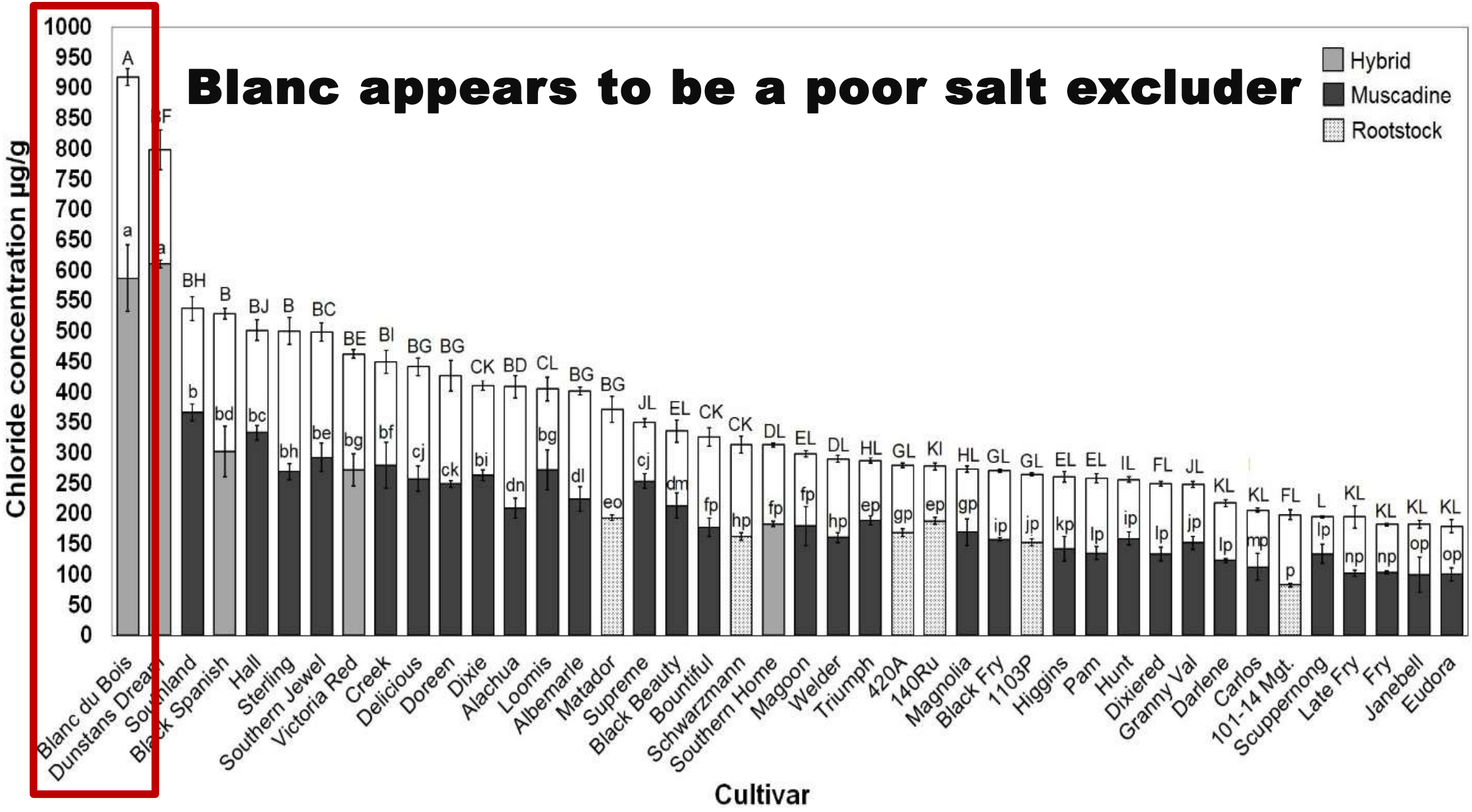
Blanc appears to be a poor salt excluder



Average Tissue Test Results – Late Summer

Rootstock	N	P	K	Mg	Ca	Na	Zn	Mn	Fe	Cu	B	S
G1	0.48	0.06	2.42	0.08	1.62	102.4	47.73	817	20.14	5.46	24.69	0.06
G2	0.43	0.07	2.32	0.11	1.86	154.4	42.90	544	20.22	4.80	28.11	0.08
G3	0.42	0.05	2.24	0.20	1.86	58.2	45.45	671	20.26	4.59	26.35	0.06
G4	0.40	0.05	2.04	0.16	1.85	73.3	45.28	841	22.69	4.42	29.13	0.06
G5	0.45	0.05	2.18	0.15	1.86	51.3	48.20	753	20.48	4.39	30.10	0.05
5B	0.41	0.05	2.11	.016	1.76	139.9	46.64	754	24.63	5.13	33.67	0.07
5C	0.44	0.05	2.13	0.14	1.82	146.5	51.77	962	22.56	5.57	30.60	0.06
3P	0.52	0.07	2.20	0.14	1.61	154.0	49.68	727	24.73	5.69	28.46	0.07
RAM	0.55	0.06	2.13	0.18	1.84	207.0	62.62	959	23.09	5.89	26.09	0.07
DR	0.39	0.05	2.19	0.24	1.71	540.7	49.77	980	22.60	5.81	28.96	0.06
OWN	0.49	0.05	1.79	0.14	2.24	689.07	49.77	988	22.86	6.40	27.93	0.07

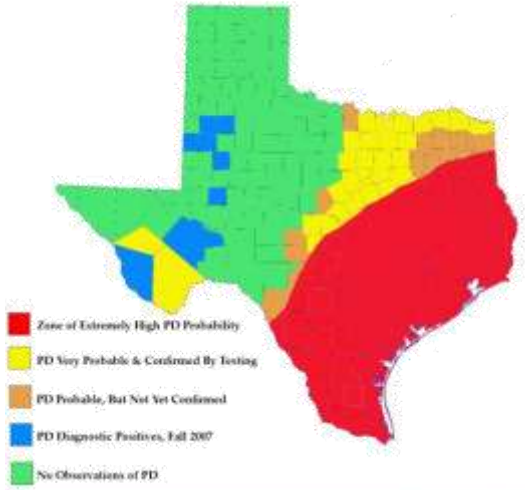
Blanc appears to be a poor salt excluder

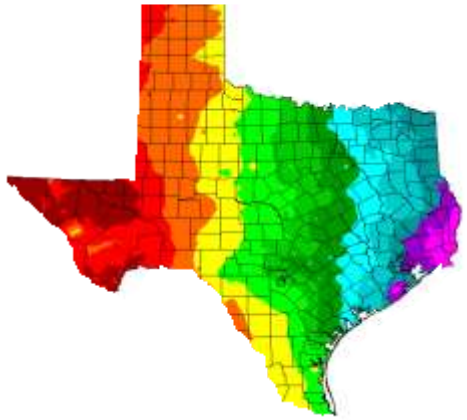


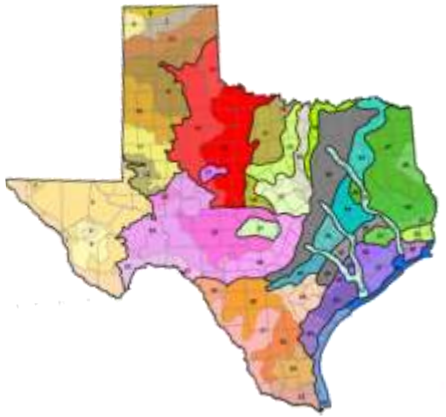
Salt burn – Marginal Necrosis

Blanc Du Bois in Texas

1. Moderately productive (poor fruit set is a common problem)
2. Highly susceptible to anthracnose and fruit rots, moderately susceptible to downy mildew and black rot
3. Wine quality potential rivals vinifera, but fruit does not typically accumulate high sugars (>20°Brix)
4. Vigorous grower, but poor alkaline soil tolerance
5. Virus has been recently observed

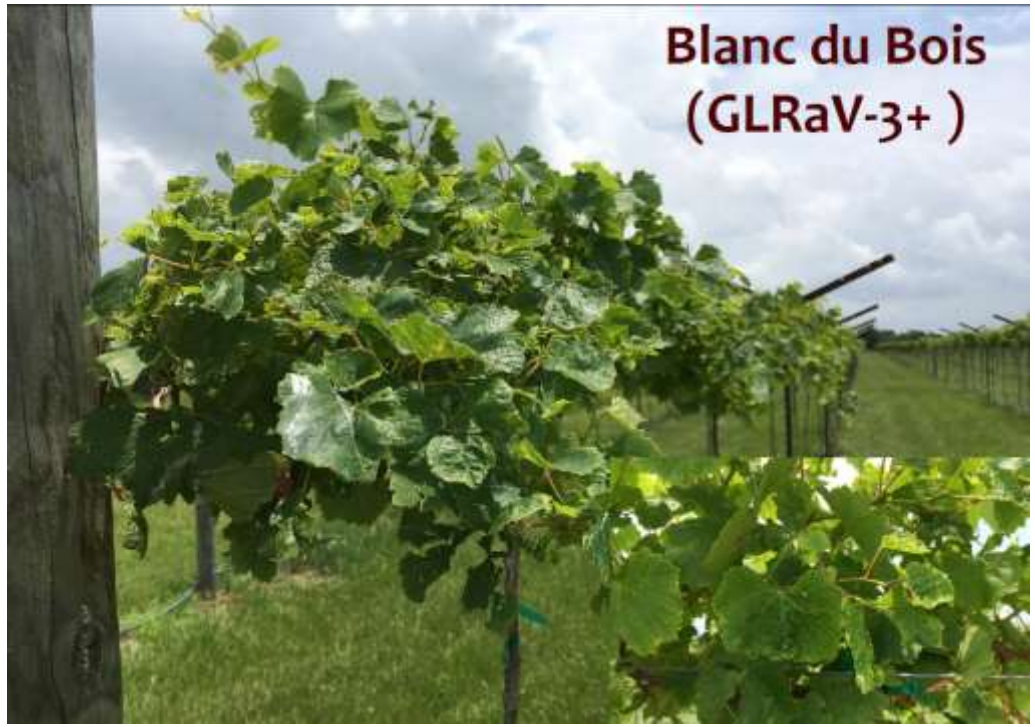






Virus in Blanc Du Bois

- Over 70 different grape viruses identified around the world
- Only a handful are recognized as major threats



Symptoms in Blanc have included: cupped, wrinkled, tattered, small leaves; atypical chlorosis

Viruses Identified in Blanc Du Bois

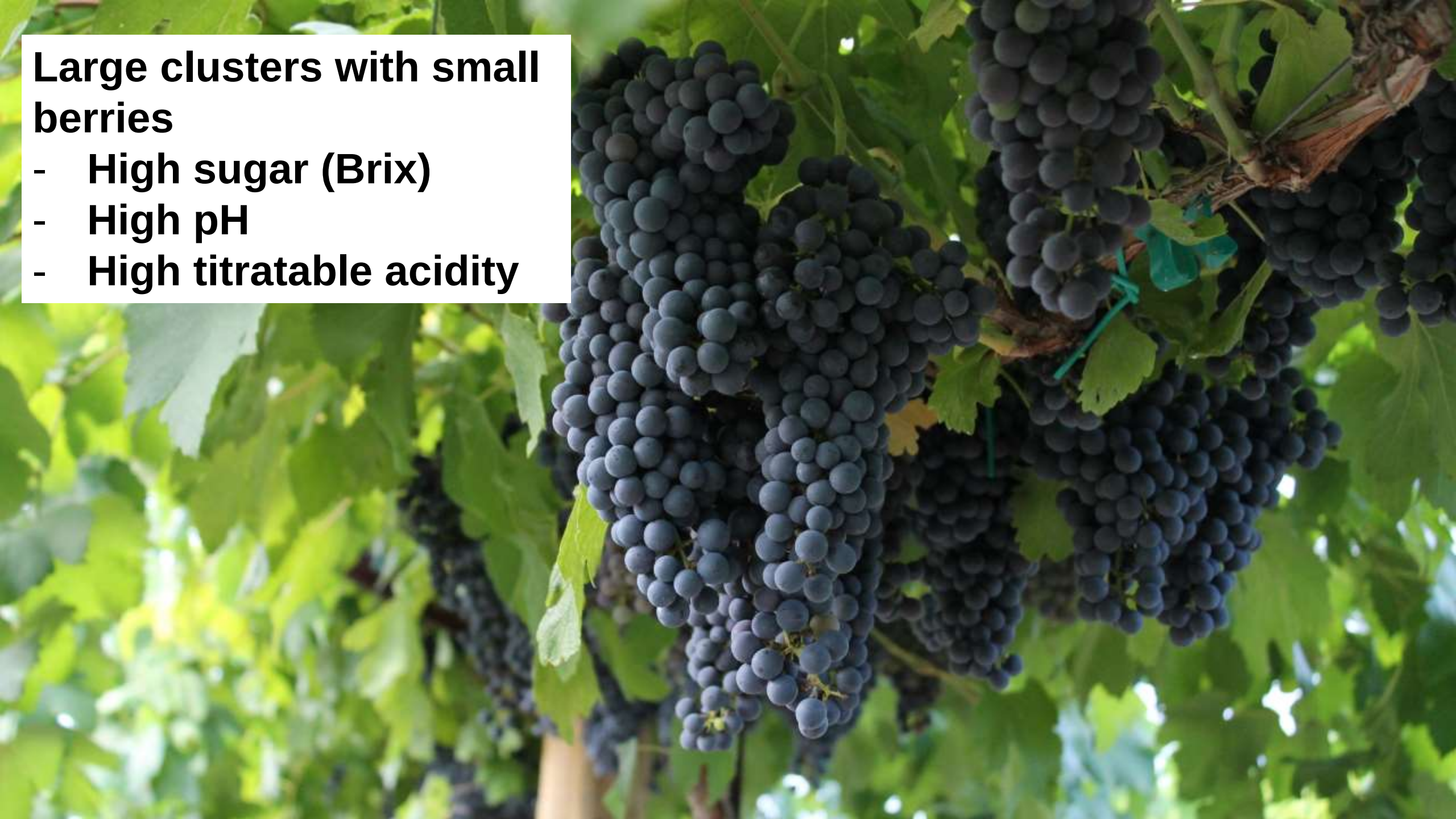
Viruses identified in Texas:

- Grapevine leafroll-associated virus 3 (GLRaV-3)
- Grapevine Red Blotch virus (GRBV)
- Grapevine fleck
- Grapevine rupestris stem pitting-associated virus (GRSPaV)
- Grapevine vitivirus (8 or 9): Grapevine virus A, B,C..
- Grapevine virus M (new virus)
- Viroids (Hop Stunt viroid and Grapevine Yellow Speckle viroid)

Black Spanish

- Unknown origin and parentage
- Consistent producer
- Aesthetic
- Powdery mildew resistant
- Wine has unique flavor


Upright growth
- Can be trained low or high
- Large leaves



Large clusters with small berries

- **High sugar (Brix)**
- **High pH**
- **High titratable acidity**


Highly susceptible to downy mildew

Lomanto

Lomanto: Interspecific hybrid ('Salado' x 'Pense') developed by T.V. Munson in 1902. Slightly compact clusters with medium black berries. Lomanto makes an exceptionally deep colored red wine, juice and jelly.

Can be trained high and allow canopy to sprawl or low with canopy positioned upright

Moderate susceptibility to black rot


Lomanto

Lomanto

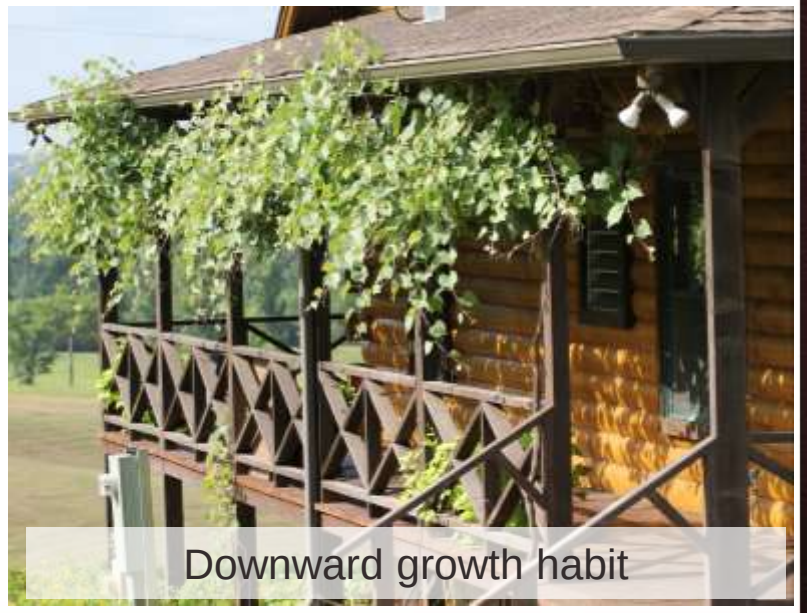
- Low to moderate yield potential
- Large berries, but excellent color
- Spindly growth habit (can be trained high or low)
- Good disease resistance
- Wine: jammy, fruity flavor, insignificant tannins

Champanel

Champanel: Interspecific hybrid (*V. champinii* x‘Worden’) developed by T.V. Munson in 1893. Medium to large clusters with large black berries that have a jelly-like pulp. The fruit of Champanel makes excellent jelly, and may be used to make a fruity flavored wine.

Flavors somewhat similar to Concord

Large slip-skin berries



Downward growth habit


Champanel

Lake Emerald (‘Pixiola’ x ‘Golden Muscat’) released by the University of Florida in 1954. Large clusters of small green berries that turn yellow with advanced maturity.


Herbemont

Lake Emerald (‘Pixiola’ x ‘Golden Muscat’) released by the University of Florida in 1954. Large clusters of small green berries that turn yellow with advanced maturity.