Welcome to Olive Oil Day 2024

Welcome

MICHAEL FOX – OOCC RESEARCH COMMITTEE CHAIR

CHRIS ZANOBINI – OOCC EXECUTIVE DIRECTOR

Water Management Strategies for Hedgerow Olive Orchards in California

GIULIA MARINO, DEPARTMENT OF PLANT SCIENCES, UC DAVIS

Water Management Strategies for Hedgerow Olive Orchards in California

Giulia Marino,
Professor of Cooperative Extension in Orchard Systems, UC Davis

Olive Oil Commission of California
cdfa
California Department of Food & Agriculture
California Olive Ranch
CORTO
a NEW WORLD of FRESH
UC DAVIS
UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources
TREE SYSTEMS LAB
UC DAVIS

Irrigation impacts on SHD olive orchards profitability

Number of fruits

Fruit size

Oil content and extraction

Oil quality

Orchard health

Alternate bearing

Expenses

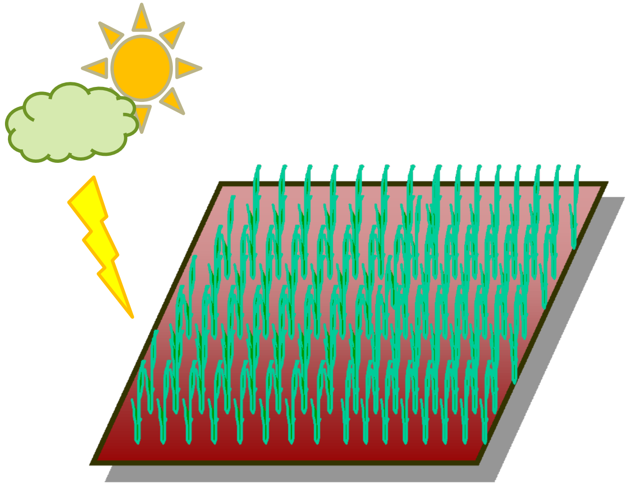
Frost resistance

Ripening timing

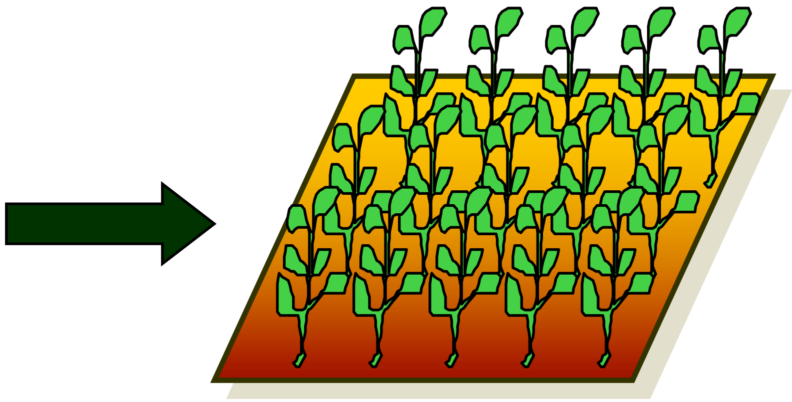
Estimate crop evapotranspiration

$$ET_c = ET_o \times K_c$$

- **ET_o accounts for weather factors**
- **K_c accounts for crop differences**



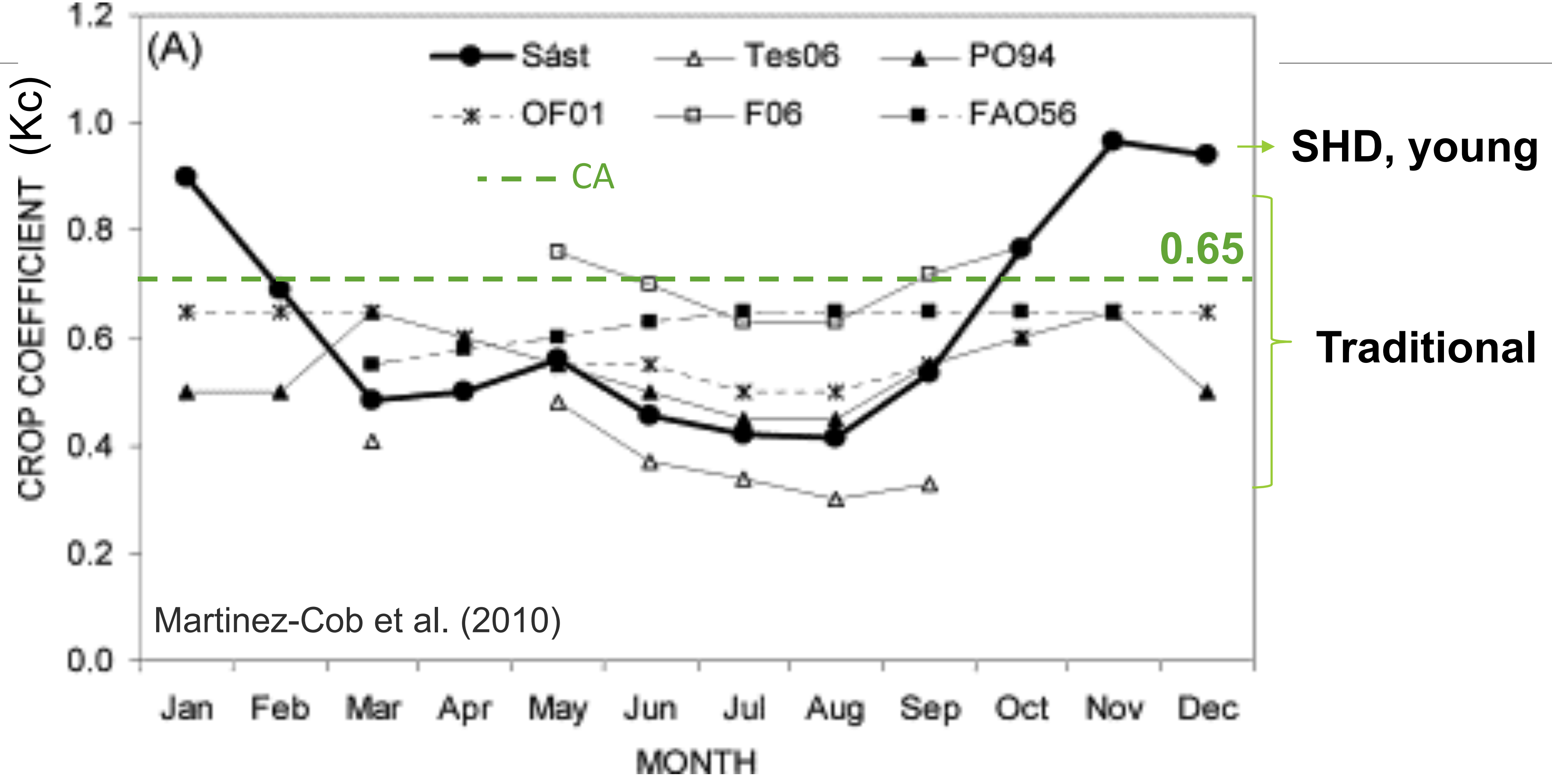
ETo = Reference ET



Kc = Crop coefficient

Olive Crop Coefficient (Kc)

ETc = Kc x ETo

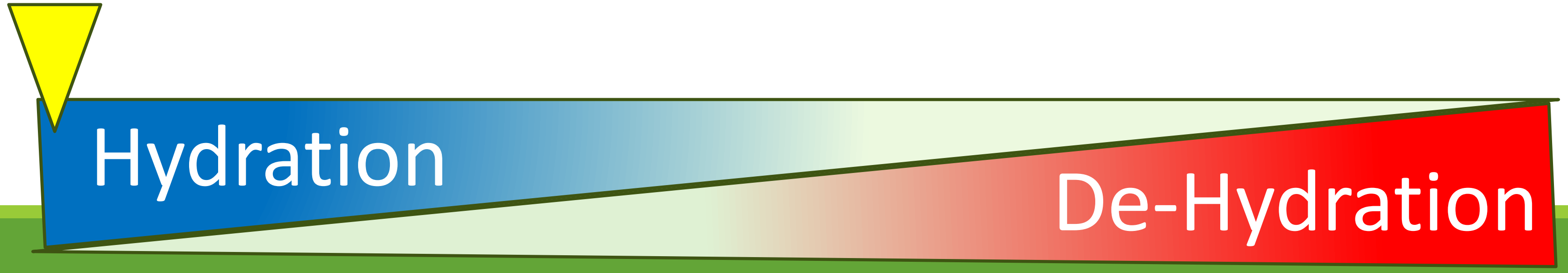


Kc in CA for olive **0.65**. Developed in spaced (5 x 9 m), vase-shaped Manzanillo orchards, some flood-irrigated. Goldhamer et al. (1994)

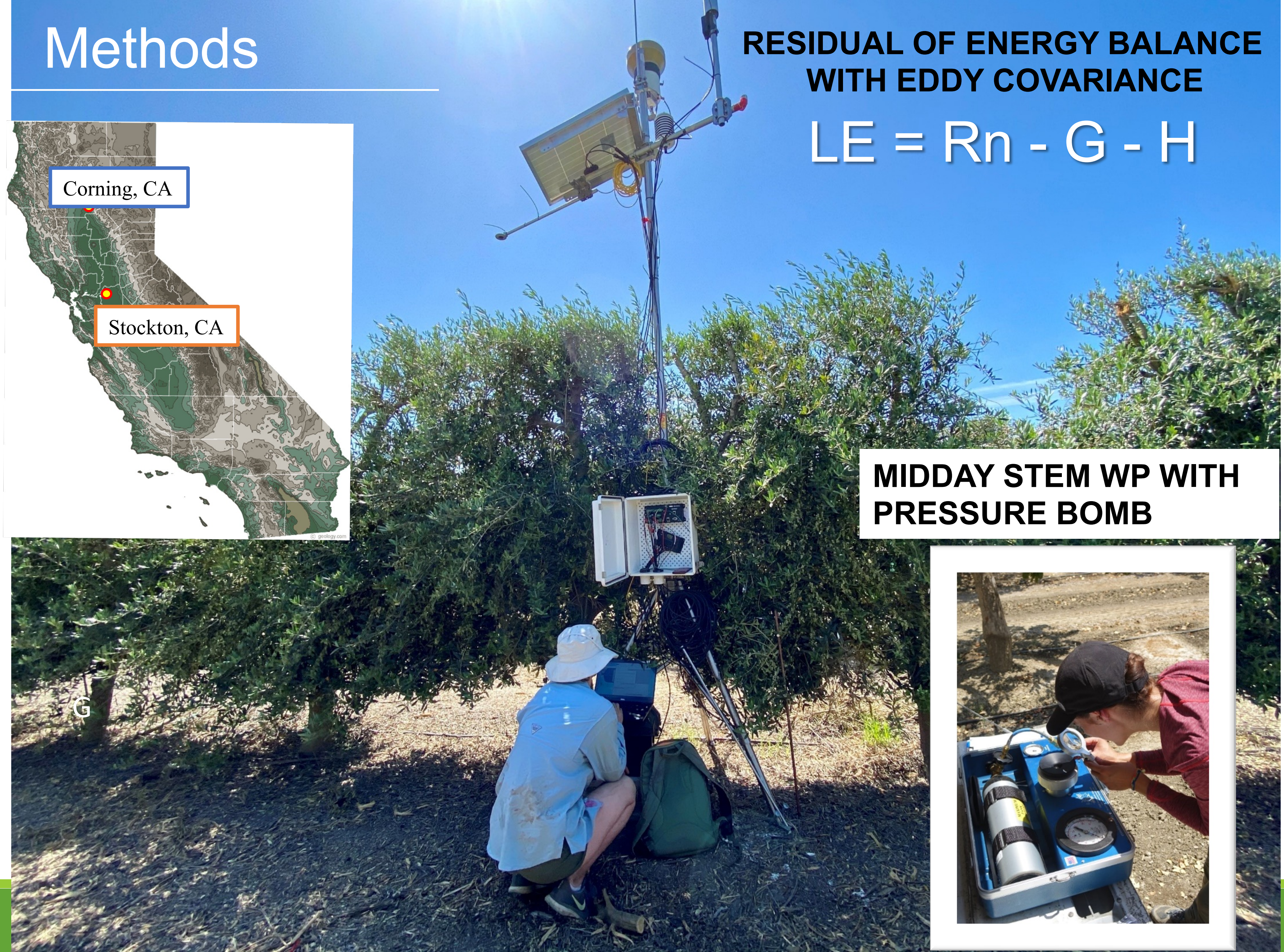
Objectives

Inform precise water management

1. Characterize maximum water use (ET) and crop coefficients (Kc) of California SHD olive orchards



Methods



RESIDUAL OF ENERGY BALANCE WITH EDDY COVARIANCE

$$LE = Rn - G - H$$

MIDDAY STEM WP WITH PRESSURE BOMB

Orchards' characteristics

2000 trees/ha

Hedgerow

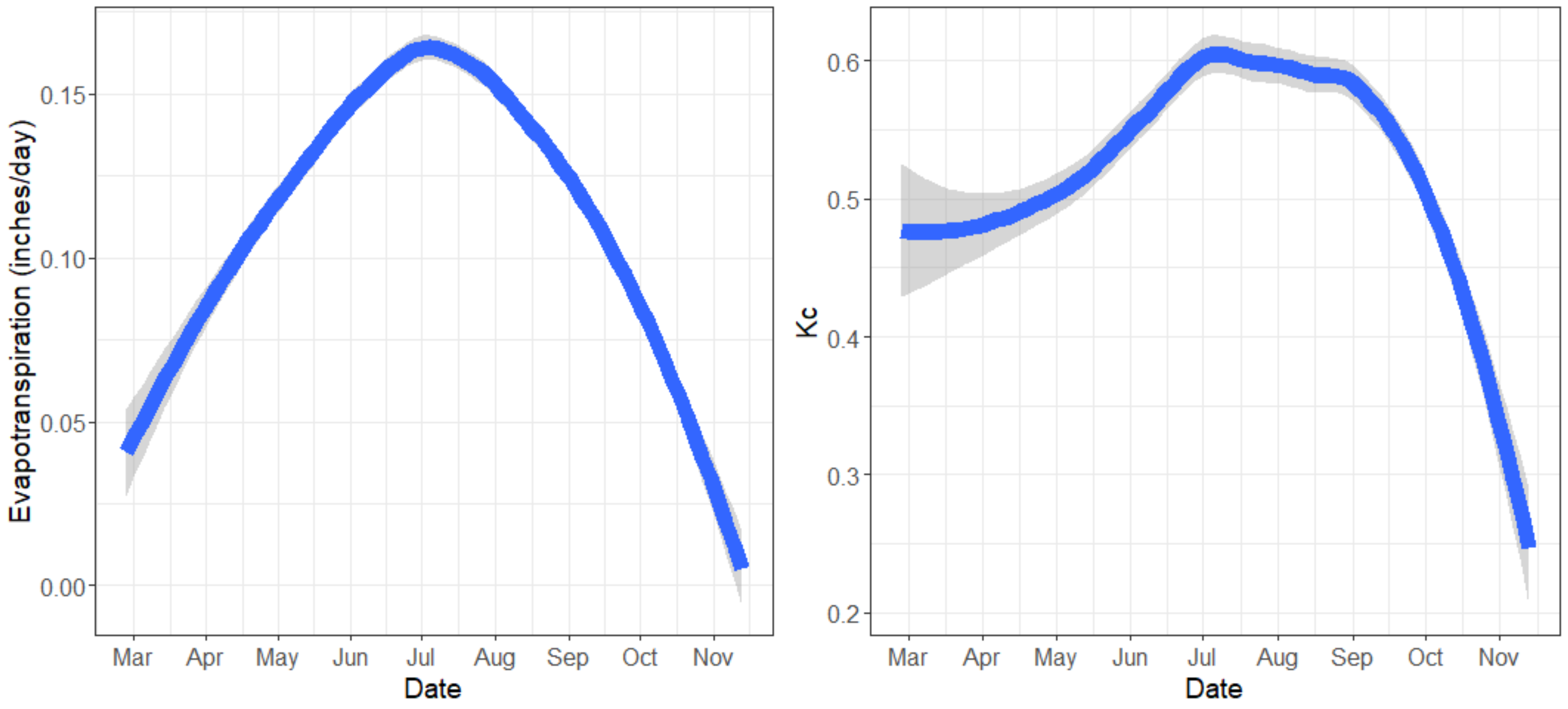
'Full' irrigation (600 mm/year)

Based on Kc ~ 0.55-0.65

Drip irrigation, single line

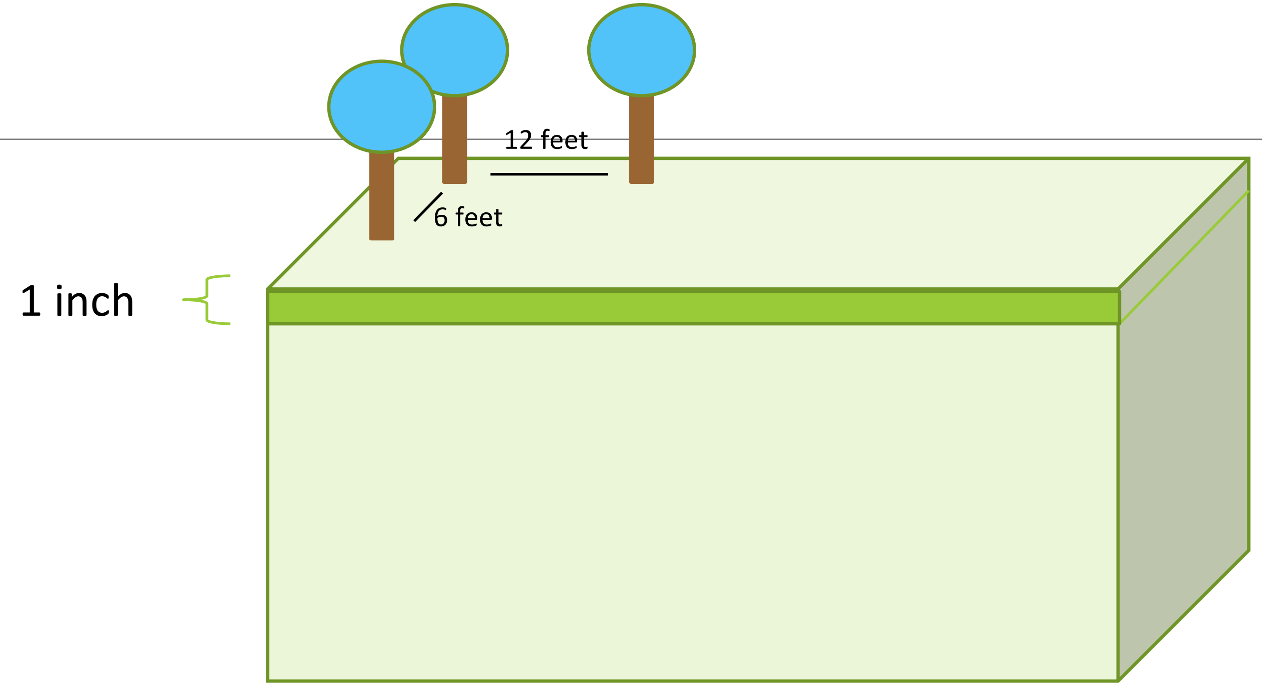
Cultivar Arbequina

Evapotranspiration and Crop Coefficients



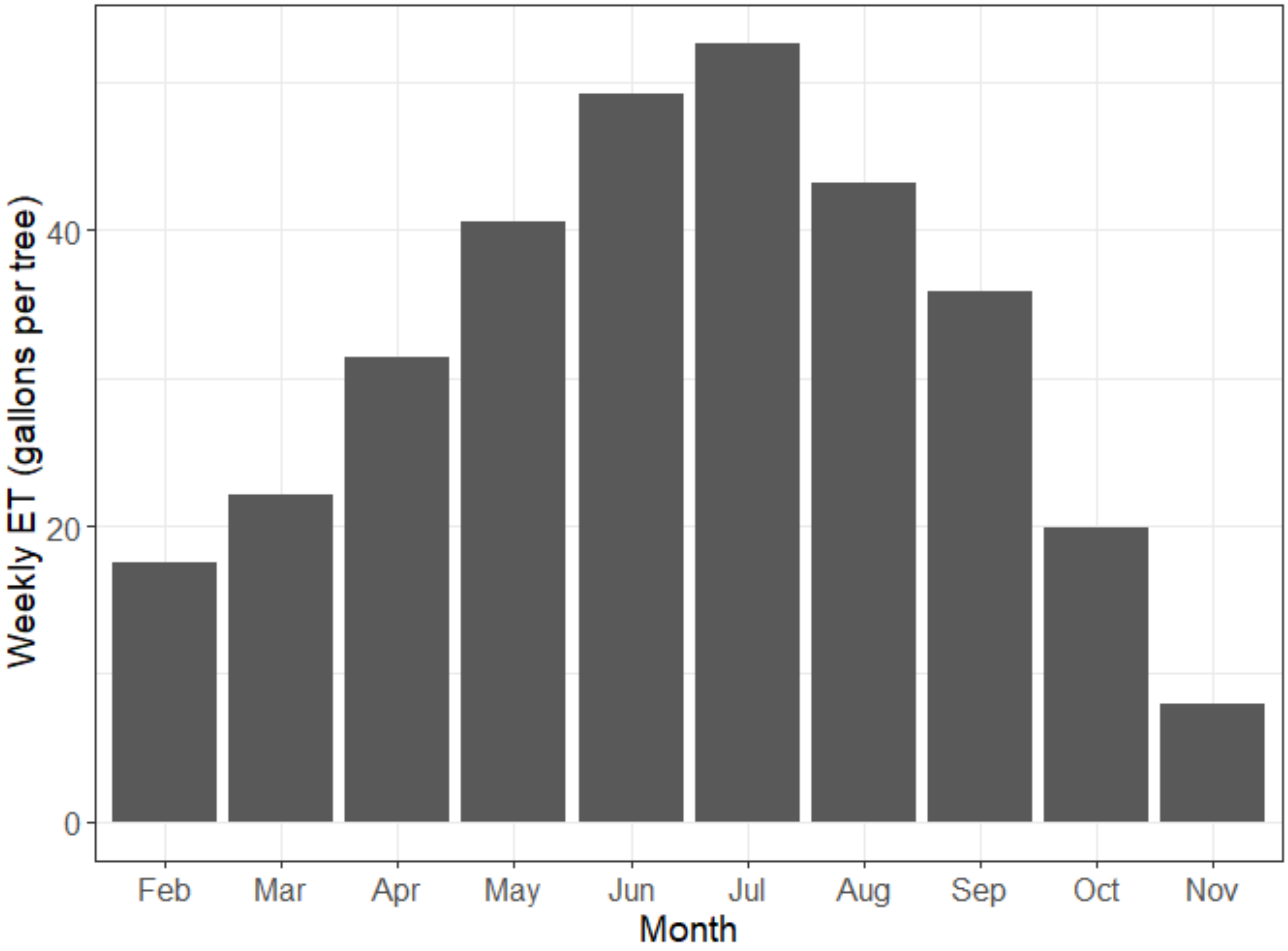
The shape of the Kc trend was the opposite of what suggested in literature

Inches/acre to gallons/tree conversion



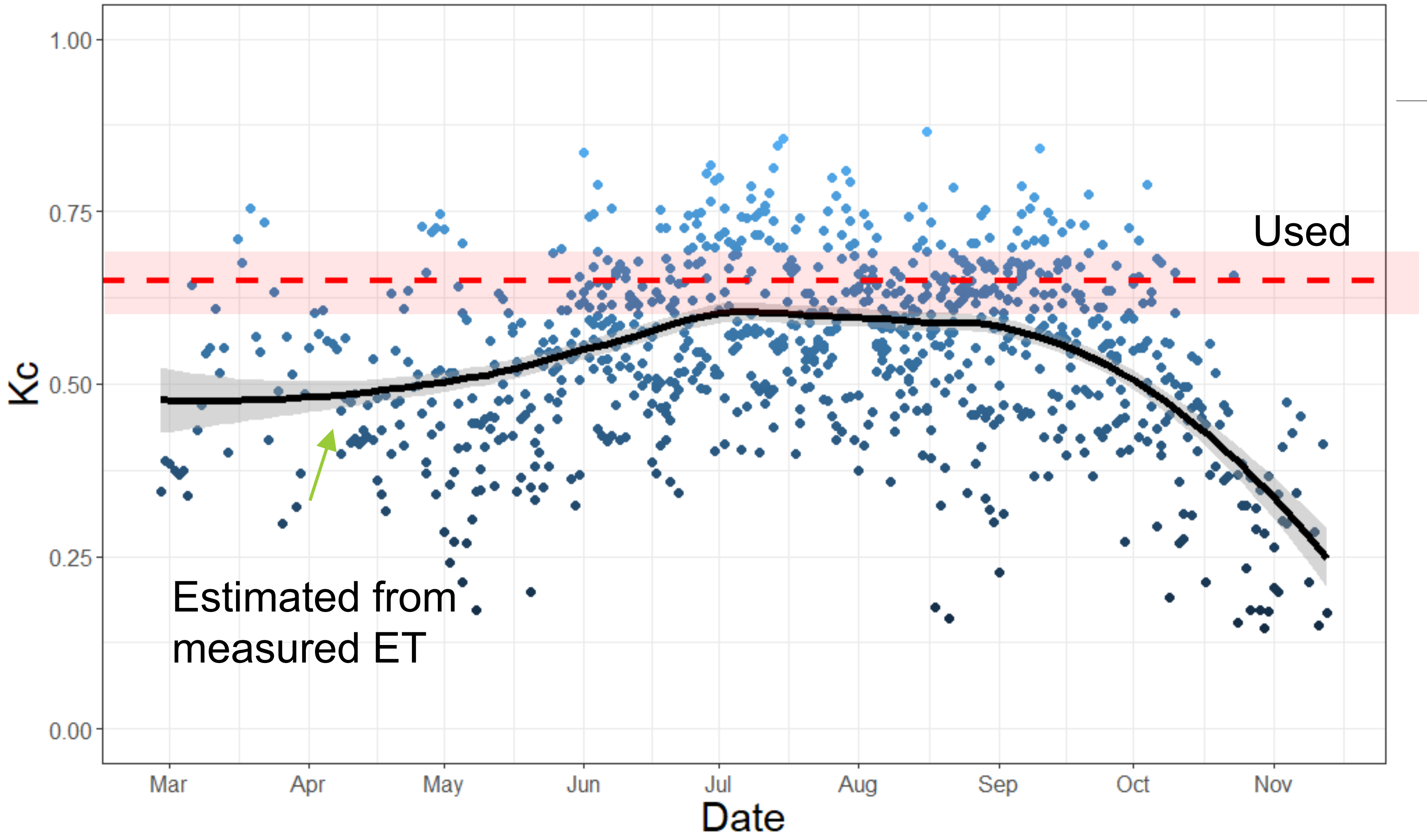
Spacing: 12 ft* 6ft = 72 sq ft

Water use per tree in July: 0.18 (in/day) x 72 x 0.623 = 8 gal per tree day

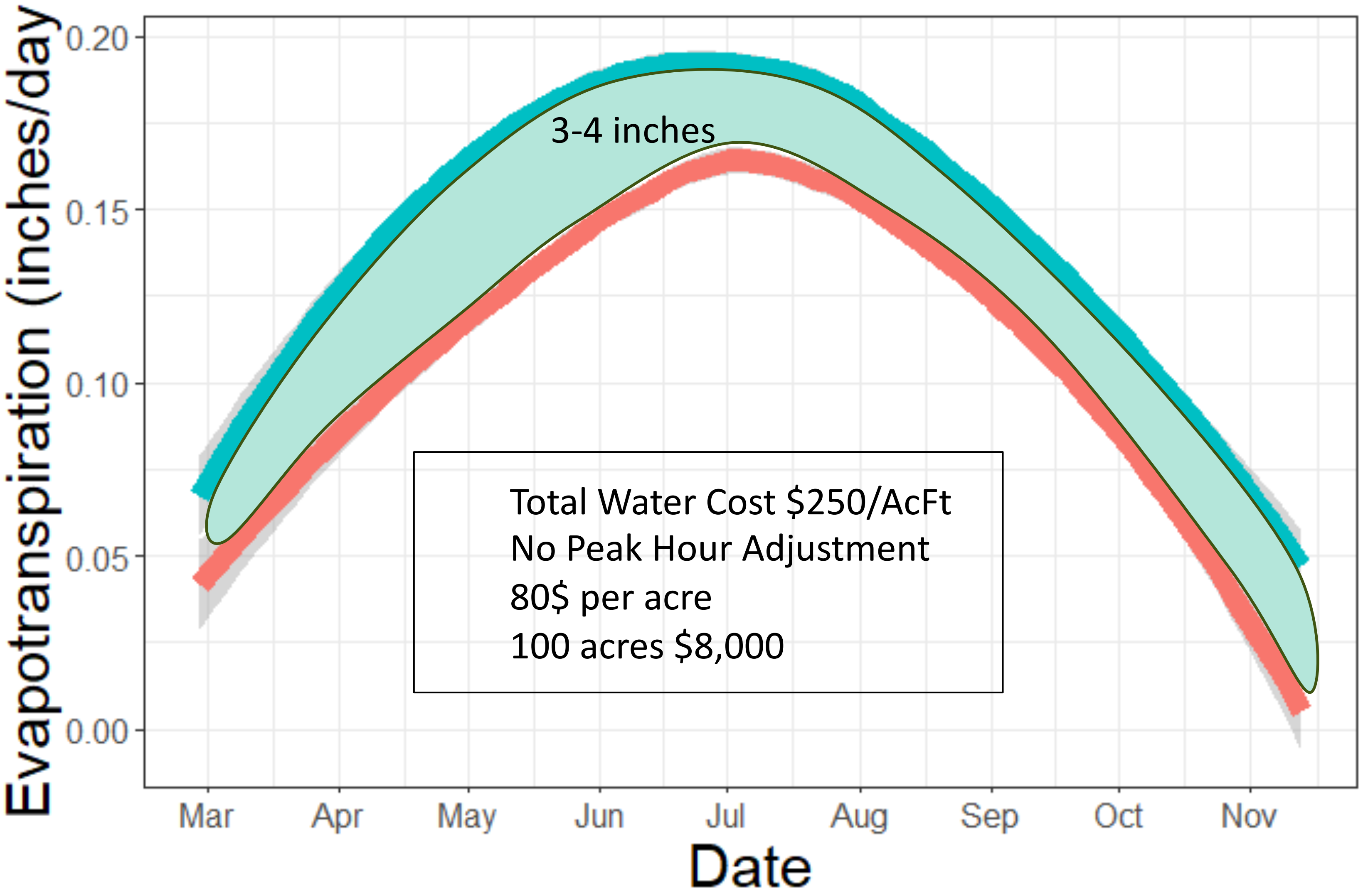

Weekly ET (gallons per tree)
40
20
0
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Month

Crop Coefficient (Kc)

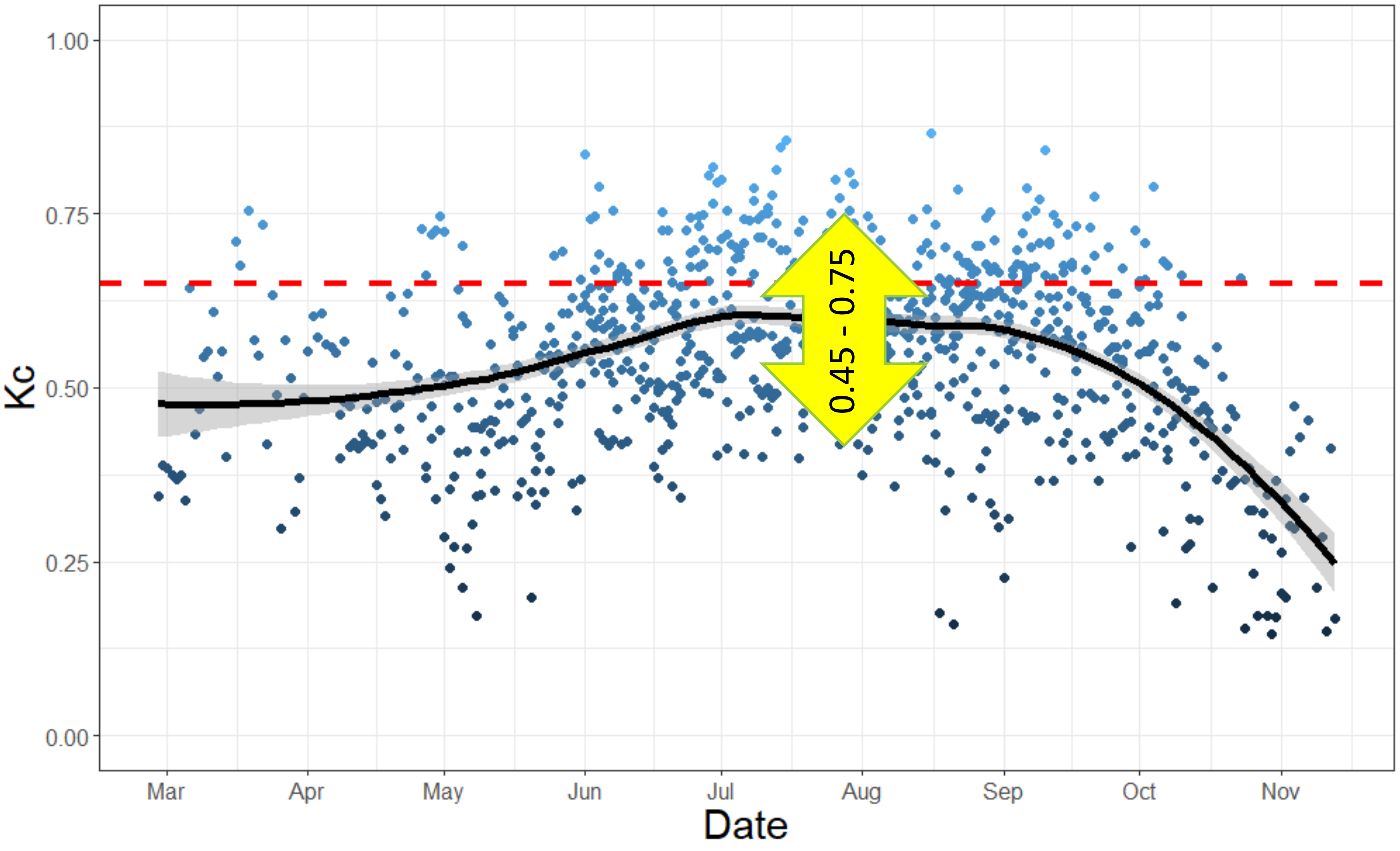
Kc = ETo / ET



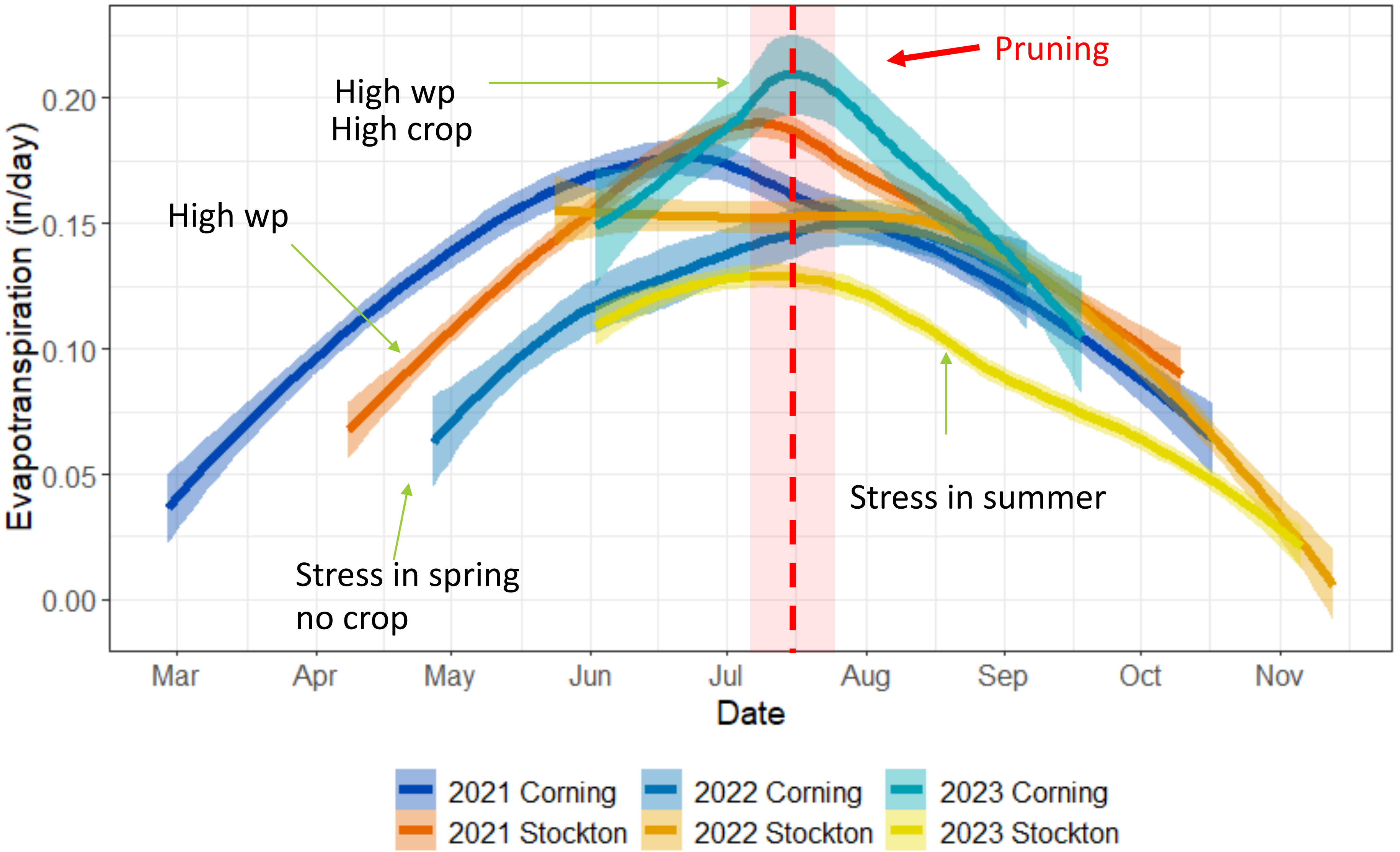
A Kc-of 0.65 would lead to overirrigation mainly in spring

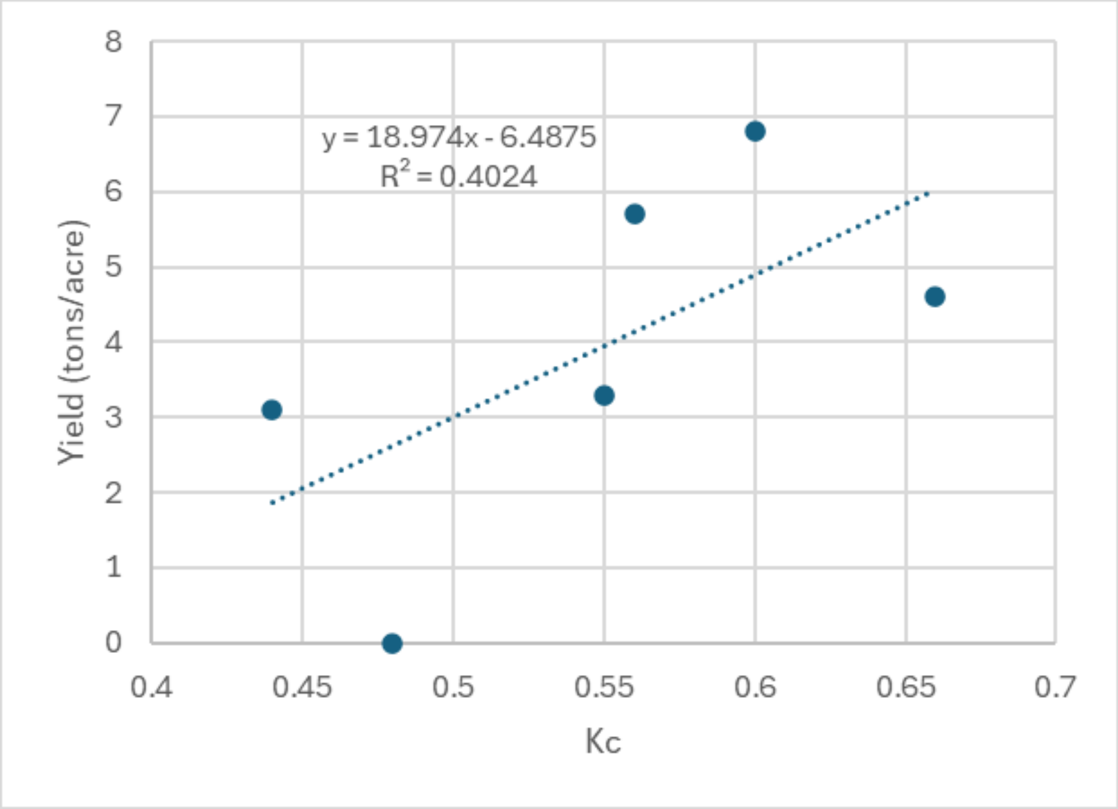


Measured ET Calculated using Kc of 0.65



Variability in Kc due to irrigation management and year and orchard changes in management, weather, crop load and pruning


Pruning
High wp
High crop
High wp
Stress in summer
Stress in spring
no crop
Evapotranspiration (in/day)
0.20
0.15
0.10
0.05
0.00
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Date
2021 Corning
2022 Corning
2023 Corning
2021 Stockton
2022 Stockton
2023 Stockton

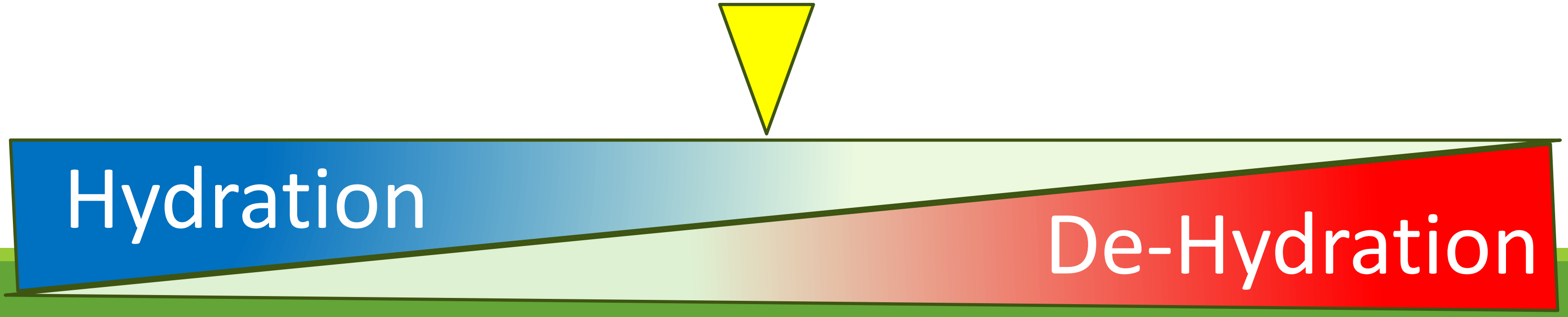


Year	Orchard	Water stress (bars)	kc	Yield (tons/acre)	Water applied (Inches/acre)
2021	Corning	-2.6	0.56	5.7	-
2021	stockton	-1.5	0.60	6.8	-
2022	corning	-2.0	0.48	0	21.4
2022	stockton	-2.7	0.55	3.3	26.9
2023	corning	-2.3	0.66	4.6	20.8
2023	stockton	-2.5	0.44	3.1	16.9

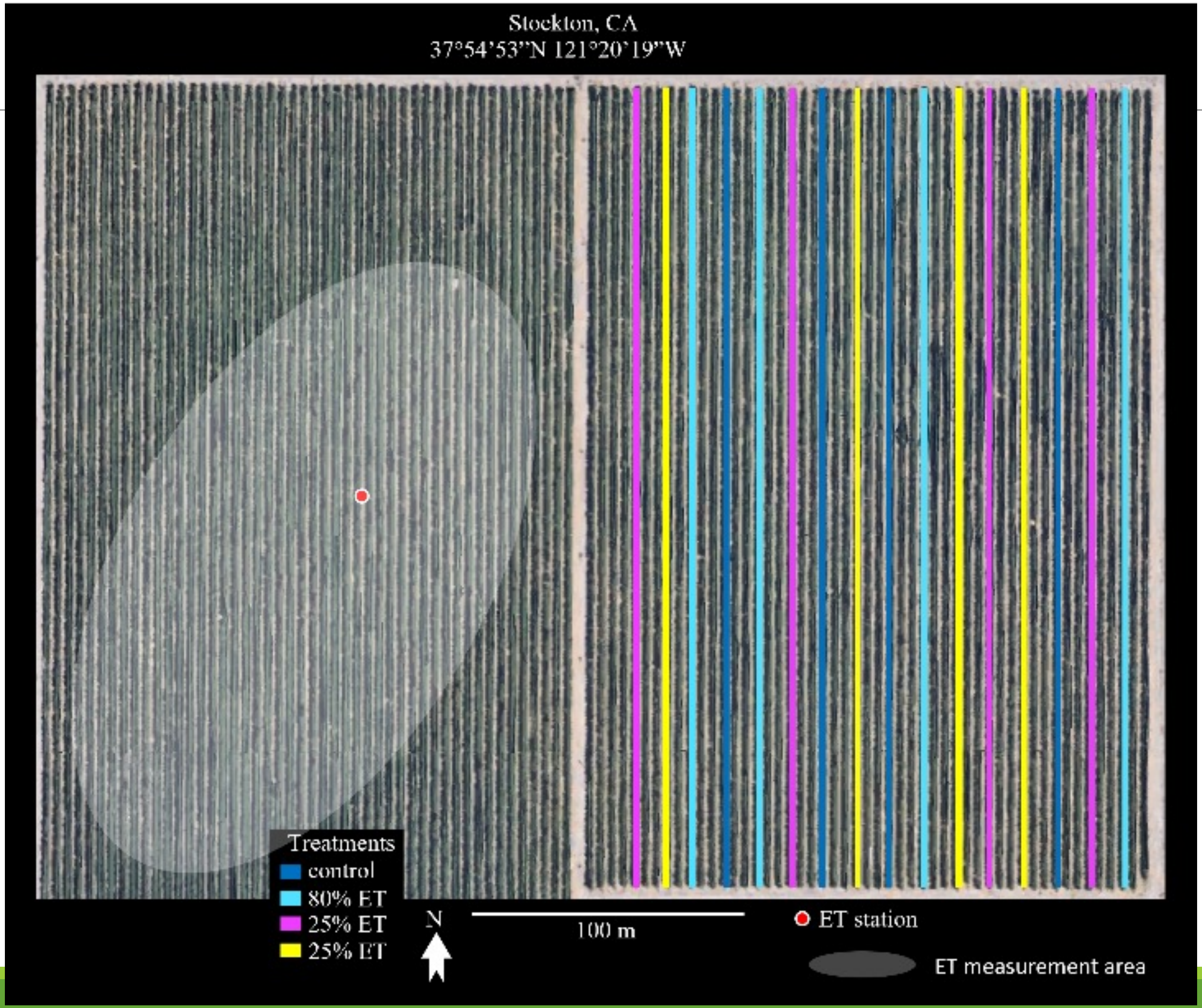
Objectives

Inform precise water management

1. Characterize maximum water use and water status
2. Develop protocols to optimize water application based on production objectives



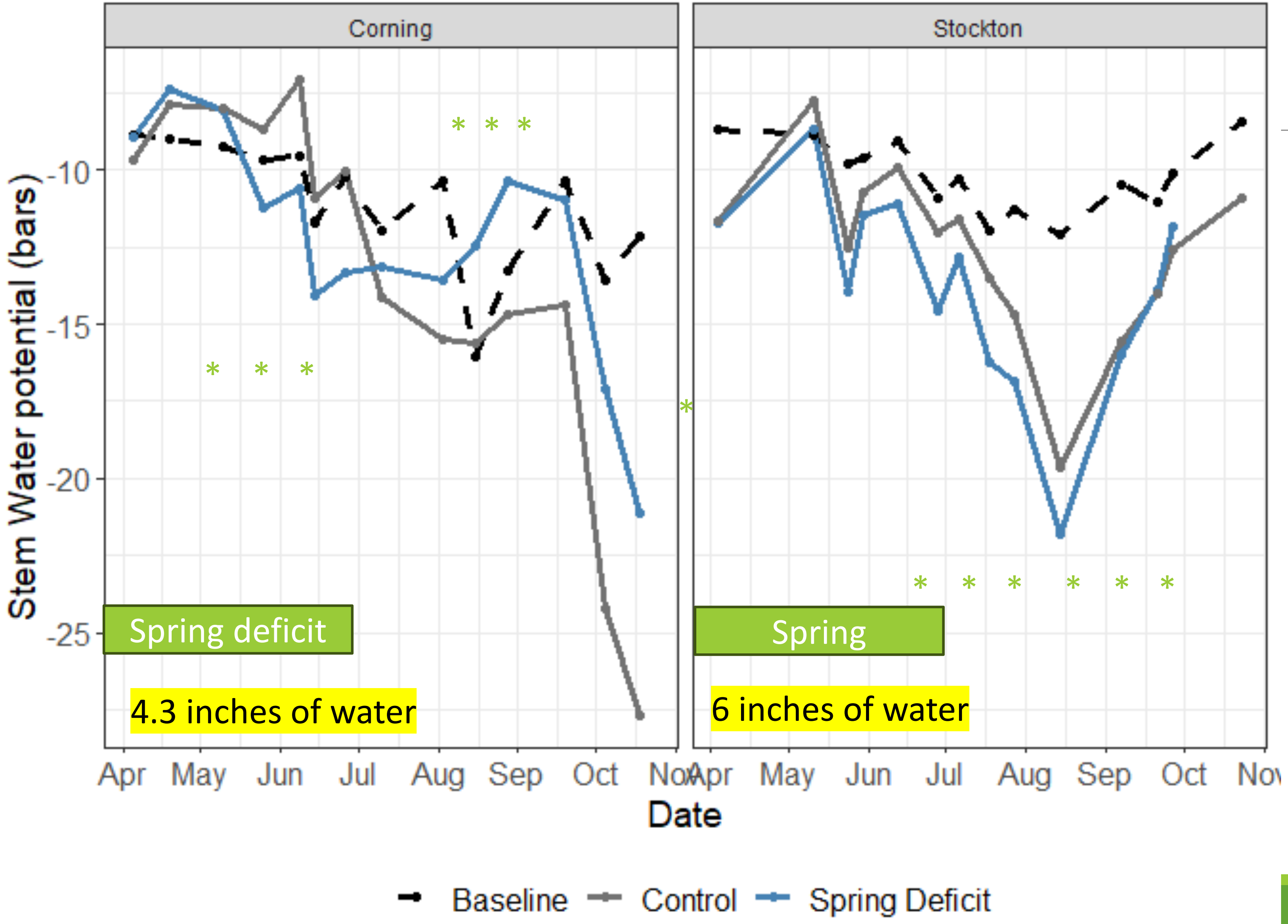
Deficit irrigation during Pit Hardening



Water stress during pit hardening

		Corning		Stockton	
year	Treatment	Yield Tons/acre	TPC ppm	Yield Tons/acre	TPC ppm
2021	Control	5.3	121.9 a	6.8	64 a
	Deficit+	4.3	120.9 a	5.1	69 a
	Deficit	4.5	160.1 c	5.0	88.2 c
2022	Control	0		3.4	96
	Deficit+	0		3.5	81
	Deficit	0		3.7	96
2023	Control	4.7	44.4 b	3.1	268
	Deficit+	4.9	75.8 a	2.6	235
	Deficit	5.2	38.1 b	3.2	256

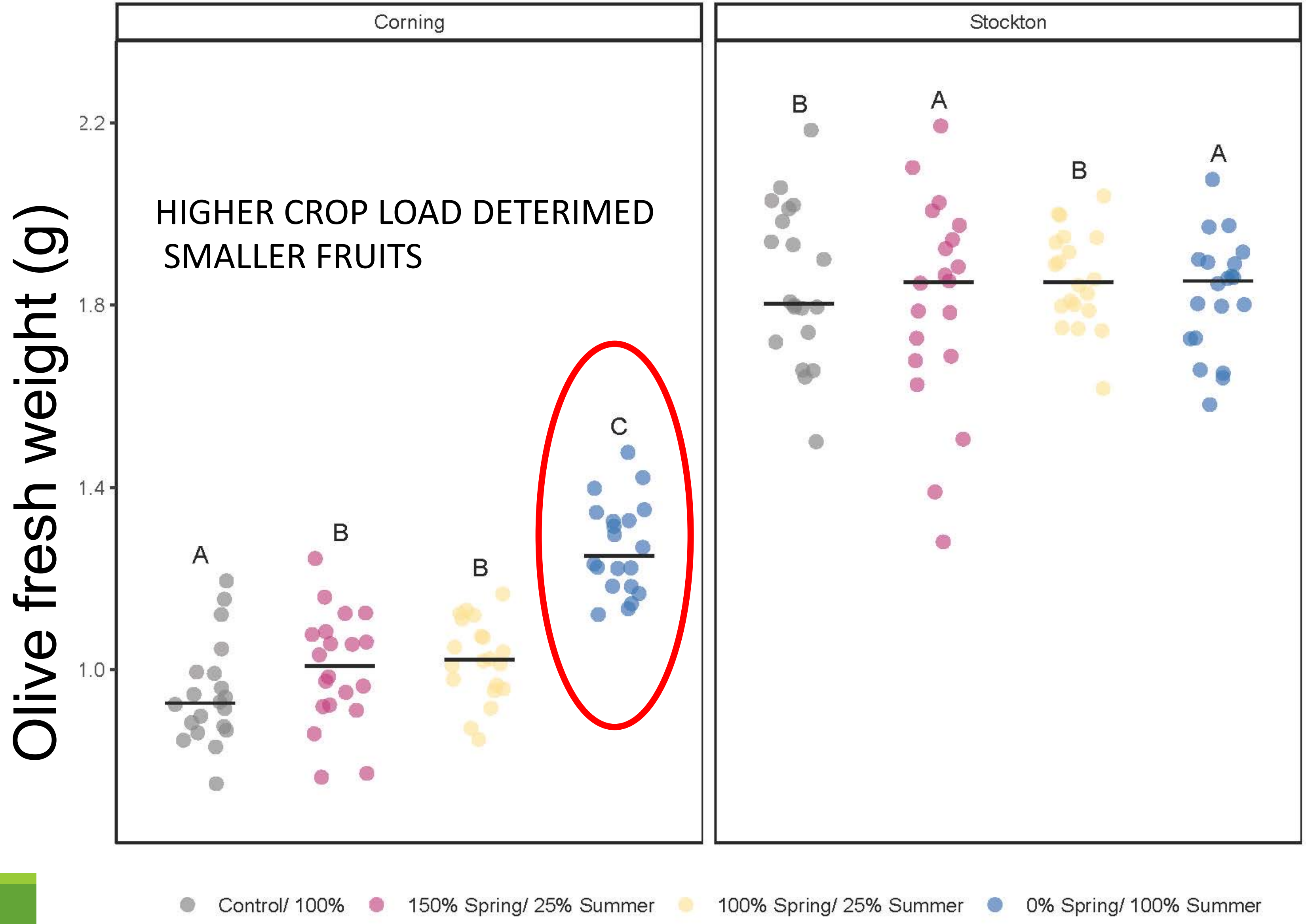
2023 SWP (spring deficit)

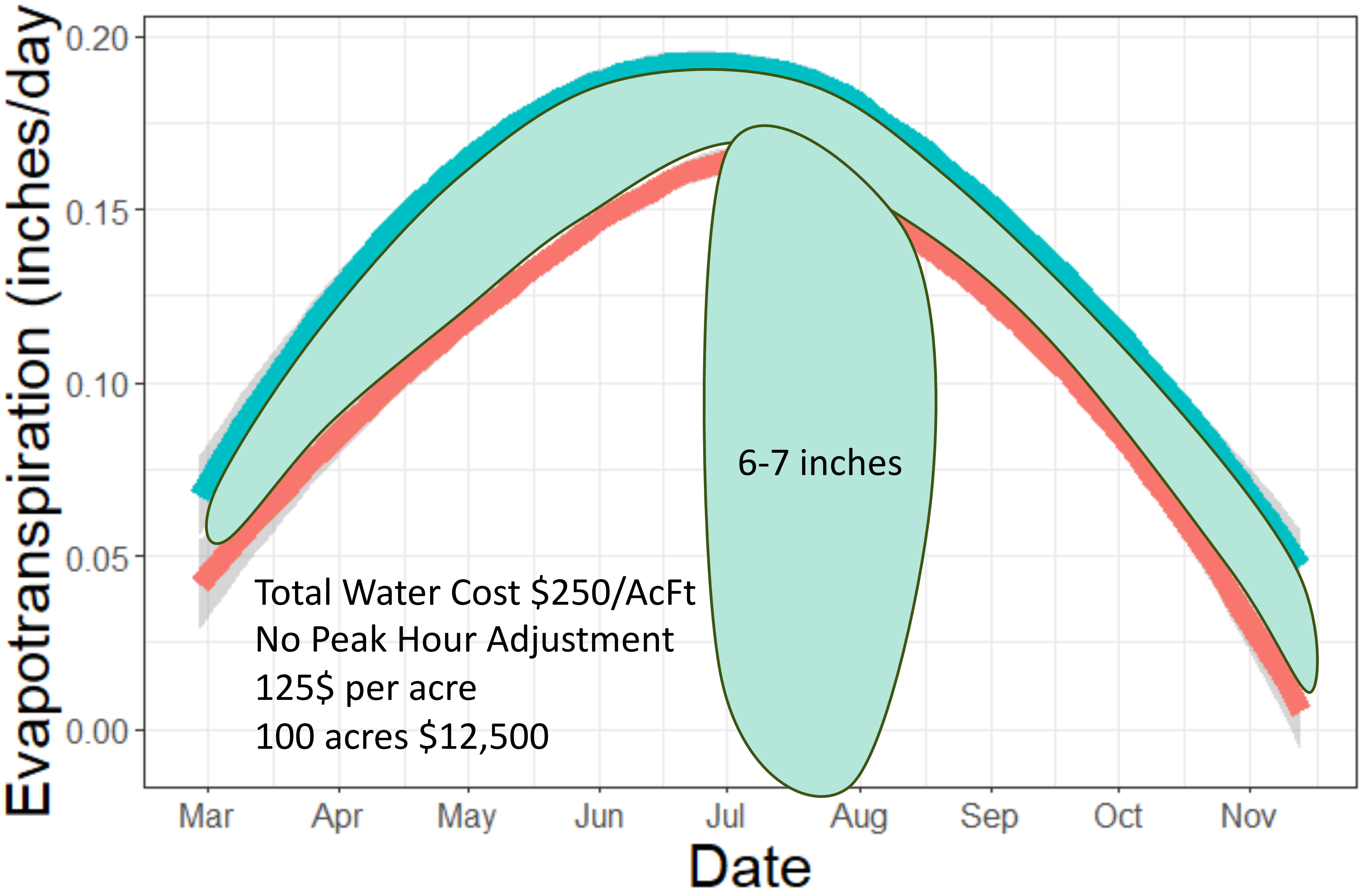


Spring deficit

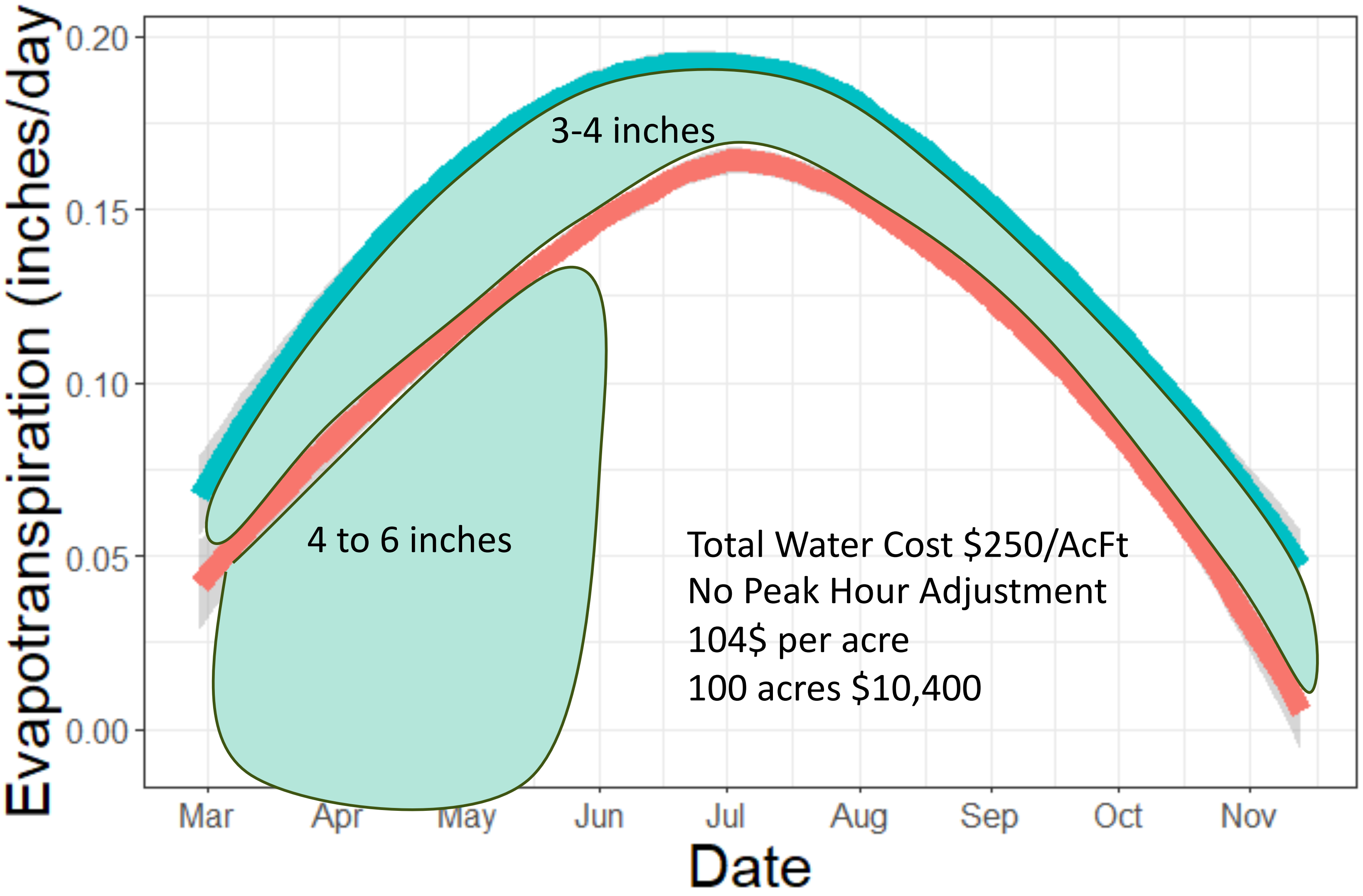
		Corning		Stockton	
year	Treatment	Yield Tons/acre	TPC ppm	Yield Tons/acre	TPC ppm
2023	Control	4.7	44.4 b	3.1 ab	267.6 b
	Spring-def	4.4	78.4 a	3.7 a	351.0 a
	Pit-Deficit +	4.9	75.8 a	2.6 b	234.6 b
	Pi-Deficit	5.2	38.1 b	3.2 ab	255.9 b

Effect on fruit size at harvest





Measured ET   Calculated using Kc of 0.65

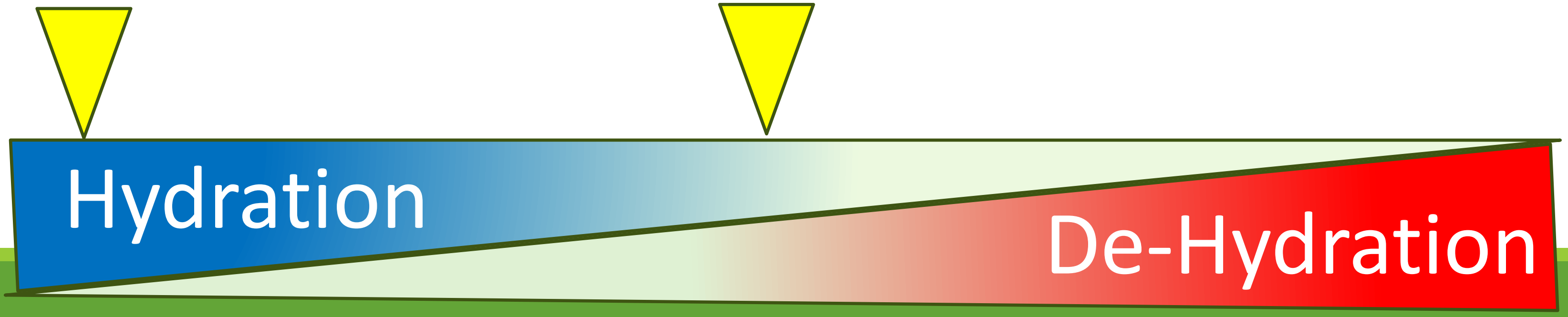


Measured ET Calculated using Kc of 0.65

Objectives

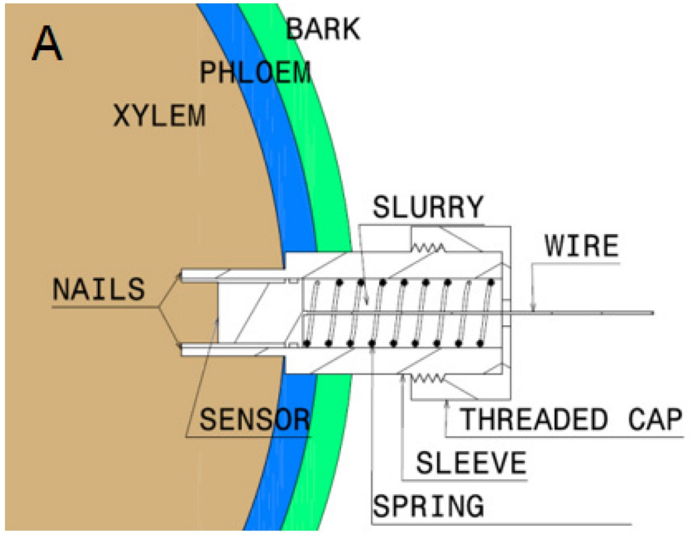
Inform precise water management

1. Characterize maximum water use and water status
2. Develop protocols to optimize water application based on tree physiology
3. develop knowledge about the use of proximate and remote water status monitoring for irrigation

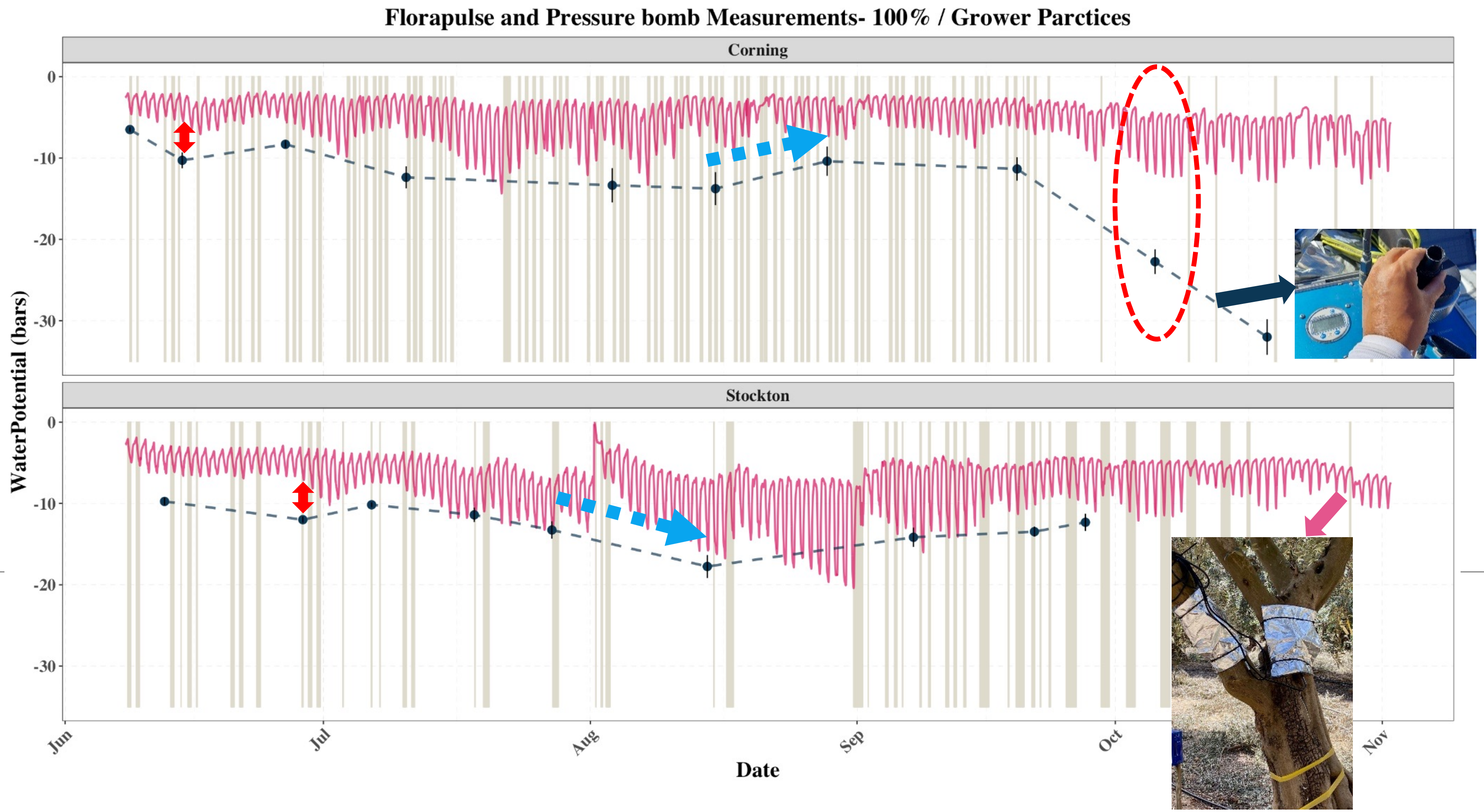



Microtensiometer

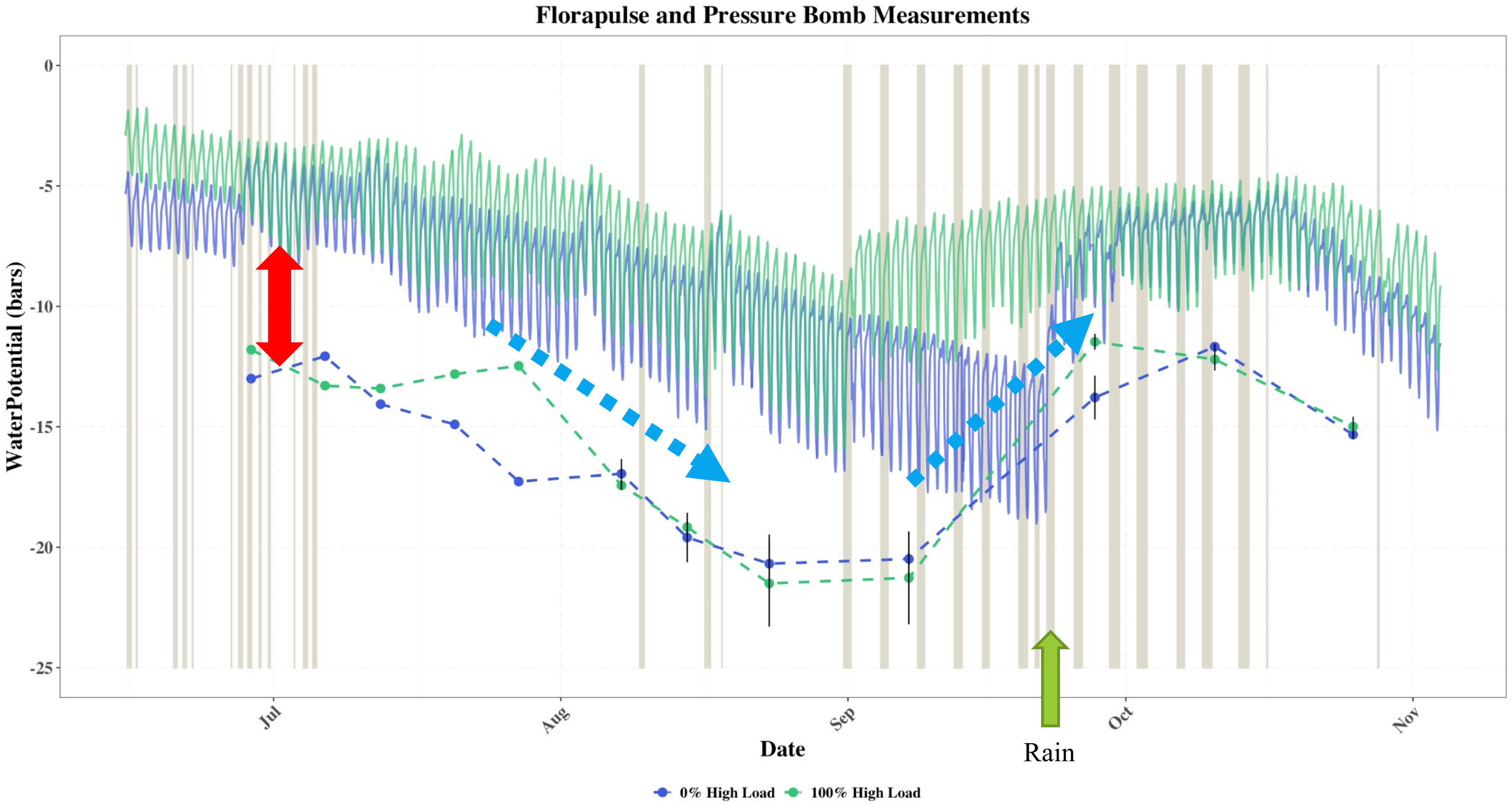
Methods

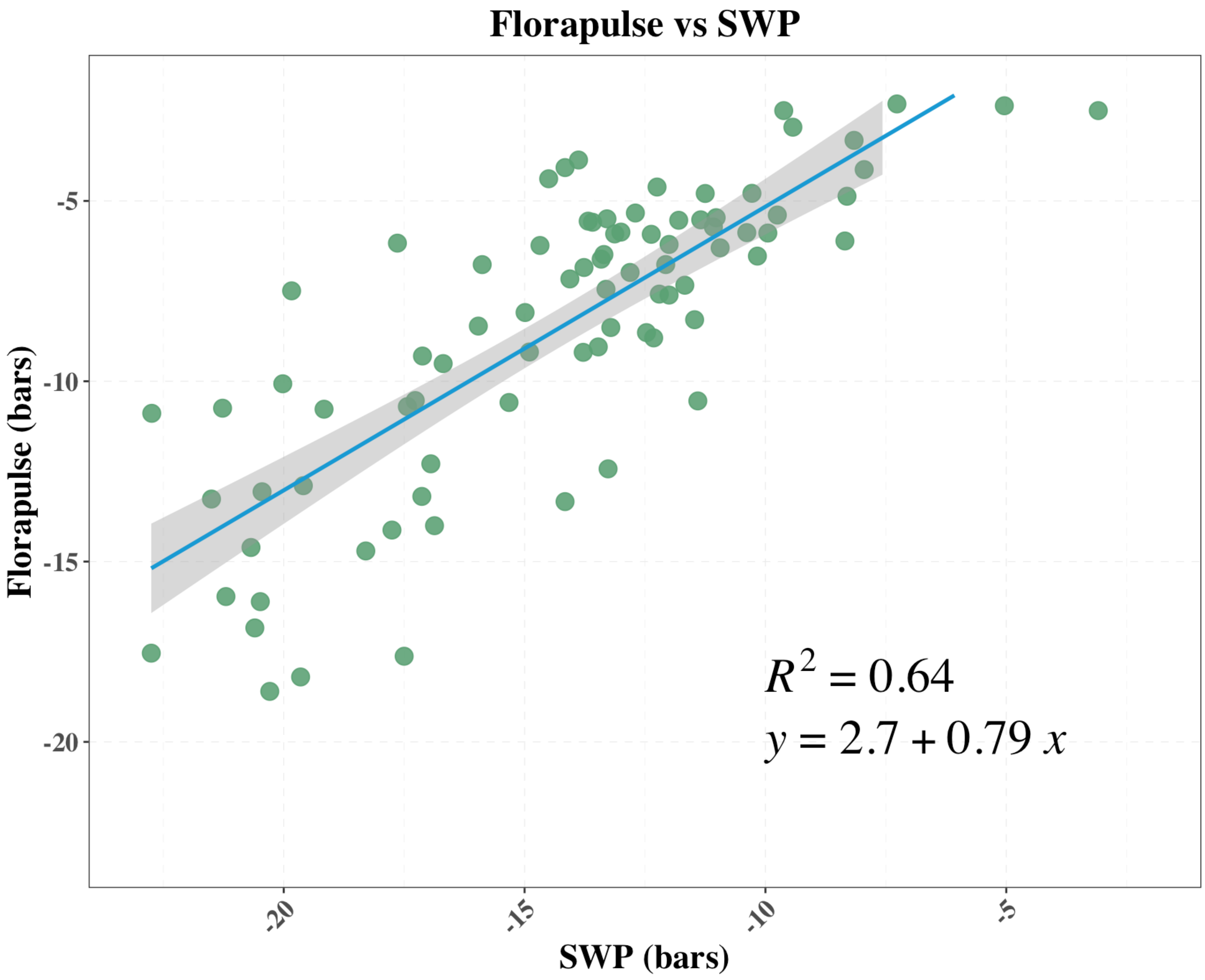

A
BARK
PHLOEM
XYLEM
SLURRY
WIRE
NAILS
SENSOR
THREADED CAP
SLEEVE
SPRING

Continuous SWP measurements



Continuous SWP measurements





Florapulse vs SWP
Florapulse (bars)
-5
-10
-15
-20
SWP (bars)
-20
-15
-10
-5
$R^2 = 0.64$
$y = 2.7 + 0.79\,x$

Conclusions

- Kc was lower than reported values, particularly in spring
- Water reduction can be applied during pit hardening without impacting commercial yield
- Up to 10 inches of water saved with more informed management as result of this project
- Microtensiometers show promising results in olive, and could substitute manual SWP measurements and support implementation of plant-based irrigation management in the future

Collaborators

OOCC

Corto Olive

California Olive Ranch

Rich Marchini

Emily Santos, Research Assistant

Kosana Suvočarev, Cooperative Extension Specialist in biometeorology

Selina Wang, Cooperative Extension Specialist

Mohamed Nouri, UCCE Orchard Systems Advisor

Taylor Synstelien, Student Research Assistant

Paula Guzman-Delgado, Project Scientist

Louise Ferguson, Cooperative Extension Specialist in Orchard Systems

Richard Rosecrance, professor of fruit tree physiology

Ken Shackel, Professor/Pomologist in Plant Sciences

Curt Pierce, UCCE Irrigation and Water Resources Advisor

Luke Kinney Milliron, UCCE Orchard Systems Advisor, Butte County

Jarin Tasnim Anika, Graduate Student research

Khaled Bali, Irrigation Water Management Specialist

Andre Daccache, professor of Precision Irrigation

UC Davis Olive Center


Emily Santos


Amrit Pokhrel


Aileen Salas


Jullia Souza


Raman Kaur


Daniel Ruiz

TREE SYSTEMS LAB

UC DAVIS


Paula Guzman Delgado

Giulia Marino

giumarino@ucdavis.edu

What are the current orchard management practices in California olive?

We want to hear from you!

Follow the QR code to take the olive management and irrigation survey:

Nitrogen Management Field Trials in SHD Orchards

ANDREW COURTRIGHT, DEPARTMENT OF LAND, AIR AND WATER RESORCES, UC DAVIS AND UCD OLIVE CENTER

Nitrogen Management Field Trials in Super-High Density Orchards

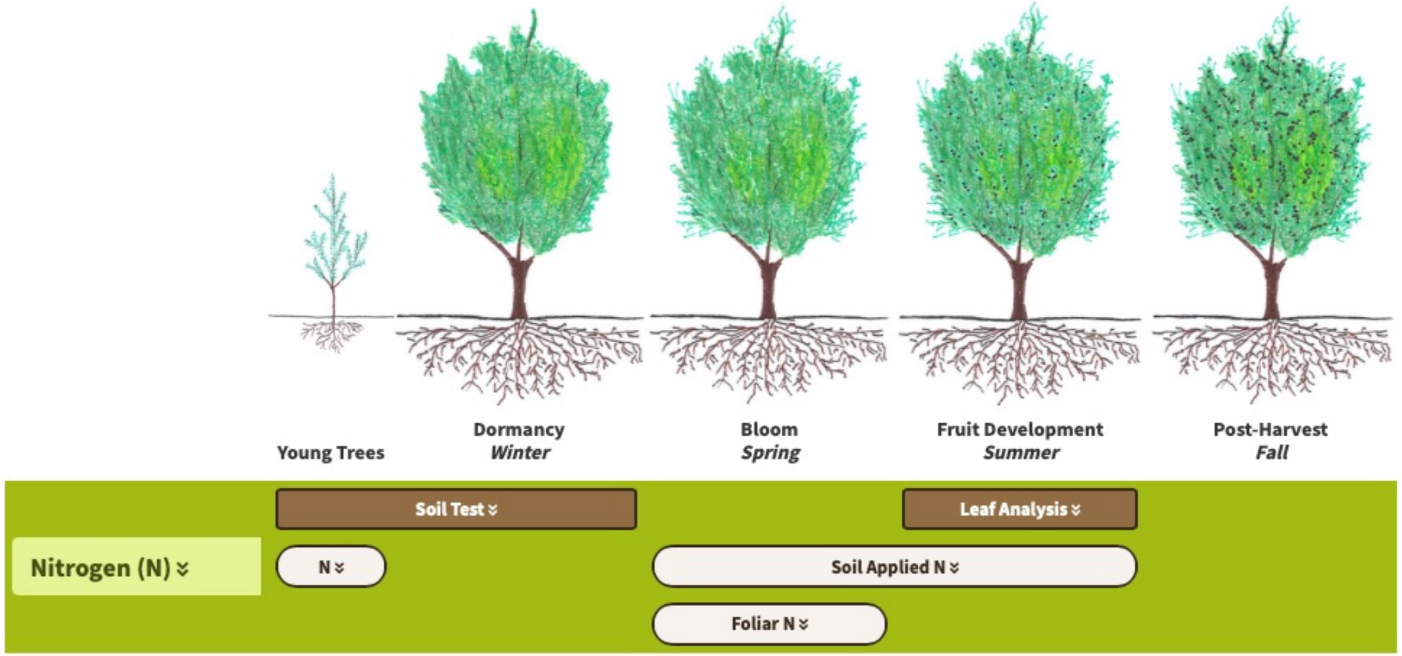
2024 CALIFORNIA OLIVE OIL DAY

MARCH 7, 2024

ANDREW J. CURTRIGHT, JAVIER FERNANDEZ-SALVADOR, XIA ZHU-BARKER

Olive Nitrogen Needs

- Olives use less N compared to other crops
- N addition should balance N removal from pruning and harvest (4-8 lbs N / ton in fruit)
- Younger trees will also allocate N to new growth
- Soil is a significant source of fertility



What affects fertilizer rates?

- Time of year: olive growth characteristics
- Age of orchard: growing trees require more N
- Soil type: texture affects N content and mobility
- Other sources of N
  - Soil organic matter
  - Organic N
    (cover crops, compost)
  - N in irrigation water

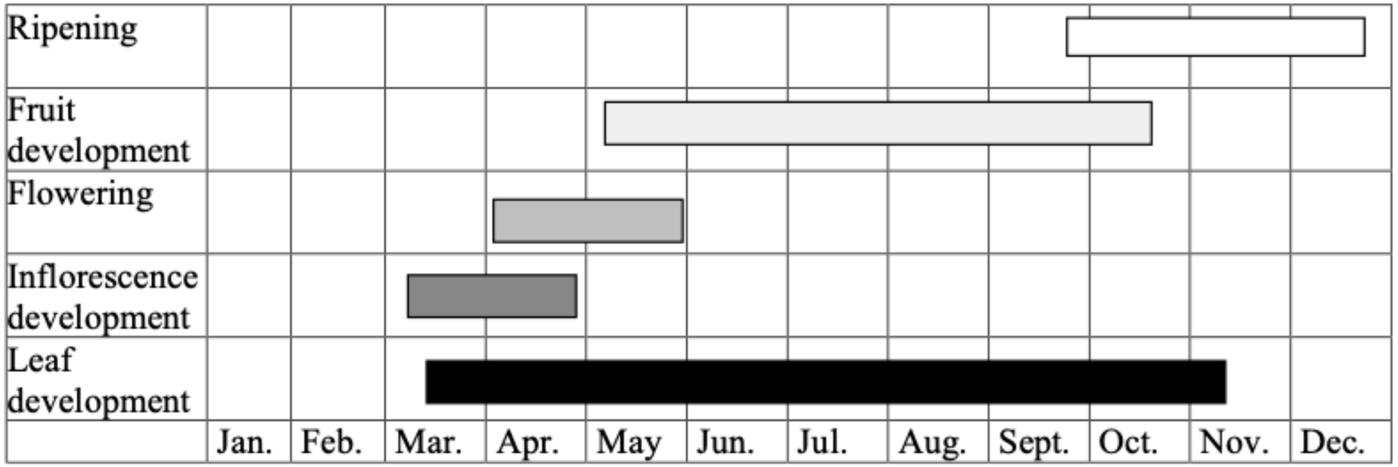
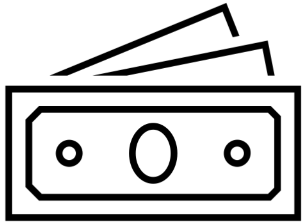


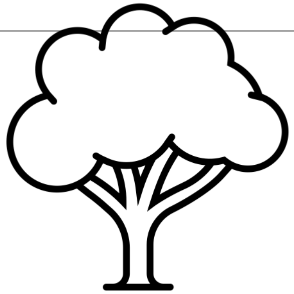
Fig. 1. Development of olive trees during the growing season.

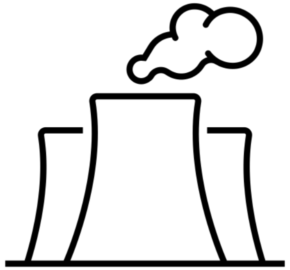
SANZ-CORTÉS, F., MARTINEZ-CALVO, J., BADENES, M.L., BLEIHOLDER, H., HACK, H., LLACER, G. and MEIER, U. (2002), Phenological growth stages of olive trees (*Olea europaea*). Annals of Applied Biology, 140: 151-157.

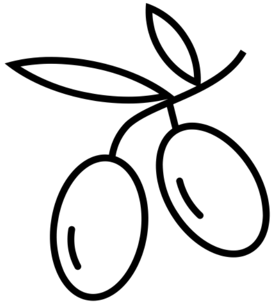
Can you have too much N?


Nitrate Leaching


Waste of Money

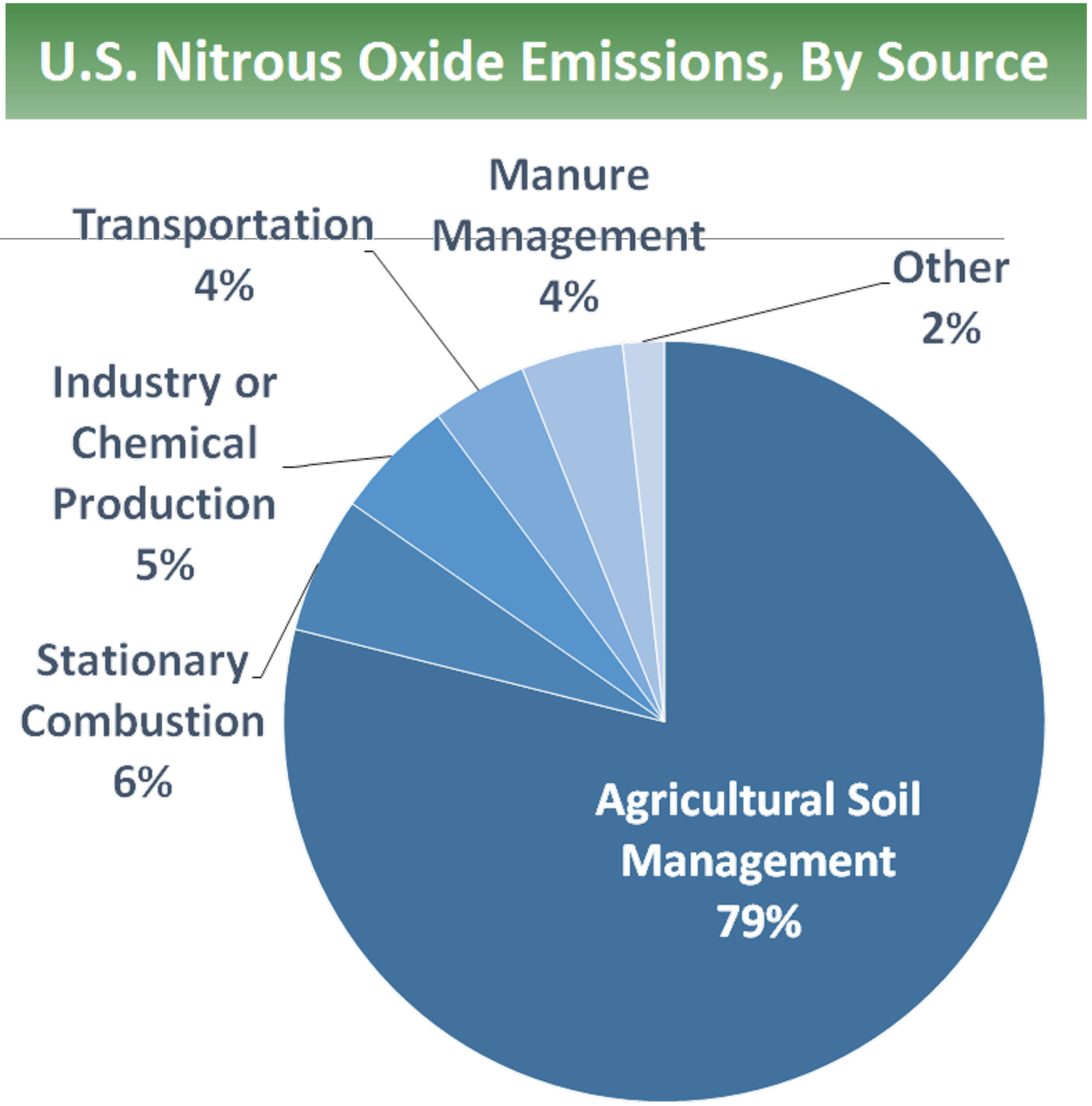

Excess Growth


Greenhouse Gas Production


Olive Oil Quality

Nitrous Oxide

- Greenhouse gas 300 times more potent than CO_2
- Number one ozone depletant
- Over-application of fertilizers is the largest man-made source of N_2O emissions
- Reduction of N_2O can be supported with CDFA HSP grants

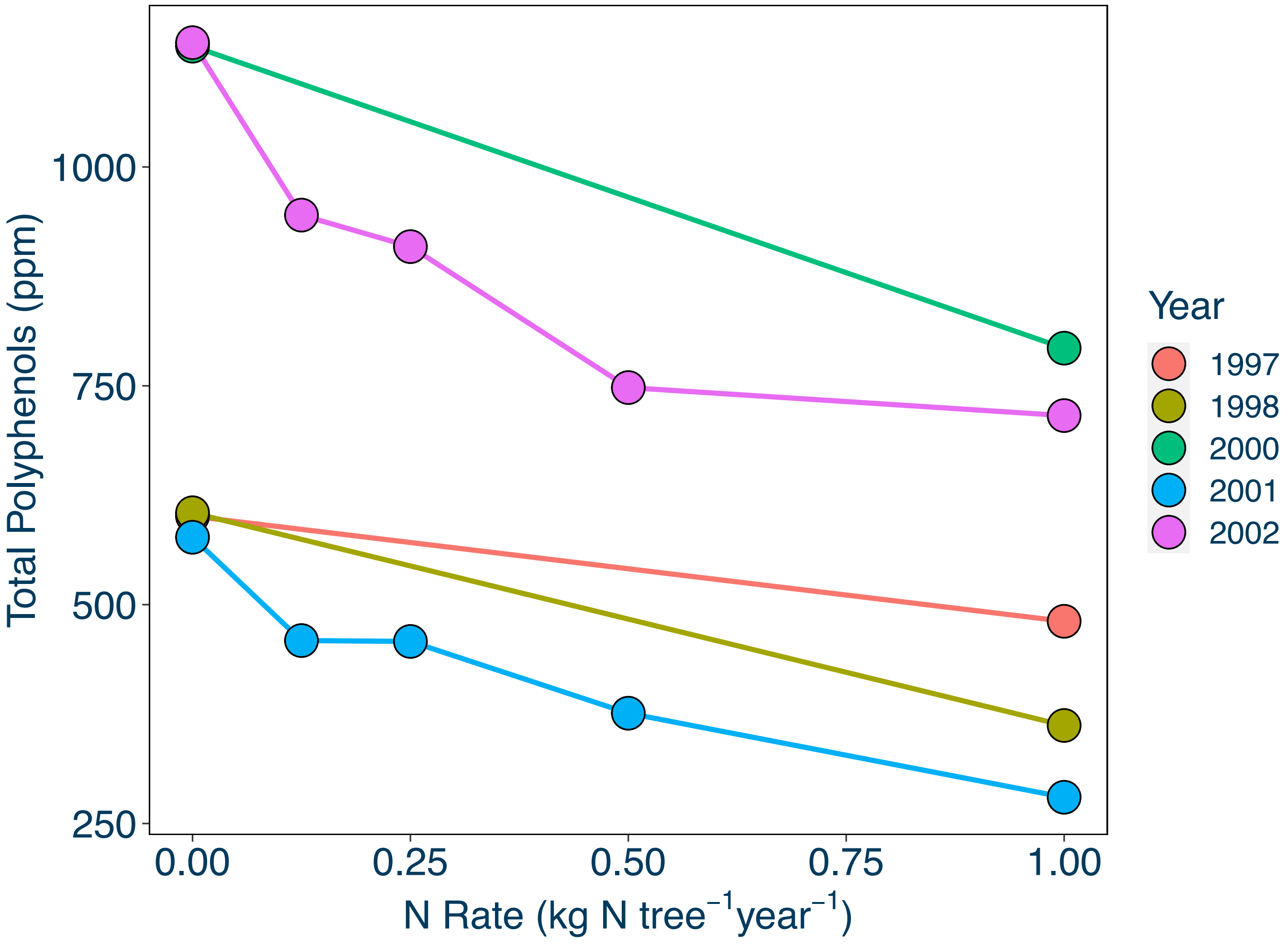


U.S. Environmental Protection Agency (2014).
U.S. Greenhouse Gas Inventory Report: 1990-2014.

Olive Oil Quality

- Leaf N concentration greater than 1.7%-2.0% is too much
- Consistent drop in polyphenols for every increase in leaf N above 1.2%

Nutrient	Deficient	Sufficient	Excessive
N (%)	<1.4	1.5-2.0	>2.0
P (%)	<0.1	0.1-0.3	
K (%)	<0.4	>0.8	
B (ppm)	14	19-150	>185



Updated Recommendations

- Currently: 40-100 lbs/A
- Current recommendations were last updated in the early 2000s
- These were based off 150 trees per acre without fertigation
- New production systems would suggest a need to revise our recommendations

Compost and Nutrient Manage

- Compost can act as a source of N
- Compost can also stimulate “immobilization”
- Microbes are after a balanced diet
  - If there is too much C in the compost, microbes will take N from the soil
  - If there is too much N in the compost, microbes will make N available from the compost
- C:N ratio is important: 15 lbs C to 1 lb N is a rough cutoff

Compost Amendment

- Compost can be a good buffer
  - In high N soils, compost with high C:N ratio can keep N in the field
  - In low N soils, compost with low C:N ratio can be a steady source of N
- Compost amendments are of interest for soil health benefits, including building soil C
- Need to know how compost influences nutrient requirements and environmental benefits in olive orchards

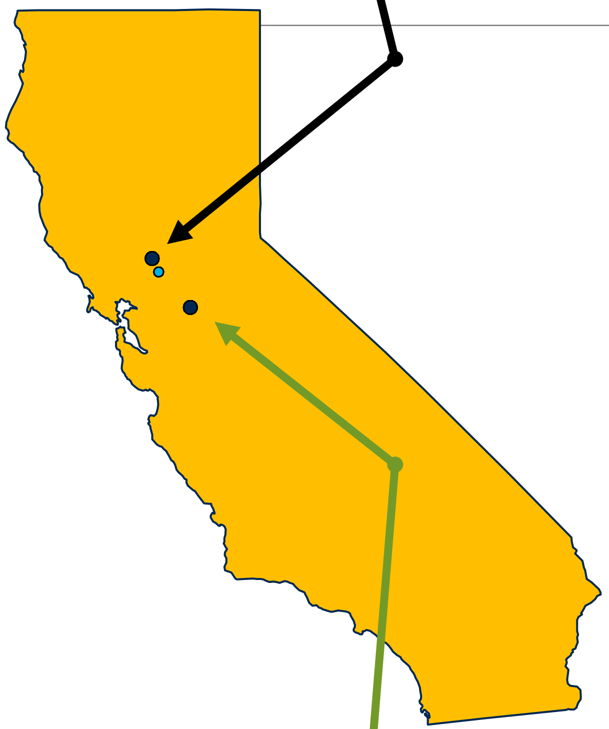
Resources for $$$

NRCS Conservation Practices (Click Practice Name for Documentation)	Enter Unit Value (acres or feet)	Carbon Dioxide	Nitrous Oxide	Methane	Total CO_2-Equivalent	Estimated HSP payment dollars for the Project Term
[Info] **Yolo, CA** Nutrient Management (CPS 590) - Improved N Fertilizer Management on Orchards/Vineyards - Reduce Fertilizer Application Rate by 15% - Basic NM [delete]	100 Acre(s)	-8	15	0	7	$4,518.00
Total		**-8**	**15**	**0**	**7**	**$4,518.00**

NRCS Conservation Practices (Click Practice Name for Documentation)	Enter Unit Value (acres or feet)	Carbon Dioxide	Nitrous Oxide	Methane	Total CO_2-Equivalent	Estimated HSP payment dollars for the Project Term
[Info] **Yolo, CA** Compost Application (Interim CPS 808) - Compost (C/N > 11) Application to Orchards, On-farm produced compost - 6 tons/acre [delete]	100 Acre(s)	470	-18	1	453	$90,000.00
Total		**470**	**-18**	**1**	**453**	**$90,000.00**

Woodland

- Super-high density: 6 × 14 ft
- Arbequina
- New planting: 4 years ago



Stockton

- Super-high density: 6 × 14 ft
- Arbequina
- Older plantings: ~15 years old

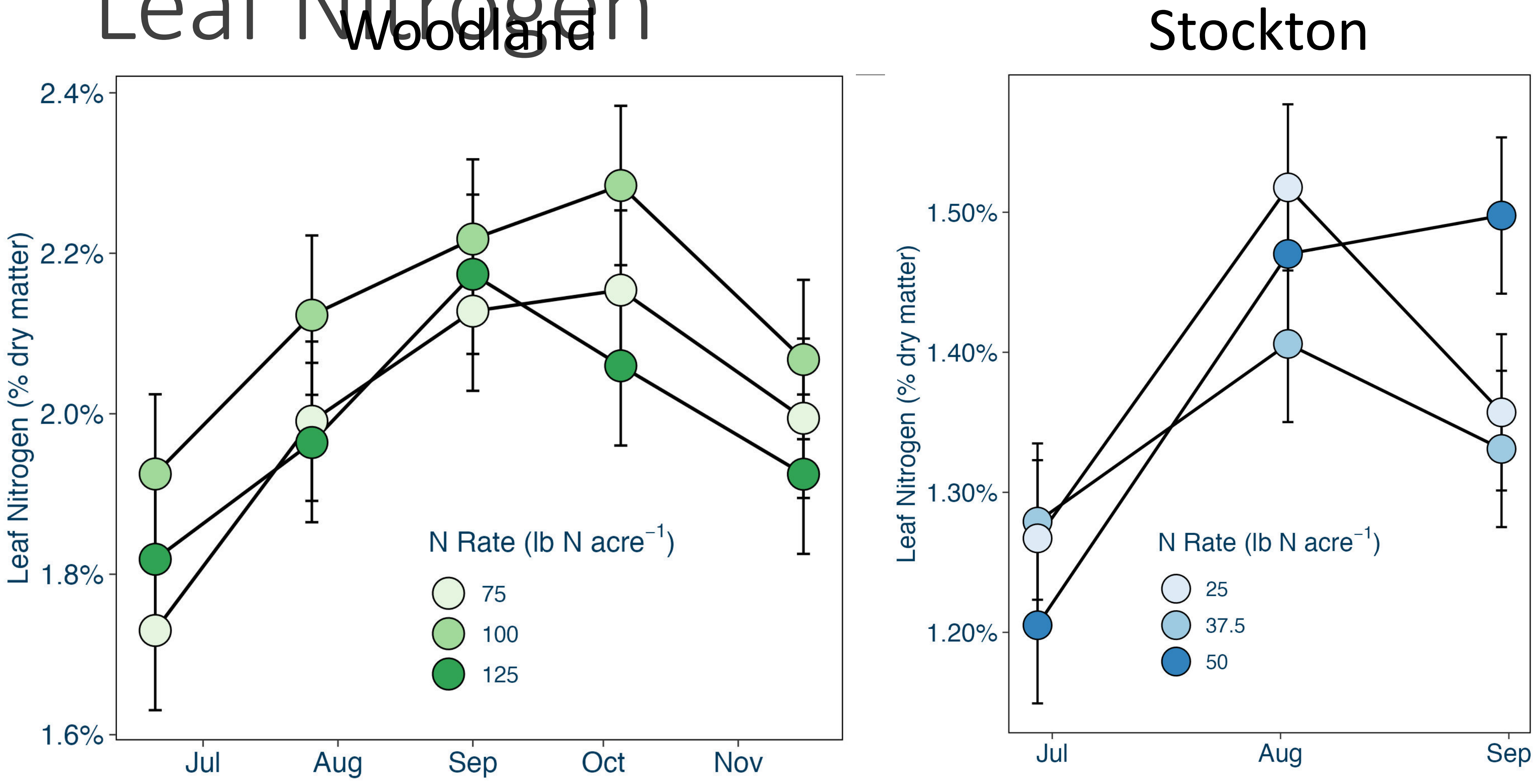
Treatments

N Treatment (UAN-32)	Woodland	Stockton
Low	75 lbs $acre^{-1}$	25 lbs $acre^{-1}$
Medium	100 lbs $acre^{-1}$	37.5 lbs $acre^{-1}$
High	125 lbs $acre^{-1}$	50 lbs $acre^{-1}$
Application Timing	7 Fertigation Events	3 Fertigation Events

With or without green-waste compost (4 T $acre^{-1}$)

Each set of 6 treatments is replicated over 4 blocks at each location

Leaf Nitrogen

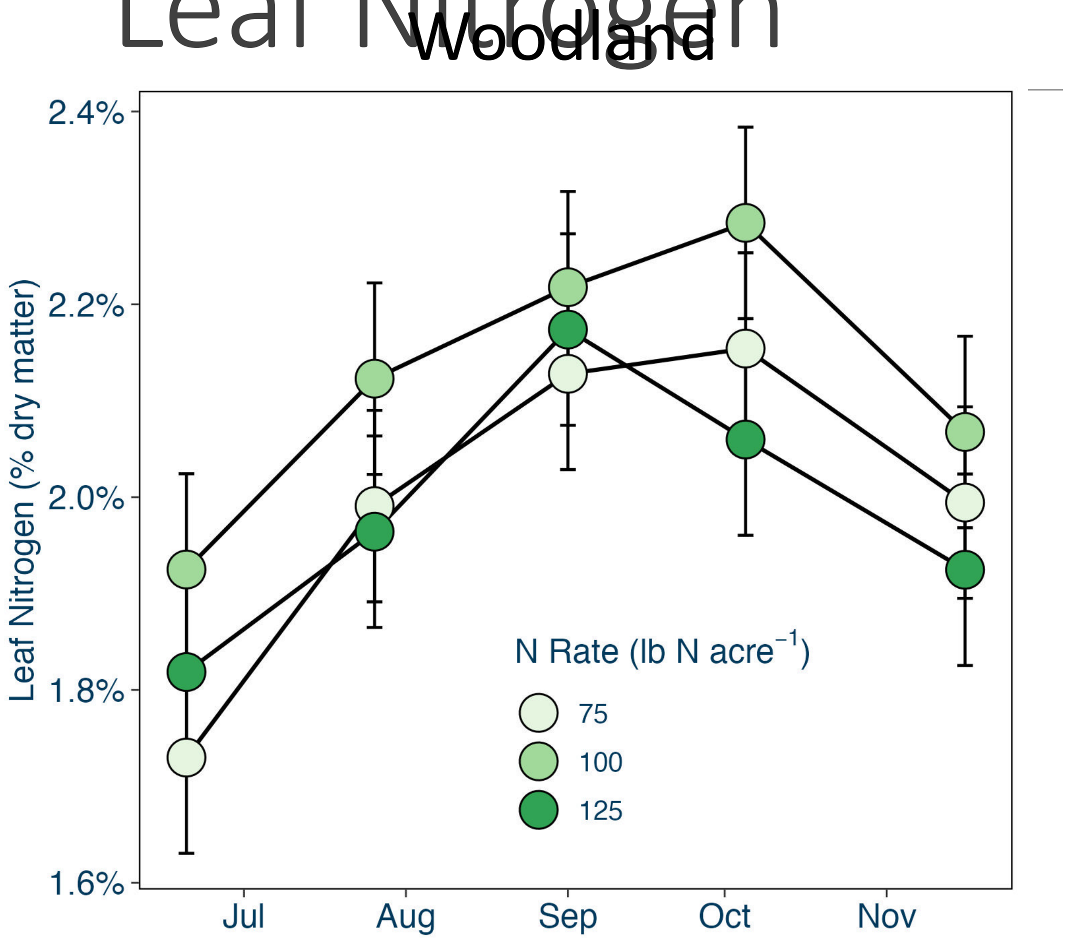


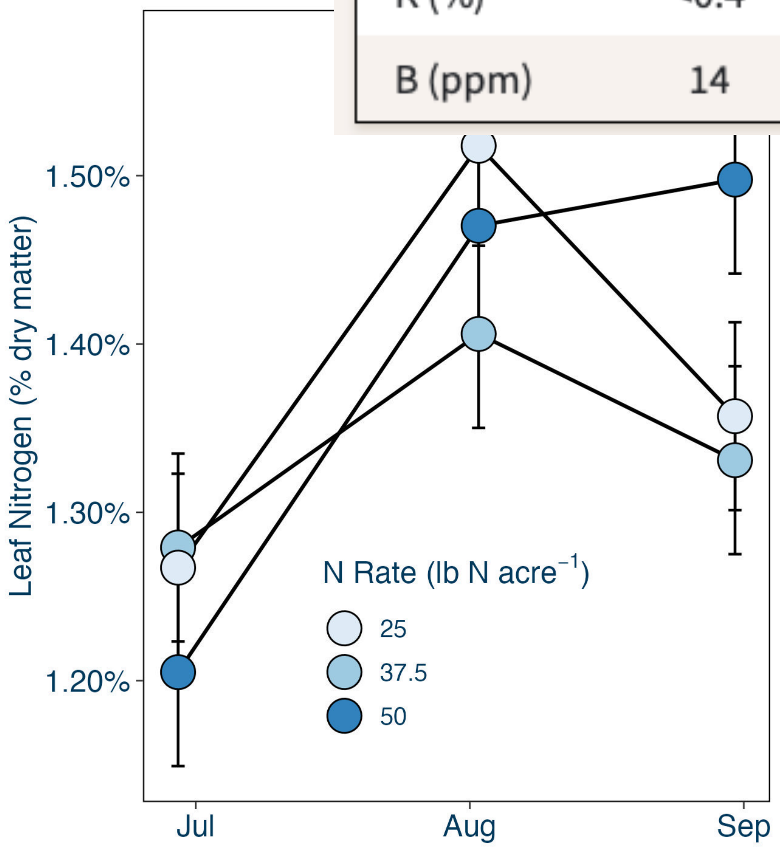
Fertigation Events
June through August

Leaf tissue N content from olive trees in Woodland (left) and Stockton (right) in 2022. Samples were taken throughout the summer and fall. Bars are means of four replicates, with error bars representing +/- one standard error (n = 4).

Leaf Nitrogen

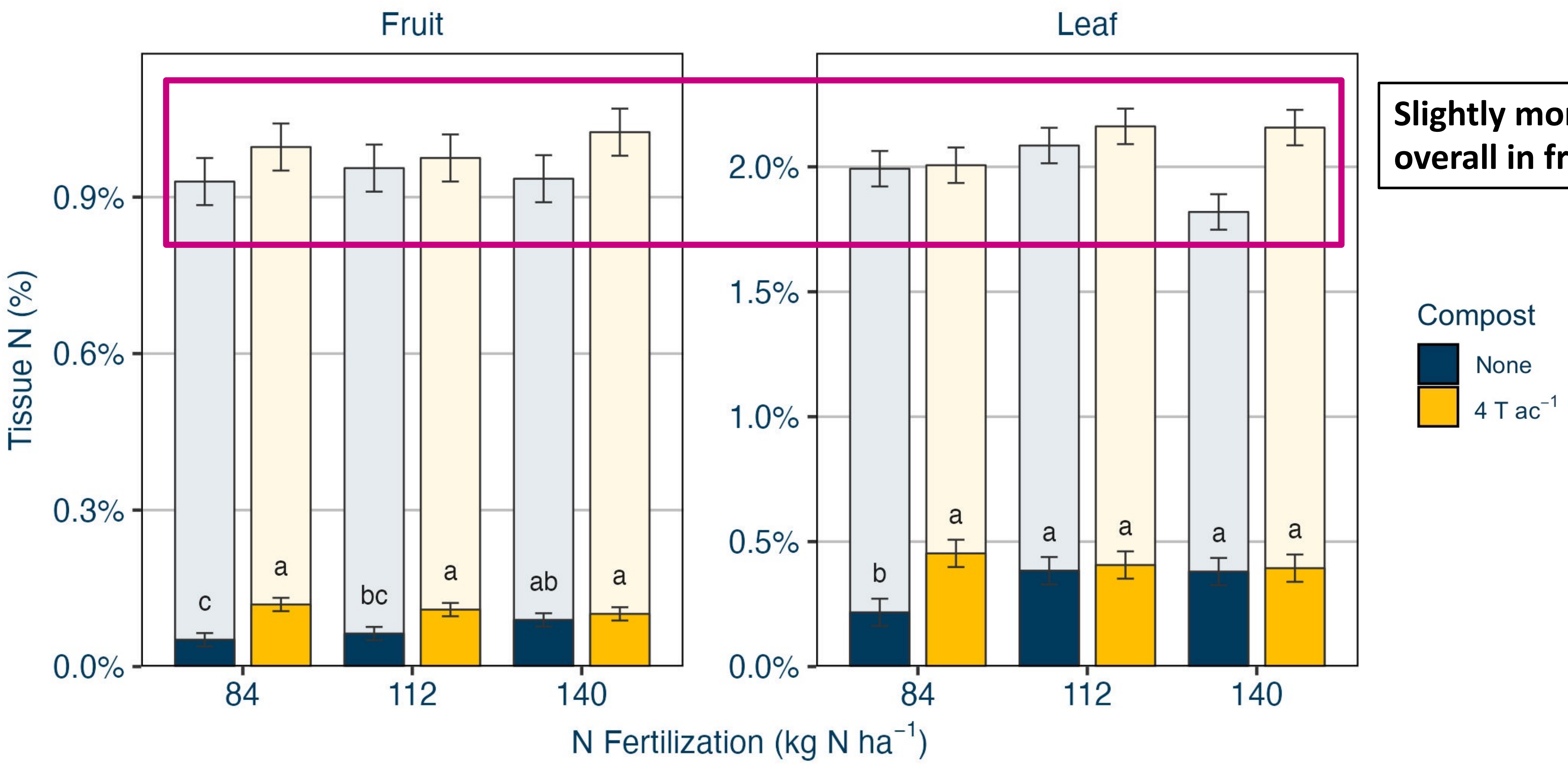
Nutrient	Deficient	Sufficient	Excessive
N (%)	<1.4	1.5-2.0	>2.0
P (%)	<0.1	0.1-0.3	
K (%)	<0.4	>0.8	
B (ppm)	14	19-150	>185





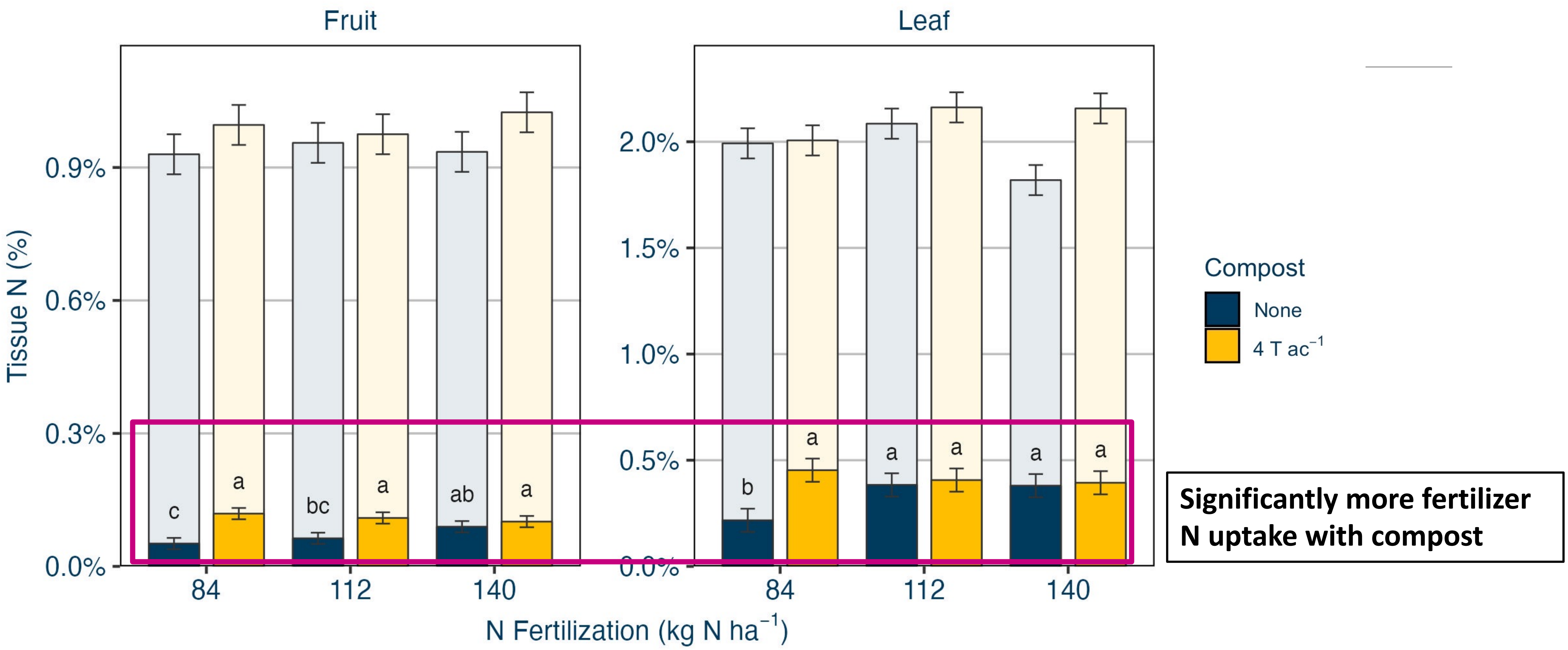
Fertigation Events
June through August

Leaf tissue N content from olive trees in Woodland (left) and Stockton (right) in 2022. Samples were taken throughout the summer and fall. Bars are means of four replicates, with error bars representing +/- one standard error (n = 4).



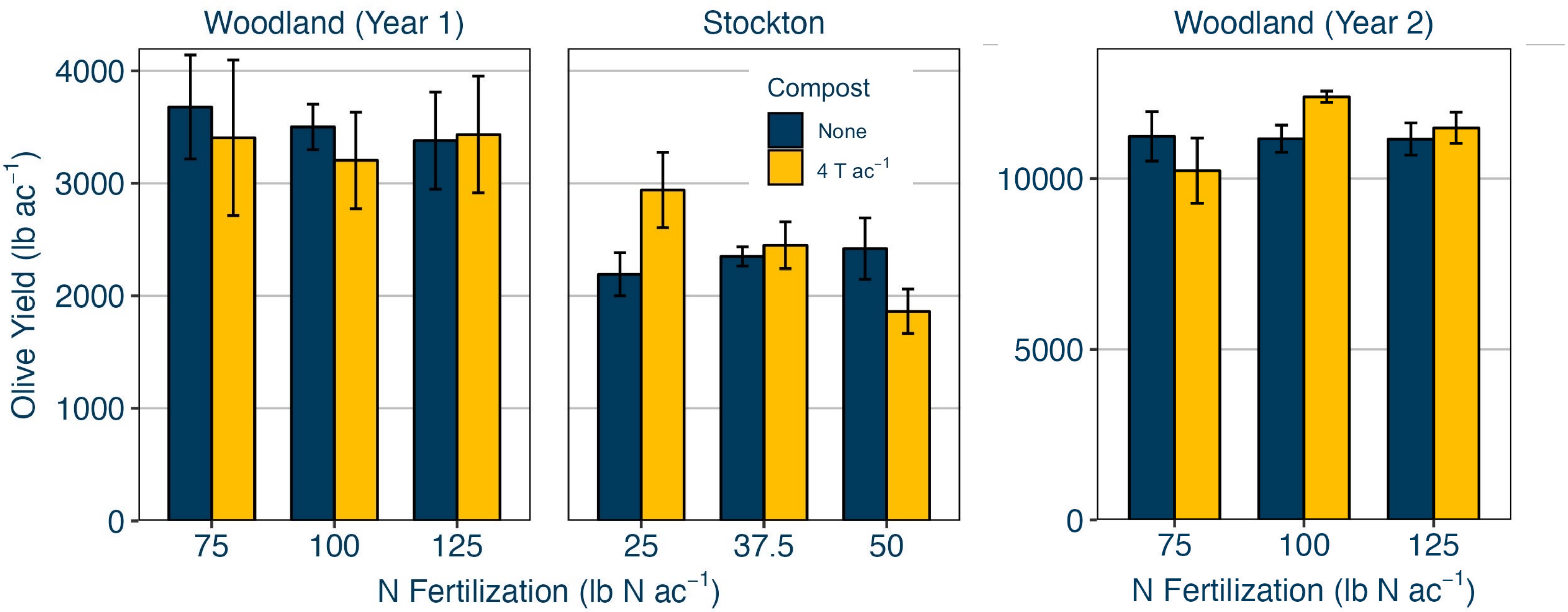
Slightly more tissue N overall in fruits and leaves

Tissue N content in fruits and leaves sampled from the Woodland site averaged over the 2022 growing season. Darker bars indicate the fraction of N derived from fertilizer, with the lighter bar representing total N content



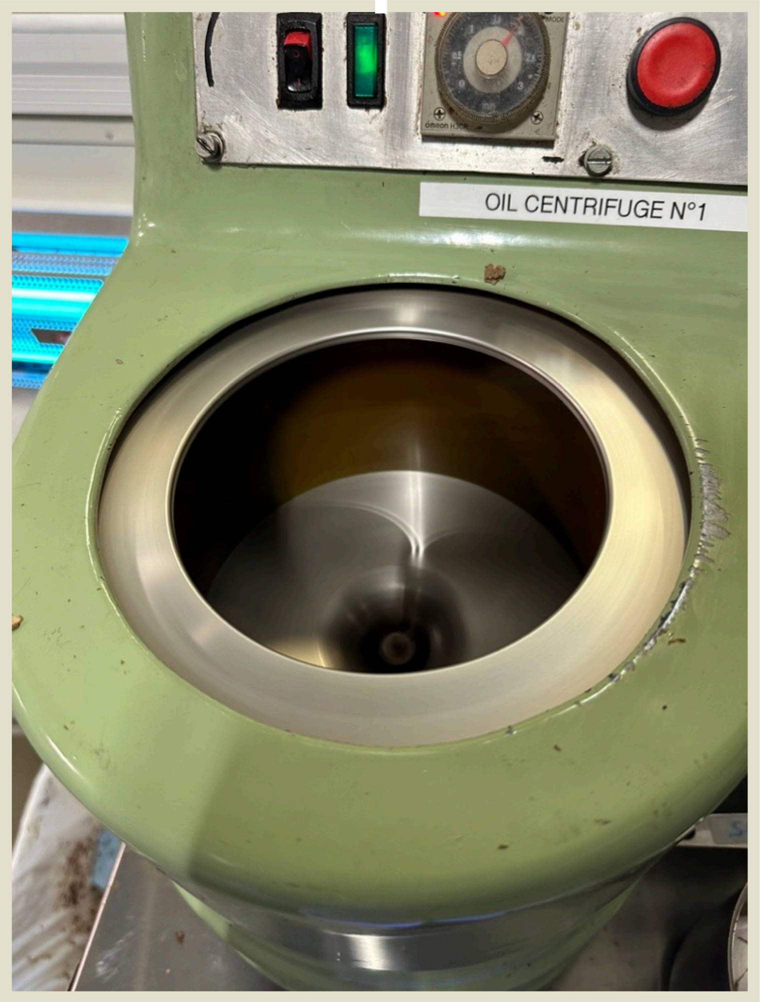
Tissue N content in fruits and leaves sampled from the Woodland site averaged over the 2022 growing season. Darker bars indicate the fraction of N derived from fertilizer, with the lighter bar representing total N content

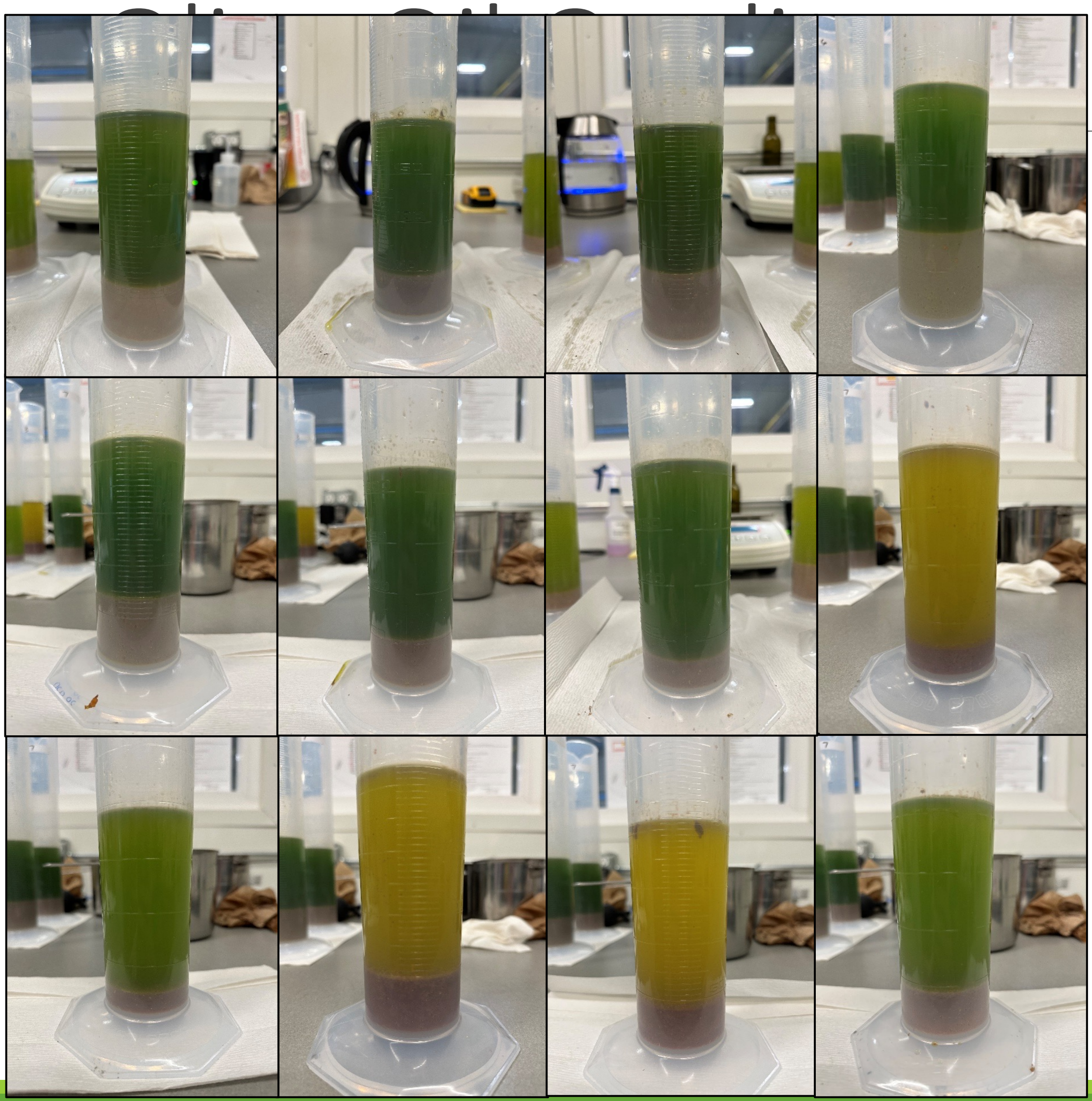
Yield

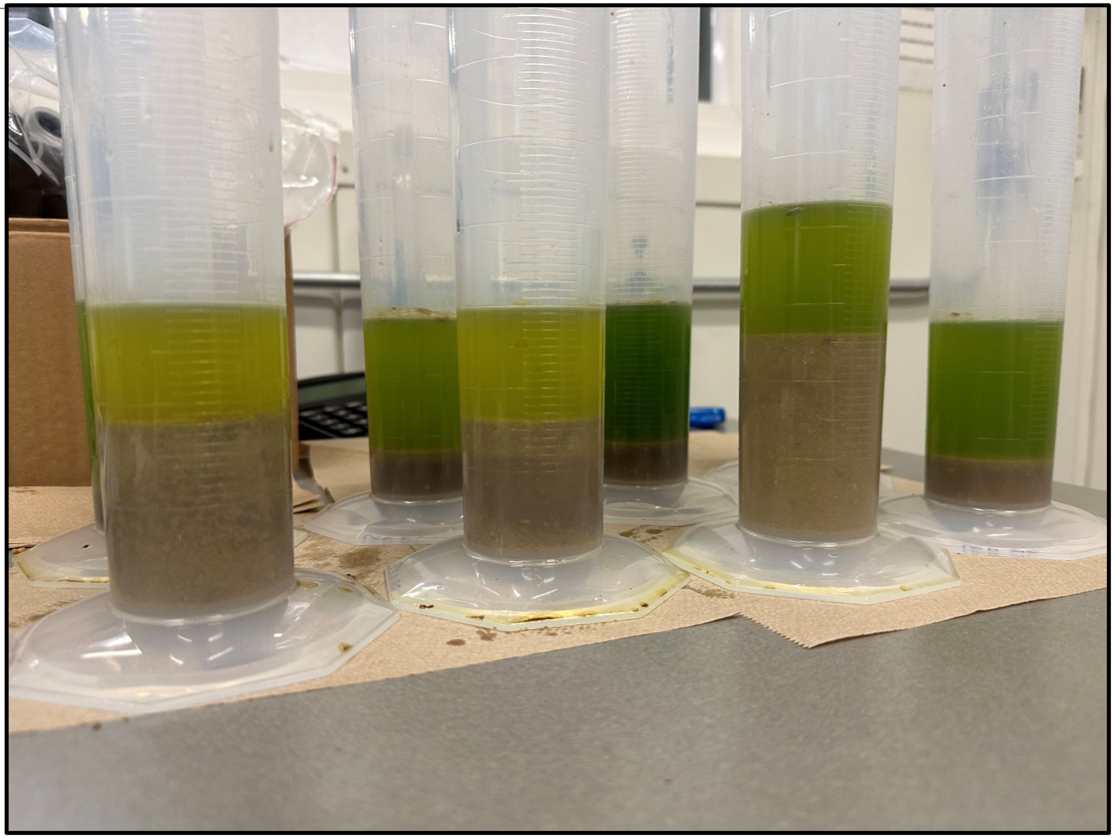


Field weights of olives harvested from in Woodland and Stockton. Bars are means of four replicates, with error bars representing +/- one standard error (n = 4).

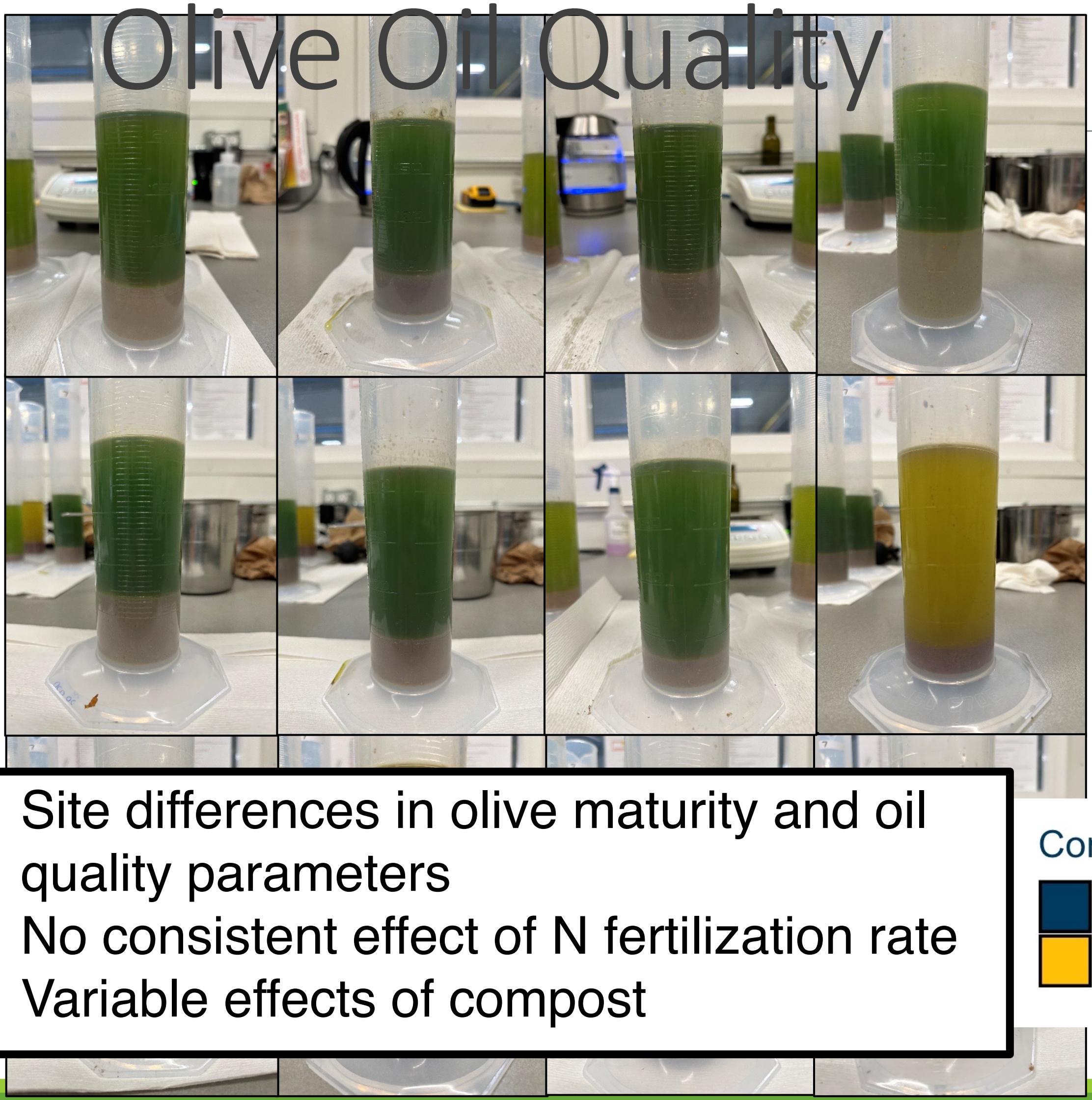
Olive Oil Milli







Olive Oil Quality



- Site differences in olive maturity and oil quality parameters
- No consistent effect of N fertilization rate
- Variable effects of compost

Summary

- No consistent effects of N fertilization rate or compost on olive yield or olive oil quality over two years
- This is good! It suggests that less N fertilizer could be used without any effect on yield or olive quality.
- However, this is only two fields and two years. We would like to continue this research in a new study to see if these trends persist.

N Treatment (UAN-32)	Woodland	Stockton
Low	75 lbs $acre^{-1}$	25 lbs $acre^{-1}$
Medium	100 lbs $acre^{-1}$	37.5 lbs $acre^{-1}$
High	125 lbs $acre^{-1}$	50 lbs $acre^{-1}$
Application Timing	7 Fertigation Events	3 Fertigation Events

Evaluation of Canopy Management Strategies

CAMERON GURLEY, BOUNDARY BEND

Cameron Gurley
530-383-3080
c.gurley@cobramestateolives.com

Evaluation of canopy management strategies

ESTABLISHED SHD OLIVES FOR OLIVE OIL PRODUCTION

YEAR 3 OF 4

OLIVE DAY 2024

Contents

- Canopy Management Principles
- Background – the "why?"
- Study site selection
- Trial results

Canopy Management Principles

- Pruning a tree reduces its capacity and, as a consequence of that, the amount of fruit that is going to be produced during the next season is also reduced.

- Capacity of a tree (productivity) is directly related to the amount of shoots that have been developed during the last vegetative period.

- Trees tend to show more vigour and total growth in vertical branches and upper part of the canopy.

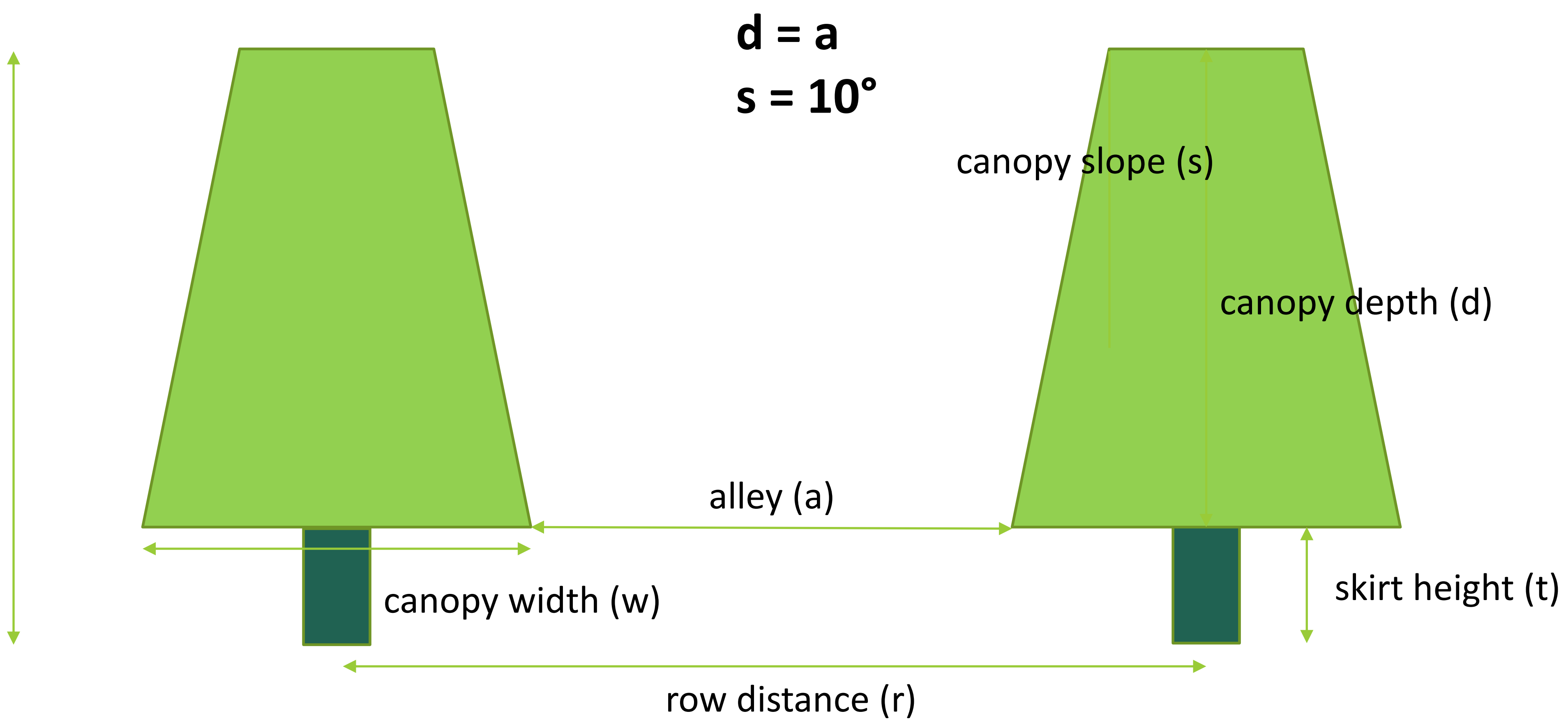
- The productivity of an olive orchard depends on light interception and on canopy volume with maximum leaf/wood ratio that is appropriately illuminated (>30% of radiation).

Vigor and capacity

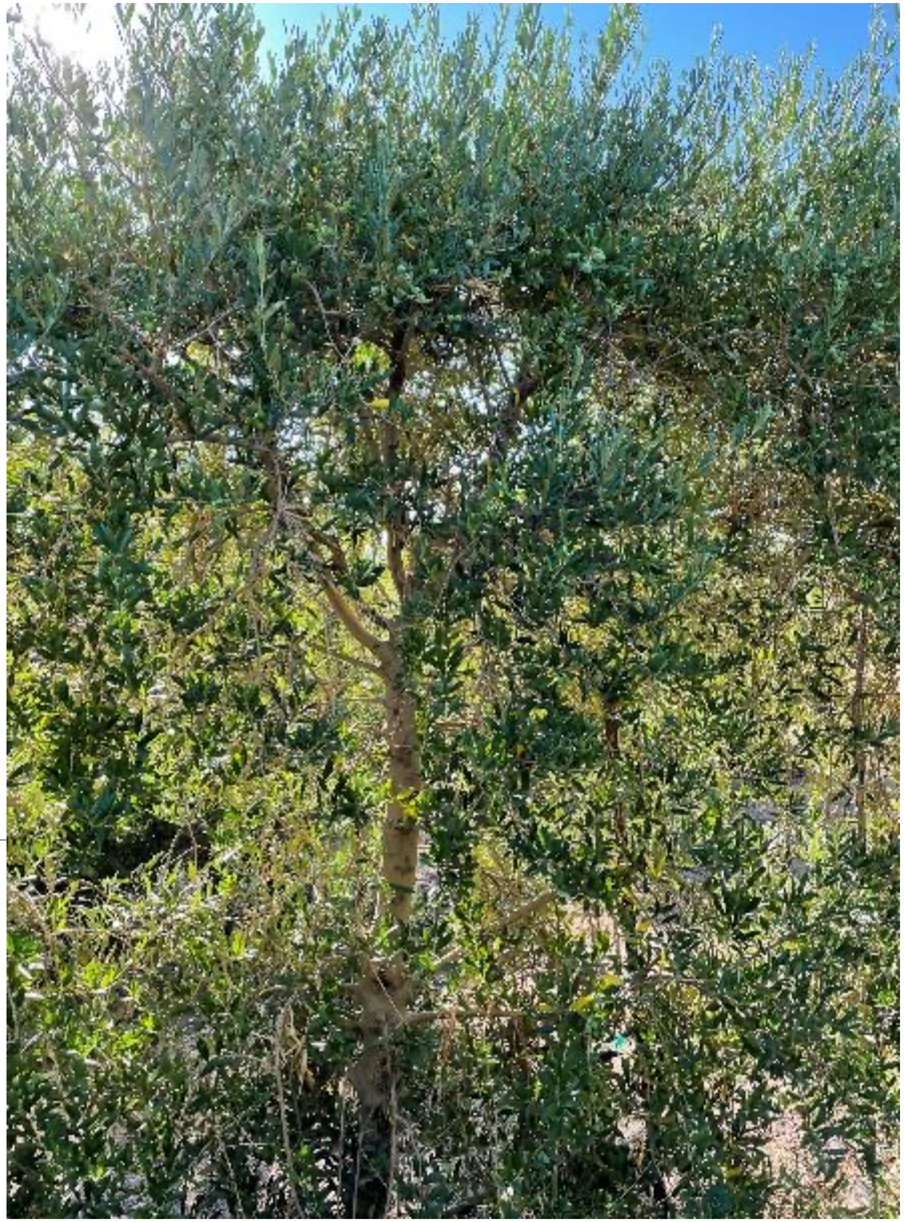
Vigor: Vegetative growth rate.

Capacity: Total growth (yield potential).

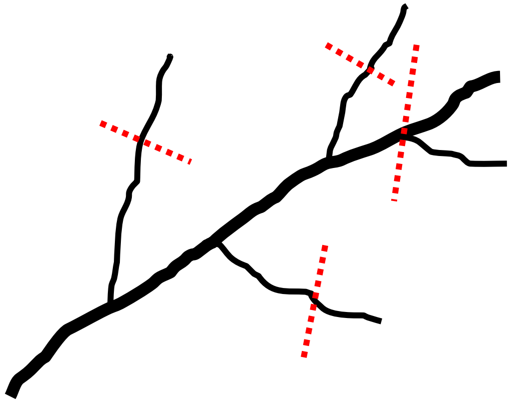
Canopy Size & Shape

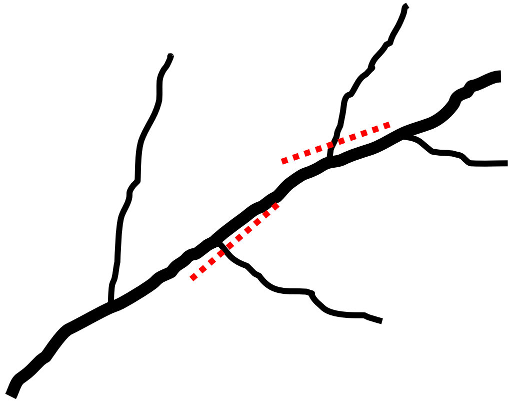


Source: Towards optimal design for hedgerow olive orchards: Connor, D.; Australian Journal of Agricultural Research, 2006, 57, 1067-1072



Quality & Capacity





MECHANICAL (heading cuts)

Pros

- Faster.
- Cheaper.
- Allows fine adjustments for crop regulation.

Cons

- Not selective.
- Decreases leaf/wood ratio.

MANUAL (thinning cuts)

Pros

- Selective.
- Allows removal of olive knot affected branches
- Allows for gradual canopy renovation.

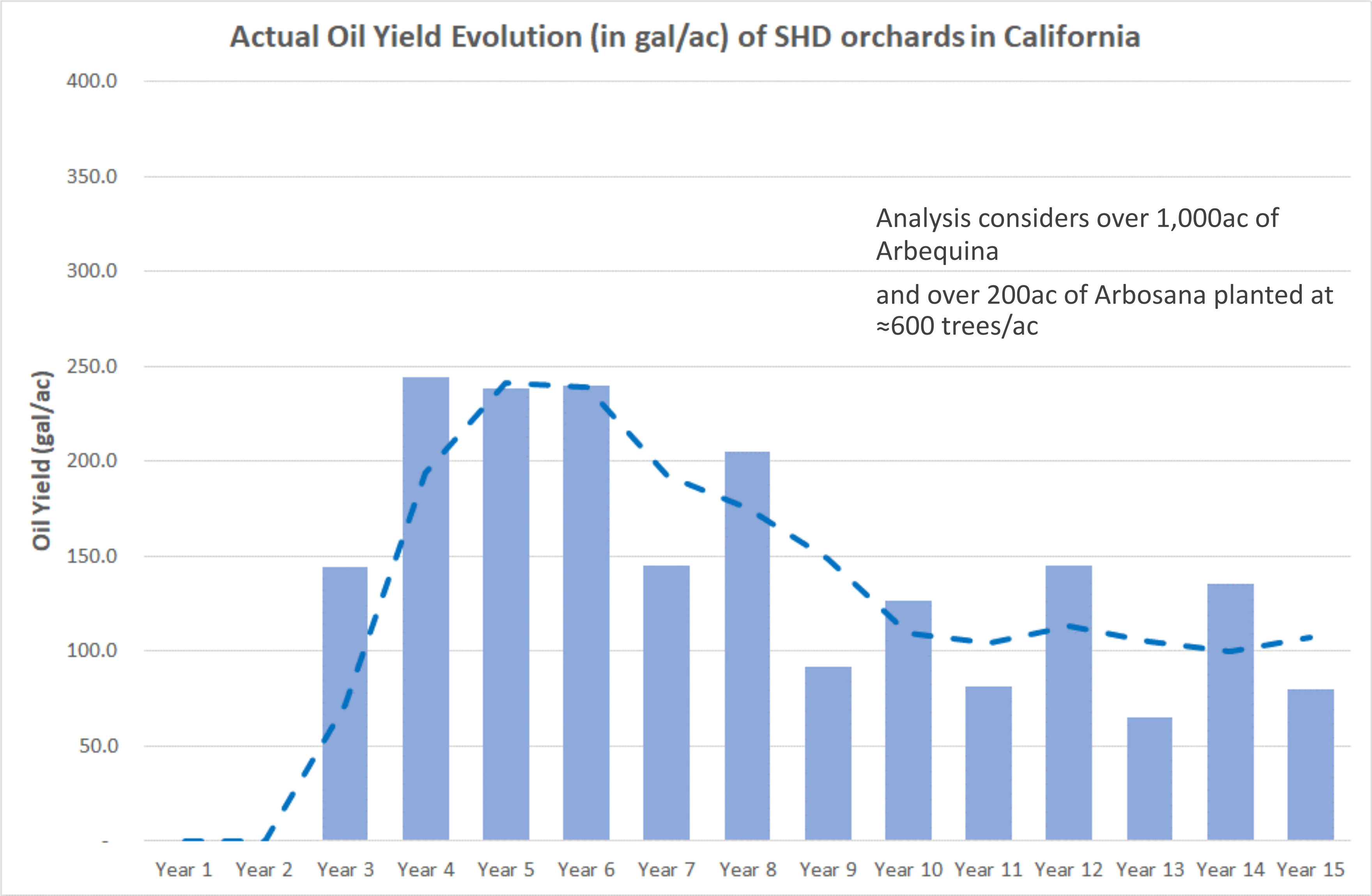
Cons

- Expensive.
- Slow.


Why study this?

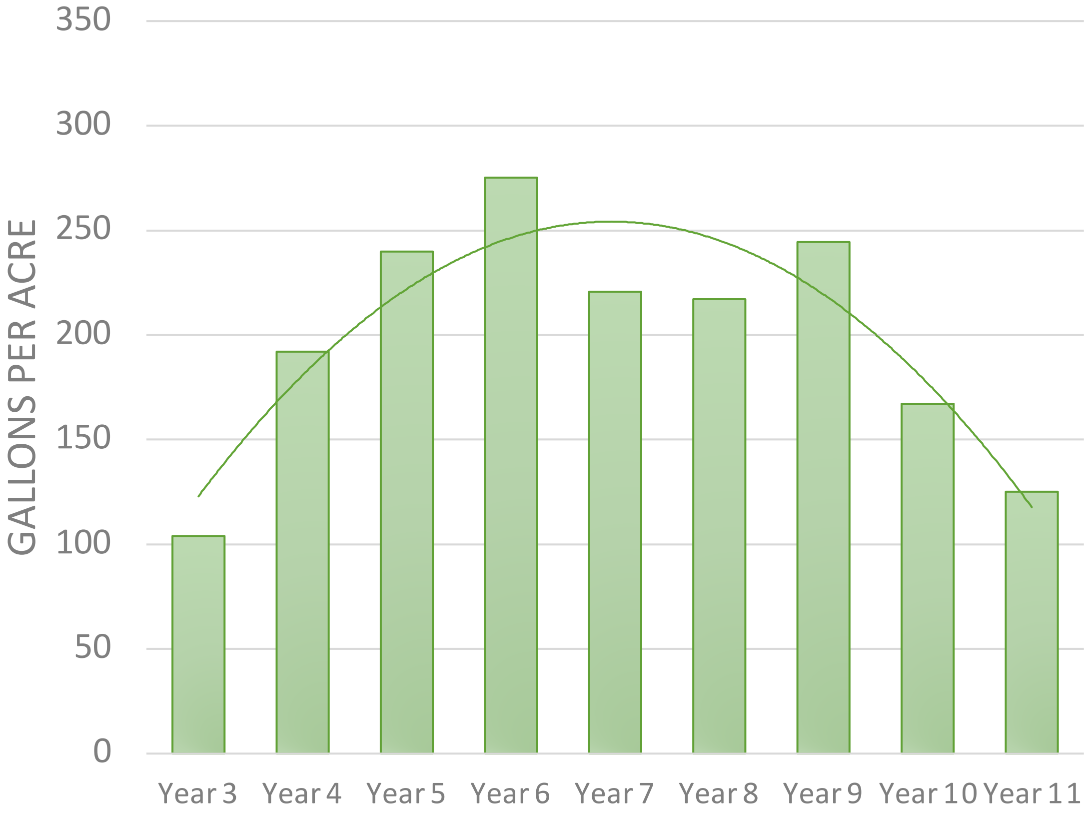
Motivation behind study

- Industry concerns
  - Across the state +10-year-old olive trees are experiencing a decline in yields.
  - Alternate bearing production.
  - Declining harvesting efficiencies.
- Data and practical observation would suggest that canopy management strategies can be utilized to address these aging trees.
- Trial and comprehensively evaluate for the optimal canopy management practices to maximize grower profitability.

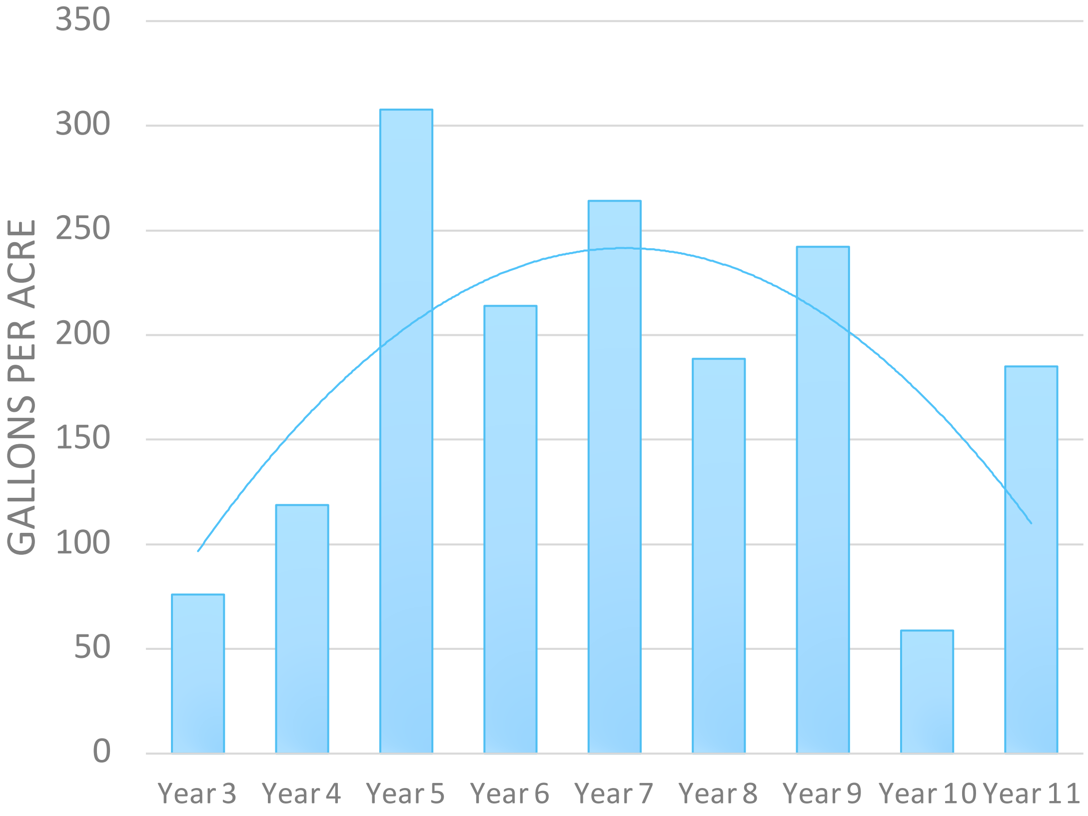

Actual Oil Yield Evolution (in gal/ac) of SHD orchards in California
Oil Yield (gal/ac)
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
-
Year 1
Year 2
Year 3
Year 4
Year 5
Year 6
Year 7
Year 8
Year 9
Year 10
Year 11
Year 12
Year 13
Year 14
Year 15
Analysis considers over 1,000ac of Arbequina
and over 200ac of Arbosana planted at ≈600 trees/ac

Declining yields in many 10+ y/o SHD groves

SHD – Arbequina Grower X



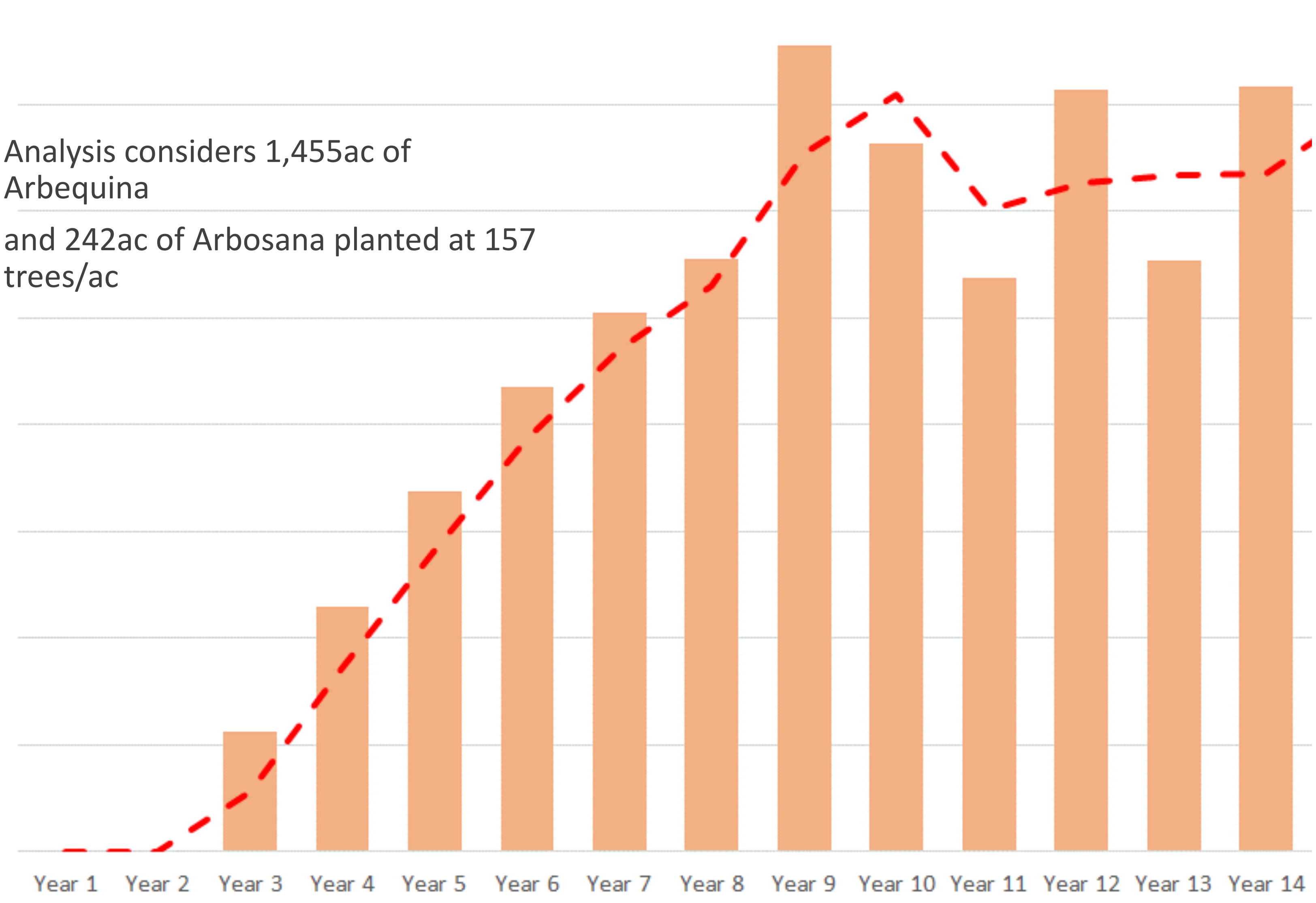
SHD – Arbequina Grower Y



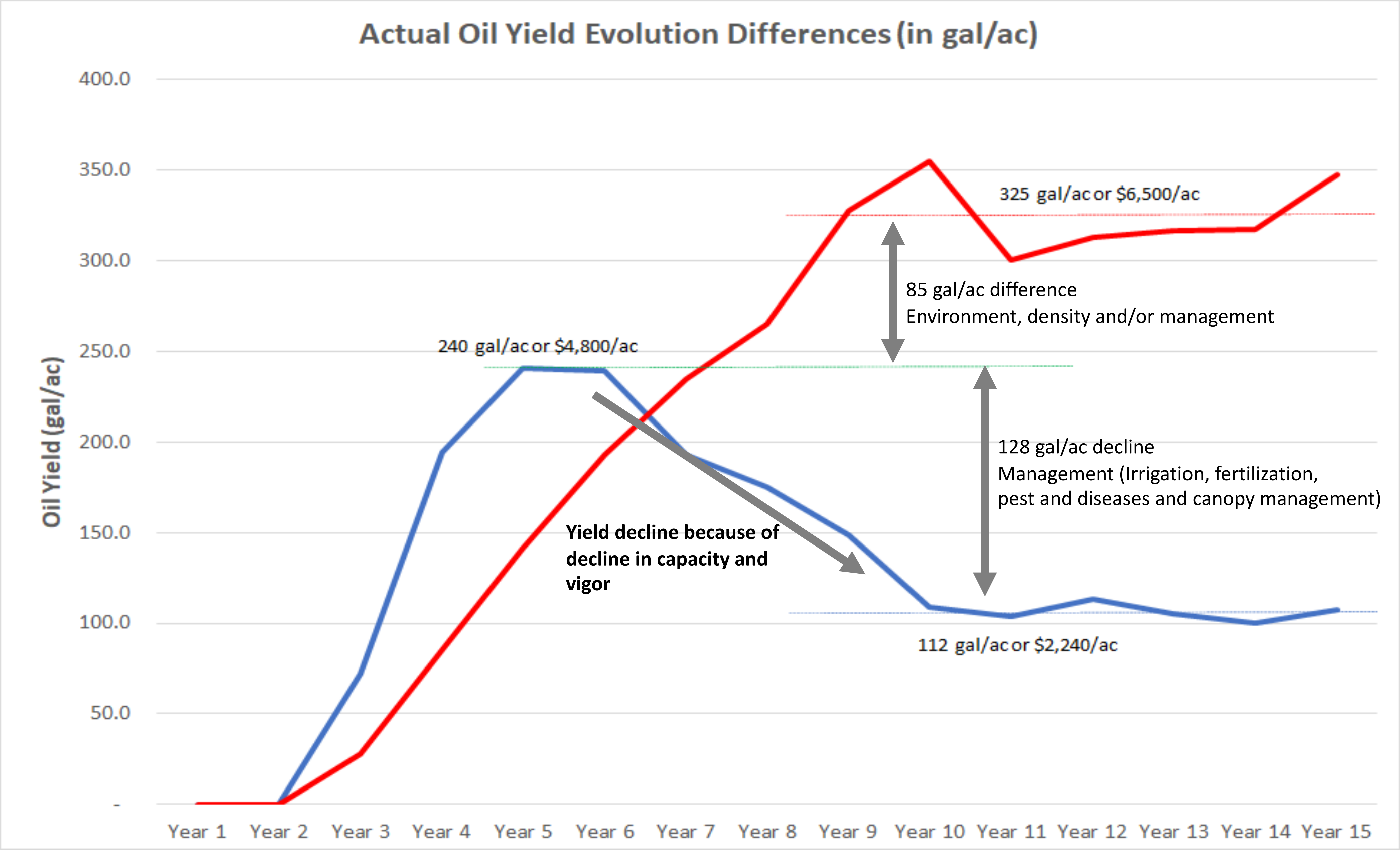
Actual Oil Yield Evolution (in gal/ac) of HD orchard in Australia

Analysis considers 1,455ac of Arbequina

and 242ac of Arbosana planted at 157 trees/ac



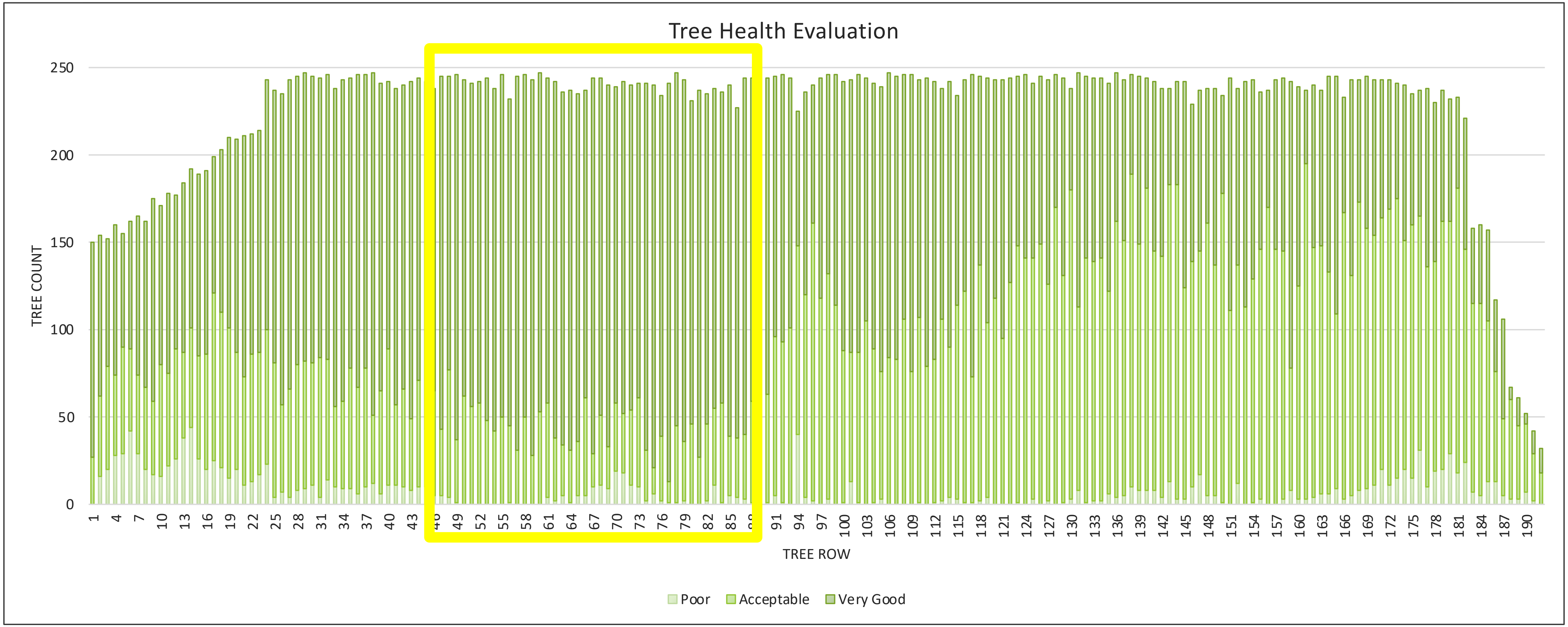
High Density Grove



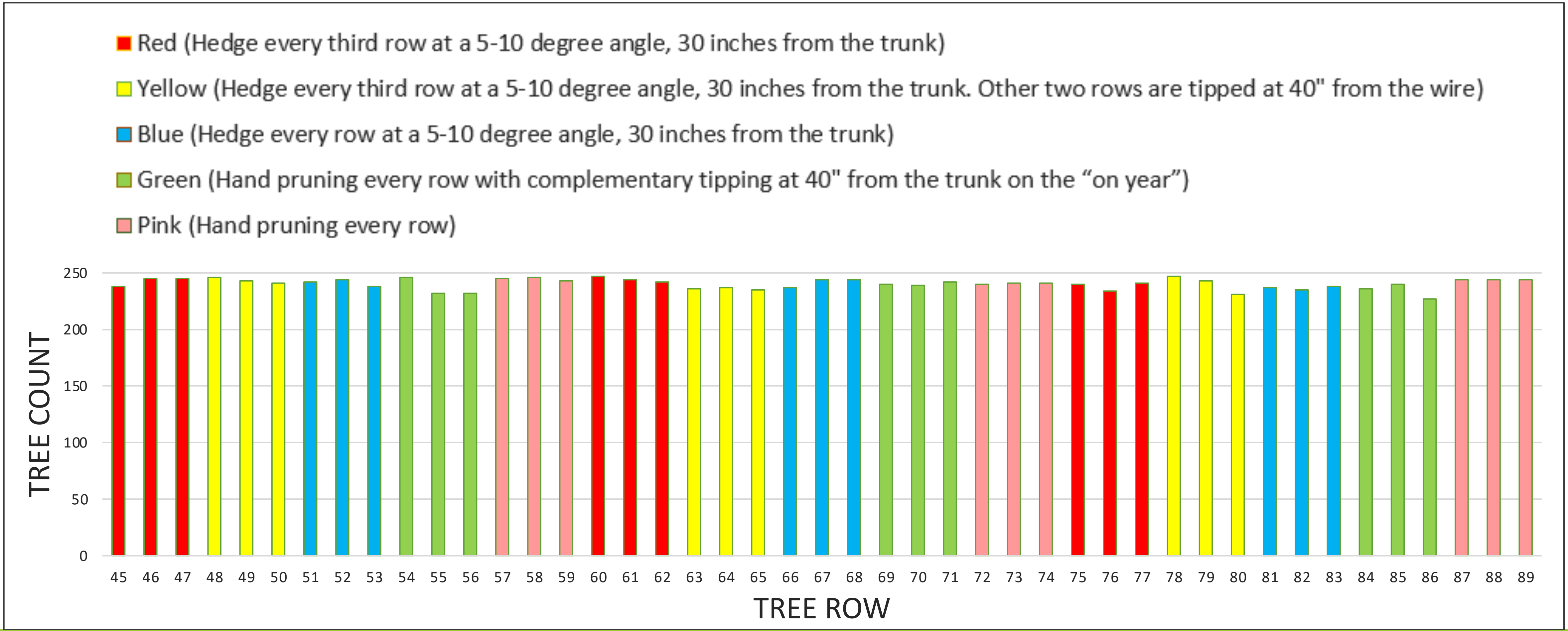
Actual Oil Yield Evolution Differences (in gal/ac)
Oil Yield (gal/ac)
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
-
Year 1
Year 2
Year 3
Year 4
Year 5
Year 6
Year 7
Year 8
Year 9
Year 10
Year 11
Year 12
Year 13
Year 14
Year 15
325 gal/ac or $6,500/ac
85 gal/ac difference
Environment, density and/or management
240 gal/ac or $4,800/ac
128 gal/ac decline
Management (Irrigation, fertilization,
pest and diseases and canopy management)
Yield decline because of
decline in capacity and
vigor
112 gal/ac or $2,240/ac

The Study

Site Selection



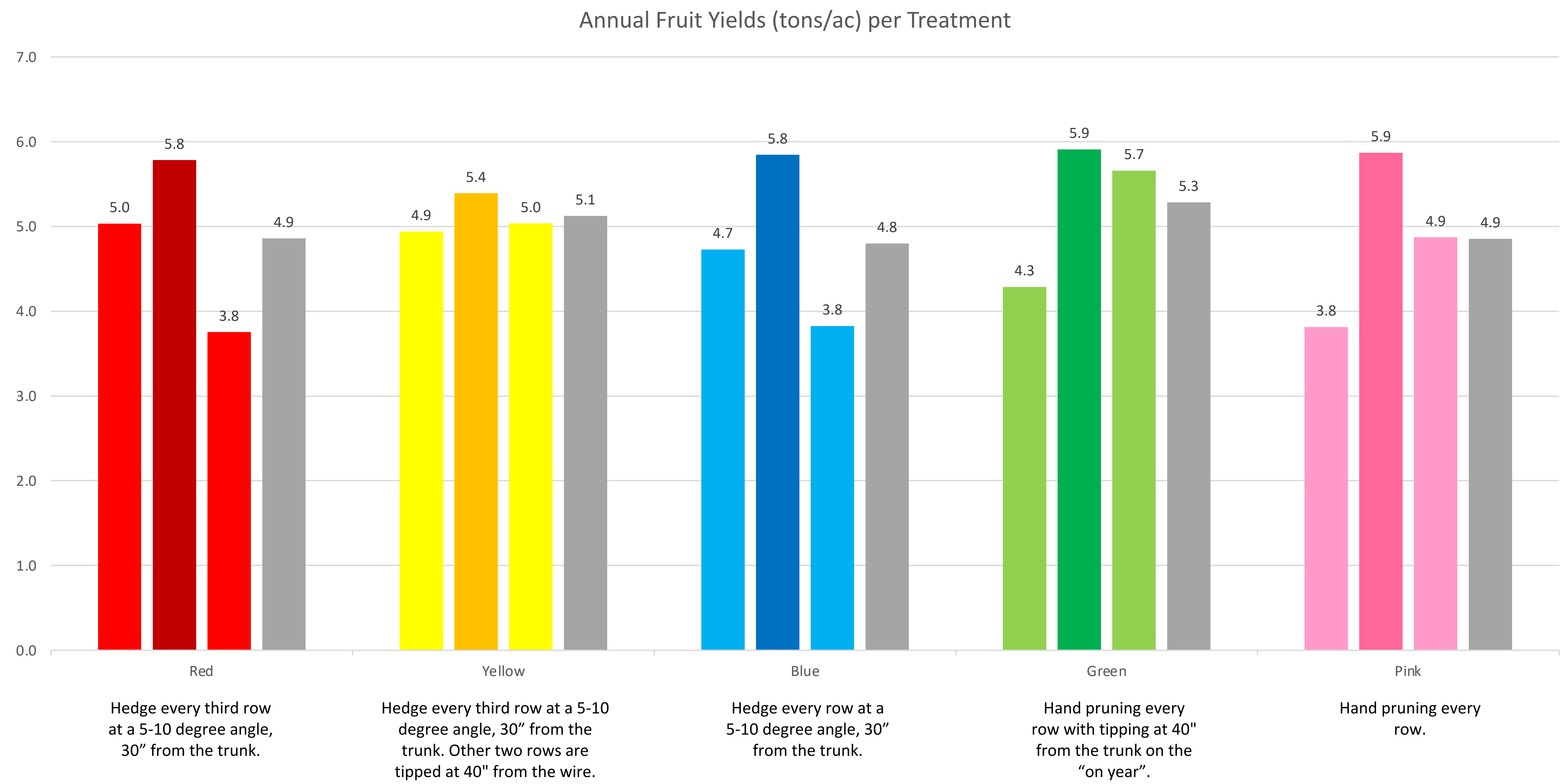
Trial block layout



Canopy Management Trial Treatments

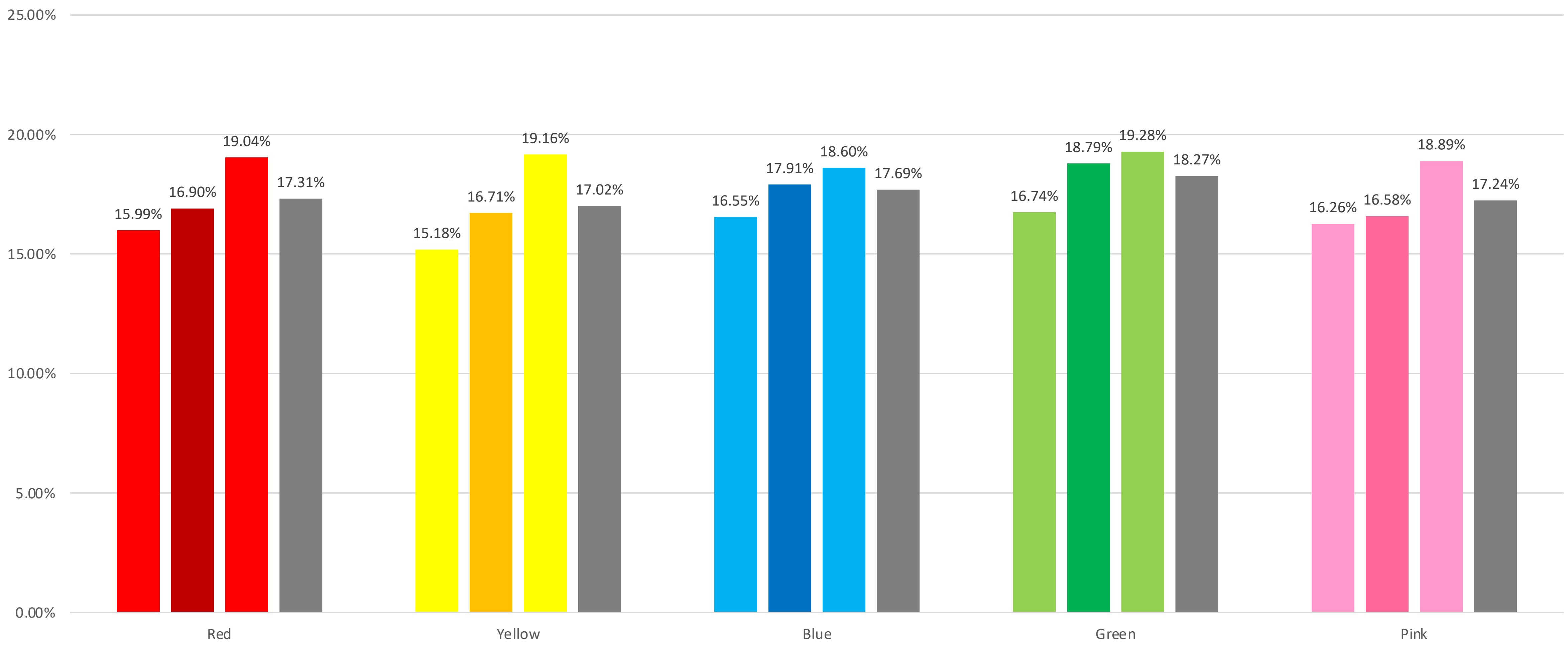
Red	(Treatment 1): Hedge every third row at a 5-10 degree angle, 30 inches from the trunk.
Yellow	(Treatment 2): Hedge every third row at a 5-10 degree angle, 30 inches from the trunk. Other two rows are tipped at 40" from the wire.
Blue	(Treatment 3): Hedge every row at a 5-10 degree angle, 30 inches from the trunk.
Green	(Treatment 4): Hand pruning every row with complementary tipping at 40" from the trunk on the “on year”.
Pink	(Treatment 5): Hand pruning every row.

Results



Annual Fruit Yields (tons/ac) per Treatment
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5.0
5.8
3.8
4.9
4.9
5.4
5.0
5.1
4.7
5.8
3.8
4.8
4.3
5.9
5.7
5.3
3.8
5.9
4.9
4.9
Red
Yellow
Blue
Green
Pink
Hedge every third row at a 5-10 degree angle, 30” from the trunk.
Hedge every third row at a 5-10 degree angle, 30” from the trunk. Other two rows are tipped at 40" from the wire.
Hedge every row at a 5-10 degree angle, 30” from the trunk.
Hand pruning every row with tipping at 40" from the trunk on the “on year”.
Hand pruning every row.

Annual Oil in Fresh (%) per Treatment



Hedge every third row at a 5-10 degree angle, 30” from the trunk.

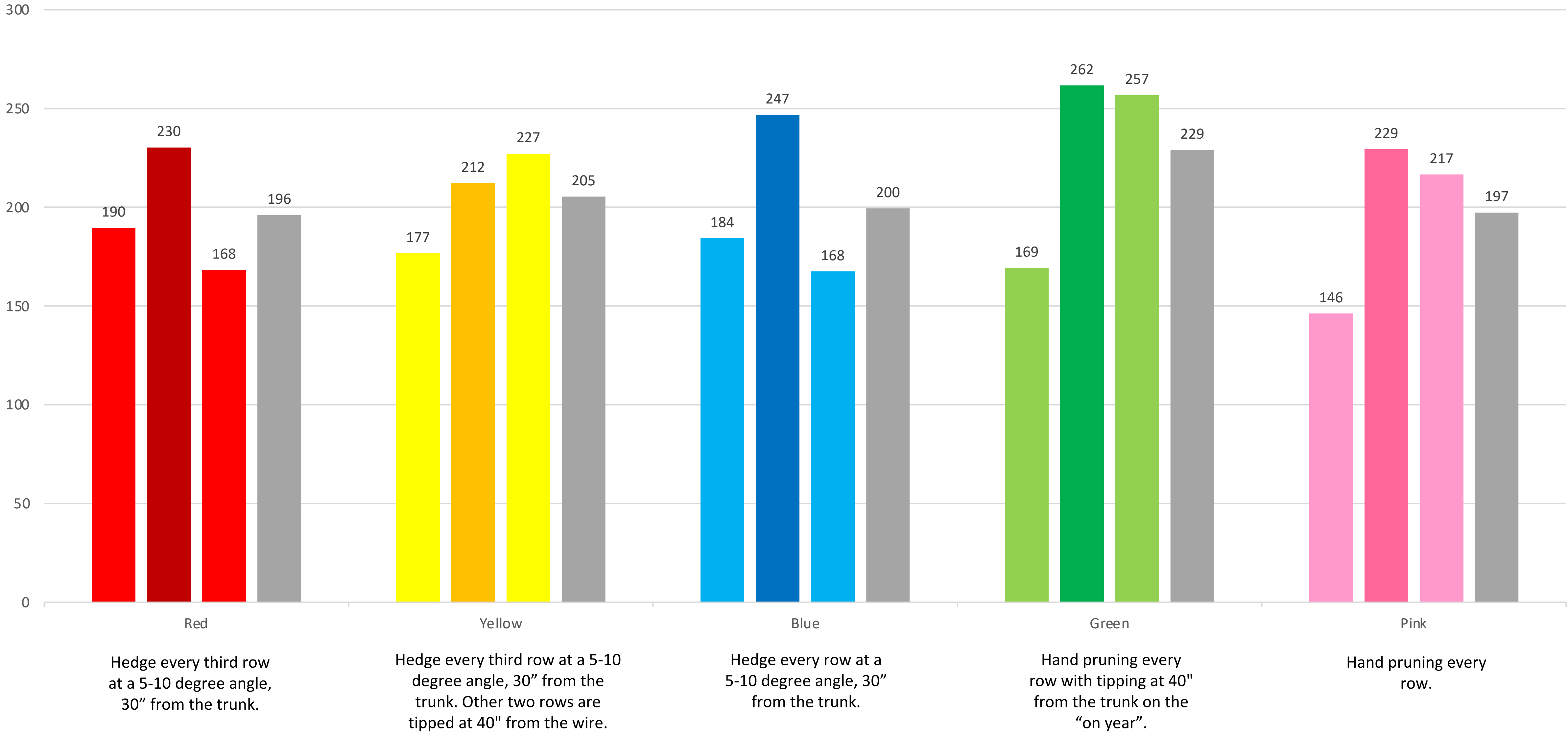
Hedge every third row at a 5-10 degree angle, 30” from the trunk. Other two rows are tipped at 40" from the wire.

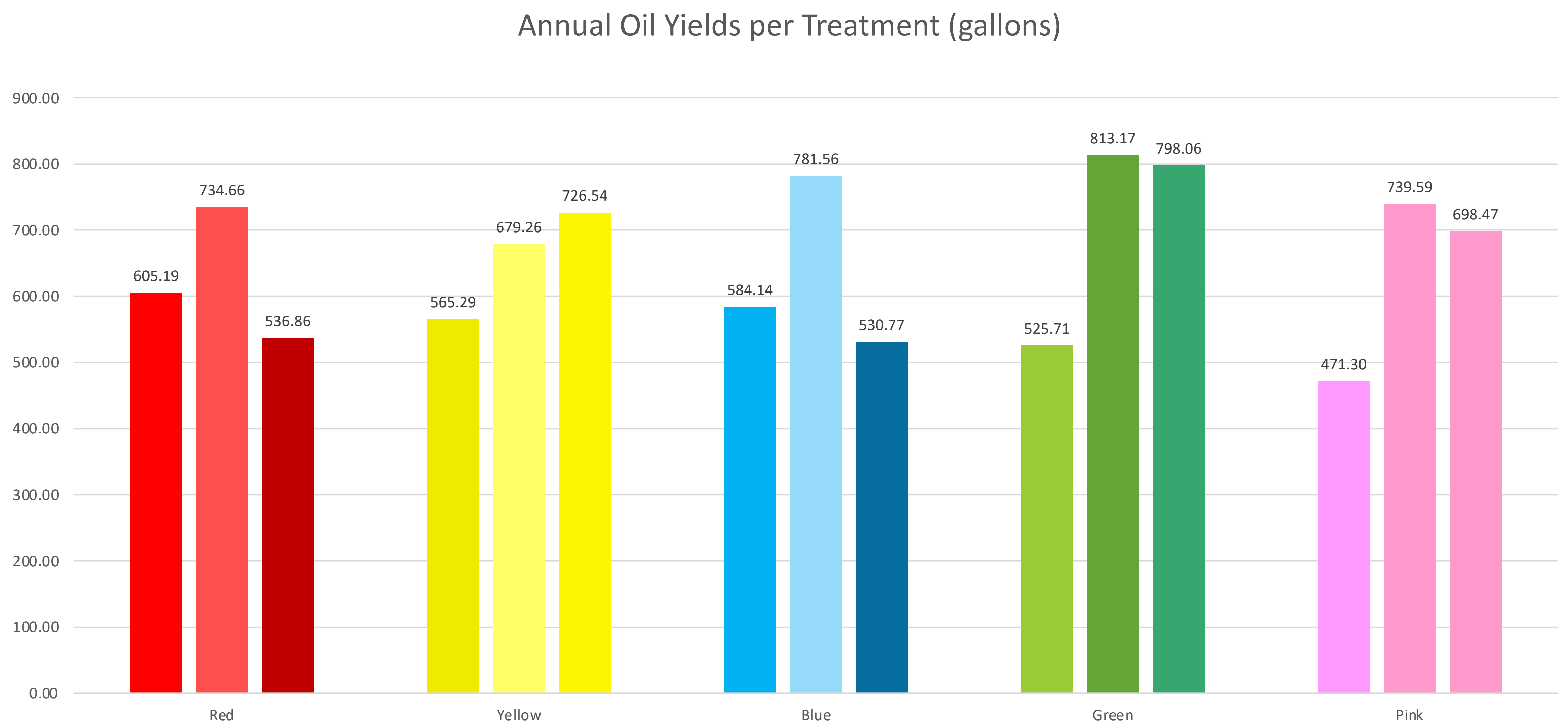
Hedge every row at a 5-10 degree angle, 30” from the trunk.

Hand pruning every row with tipping at 40" from the trunk on the “on year”.

Hand pruning every row.

Annual Oil Yields (gal/ac) per Treatment





Hedge every third row at a 5-10 degree angle, 30” from the trunk.

Hedge every third row at a 5-10 degree angle, 30” from the trunk. Other two rows are tipped at 40" from the wire.

Hedge every row at a 5-10 degree angle, 30” from the trunk.

Hand pruning every row with tipping at 40" from the trunk on the “on year”.

Hand pruning every row.

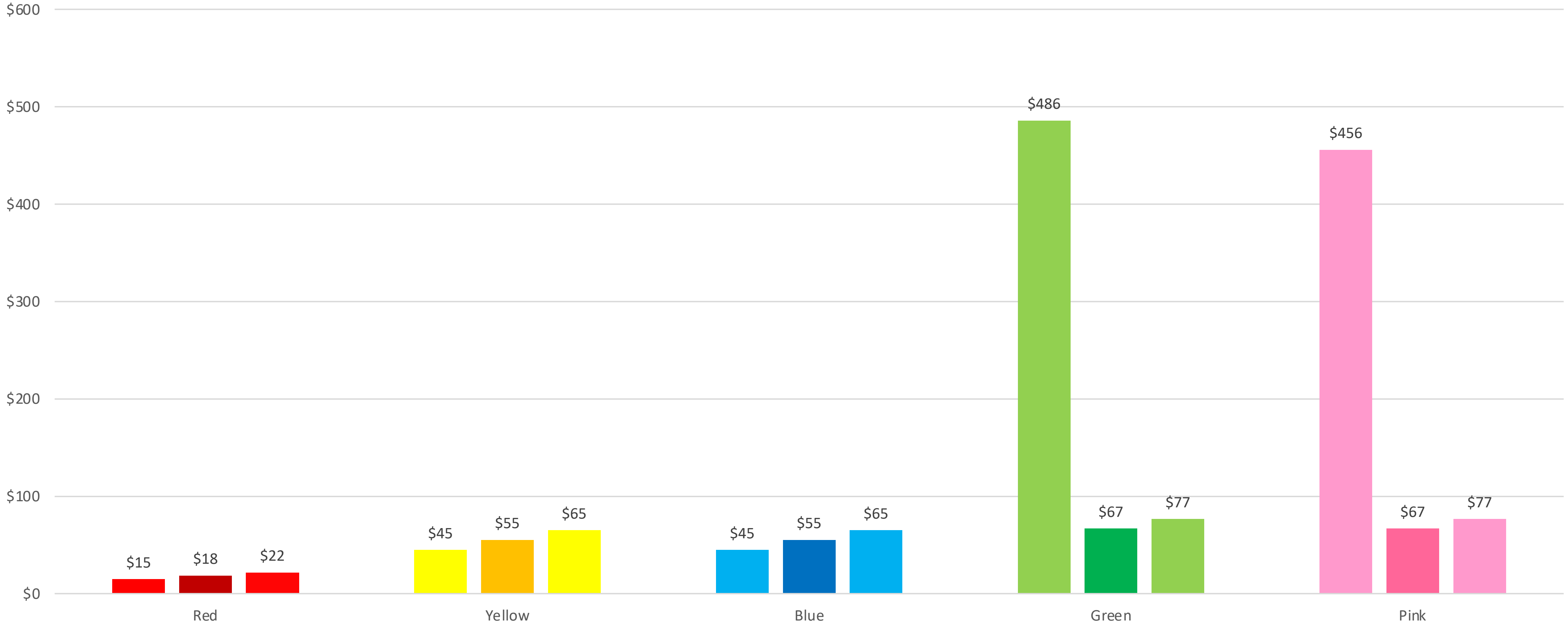
Annual Oil Yields per Treatment (gallons)

Treatment	**Acres**
Red	3.19
Yellow	3.20
Blue	3.17
Green	3.11
Pink	3.23

Treatment	**2021**	**2022**	**2023**	**Total**
Red	605.19	734.66	536.86	1876.71
Yellow	565.29	679.26	726.54	1971.10
Blue	584.14	781.56	530.77	1896.47
Green	525.71	813.17	798.06	2136.94
Pink	471.30	739.59	698.47	1909.36

Red	(Treatment 1): Hedge every third row at a 5-10 degree angle, 30 inches from the trunk.
Yellow	(Treatment 2): Hedge every third row at a 5-10 degree angle, 30 inches from the trunk. Other two rows are tipped at 40" from the wire.
Blue	(Treatment 3): Hedge every row at a 5-10 degree angle, 30 inches from the trunk.
Green	(Treatment 4): Hand pruning every row with complementary tipping at 40" from the trunk on the “on year”.
Pink	(Treatment 5): Hand pruning every row.

Annual Cost/Acre per Treatment



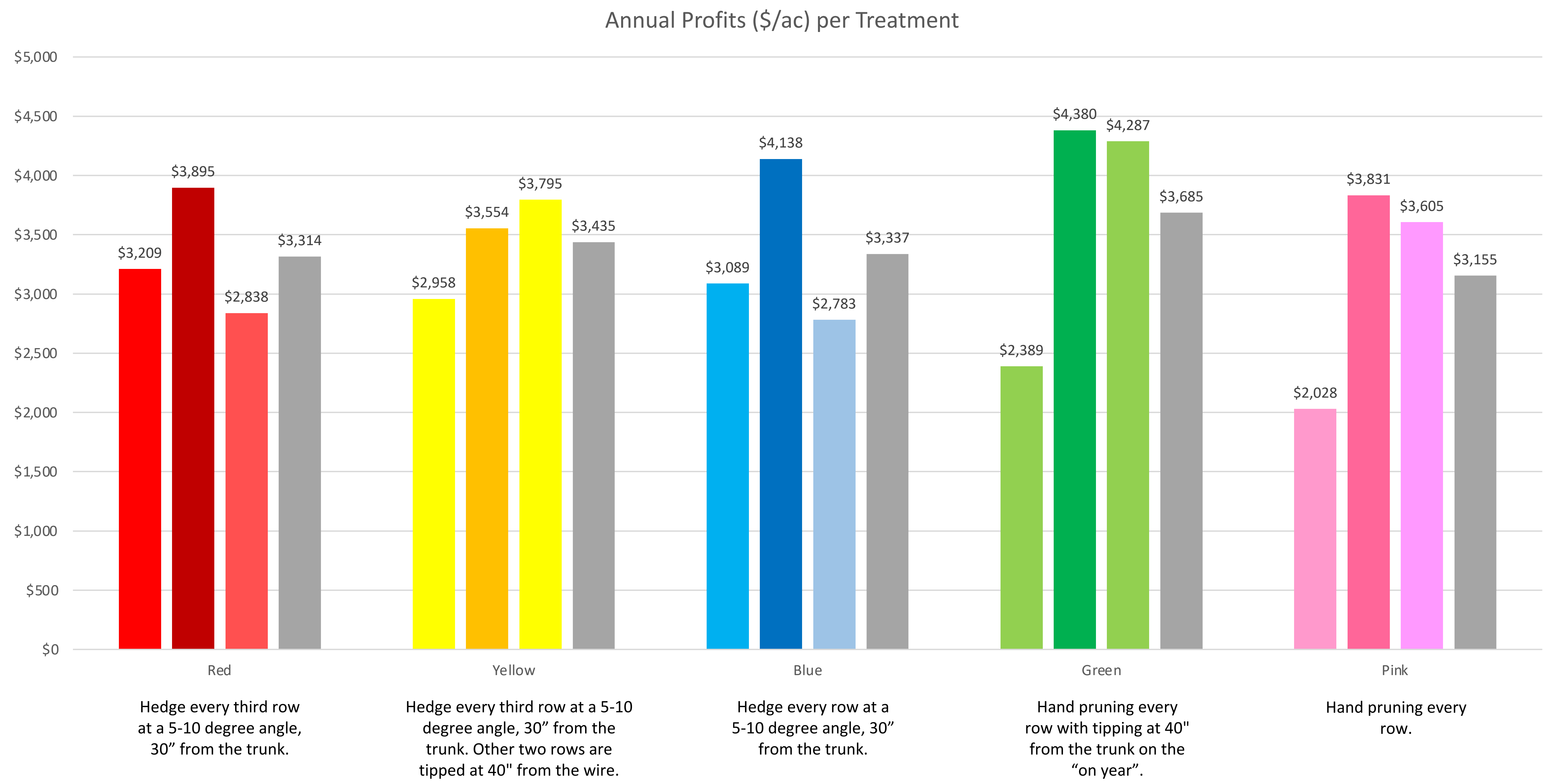
Hedge every third row at a 5-10 degree angle, 30” from the trunk.

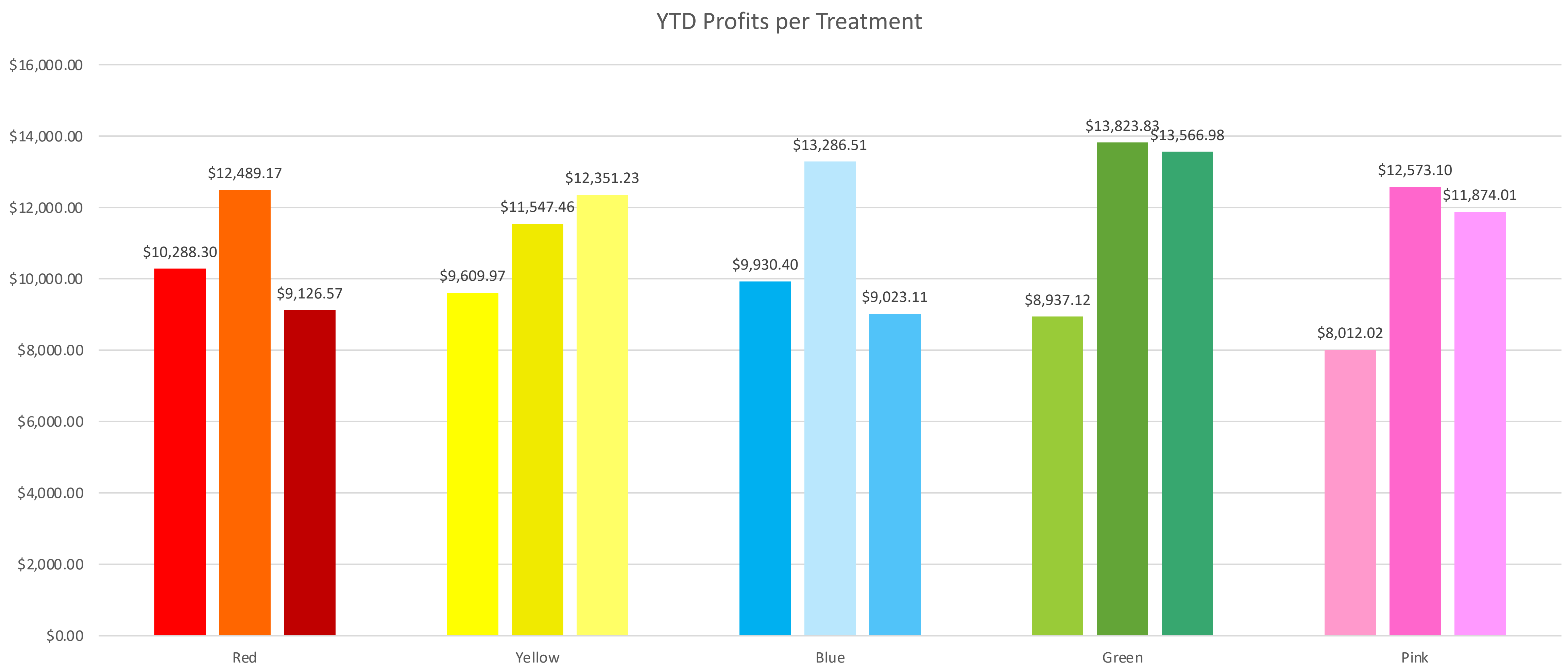
Hedge every third row at a 5-10 degree angle, 30” from the trunk. Other two rows are tipped at 40" from the wire.

Hedge every row at a 5-10 degree angle, 30” from the trunk.

Hand pruning every row with tipping at 40" from the trunk on the “on year”.

Hand pruning every row.


Annual Profits ($/ac) per Treatment
$5,000
$4,500
$4,000
$3,500
$3,000
$2,500
$2,000
$1,500
$1,000
$500
$0
$3,209
$3,895
$2,838
$3,314
$2,958
$3,554
$3,795
$3,435
$3,089
$4,138
$2,783
$3,337
$2,389
$4,380
$4,287
$3,685
$2,028
$3,831
$3,605
$3,155
Red
Yellow
Blue
Green
Pink
Hedge every third row at a 5-10 degree angle, 30” from the trunk.
Hedge every third row at a 5-10 degree angle, 30” from the trunk. Other two rows are tipped at 40" from the wire.
Hedge every row at a 5-10 degree angle, 30” from the trunk.
Hand pruning every row with tipping at 40" from the trunk on the “on year”.
Hand pruning every row.



Red	Yellow	Blue	Green	Pink
Hedge every third row at a 5-10 degree angle, 30” from the trunk.	Hedge every third row at a 5-10 degree angle, 30” from the trunk. Other two rows are tipped at 40" from the wire.	Hedge every row at a 5-10 degree angle, 30” from the trunk.	Hand pruning every row with tipping at 40" from the trunk on the “on year”.	Hand pruning every row.

YTD Profits per Treatment

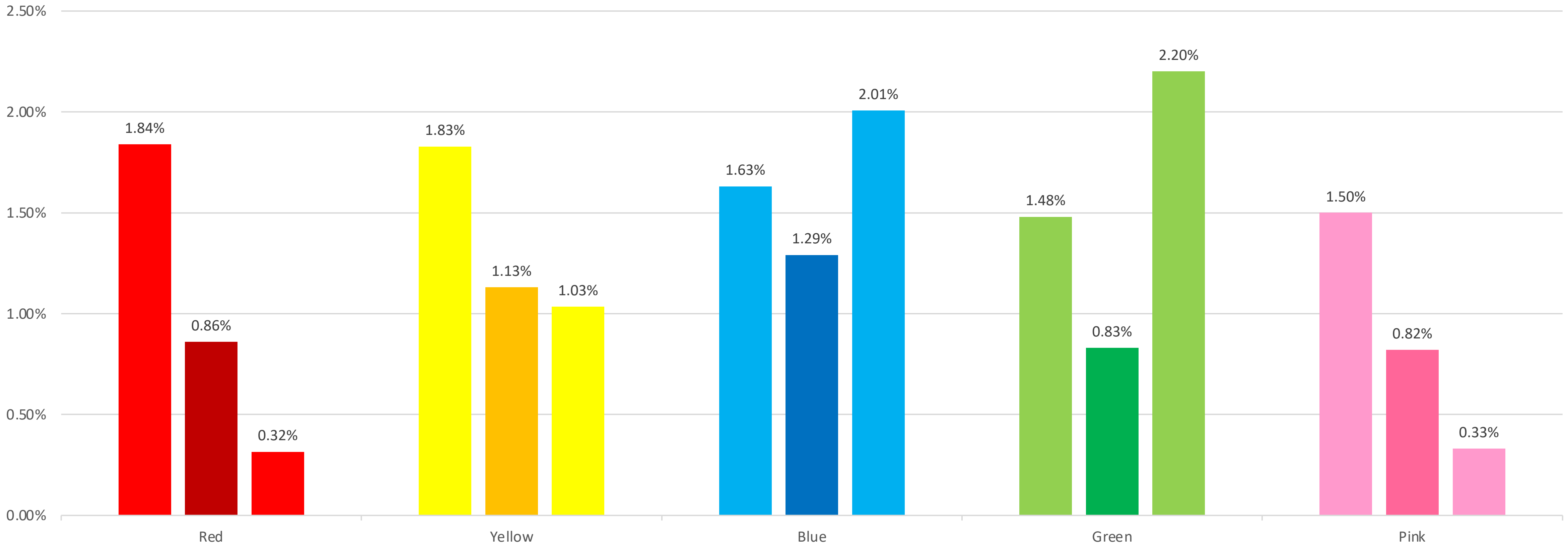
Treatment	Acres
Red	3.19
Yellow	3.20
Blue	3.17
Green	3.11
Pink	3.23

Treatment	2021	2022	2023	Total
Red	$10,288.30	$12,489.17	$9,126.57	$31,904.04
Yellow	$9,609.97	$11,547.46	$12,351.23	$33,508.66
Blue	$9,930.40	$13,286.51	$9,023.11	$32,240.03
Green	$8,937.12	$13,823.83	$13,566.98	$36,327.93
Pink	$8,012.02	$12,573.10	$11,874.01	$32,459.13

Red	(Treatment 1): Hedge every third row at a 5-10 degree angle, 30 inches from the trunk.
Yellow	(Treatment 2): Hedge every third row at a 5-10 degree angle, 30 inches from the trunk. Other two rows are tipped at 40" from the wire.
Blue	(Treatment 3): Hedge every row at a 5-10 degree angle, 30 inches from the trunk.
Green	(Treatment 4): Hand pruning every row with complementary tipping at 40" from the trunk on the “on year”.
Pink	(Treatment 5): Hand pruning every row.

Increasing levels of (MOO)

Annual Material Other than Olives (%) per Treatment



Hedge every third row at a 5-10 degree angle, 30” from the trunk.

Hedge every third row at a 5-10 degree angle, 30” from the trunk. Other two rows are tipped at 40" from the wire.

Hedge every row at a 5-10 degree angle, 30” from the trunk.

Hand pruning every row with tipping at 40" from the trunk on the “on year”.

Hand pruning every row.

Year 3 Wrap-Up

- Both mechanical and manual pruning are valuable tools for canopy management
- Hand pruning costs can be high in the first year following many years of mechanical pruning but are significantly lower when performed regularly every year
- The GREEN treatment, (hand prune every row + tipping at 40” on the on-year) produced the highest yields both in terms of volume of fruit and oil (14.9% higher than the average of the other four treatments) despite the drop in yields following the first year of hand pruning
- Despite the higher initial pruning costs, the GREEN treatment is, until now, the most profitable treatment (11.3% higher than the average of the other four treatments)
- Due to the alternate bearing nature of olives, the research project was specifically indented to be a 4-year study. As the first crop only showed the direct impact of the pruning but not the effects of its execution, we would need one more year of observations to properly complete this project.

Thank you!

Cameron Gurley
530-383-3080
c.gurley@cobramestateolives.com

The Effect of Olive Cultivation Practice on Oil Quality

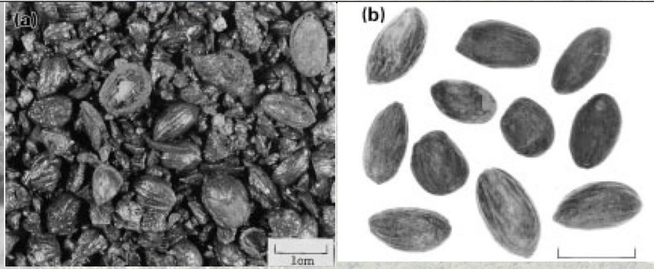
ARNON DAG, ARO VOLCANI CENTER, ISRAEL

The Effect of Olive Cultivation Practice on Oil Quality

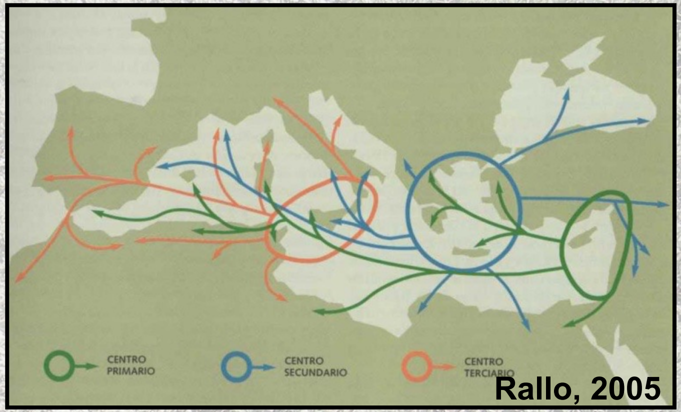
Arnon Dag, Volcani Institute
Agricultural Research Organization
Ministry of Agriculture, Israel
(*Currently in a Sabbatical Year at UC Davis*
with Giulia Mariano and Louise Ferguson)

Domestication of olive started in the Middle East ca. 6500 years ago


Galili et al. 1997



~ 6,500 years



Rallo, 2005

Wild type

O. europea oleaster

Barazani, O., Westberg, E., Hanin, N., Dag, A., Kerem, Z., Tugendhaft, Y., Hamidt, M., Hijawi, T. and Kadereit, J.W, (2014) A comparative analysis of genetic variation in rootstocks and scions of old olive trees- a window into the history of olive cultivation practices and past genetic variation. BMC Plant Biol. 14: 146.

Olive oil classification (IOC)

- Extra virgin olive oil.
- Virgin olive oil .
- Ordinary olive oil.
- Lampante olive oil

INTERNATIONAL OLIVE COUNCIL

The permitted health claims for olive oil (in accordance to the EU regulation) are relative to olive oil polyphenols, oleic acid, vitamin E and monounsaturated and/or polyunsaturated fatty acids.

שמן זית ישראלי
קונים רק עם תו איכות
בפיקוח ענף הזית
במועצת הצמחים

Peroxide value (milieqvivalent / kg oil)	Free acidity (%)	
20 ≥	0.8 ≥	Extra virgin olive oil
20 ≥	2.0 ≥	Virgin olive oil .
20 ≥	3.3 ≥	Ordinary olive oil.
20 ≥	3.3 <	Lampante olive oil

INTERNATIONAL OLIVE COUNCIL

Sensorial evaluation

4. QUALITY CRITERIA

The limits established for each criterion and designation include the precision values of the attendant recommended method

	Extra virgin olive oil	Virgin olive oil	Ordinary virgin olive oil	Lampante virgin olive oil *	Refined olive oil	Olive oil	Crude olive-pomace oil	Refined olive-pomace oil	Olive-pomace oil
4.1 Organoleptic characteristics									
- odour and taste					acceptable	good		acceptable	good
- odour and taste (on a continuous scale):									
. median of defect . median of the fruity attribute	Me = 0 Me > 0	0 < Me ≤ 3.5 Me > 0	3.5 <Me ≤ 6.0**	Me > 6.0					
- colour					light yellow	light, yellow to green		light, yellow to brownish yellow	light, yellow to green
- aspect at 20°C for 24 hours					limpid	limpid		limpid	limpid
4.2. Free acidity % m/m expressed in oleic acid	≤ 0.8	≤ 2.0	≤ 3.3	> 3.3	≤ 0.3	≤ 1.0	no limit	≤ 0.3	≤ 1.0
4.3. Peroxide value in milleq. Peroxide oxygen per kg/oil	≤ 20	≤ 20	≤ 20	no limit	≤ 5	≤ 15	no limit	≤ 5	≤ 15

How does crop cultivation affect oil quality ?

Irrigation regime

Fertilization regime

Harvest timing

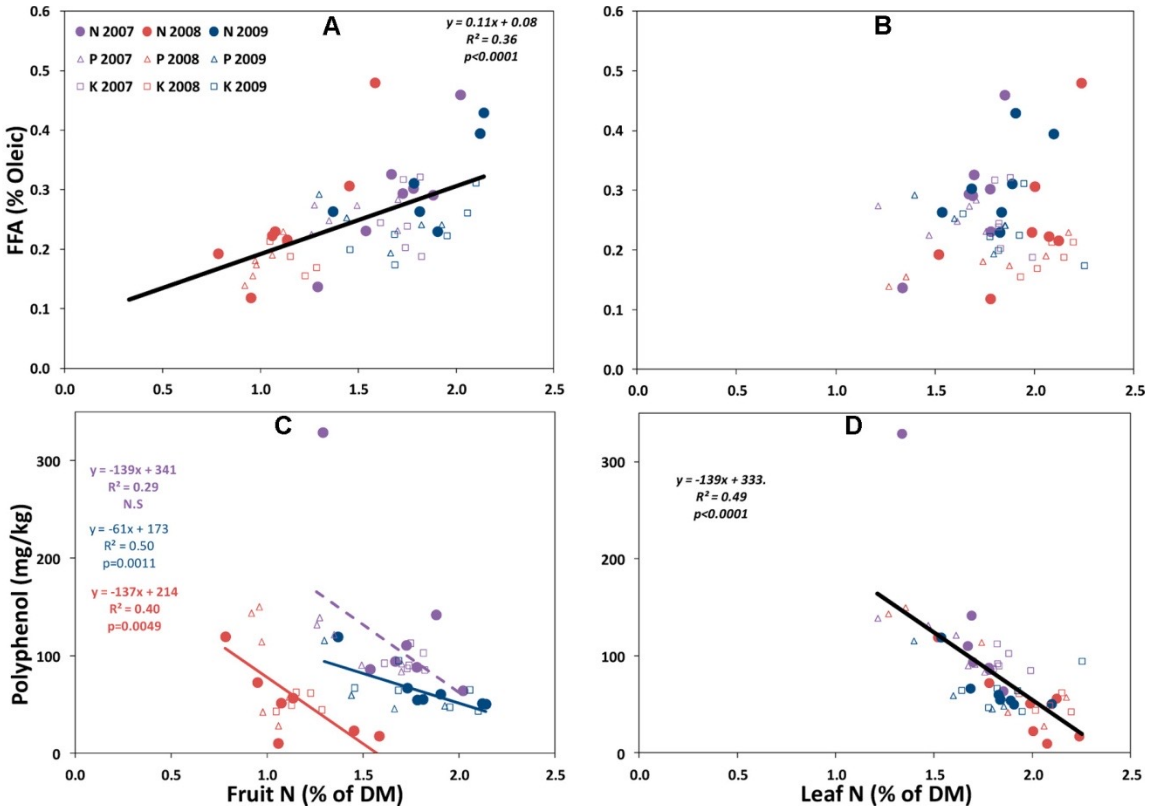
Harvest method

Pests and diseases

Genetics (cultivars)

Controlled N containers experiment

The effect of nitrogen availability on oil quality parameters



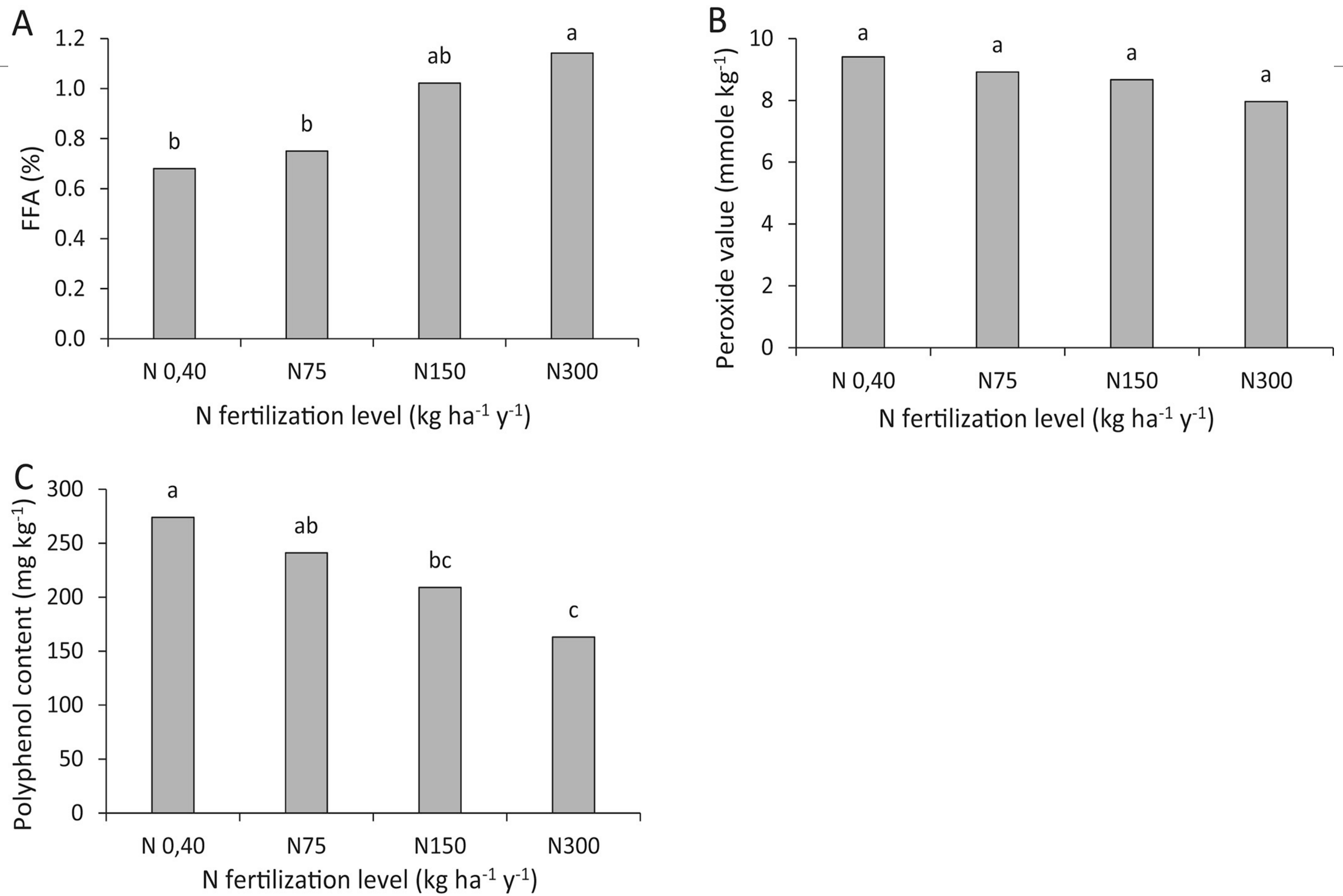
Average free fatty acid (a and b) and polyphenol (c and d) concentration as a function of N concentration in fruit flesh (a and c) and in leaves (b and d) for the three studied years: 2007 (purple), 2008 (red), and 2009 (blue) and the three manipulated treatments: N (●), P (▲), and K (■). Each point represents an average of six replicates in 2007 and three replicates in 2008 and 2009.

Published in: Ran Erel; Zohar Kerem; Alon Ben-Gal; Arnon Dag; Amnon Schwartz; Isaac Zipori; Loai Basheer; Uri Yermiyahu; *J. Agric. Food Chem.* **2013,** 61, 11261-11272.

The effect of nitrogen availability on oil quality parameters, 6-year average, field study (Negba)

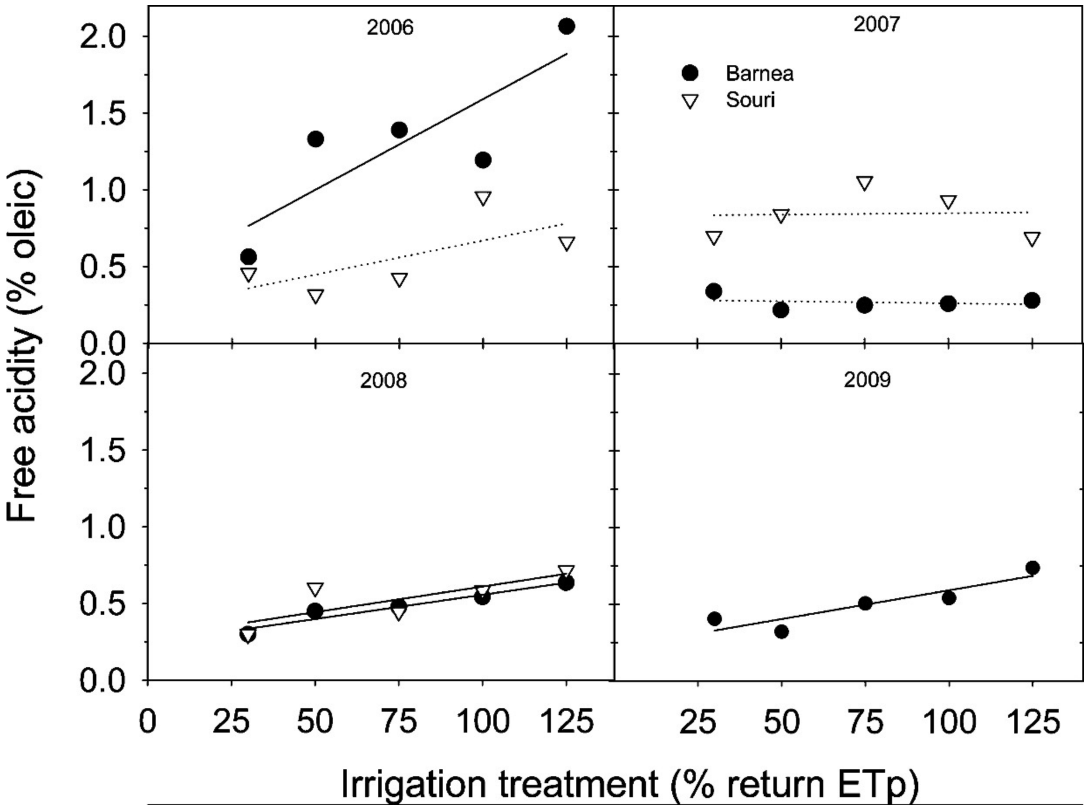
Zipori et al. (2023). J. Sci. Food Agric. 48-56.

The effect of nitrogen availability on oil quality parameters, 6-year average, field study (Negba)



Zipori et al. (2023). J. Sci. Food Agric. 48-56.

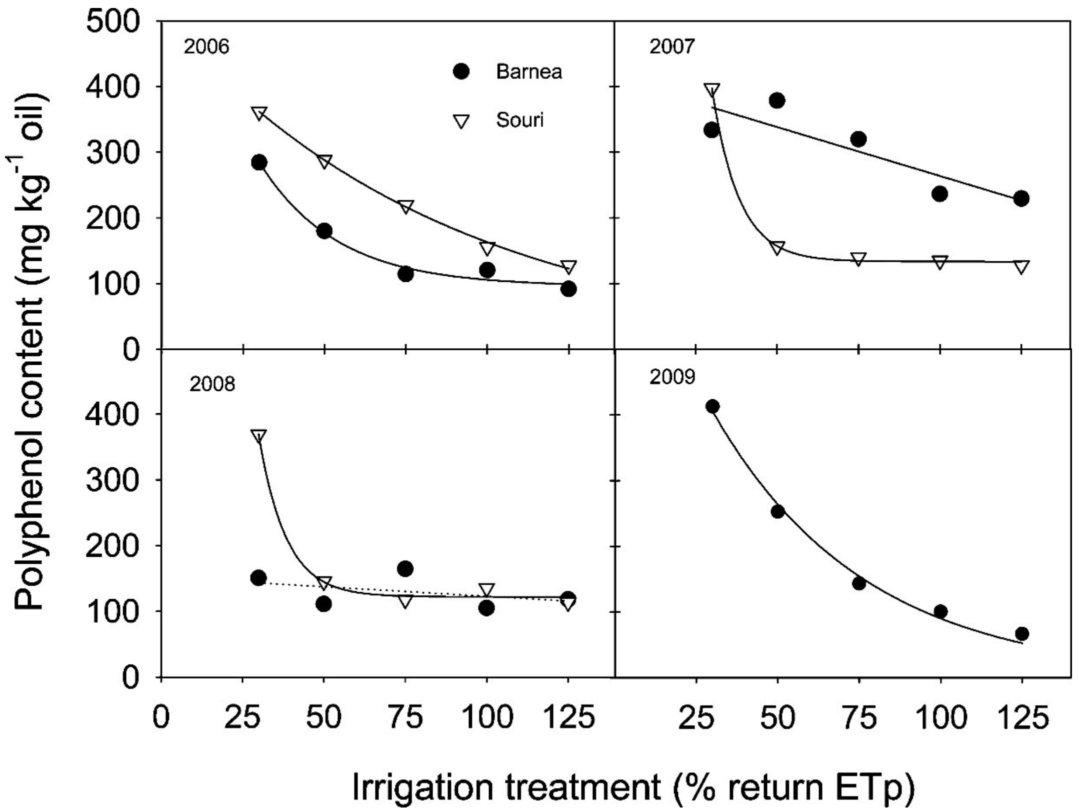
The effect of irrigation level on oil FAA



Free fatty acids in olive oil as a function of irrigation water application rate. Heavy fruit loads ("on" years) were experienced in 2006 and 2008 in 'Souri' trees and in 2007 and 2009 in 'Barnea'. Symbols are average measured values (*n* = 10), and lines are best-fit linear regression. Dotted lines are not significant.

Published in: Alon Ben-Gal; Arnon Dag; Loai Basheer; Uri Yermiyahu; Isaac Zipori; Zohar Kerem; *J. Agric. Food Chem.* **2011,** 59, 11667-11675.
DOI: 10.1021/jf202324x

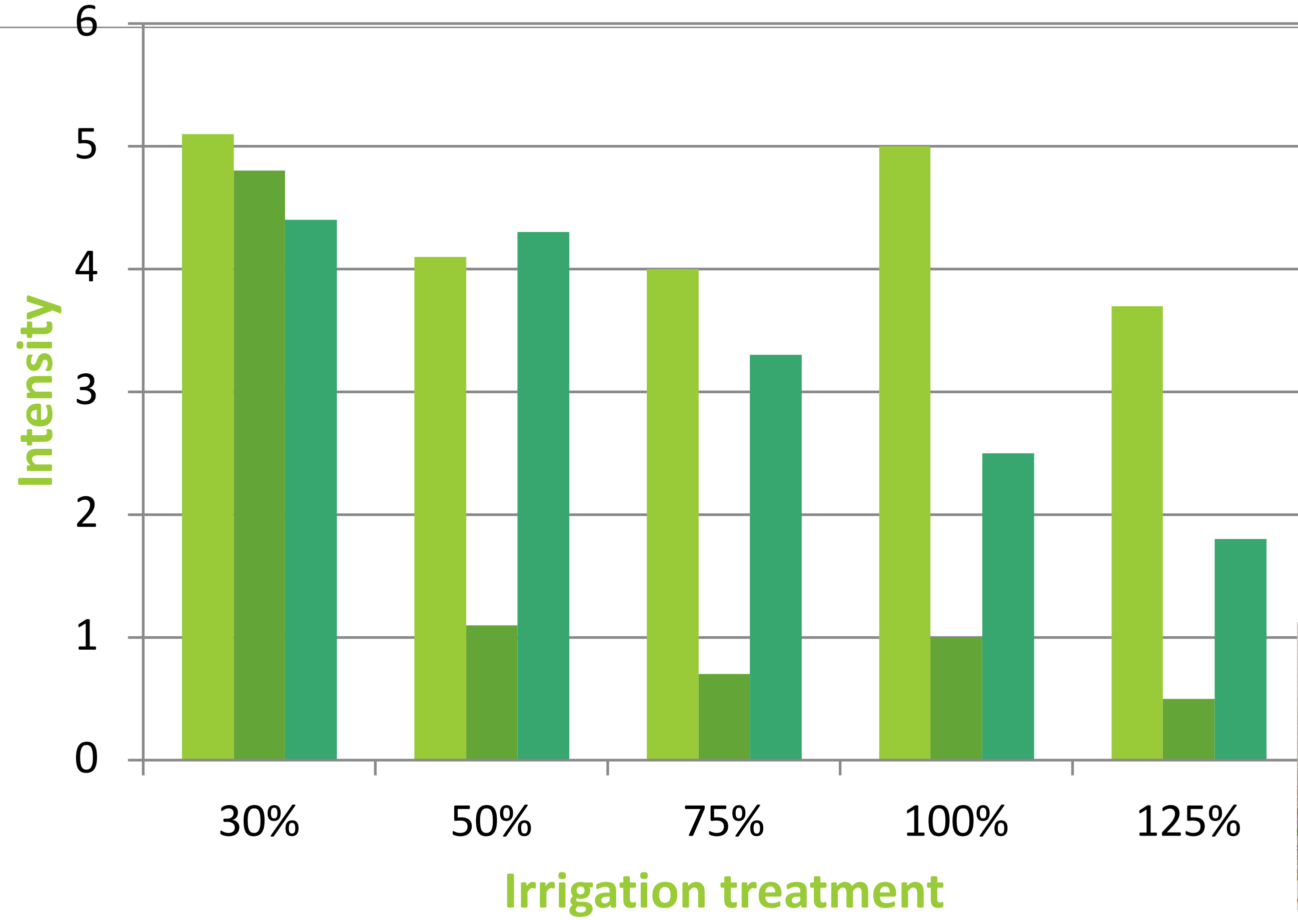
The effect of irrigation level on oil polyphenol content



Polyphenol content of olive oil as a function of irrigation water application rate. Heavy fruit loads (“on” years) were experienced in 2006 and 2008 in 'Souri' trees and in 2007 and 2009 in 'Barnea'. Symbols are average measured values (n = 10), and lines are best-fit linear and one- or two-parameter exponential decay regression curves. Dotted lines are not significant.

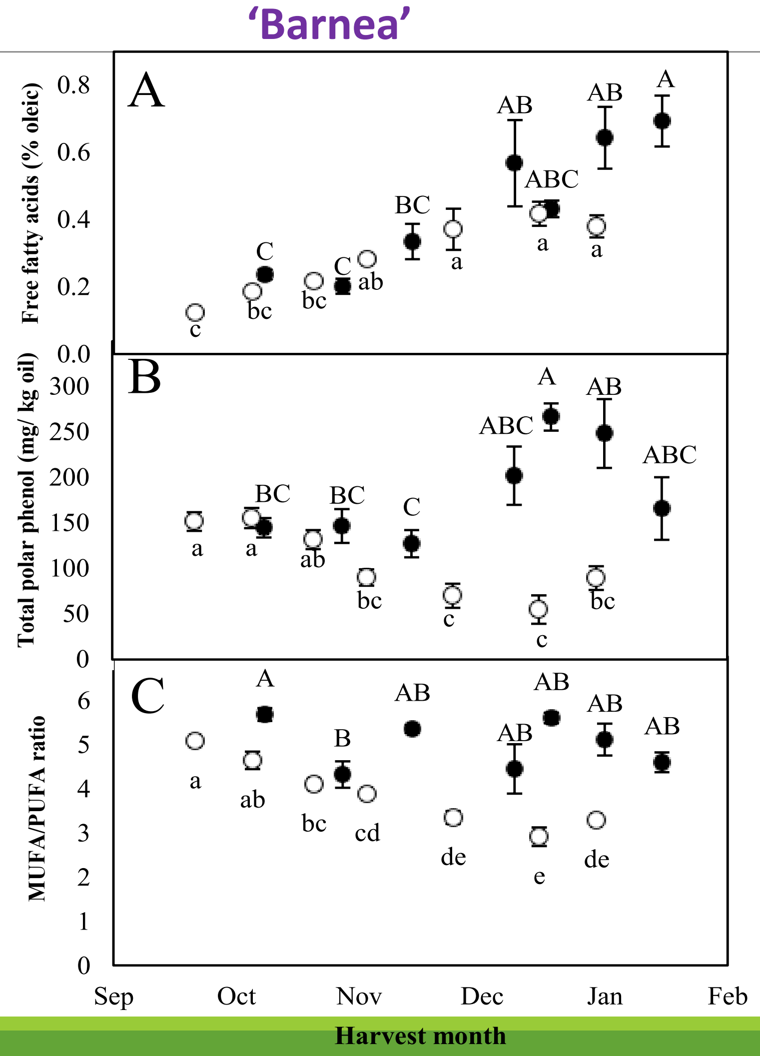
Published in: Alon Ben-Gal; Arnon Dag; Loai Basheer; Uri Yermiyahu; Isaac Zipori; Zohar Kerem; *J. Agric. Food Chem.* **2011,** 59, 11667-11675.
DOI: 10.1021/jf202324x

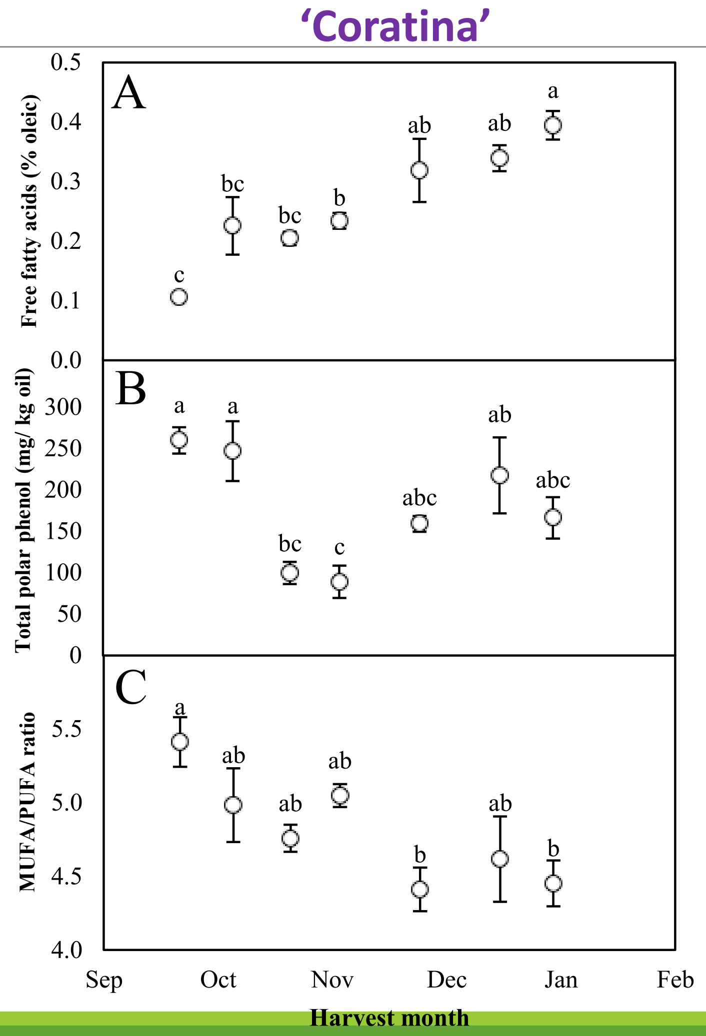
The effect of irrigation level on positive attributes in oil testing, ‘Souri’, 2008



Ben-Gal, A., Dag, A., Basheer, L., Yermiyahu, U., Zipori, I., & Kerem, Z. (2011). The influence of bearing cycles on olive oil quality response to irrigation. *Journal of agricultural and food chemistry*, *59*(21), 11667-11675.

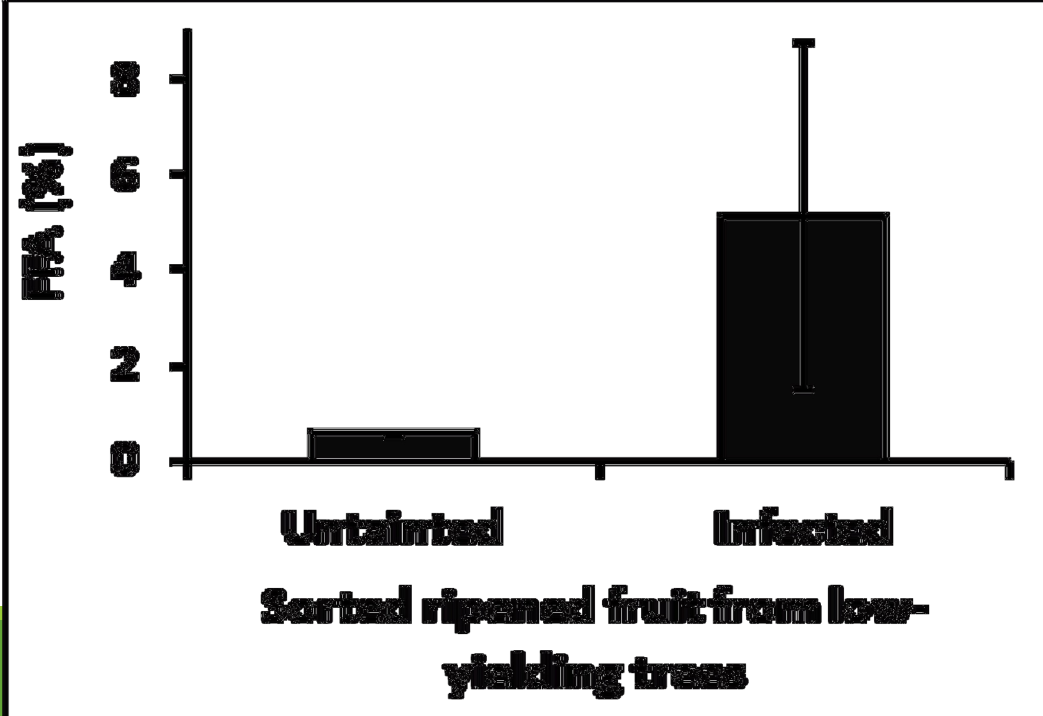
Effect of harvest timing on oil quality





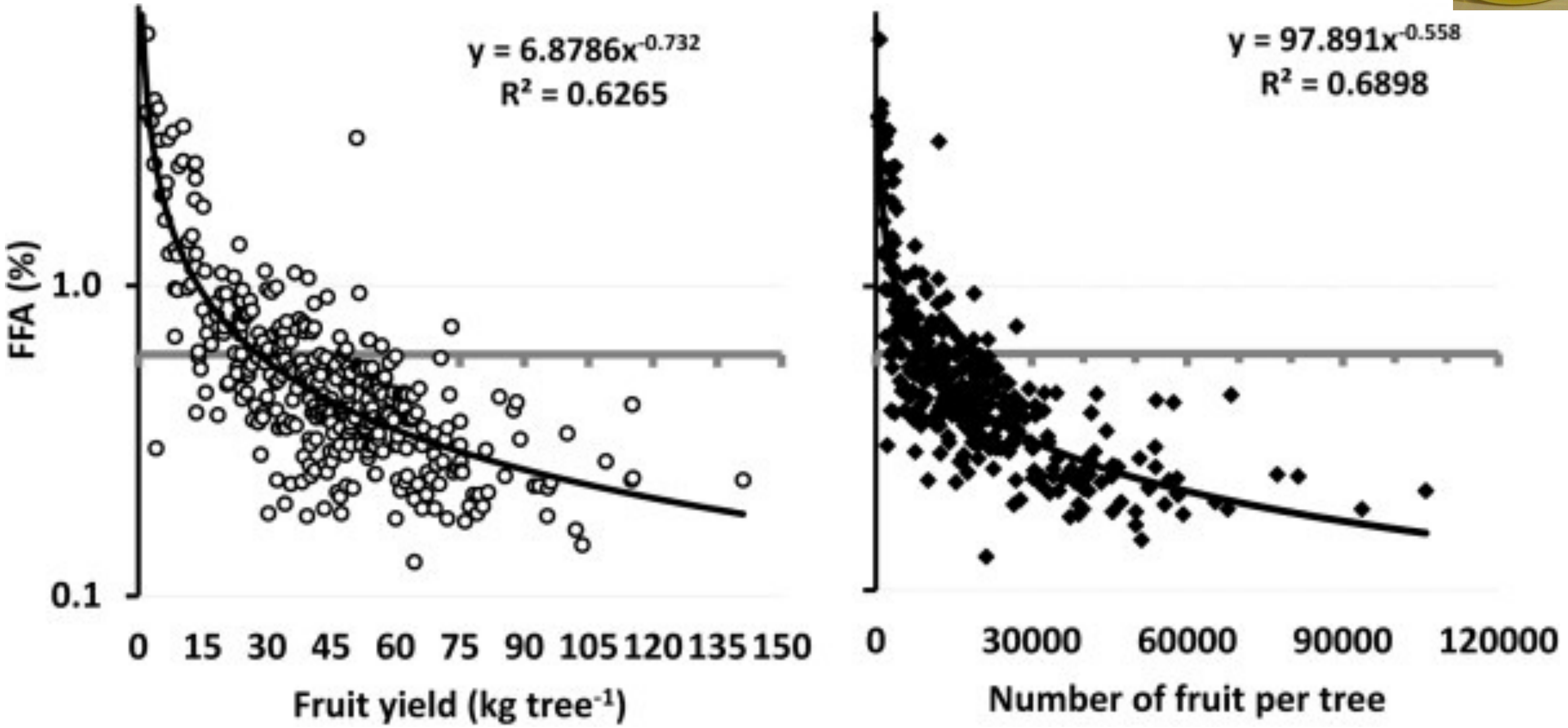
Dag et al. (2013) Eur. J. Lipid Sci. 116: 169-176.

The effect of fungal infestation of ripe 'Barnea' fruit on oil FAA



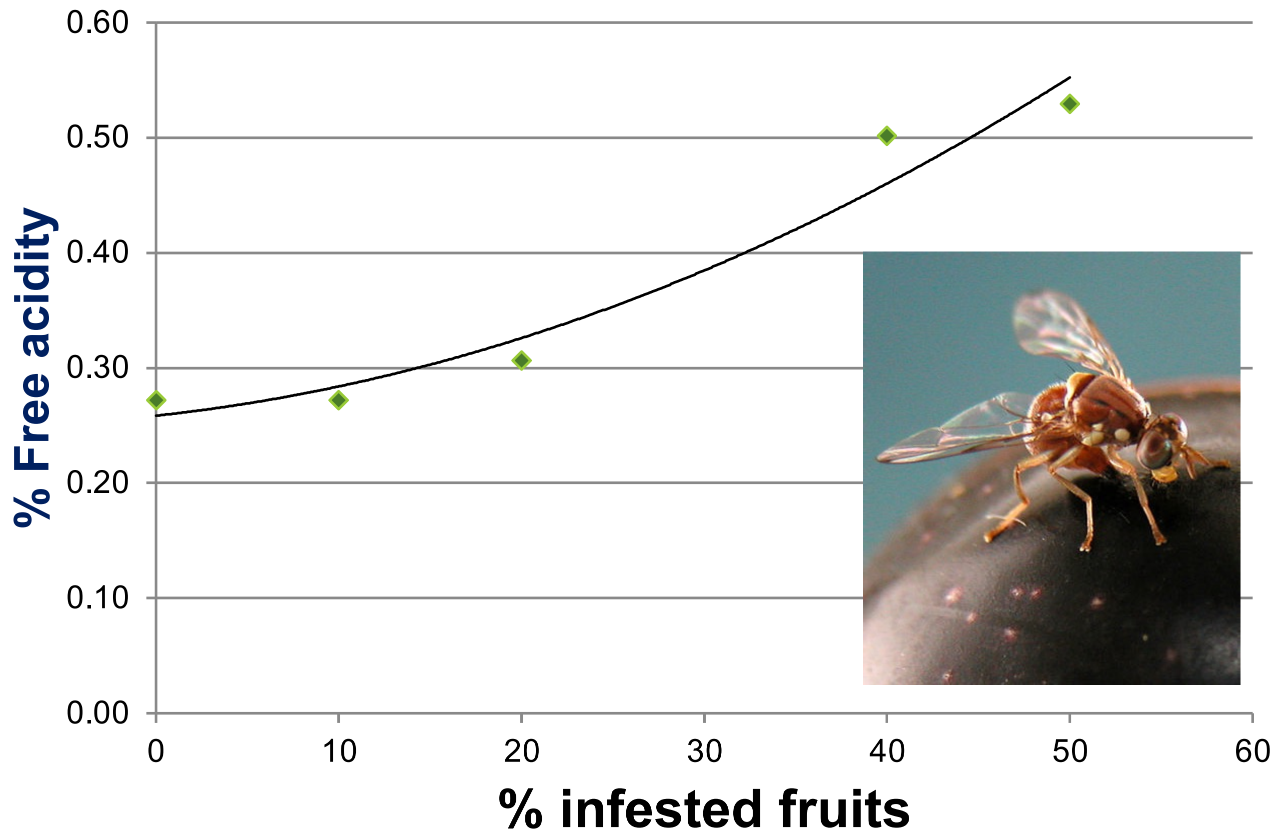
Bustan, A., Kerem, Z., Yermiyahu, U., Ben-Gal, A., Lichter, A., Droby, S., ... & Dag, A. (2014). Preharvest circumstances leading to elevated oil acidity in 'Barnea' olives. *Scientia Horticulturae*, *176*, 11-21.

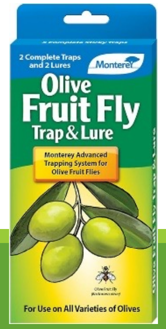
The effect of fruit load on FFA ('Barnea')



Bustan, A., Kerem, Z., Yermiyahu, U., Ben-Gal, A., Lichter, A., Droby, S., ... & Dag, A. (2014). Preharvest circumstances leading to elevated oil acidity in 'Barnea'olives. *Scientia Horticulturae*, *176*, 11-21.

The effect of olive fly infestation on oil acidity (Souri)





Pests and diseases

Direct effect on oil quality

↔

Residues of agrochemicals in oil

The risk is especially pronounced in lipophilic compounds

(Cordova 1989-1997)

CUADRO 4

CONTENIDO EN POLIFENOLES TOTALES DE LOS ACEITES DE 24 VARIEDADES DEL BANCO DE GERMOPLASMA MUNDIAL DEL CIFA "ALAMEDA DEL OBISPO" DE CÓRDOBA

(período 1989-1997)

Variedad[1]	Polifenoles (ppm ácido caféico)
'Chetoui'	1.240,3 ± 101,8[2]
'Picholine Marroquí'	787,3 ± 72,1
'Picual'*	664,3 ± 133,2
'Cornicabra'	464 ± 192,1
'Manzanilla de Sevilla'*	461,7 ± 162,5
'Changlot Real'	451,7 ± 125,2
'Lechín de Sevilla'	445,3 ± 136,8
'Empeltre'*	420,7 ± 88,1
'Manzanilla Cacereña'	393,7 ± 73,3
'Frantoio'	382,7 ± 118,6
'Lechín de Granada'	339 ± 45,4
'Maurino'	334,3 ± 62,4
'Kelb-et-Ter-145'	334 ± 41,3
'Kalamon'	332 ± 68,7
'Blanqueta'*	293,7 ± 98,5
'Grappolo'	280,3 ± 79,9
'Picudo'*	246,7 ± 11,3
'Zarza'	234,3 ± 37,3
'Callosina'	232,3 ± 69,6
'Sorani'	211 ± 31,8
'Hojiblanca'*	187,3 ± 55,6
'Arbequina'*	181,7 ± 52,3
'Jaropo'	171,7 ± 76,9
'Nevadillo de Santisteban del Pto.'	121,3 ± 21
Valor medio ± s	**3.68,5 ± 160**
CV (%)	**43,5**

1 Con *, las variedades coincidentes en ambos Bancos. En negrita, variedades principales españolas.

2 Error estándar (SE); s: desviación típica; CV: coeficiente de variación.

Source; Variedades de Olivo en Espańa

The effect of cultivar on monounsaturated fatty acids in olive oil (Cordova, Spain)


BAKINGBUSINESS.com

Companies · Business · Product Development · Operations · Trends · Advertising

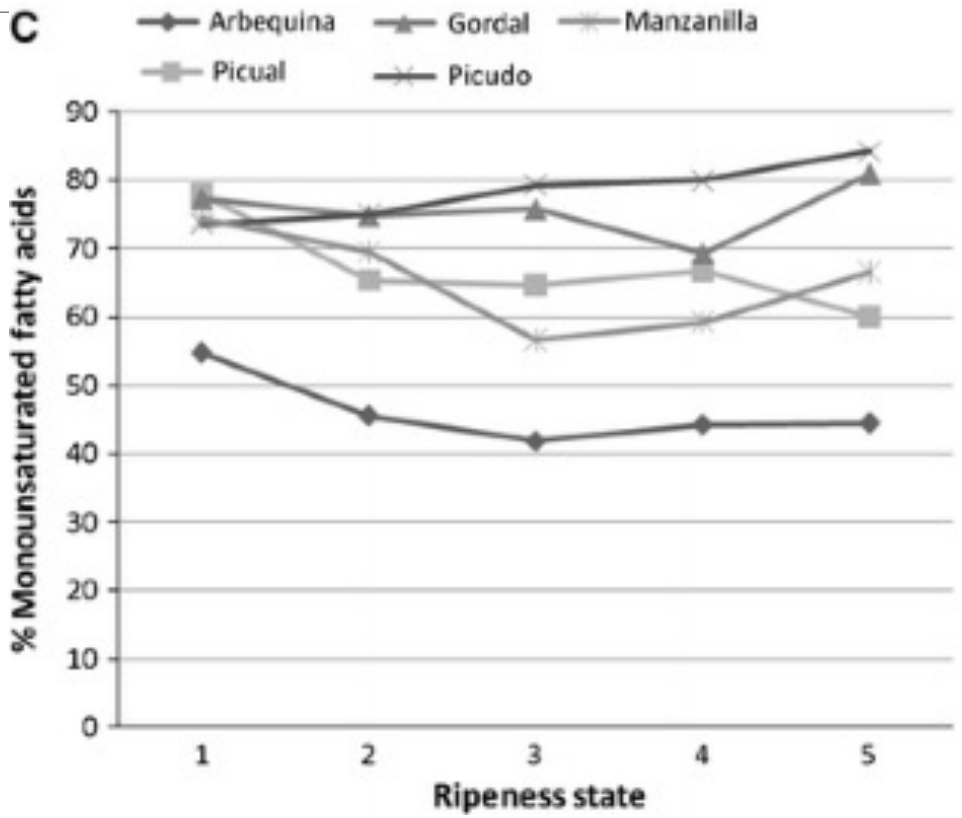
Producers get a helping hand from high-oleic oils

Source: ©VAYLA82 - STOCK.ADOBE.COM

11.15.2023 By Lucas Cuni-Mertz

More manufacturers are turning to high-oleic oils to reduce saturated fat content and provide other functional benefits to their foods. According to Expert Market Research, the global high-oleic market is projected to grow at a CAGR of 6.5% between 2023 and 2028, reaching approximately $6.8 billion.

High-oleic oils, including sunflower, olive, canola and soy, are low in saturated fats and high in monounsaturated fats, both of which promote lower LDL (bad) cholesterol. These oils also offer greater oxidative stability.

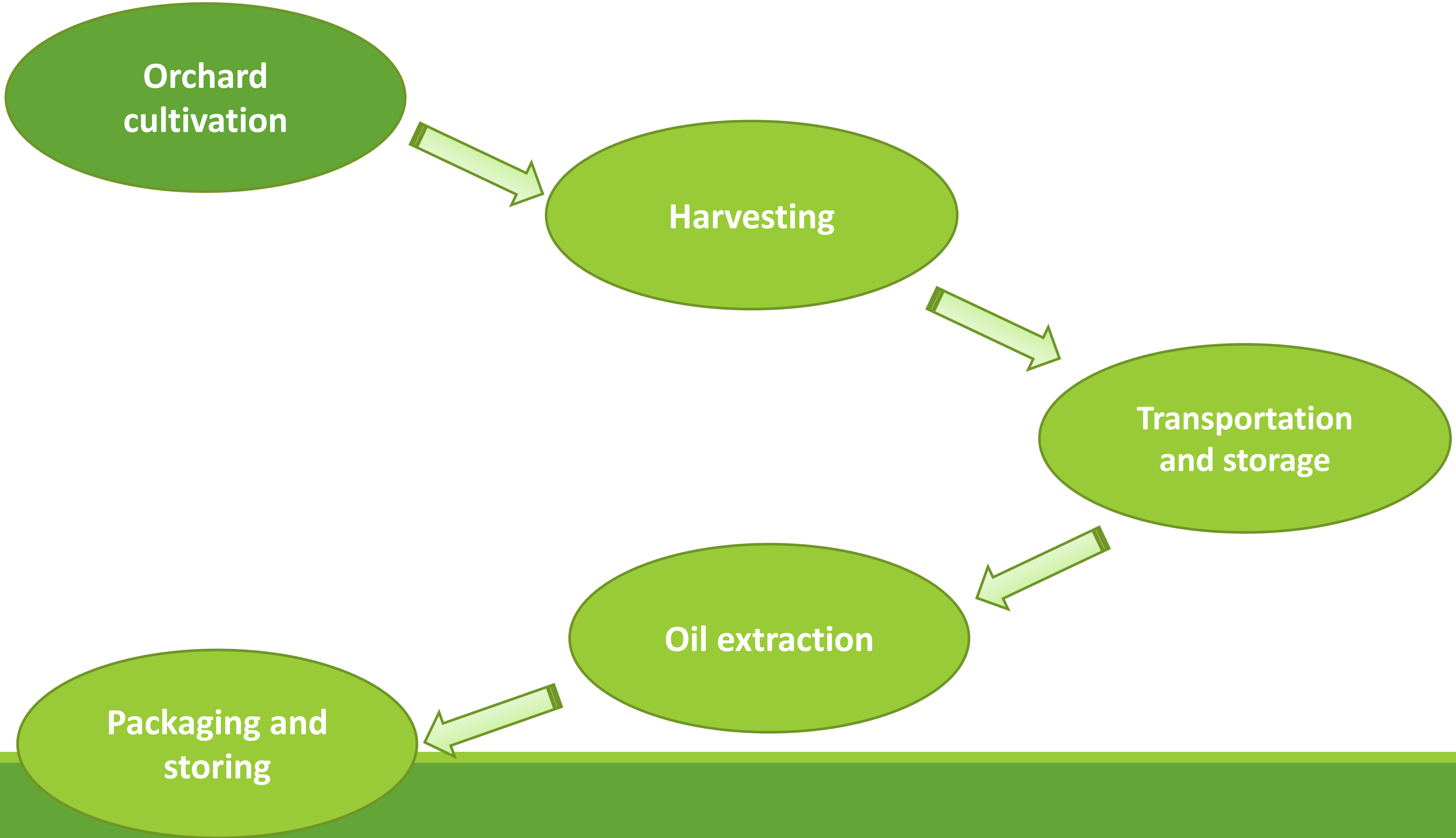


Gómez-González, S., Ruiz-Jiménez, J., & Luque de Castro, M. D. (2011). Oil content and fatty acid profile of Spanish cultivars during olive fruit ripening. *Journal of the American Oil Chemists' Society*, *88*, 1737-1745.

How can we improve olive oil quality at the orchard level ?

- Control irrigation level
- Avoid over-fertilization with nitrogen
- Control pests and diseases (if possible)
- Monitor oil quality parameters along the ripening process and harvest earlier when FFA starts to increase
- Avoid damage to fruits during harvest
- Select the right cultivar (with respect to oil quality)

Olive oil production process




Thank you !

Grower Panel on Water, Inputs and Orchard Management

MODERATOR – BRITTANY FAGUNDES

PANEL – ADAM ENGLEHARDT, LIZANDRO MAGANA, MARCELO BERLANDA, DINO DEL CARLO

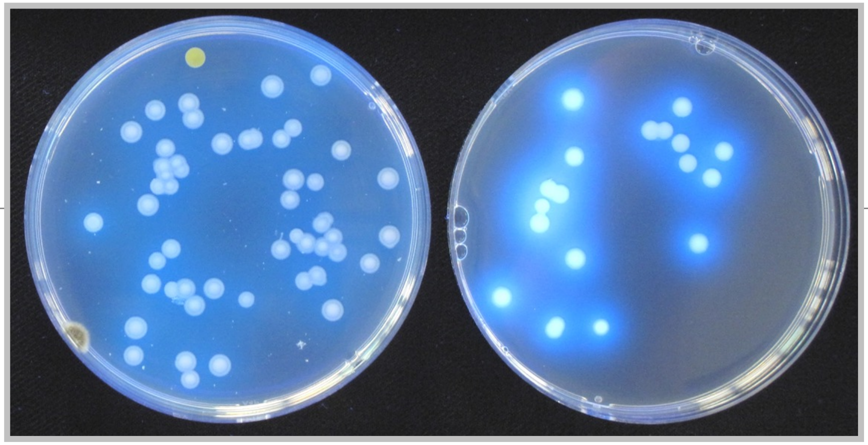
Epidemiology of Olive Knot and Control of Olive Leaf Spot/Peacock Spot

JAMES ADASKAVEG, DEPARTMENT OF PLANT PATHOLOGY,UC RIVERSIDE

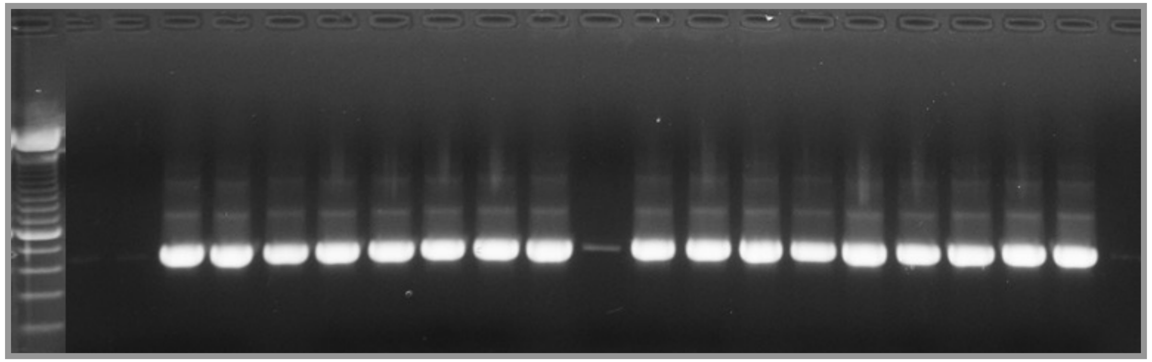
Management of olive knot caused by *Pseudomonas savastanoi* pv. *savastanoi*

J. E. ADASKAVEG, UNIVERSITY OF CALIFORNIA

Olive Knot - Pseudomonas savastanoi pv. *savastanoi*



Isolation plates of *Psv* on KMB (left) and PVF-1 (right) under long-wave UV.



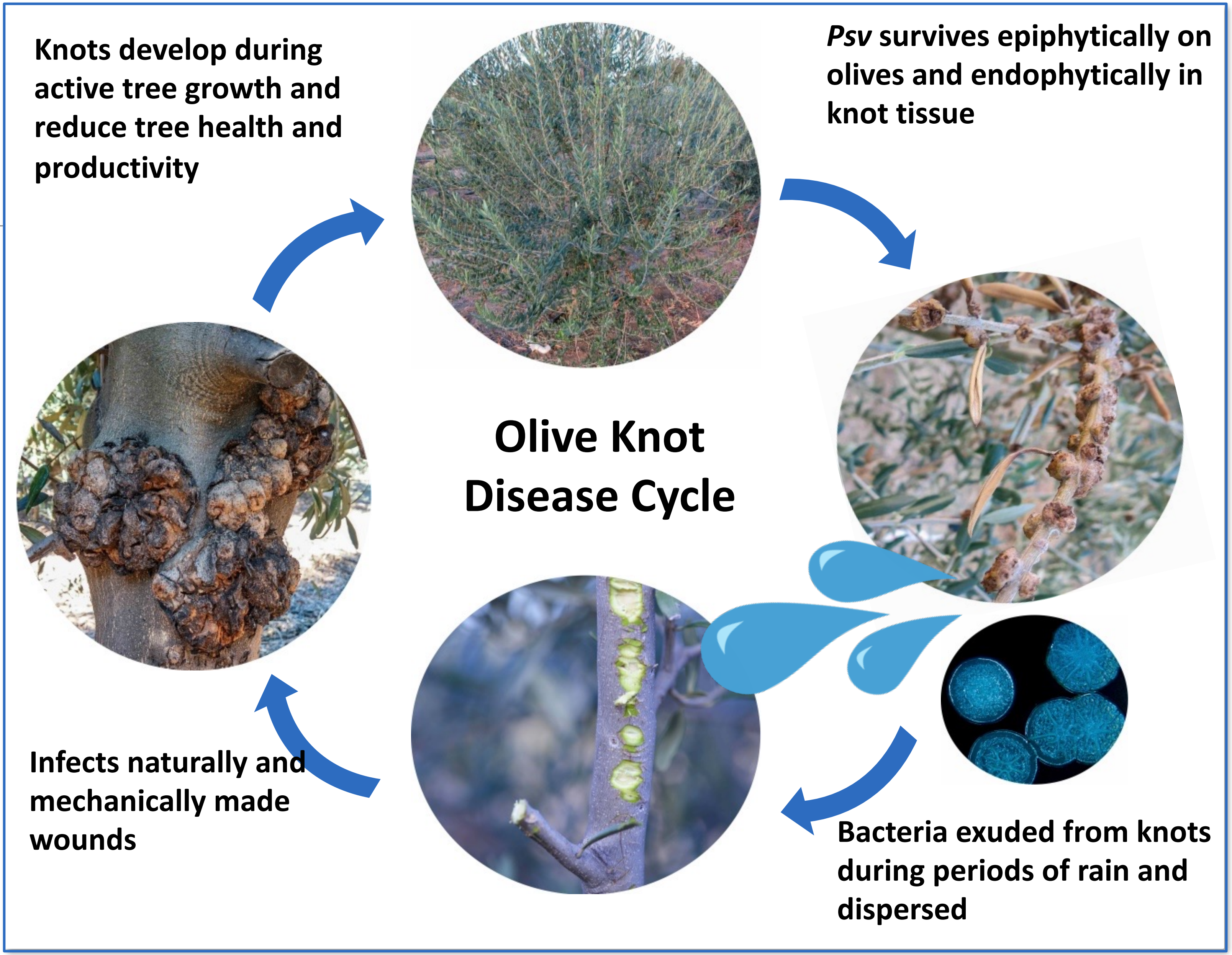
Specific amplification of *Psv*

- Economically important worldwide
- All olive cultivars are susceptible to Psv.
- Pathogen gains entry into host through wounds.
- Psv is an epiphyte on plant surfaces and an endophyte inside knots.
- Produces phytohormones that cause hyperplastic and hypertrophic outgrowths (knots, galls).
- Severe infections cause tree defoliation, branch dieback, and reduced tree vigor.
- Knots develop over a 3- to 6-month period

Olive Knot – Disease Cycle

Pseudomonas savastanoi* pv. *savastanoi (Psv)

- Gram-negative bacterium
- Epiphytic, opportunistic wound pathogen
- Naturally disseminated by rain and water splash
- Also disseminated by orchard activities - pruning, harvesting
- Knots develop in 3 to 6 months after infection of injuries including leaf scars.



Olive knot - Epidemiology

- **Infection through:**
  - **Leaf scars** – spring leaf drop
  - **Cold injury** - frost
  - **Mechanical injury** - pruning, harvesting machinery, hail
- **Increase in olive knot**
  - High-density plantings and mechanical harvesting and pruning operations to optimize yield and reduce labor costs is causing an increase in bark injuries.
  - Olive (especially oil varieties) growing areas have expanded into areas that are more prone to winter freezes.

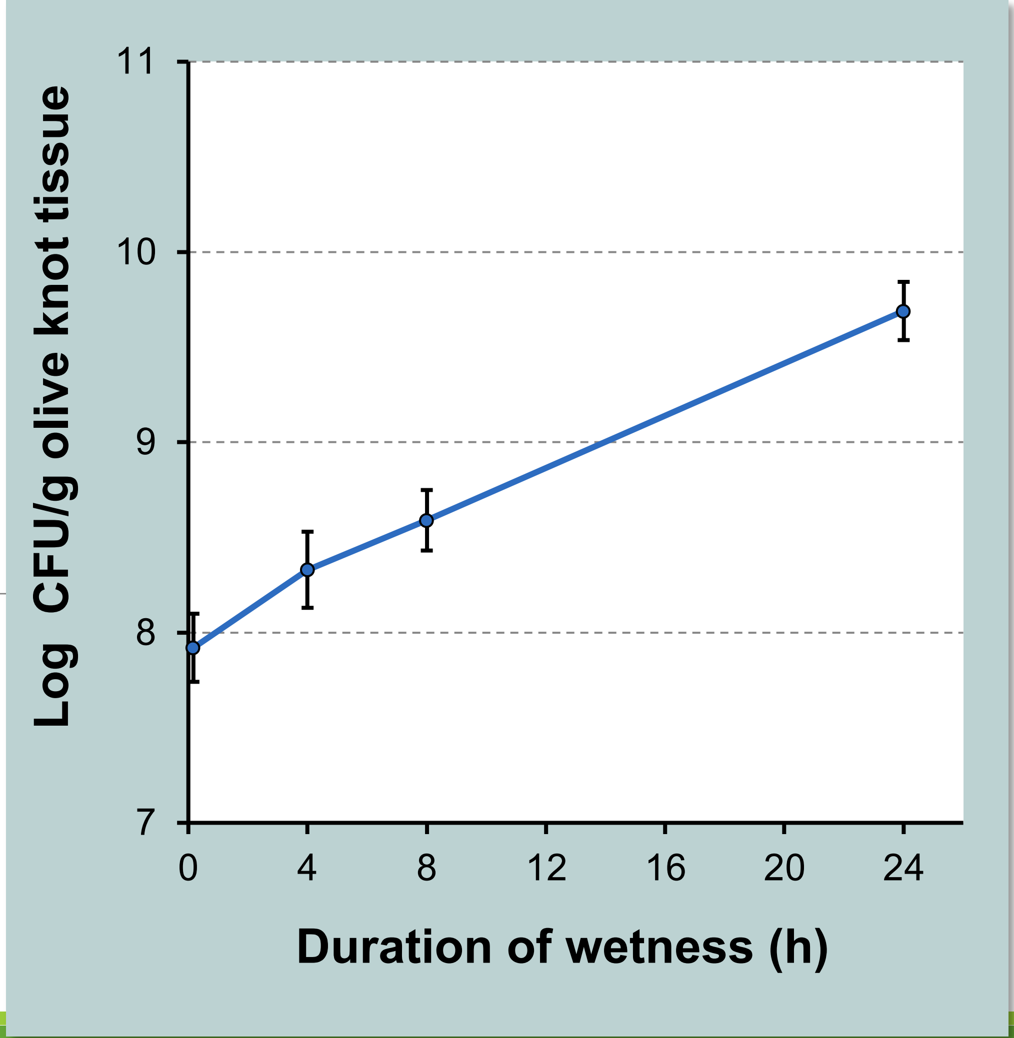
Leaf scar infection

Mechanized pruning

Mechanized harvest

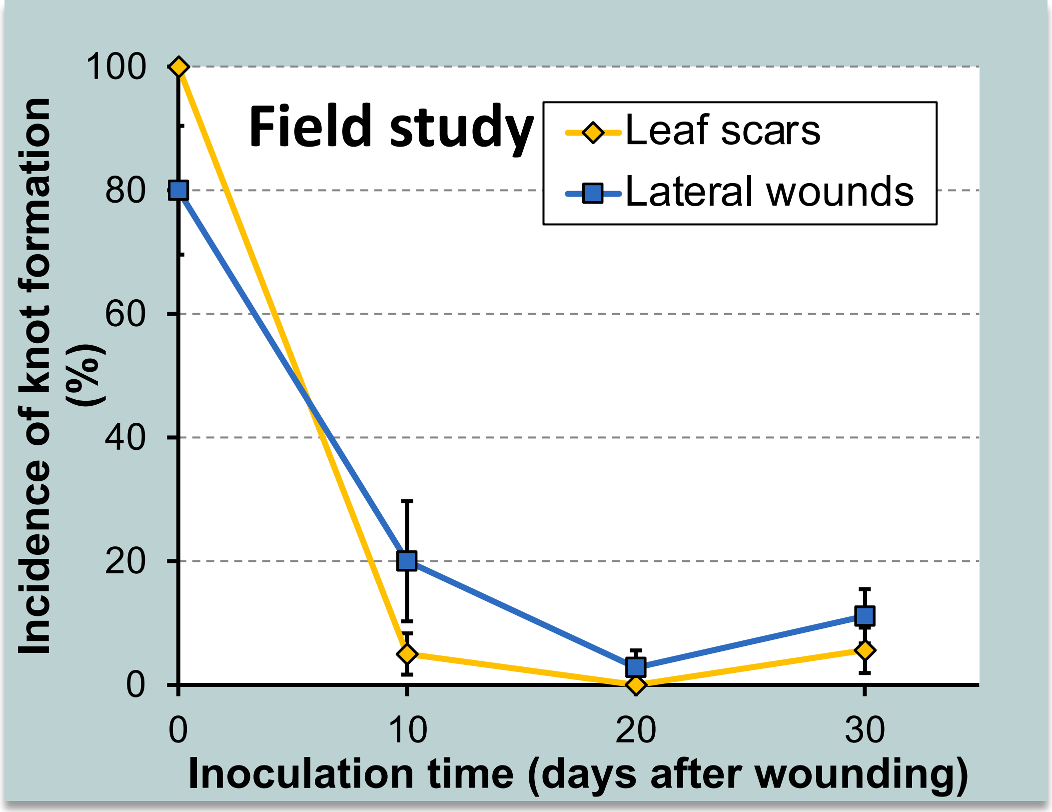
Olive knot – Epidemiology
Knots are inoculum sources

- Knots with living host tissue contain viable inoculum
- Re-hydrating olive knots for **one** hour led to bacterial oozing from most of the knots.
- **Nearly all** knots tested continued to ooze the pathogen after 18 to 24 h of hydration.



Duration of susceptibility of injuries to infection

Age of the injury is a critical factor - Wound-healing occurs over time and is not affected by wetness.



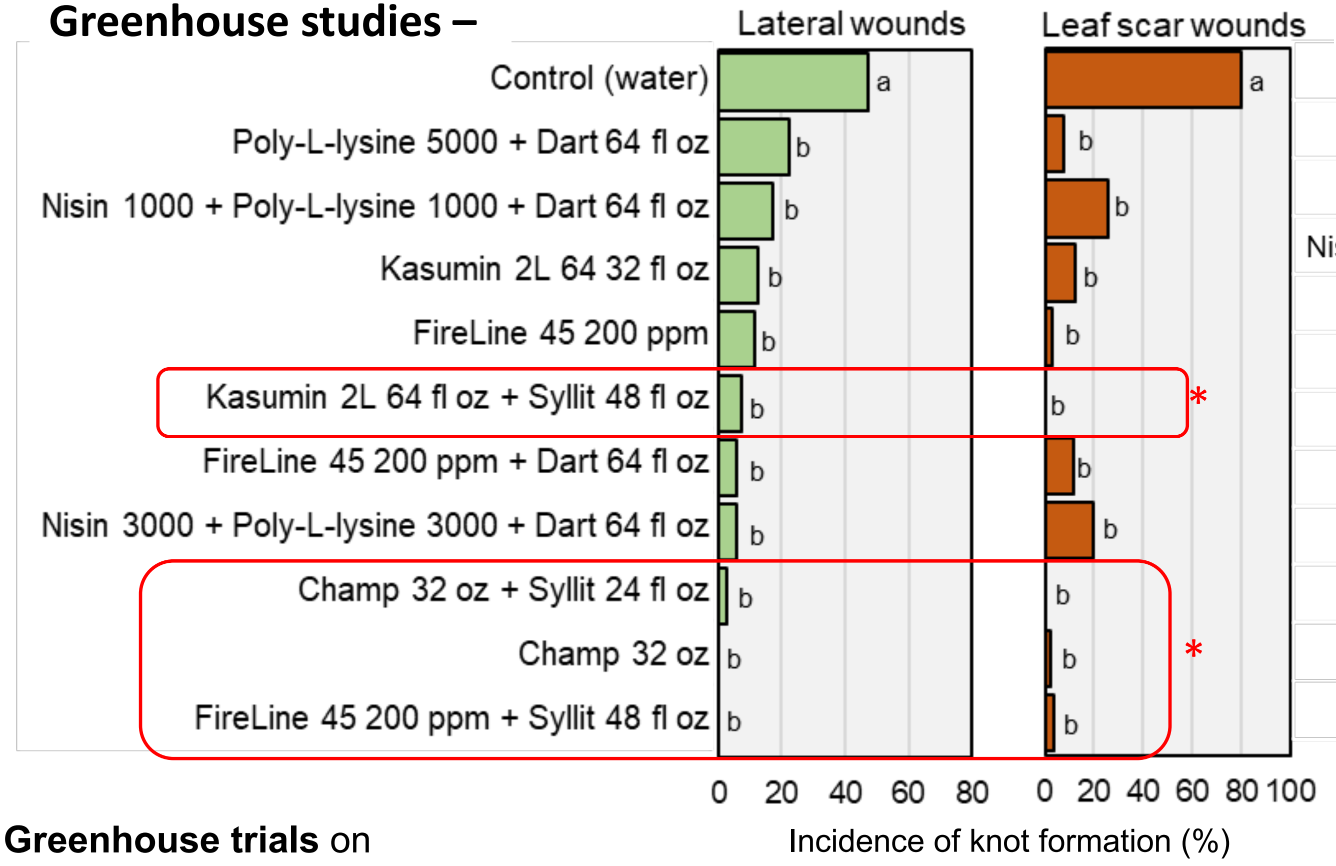
Studies	Leaf Scars	Lateral wounds
Greenhouse	10 days - >90% reduction	14 days - >90% reduction
Field	10 days - >90% reduction	10 days - 80% reduction 20 days - >90% reduction

Management of Olive knot

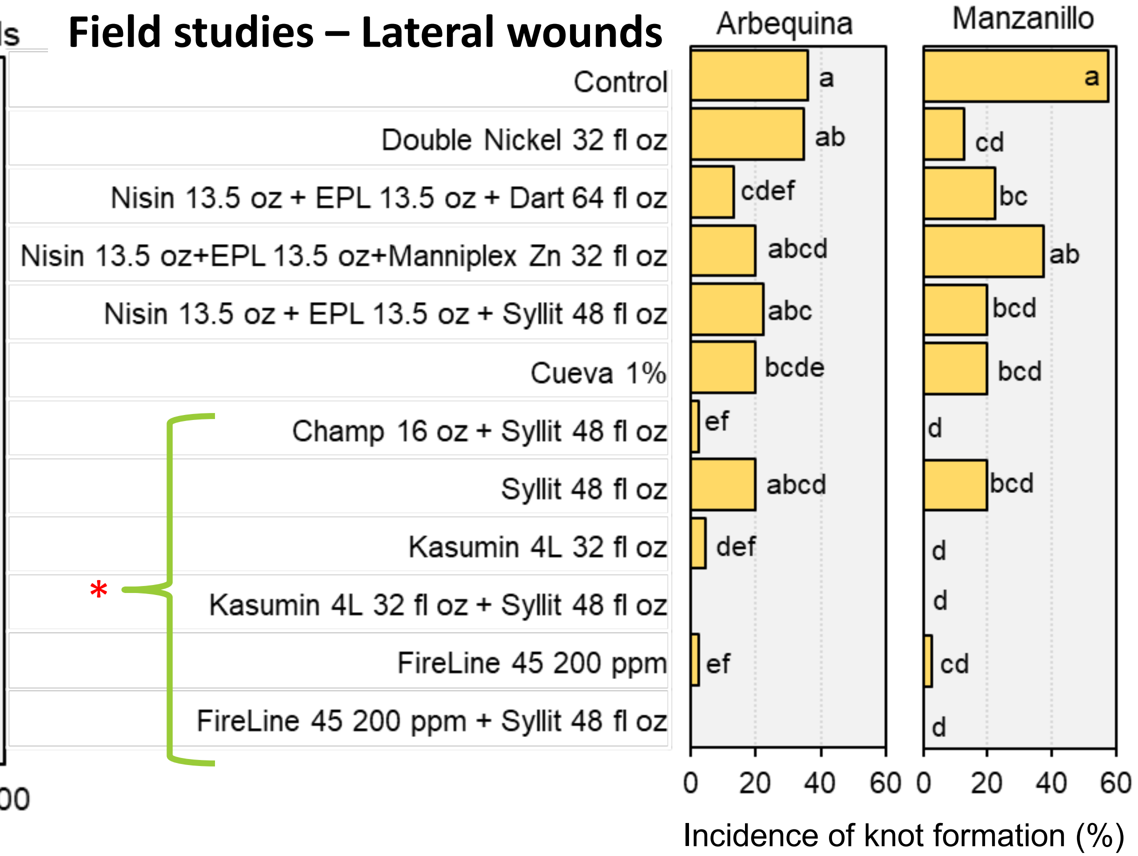
- **Cultural:**
  - Maintain tree vigor, reduce tree stress, reduce leaf drop
- **Sanitation:**
  - Pruning and removal of knots during dry periods (inoculum reduction)
  - Disinfection of pruning tools (sodium hypochlorite, quaternary ammonia)
- **Chemical applications to trees:**
  - Painting galls with Gallex
  - Spray applications with copper-containing bactericides to reduce inoculum and protect wounds

Efficacy of experimental bactericides against olive knot

Greenhouse studies –



Field studies – Lateral wounds

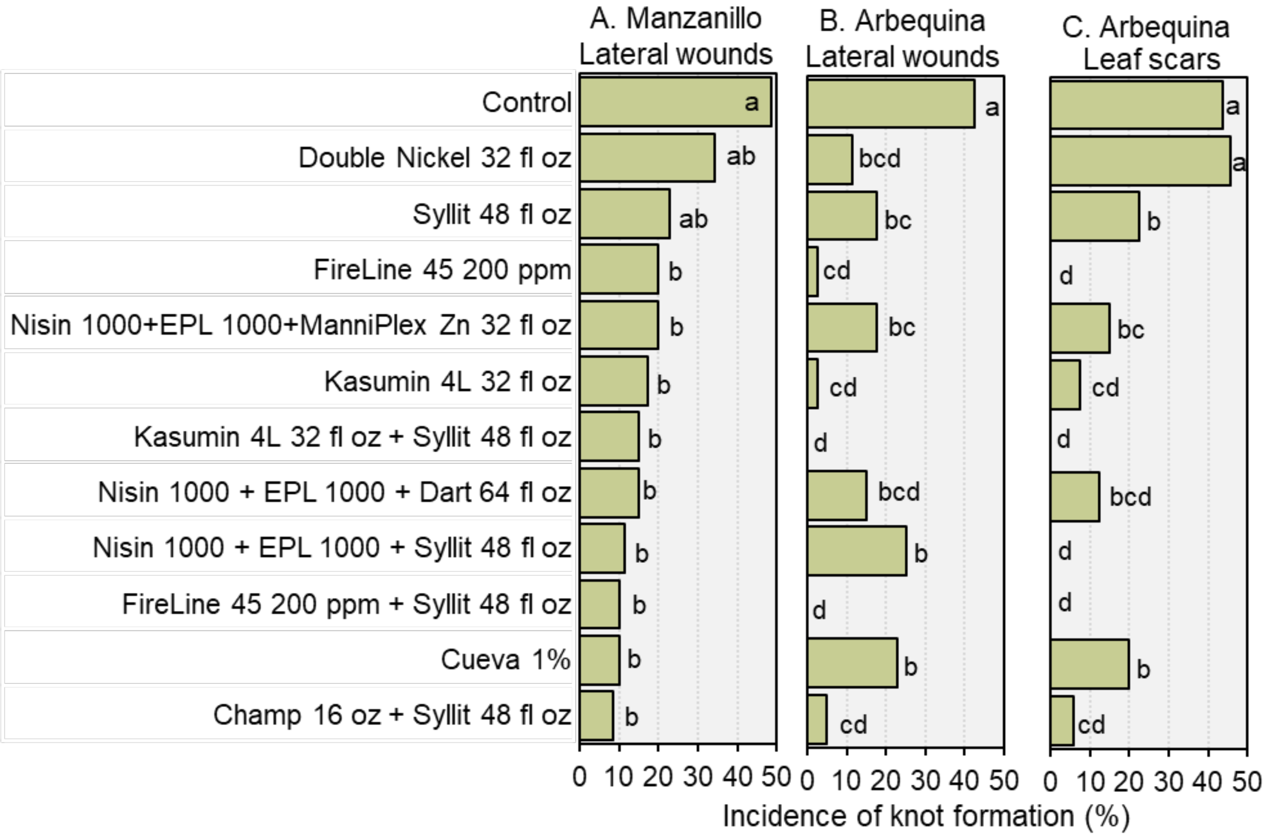


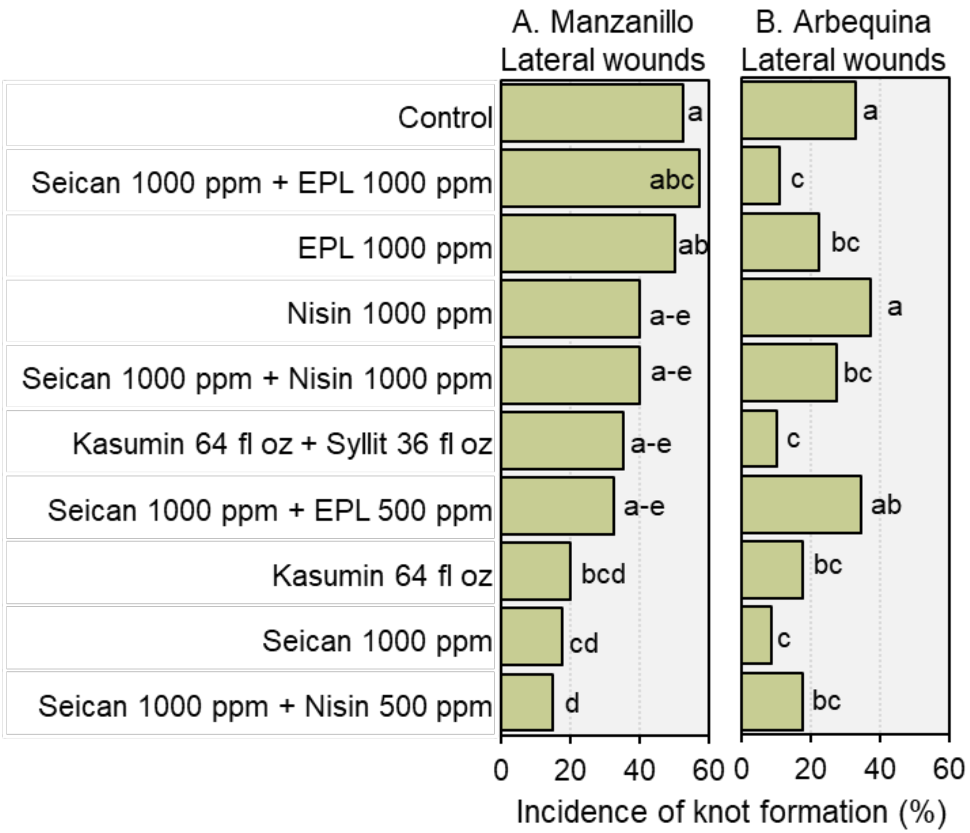
Greenhouse trials on cv. Arbequina **and Field trials** on Arbequina and Manzanillo **-** Treatments were spray-applied to wounds and then wounds were then inoculated with a **Cu-sensitive *Psv* strain.**

Summary

- **ε-poly-L-lysine (EPL) mixtures with Dart** performed well.
- **Nisin, EPL, and Dart mixtures** performed well against Cu-S strains
- **Oxytetracycline** (**FireLine**) performance was similar to that of kasugamycin on lateral wounds.
- **Kasumin-dodine (Syllit) and oxytetracycline-dodine were similar to copper-dodine treatments**.

Evaluation of new bactericides for the management of olive knot after inoculation with *Psv* in field studies at UC Davis





Lateral wounds were made in Nov. 2022 and were treated by hand-spraying treatments until runoff. Wounds were inoculated with a Cu^{S}-strain of *Psv* and evaluated for knots in Fall 2023.

Summary of Olive Knot Management with Bactericides

- The PRIA date for Kasumin (kasugamycin) and FireLine (oxytetracycline) was again changed and postponed with no new PRIA date until EPA sorts out the handling of the Endangered Species Act requirements and policies on antimicrobials.
- Syllit (dodine) is being federally registered on olive based on IR-4's submission to EPA through the Chemistry Science Advisory Council (CHEMSAC) program since 2021-2023, and olive will be added to the CA label (hopefully in 2024).
- We envision that Syllit will be mixed with Kasumin, FireLine, or with copper products to enhance the performance of the treatment and to prevent against the selection of resistance to any one mode of action.
- Studies with the food preservatives and cinnamaldehyde and other biologicals are ongoing.

Questions?

Thank you!

Managing Olive Leaf Spot (Peacock Spot) in California

J. E. ADASKAVEG, UNIVERSITY OF CALIFORNIA

Symptoms of Olive Leaf Spot (Peacock Spot)

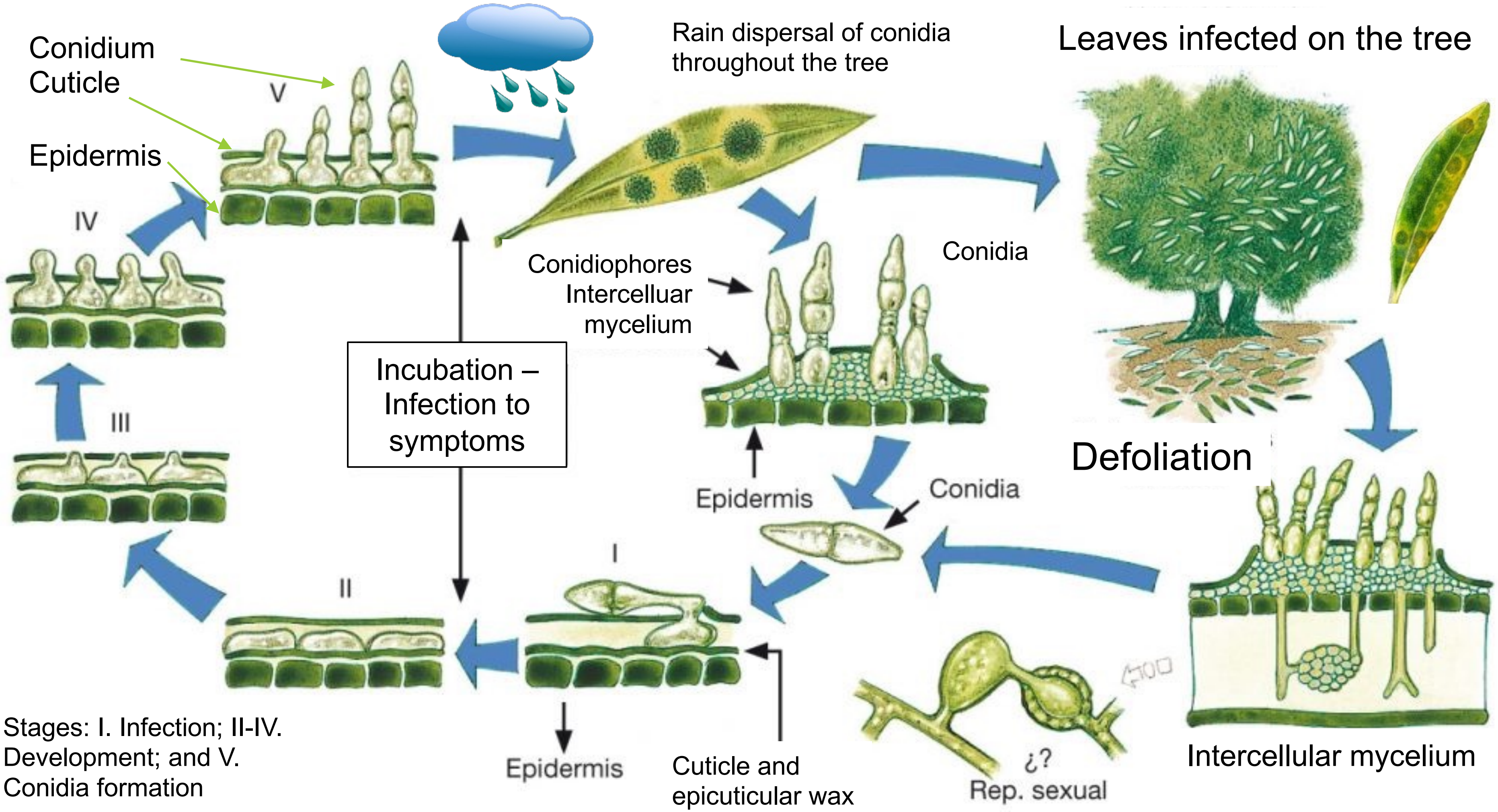
Spots on the **leaves** are usually surrounded by a **yellow halo**. As the spots age, they change color giving rise to green, brown, or yellow rings.

With mild temperatures, small, irregular brown spots with reduced presence of spores are produced. With high temperature, the cuticle separates from the leaf causing a silvery appearance.

Venturia oleaginea
(syn. *Spilocea oleaginea, Cycloconium oleaginum, Fusicladium oleagineum*)

Fruit infections are uncommon but may develop as brown-black, circular-asymmetric spots. Infections remain green as fruit change color.

Peacock Spot Disease Cycle



Two infection periods – fall (Sept.-Nov.) and spring (Feb.-Apr) based on high humidity from rain and temperatures between 8C/46F and 24C/75F (optimum 15C/59F). Symptoms develop after 4 to 15 weeks.

Management of peacock spot

- Adequate pruning to facilitate air circulation in the canopy and among trees.
- Adequate nutrition in the olive grove, with special attention to nitrogen levels (never in excess) and potassium (ensure availability).
- Avoid waterlogging under trees due to poorly planned irrigation.
- Properly timed fungicides for protection against fungal infection (fall and winter before infection periods)
  - Historically, only copper products were available

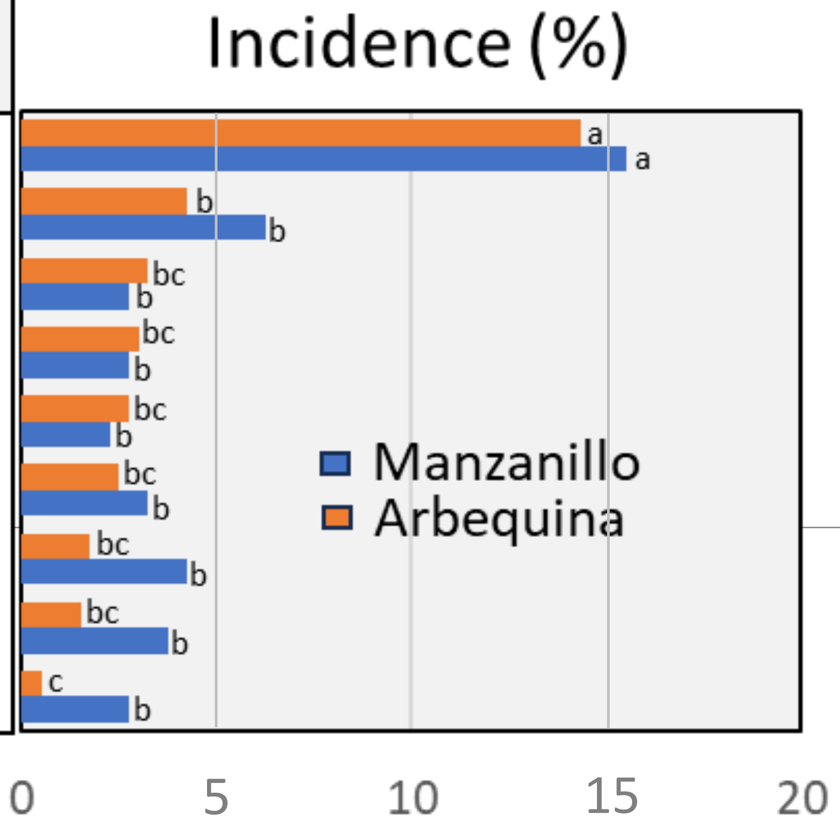
The Federal IR-4 Program

- The purpose of the IR-4 program is to enable the chemical industry to provide safe, effective, and economical crop protection products for growers and consumers of minor/specialty crops.
- The chemical industry cannot justify the costs associated with the research and development, registration, production, and marketing of crop protection products for minor/specialty crops due to the small market and limited sales potential.
- The IR-4 program provides the assistance needed to ensure that new and more effective crop protection products are developed and made available to minor/specialty crop producers. These efforts require effective collaborations among federal agencies, the crop protection industry, and land-grant colleges and universities.

Efficacy of fungicide treatments for management of peacock spot - 2022-23

Solano Co.

Treatment	Rate/A	FRAC Code
Control	---	---
Ziram + Cueva	64 oz + 8 pt	M03 + M01
Abound	12.5 fl oz	11
Inspire Super	20 fl oz	3/9
Quadris Top	14 fl oz	3/11
Champ	96 oz	M01
Syllit + Ph-D*	32 + 6.2 oz	U12+19
Syllit	48 oz	U12
Ph-D*	6.2 oz	19



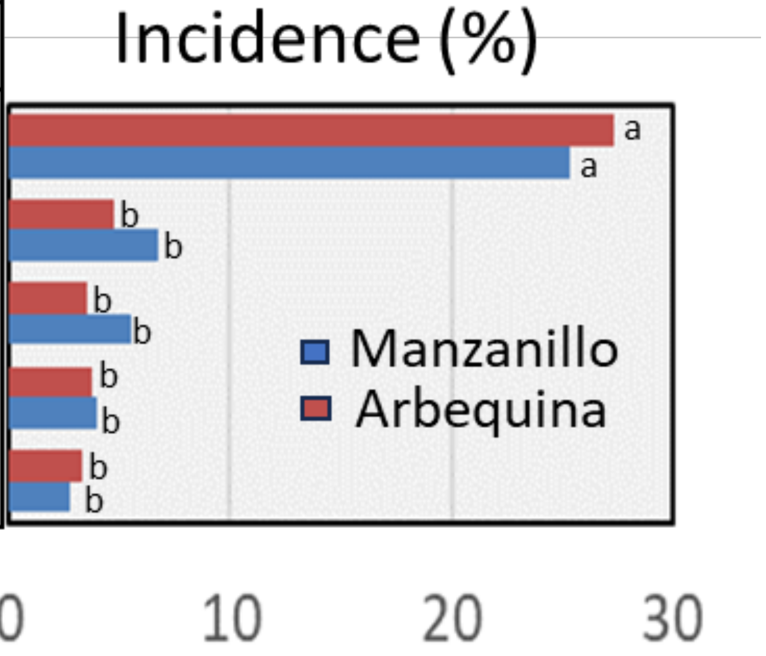
- Treatments were applied using an air-blast sprayer at 100 gal/A on 11/22/22.
- Disease was evaluated on 4-28-21 and 100 random leaves of each tree were assessed for the presence of typical disease symptoms.

* -Polyoxin-D is a biofungicide and exempt from tolerance. Efficacy data is only needed for registration (no GLP residue studies required).

Efficacy of fungicide treatments for management of peacock spot - 2022-23

Solano Co.

Treatment	Rate/A	FRAC Code	Applications 11-22-22	Applications 2-7-23
Control	---	---	---	---
Abound	12.5 fl oz	11	@	@
Ph-D*	6.2 oz	19	@	@
Quadris Top	14 fl oz	3/11	@	@
Syllit + Ph-D*	32 + 6.2 oz	U12/19	@	@



- Treatments were applied using an air-blast sprayer at 100 gal/A.
- Disease was evaluated on 4-28-21 and 100 random leaves of each tree were assessed for the presence of typical disease symptoms.

* -Polyoxin-D is a biofungicide and exempt from tolerance. Efficacy data is only needed for registration (no GLP residue studies required).

Summary of new fungicides accepted into the IR-4 Program at the Food Use Workshop

Year	Fungicide	Active ingredient(s)	FRAC Code	IR-4/EPA	Status
2018	Ziram*	ziram	M3	Supported	Ongoing
2018	Inspire Super	difenoconazole-cyprodinil	3/9	Supported	Ongoing
2019	Ph-D	polyoxin-D	19	Biopesticide	UPL label change
2020	Quadris Top	azoxystrobin-difenoconazole	3/11	Supported	Ongoing
2020	Syllit	dodine	U12	Supported	Chem-SAC
2018	Topsin-M**	thiophanate-methyl	1	Rejected	Not considered
2018	Bravo	chlorothalonil	M5	Rejected	Not considered

- Ongoing IR-4 project (Field studies conducted in 2019/20; lab residue studies in 2021) for ziram and difenoconazole/cyprodinil); Quadris Top initiated in 2020 based on the after-harvest and winter season usage with expected zero residues on the crop in the following harvest season as demonstrated with Ziram and Inspire Super. Multiple FRAC Codes to develop resistance management programs.
- Syllit has international tolerances justifying an IR-4 Chem-SAC proposal (submitted in Oct. 2020) and UPL will add olive to the Ph-D biopesticide label for Section 3 PRIA date Oct. 2022. Additional crop safety / efficacy data requested by EPA.
- These fungicides are also highly effective against newly described **Neofabraea** and **Phlyctema** diseases of olive in California.

* - Ziram cancellation on all crops was proposed in Feb. 2022. EPA has it still under review.

** - Topsin-M was re-classified with potential for registration on olives but this denied (IR-4 FUW 2021).

Summary of Peacock Spot Management with Fungicides

Chemical management is currently based on the use of copper and lime sulfur that are increasingly being restricted by regulatory agencies

Due to the small US acreage of olive production, limited mostly to California, registration of any new material needs to be done through the IR-4 program.

Proposed for registration: Ziram (FC M3), Inspire Super (FC 3/9), Quadris Top (FC 3/11), Syllit (FC U12), and Ph-D (FC 19).

UPL (ziram, polyoxin-D, dodine) and Syngenta (difenoconazole/ cyprodinil, or /azoxystrobin) support their respective products on olive.

Polyoxin-D and dodine (Chem SAC proposal) have expected registrations in 2024 because they are exempt from tolerance or have an established tolerance in other countries, respectively. UPL updated Section 3 registration as of fall 2023 but indicated a concurrent review should be requested for CA.

US EPA has slowed down the registration of products due to ESA requirements. Furthermore, EPA has proposed cancellation of Ziram, and new registrations may be difficult to obtain.

Five new fungicide registrations will be an expected final outcome that will allow for sustainable management programs for years to come. EPA may prevent some of these registrations.

Questions?

Thank you!

Update on EPA activities

PART I –

- **EPA's goal: Cancel older chemistries that persist in the environment and have less specific toxicity**
- **Counter argument: Multi-site MOA fungicides are needed for anti-resistance and for long-term efficacy**

Planned label restrictions –

- **Ziram** (and other DMDCs) – cancellation proposed in 2022 over concerns with pollinators, worker safety, etc. Comments submitted citing timing restrictions to prevent injury to pollinators and PPE used to protect workers. (I requested Ziram registration on olive)
- **Iprodione** - cancellation proposed in 2022 over concerns with toxicology, pollinators, worker safety
- **Captan** – formulation restrictions, application restrictions (methods, reduced rates, acreage limits per day, standing water in the orchard).
- **Chlorothalonil** – rate restrictions, number of applications, etc. proposed in 2023
- **Mancozeb** (and other EBDCs) – pending review

Update on EPA activities

Part II -

- **EPA's goal: Cancel and prevent antibiotics in plant agriculture. Medical and veterinary practitioners claim that the environment is the source of human pathogen resistance.**
- **Counter argument: External applications to plants lead to rapid degradation. Sampling soil and phyllosphere shows no change in natural resistance levels.**

Pending registrations –

- Kasugamycin on almond and olive – Section 3 postponed, PRIA dates postponed, Section 18 on almond expected approval for 2024 (4^{th} year of emergency registration).

✓Note that kasugamycin is not used for animal or human medicine and has a separate FRAC Code from other antibiotics

- Oxytetracycline on walnut, cherry - Section 3 postponed, PRIA dates postponed.

Update on EPA activities

Part III -

- **EPA's goal: Cancel or prevent registration of antimicrobials in plant agriculture that are or can be used in human or animal medicine.**
- **Counter argument: Plant agricultural uses generally do not lead to problems in animal pathogens.**
  - No documented cases with antibiotics.
  - Documentation of resistance to DMIs in *Aspergillus fumigatus* developed from agricultural usage of DMIs. Comments submitted citing lack of PPE, composting treated crop residues selects for human pathogens, and very low incidence of human fatalities do not justify cancelation of DMIs.

EPA proposes new regulations – *Sept. 2023*

Pesticides: Concept for a Framework To Assess the Risk to the Effectiveness of Human and Animal Drugs Posed by Certain Antibacterial or Antifungal Pesticides (for plant agriculture)

Proposed lab testing of all agricultural antimicrobials for potential resistance in human pathogens including antibiotics and fungicides and restrict or prevent labeling in plant agriculture.

Analysis of 2022 Harvest Oil Quality Data and Ring Test of Fat and Moisture Content in Olives

SHIRLEY LI, DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY, UC DAVIS

Analysis of 2022 Harvest Oil Quality Data & An update on Ring Test of Fat and Moisture Content in Olives

Olive Oil Day 2024

XUEQI (SHIRLEY) LI, ASSOCIATE SPECIALIST

PROF. SELINA WANG GROUP, DEPT. OF FOOD SCI & TECH

UNIVERSITY OF CALIFORNIA, DAVIS

UC DAVIS OUTGROW the expected

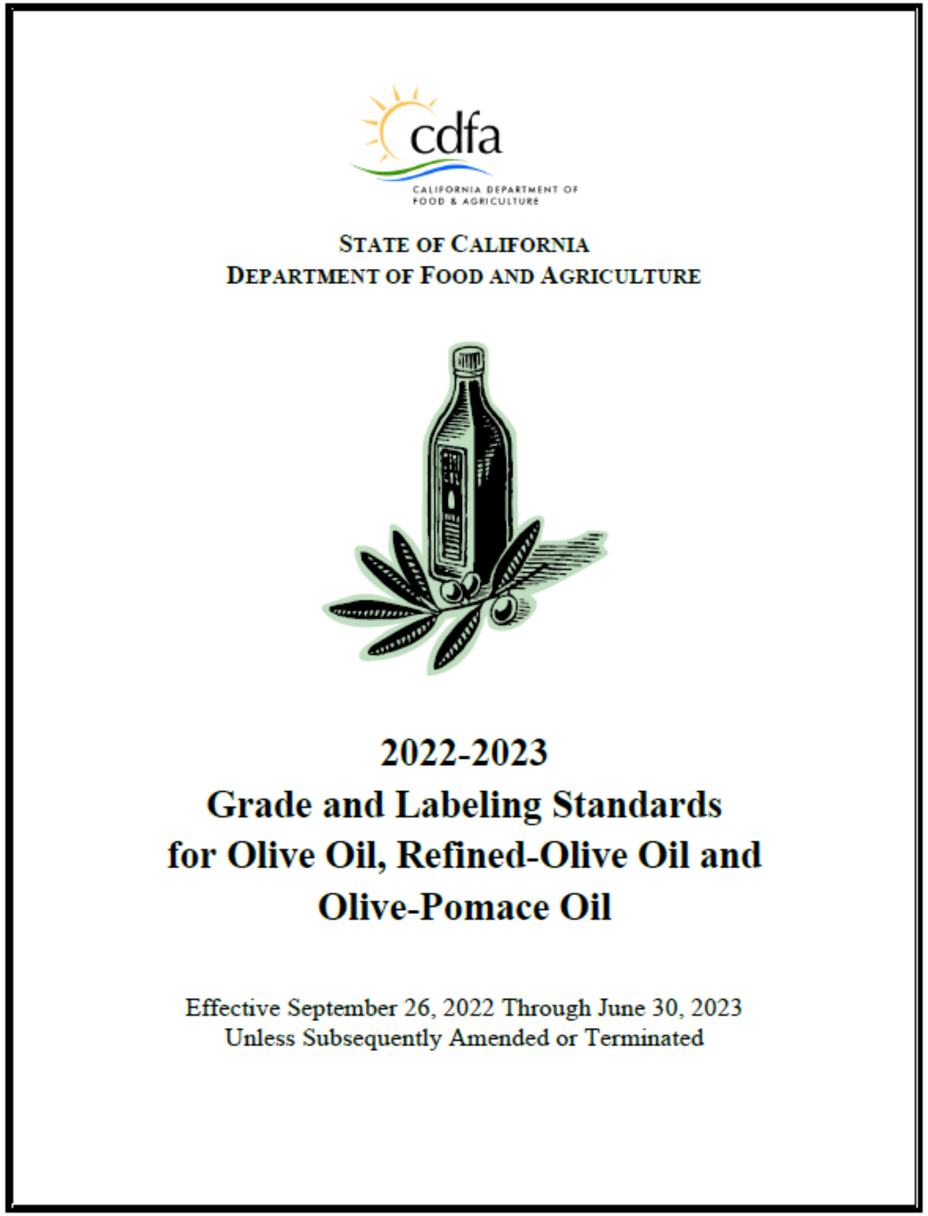
Analysis of 2022 Harvest Oil Quality Data

Mandatory Testing Program Overview

Handler (compulsory and

→ Samples and tests every lot
(regardless of harvest year) on
parameters.

→ Designates presumed grade
to testing.


cdfa
CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

STATE OF CALIFORNIA
DEPARTMENT OF FOOD AND AGRICULTURE

2022-2023
Grade and Labeling Standards for Olive Oil, Refined-Olive Oil and Olive-Pomace Oil

Effective September 26, 2022 Through June 30, 2023
Unless Subsequently Amended or Terminated

OOCC

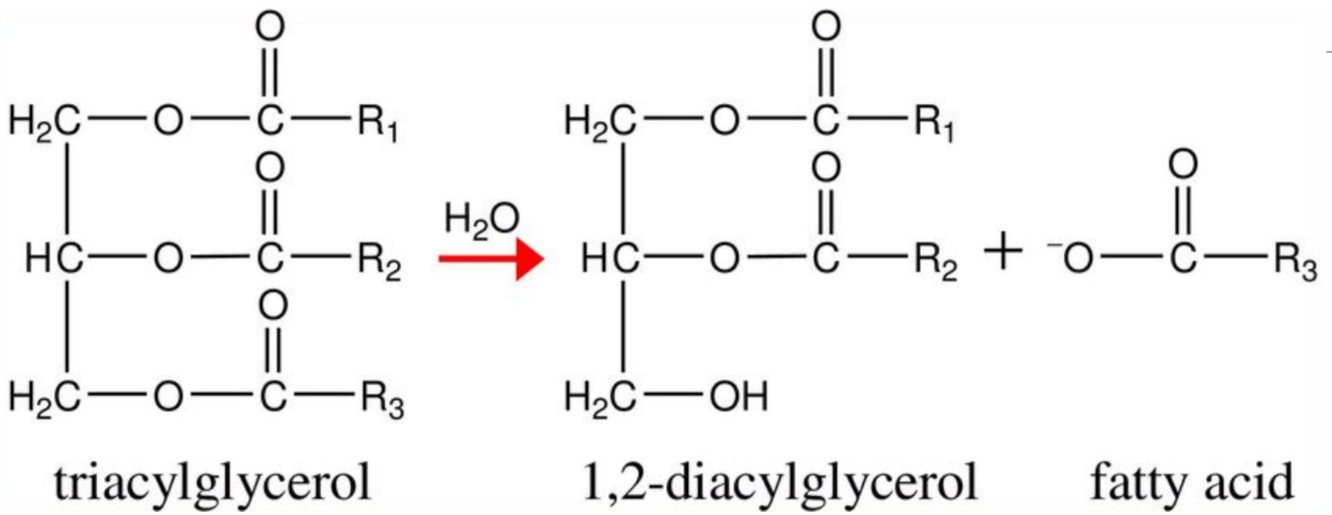
›llects *up* to six samples
h handler (voluntary
ly sampled if they are
ry).

f the collected samples for

Quality Parameters in CA Standards

Test	Extra Virgin	Virgin	Crude
Free Fatty Acidity (FFA) %m/m expressed as oleic acid	≤0.5	≤1.0	>1.0
Peroxide Value (PV) meq. O_2/kg oil	≤15.0	≤20.0	>20.0
Ultraviolet Absorbance (UV) $K^{1\%}_{1cm}$	K232≤2.40 K270≤0.22 ΔK≤/0.01/	K232≤2.60 K270≤0.25 ΔK≤/0.01/	K232>2.60 K270>0.25 ΔK≤/0.01/
Moisture and Volatile Matter (MOI) %	≤0.2	≤0.2	≤0.3
Insoluble Impurities (INI) %m/m	≤0.1	≤0.1	≤0.2
Pyropheophytin a (PPPs) %	≤17	N/A	N/A
1,2–Diacylglycerols (DAGs) %	≥35	N/A	N/A
Sensory Median of Defects (MeD)	=0.0	0.0<MeD≤2.5	>2.5
Sensory Median of Fruity (MeF)	>0.0	>0.0	N/A

Free Fatty Acidity (FFA)



Hydrolysis of triglyceride

Useful indicator of the fruit condition prior to milling

Stable value in olive oil under proper storage condition

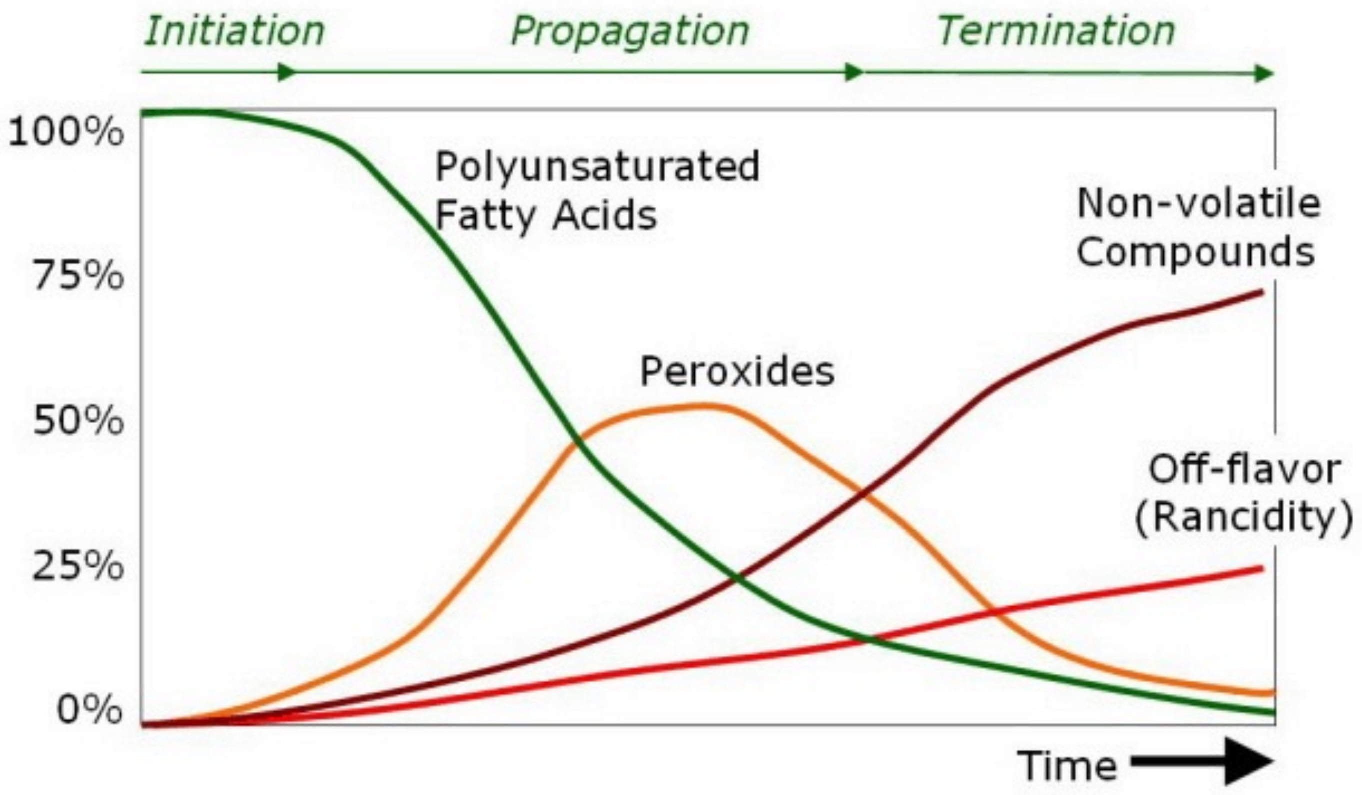
↑: fruit fermentation, oil stored with sediment

Extra Virgin	Virgin	Crude
≤0.5	≤1.0	>1.0

High value = promotes oxidation

= shorter shelf life

Peroxide Value (PV)



Oxidation indictor

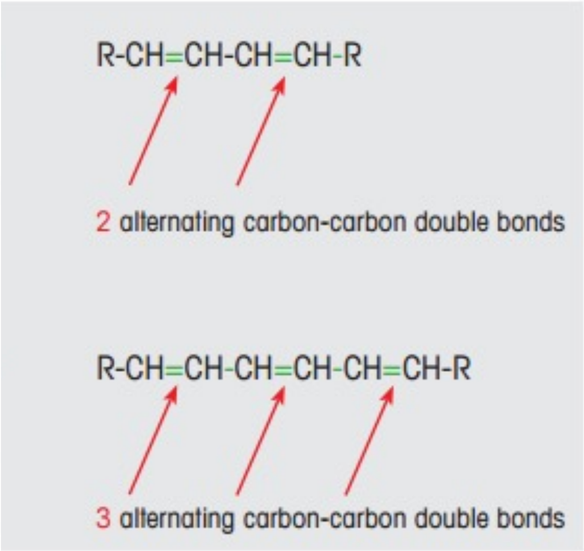
↑: poor processing, storage, age

Extra Virgin	Virgin	Crude
≤15.0	≤20.0	>20.0

High value = tired/rancid oil

= shorter shelf li

Ultraviolet Absorbance (UV)



Extra Virgin	Virgin	Crude
K232≤2.40	K232≤2.60	K232>2.60
K270≤0.22	K270≤0.25	K270>0.25
ΔK≤/0.01/	ΔK≤/0.01/	ΔK≤/0.01/

Oxidation indicator

↑ K_{232}: delays between harvest and processing, fruit damage, frost

↑ K_{232} and K_{270}: age, poor storage

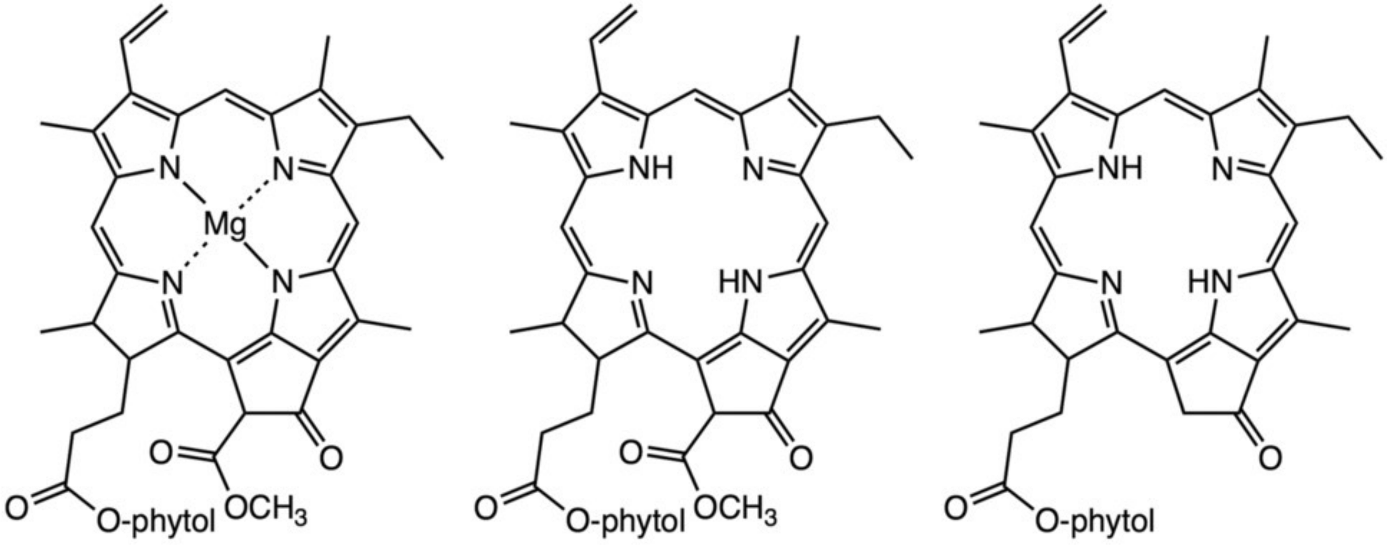
↑ ΔK: refined oil

High value = tired/rancid oil

= shorter shelf li

Pyropheophytins (PPP)

Freshness indicator



chlorophyll *a* **pheophytin *a*** **pyropheophytin *a***

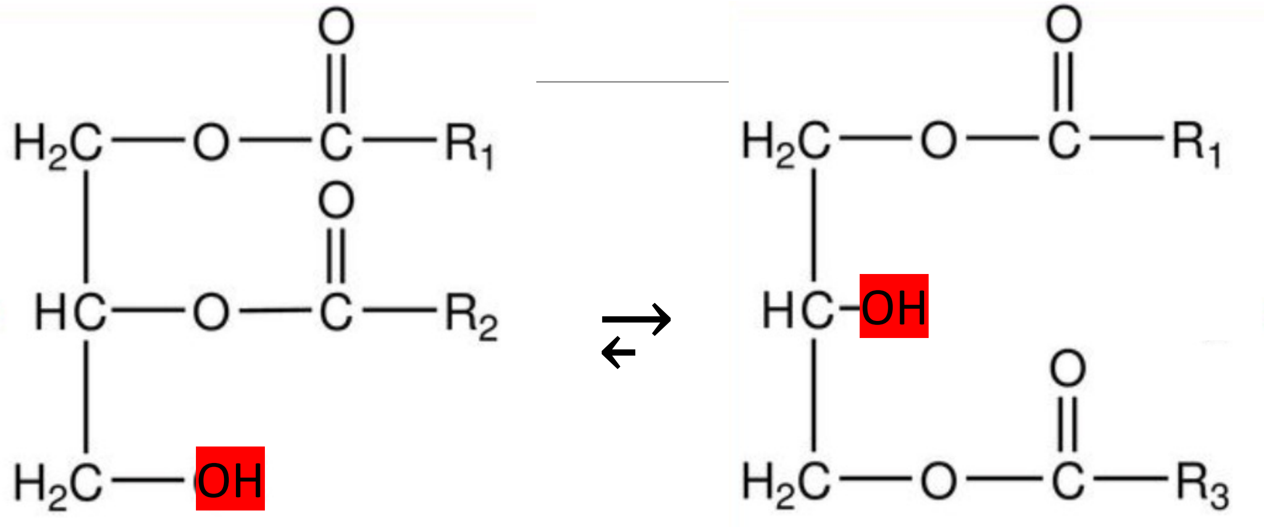
Fresh EVOO has nonexistent to very low PPP

↑: poor storage (e.g. light and heat), oil exposed to heat treatments during the refining process, age

Extra Virgin	Virgin	Crude
≤17	N/A	N/A

High value = shorter shelf life

1,2- and 1,3-diacylglycerols (DAGs)



1,2-DAG **1,3-DAG**

Fresh indicator

↓: fruit fermentation, oil stored with sediment, age

Extra Virgin	Virgin	Crude
≥35	N/A	N/A

Low value = sensory defects

= shorter shelf life

Moisture and Volatile Matter (MOI) & Insoluble Impurities (INI)

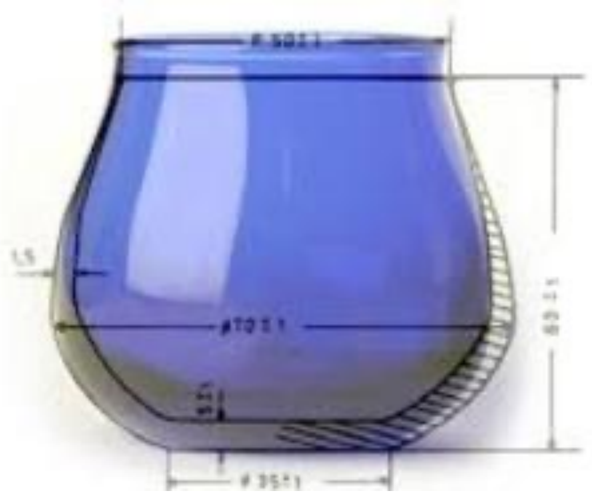
Moisture and volatile matter: the loss in mass undergone by the product on heating at 103°C ± 20°C (ISO 662).

Insoluble impurities: the quantity of dirt and other foreign matter insoluble in hexane or light petroleum (ISO 663).

Test	Extra Virgin	Virgin	Crude
Moisture and Volatile Matter (MOI) %	≤0.2	≤0.2	≤0.3
Insoluble Impurities (INI) %m/m	≤0.1	≤0.1	≤0.2

High value = more difficult oil extraction
= less bitterness and pungency
= shorter shelf life

Sensory Evaluation



- A minimum of 8 trained panelists
- Blind tasting
- Defects (fusty/muddy sediment, musty, winey, rancid…)
- Fruitiness
- Bitterness
- Pungency

Extra Virgin	Virgin	Crude
MeD=0.0	0.0<MeD≤2.5	MeD>2.5
MeF>0.0	MeF>0.0	N/A

Low MeF value = delicate oil; shorter shelf life

Evaluation of the 2022/23 Season - Overview

- 193 samples (vs. 217 from 2021/22) = 144 from 16 Handlers (11 compulsory and 5 voluntary) + 49 from OOCC
- 14 samples had incomplete testing data (vs. 18 from 2021/22)
- Comparison of grading accuracy on all grades

Presumed Grade	# of Samples with Presumed Grade		Confirmed at Presumed Grade by Testing		Grading Accuracy	
	2021/22	2022/23	2021/22	2022/23	2021/22	2022/23
Extra Virgin	193	165	190	157	98%	95%
Virgin	2	7	1	4	50%	57%
Crude	3	3	3	3	100%	100%

Comparison of 2021/2022 and 2022/23 Season – Extra Virgin

CA Extra Virgin Standards	2021/22	2022/23
Free Fatty Acidity (≤0.5)	0.2±0.1	**0.2±0.1**
Peroxide Value (≤15.0)	5.0±1.8	**5.9±2.0**
UV K_{232} (≤2.40)	1.61±0.21	**1.65±0.17**
UV K_{270} (≤0.22)	0.12±0.03	**0.12±0.03**
UV ΔK (≤/0.01/)	0.00±0.00	**0.00±0.00**
Moisture and Volatile Matter (≤0.2)	0.1±0.0	**0.1±0.0**
Insoluble Impurities (≤0.1)	0.0±0.0	**0.1±0.0**
Pyropheophytins (≤17)	2±2	**2±2**
1,2-Diacylglycerols (≥35)	89±7	**88±8**
Organoleptic/Sensory (MeF>0)	4.0±0.1	**3.9±0.6**
Induction time (hr) at 110°C	N/A	**25.2±5.7**

The Modern Olives Use-by-date Prediction Model

The use-by-date is determined by the **lowest** of the following three estimations:

1) Hours of induction time at 110°C x 1 = expected shelf-life (in months).
2) (17.0% - PPP)/0.6% = expected shelf-life (in months).
3) (DAGs – 35.0%)/FFA factor = expected shelf-life (in months).

* FFA factor = 1.7% (if FFA < 0.4%); 2.1% (if 0.4% < FFA < 0.6%); or 2.5% (if FFA > 0.6%).

CA Extra Virgin Standards	2022/23
Free Fatty Acidity (≤0.5)	**0.2±0.1**
Pyropheophytins (≤17)	**2±2**
1,2-Diacylglycerols (≥35)	**88±8**
Induction time (hr) at 110°C	**25.2±5.7**

1) Hours of induction time at 110°C x 1 = 25.2 months
2) (17.0% - PPP)/0.6% = (17-2)/0.6 = 25 months
3) (DAGs – 35.0%)/FFA factor = (88-35)/1.7 = 31.2 months

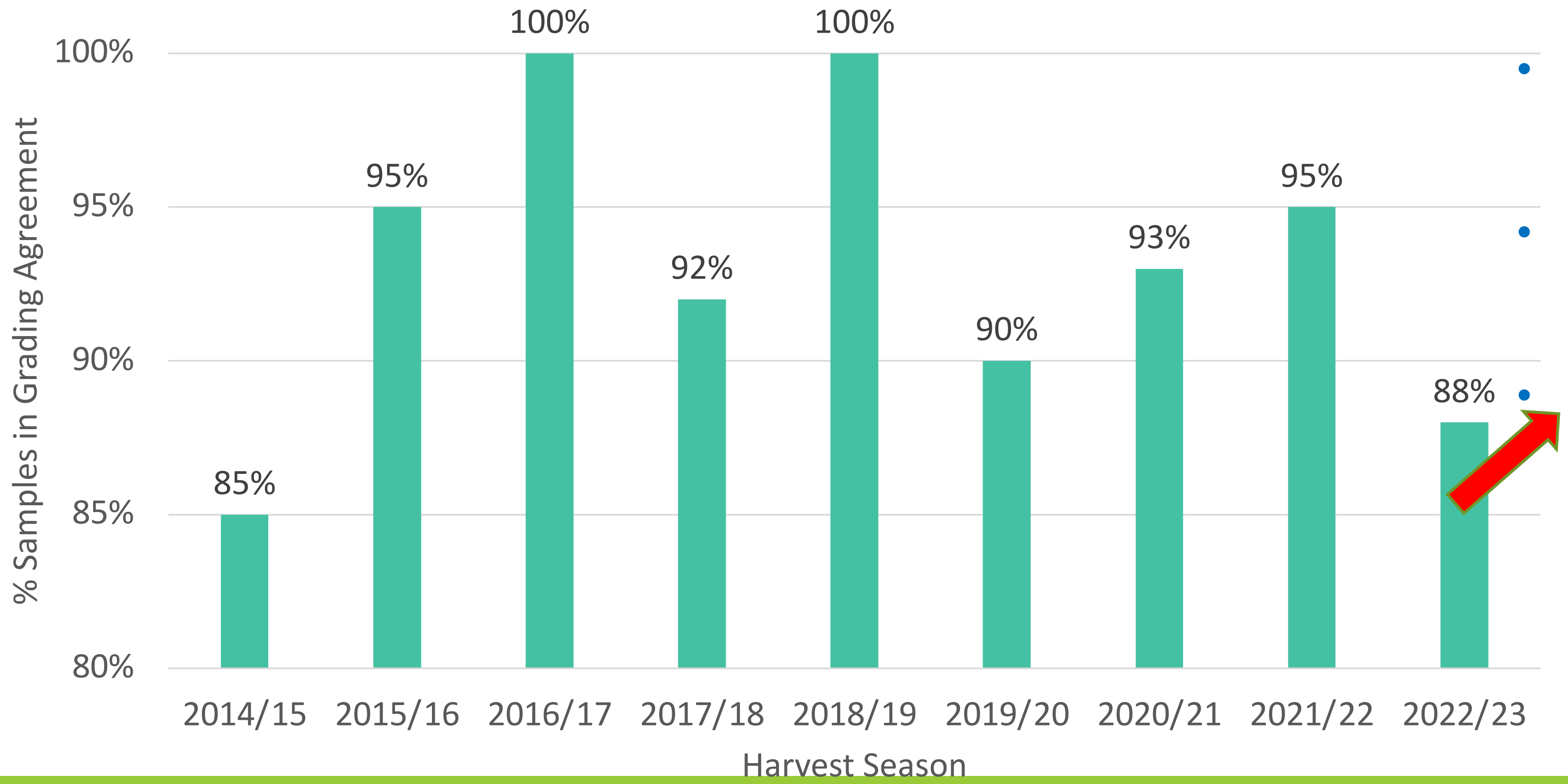
2022/23 Season – Non-Extra Virgin (20 samples)

Sampling Party	Handler Presumed Grade*	FFA	PV	UV K_{232}	UV K_{270}	DAGs	INI	MOI	Sensory	Tested Grade
CA Extra Virgin Standard		≤0.5	≤15.0	≤2.40	≤0.22	≥35	≤0.1	≤0.2	MeD=0	
Handler	"Second Extraction"	-	-	-	-	-	-	-	2.2 F/MS and 1.6 R	Virgin
Handler	"Second Extraction"	-	-	-	-	-	-	-	0.8 F/MS and 1.5 R	Virgin
OOCC	"Second Extraction"	-	-	-	-	-	-	-	1.3 R	Virgin
Handler	Crude	1.1	-	-	0.25	-	-	-	0.8 F/MS and 2.3 R	Crude
OOCC	Crude	1.1	-	-	0.26	-	-	-	1.6 R	Crude
Handler	Virgin	-	-	-	-	-	-	-	1.8 F/MS and 0.8 R	Virgin
Handler	Virgin	0.6	-	-	-	-	-	-	-	Virgin
Handler	Crude	1.1	18	2.36	0.28	20	-	-	2.5 (defect not specified)	Crude
Handler	Virgin	-	-	-	-	-	No Data	No Data	1.5 (defect not specified)	Incomplete
Handler	"Second Extraction"	0.9	-	-	0.27	-	-	-	1.5 F/MS	Crude
Handler	Extra Virgin									Virgin
Handler	Extra Virgin									Crude
Handler	Virgin									Crude
Handler	Extra Virgin									Virgin
Handler	Extra Virgin									Virgin
Handler	Extra Virgin									Virgin
OOCC	Extra Virgin									Crude
OOCC	Extra Virgin									Virgin
OOCC	Extra Virgin						-	-	No Data	Incomplete
OOCC	Extra Virgin						-	-	1.7 F/MS and 1.1 R	Virgin

Research has found significant increases of total waxes, total sterols, chlorophyll pigments, total phenols as well as elevated FFA, PV, and UV from oils obtained from a second extraction which was unfavorable of oil shelf life, though FFA, PV, and UV were still within the limit for extra virgin olive oil.

Grading Agreement 2014/15 – 2022/23

In 2022/23, 49 lots tested by both handlers and OOCC, 6 lots did not have grading agreement



- **Two EV lots confirmed by two handlers but tested as non-EV by the OOCC;**
- **Two EV lots confirmed by a handler but missing sensory by the OOCC;**
- **Two EV lots presumed by a handler was missing chemistry by the handler and missing sensory by the OOCC.**

Mandatory Testing Program Overview

Handler (compulsory and voluntary)

→ Samples and tests every lot in inventory (regardless of harvest year) on quality parameters.

→ Designates presumed grades of **all** lots prior to testing.

OOCC

→ Randomly collects *up* to six samples from lots at each handler (voluntary handlers are only sampled if they are chosen via lottery).

→ Sends part of the collected samples for purity testing

Evaluation of the 2022/23 Season - Purity Testing

24 samples collected by OOCC:

21 samples (88%) within CA standards for purity parameters

Region	Variety	Campesterol (≤4.5)	Apparent β-sitosterol (≥93.0)
Central Valley	Arbequina (2)	4.7-4.9	92.7-93.1
	Arbosana (1)	5.0	92.3

- Elevated temperature and long summertime in the Central Valley and the Desert region: ↑ campesterol and ↓ apparent β-sitosterol values in certain varieties;
- 9 SHD varieties (Arbequina, Arbosana, Koroneiki, and their blends) and 1 Ascolano from the Central Valley: **C17:1** at 0.3 (upper limit in CA standards)

Mandatory Testing Program – Purity Testing Overview

Harvest Season	# Samples Tested /# OOCC Collected	# Outlier *	Region	Variety	Heptadecenoic Acid (C17:1)	Campesterol	Apparent B-sitosterol	Total Sterol
2016/17	25/57	2	Fresno	Arbosana (1)	↑			
			Yolo	Koroneiki (1)		↑		
2017/18	47/78	2	Colusa	Koroneiki (1)			↓	↓
			Stanislaus	Sevillano (1)	↑			
2018/19	27/53	5	Madera	Koroneiki (1)		↑		
			Fresno	Koroneiki (1)		↑		
			Tehama	Coratina (1)				↓
			Central Valley	SHD Varieties (2)			↓	
2019/20	36/79	0	Arbequina and Sevillano (Stanislaus County): ~0.3% C17:1					
			Four SHD varieties (Central Valley): ~4.5% campesterol					
2020/21	28/59	4	Stanislaus	Sevillano (2)	↑			
			Sonoma	Arbosana (1)	↑			
			Fresno	Koroneiki (1)		↑	↓	
2021/22	33/67	2	Central Valley	Koroneiki (1)		↑		↓
				Arbequina (1)				
2022/23	24/49	3	Central Valley	Arbequina (2)		↑	↓	
				Arbosana (1)				

* Only outliers that were outside the limits of the four key purity parameters listed above are shown.

2022/23 Season Key Takeaways

Total gallon decreased but 96.8% still graded as EVOO; sensory test showed MeF at 3.9±0.6 after a challenging harvest; use-by-date estimated at 25 months.

"*Second extraction*" was reported by two handlers. Given the practicality of the "second extraction" category especially during low crop years, the OOCC may wish to consider its use under certain circumstances.

Incomplete information compromised the value of the mandatory testing program: sampling dates, moisture & volatile matter, insoluble impurities, and sensory.

CA purity standard needs to accommodate natural variances. More data needed for the new varieties.

50 lots were tested on induction time by four out of 11 compulsory handlers.

2022/23 Ring Test of Fat and Moisture Content in Olives

Ring Test Background

Fat and moisture content for olive fruits is critical information for both olive growers and olive oil processors.

California olive growers are paid largely based on the olive fat and moisture content of each load during milling season while oil processors use the same information as key parameters to determine oil extraction efficiency and quality.

Values usually determined by gravimetry with conventional oven and Soxhlet extraction (Official Method), or by a near-infrared spectroscopy (NIR) (Secondary Method).

Absence of uniformed measuring methods and periodic validations.

Ring Test Overview

3 olive samples/testing round; 3 rounds in total.

Discuss with AOCS, OOCC, and industrial collaborators on ring test design and implementation.

Recruit test participants (e.g., processors, testing labs) who can perform Official and/or Secondary Methods on olive **moisture** and **wet and dry fat content**.

Sample preparer collects olive fruit at different maturity index, tests in-house for estimated fat and moisture content, and vac-bags fresh fruit to ship to participants.

Test participants conducts testing and reports data within 7 business days of sample receipt.

In 2022/23, two participants did official method only, three participants did both

2022/23 Ring Test Results

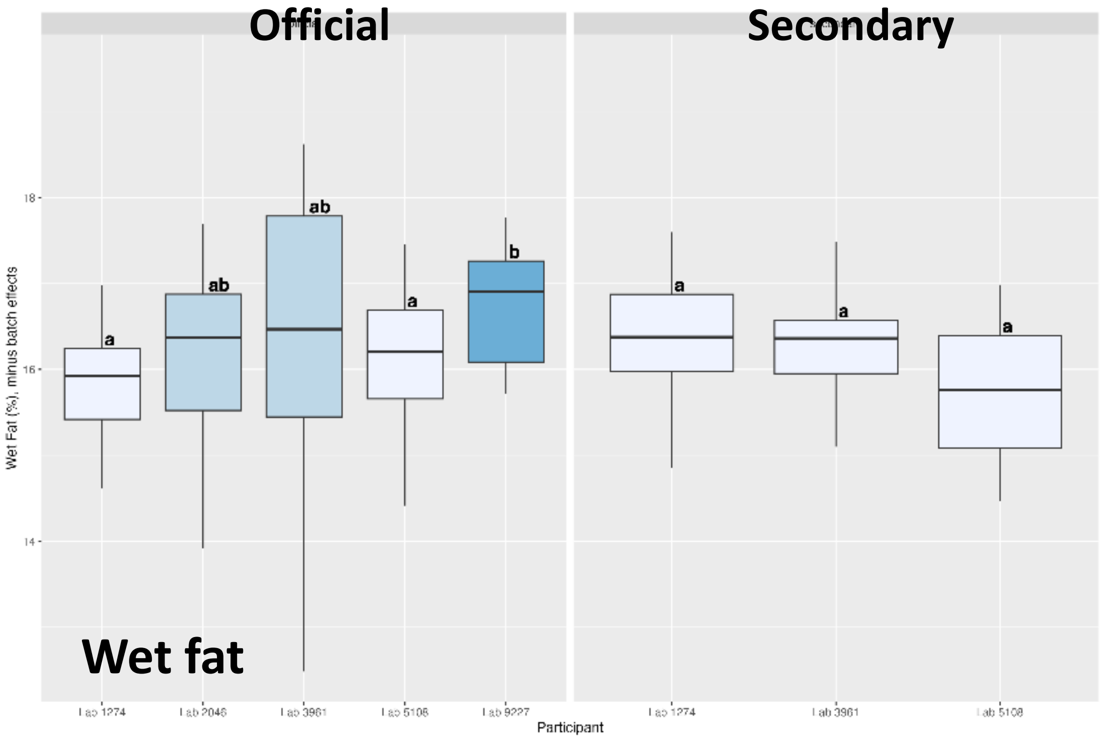
Homogeneity Check: confirm that each batch of fresh olive sample was homogenous as a pre-requisite for the ring test. Passing homogeneity check means statistical differences observed among ring test results *was not significantly impacted by natural variances among fresh fruit prior to testing.*

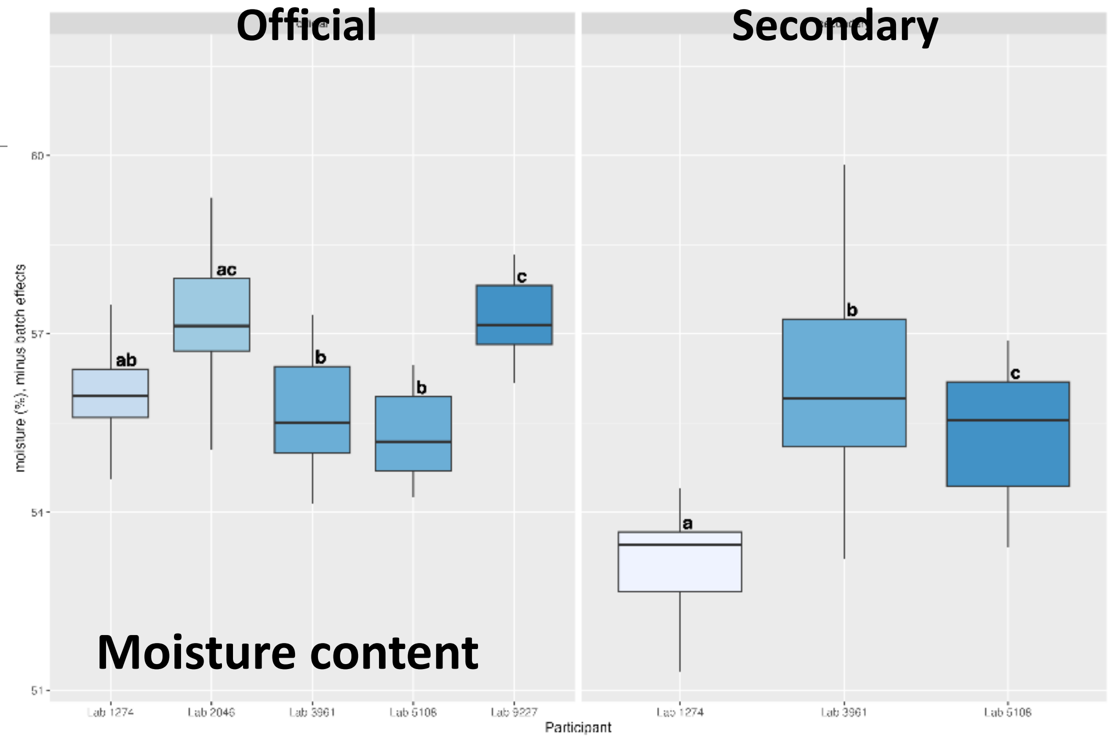
- 20 randomly selected olive samples from the same batch to participants were tested on NIR for moisture and fat content
- All samples for three testing rounds passed homogeneity check (F-test P value > 0.05).

Ring Test Results:

- Comparisons of participants among those using the same method (Official & Secondary)
- Comparison of the two methods used by the same participant (three participants who performed both methods)
- Comparison of the overall difference in two methods (Official vs Secondary)

Comparisons of participants among those using the same method (Official & Secondary)



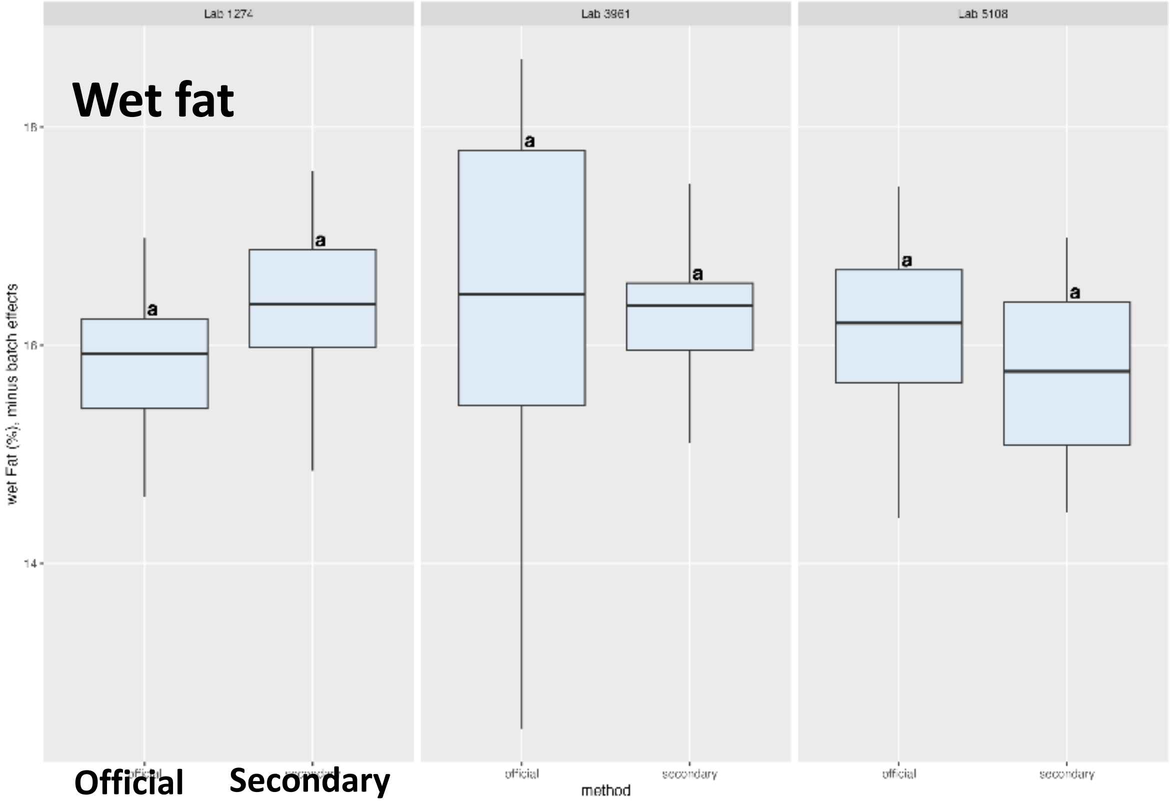


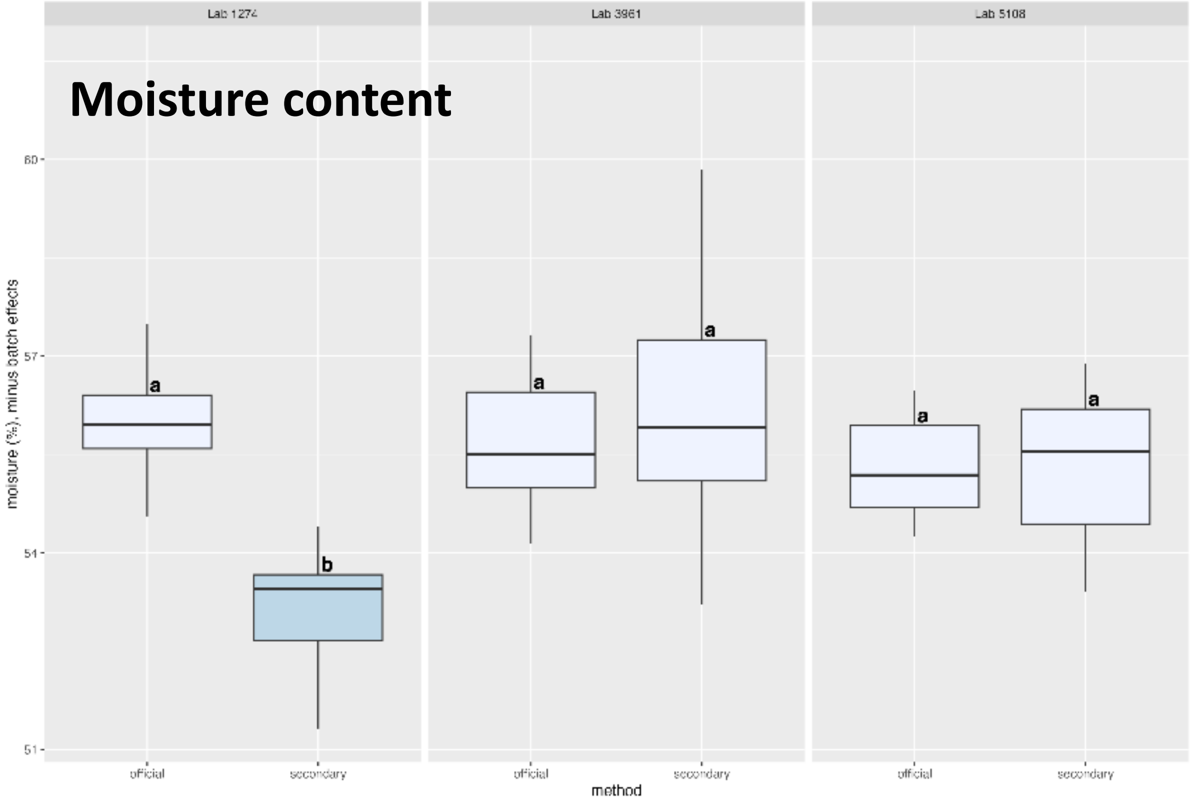
- Wet fat:
  - Official: four participants had no significant differences; one participant was significantly higher – extraction solvent and moisture content measured
  - Secondary: no significant difference

- Moisture content:
  - Official: larger deviations observed. Varied oven temperature (221°F/105°C to 266°F/130°C) and drying time used (30 min – 8 hrs)
  - Secondary: significantly different

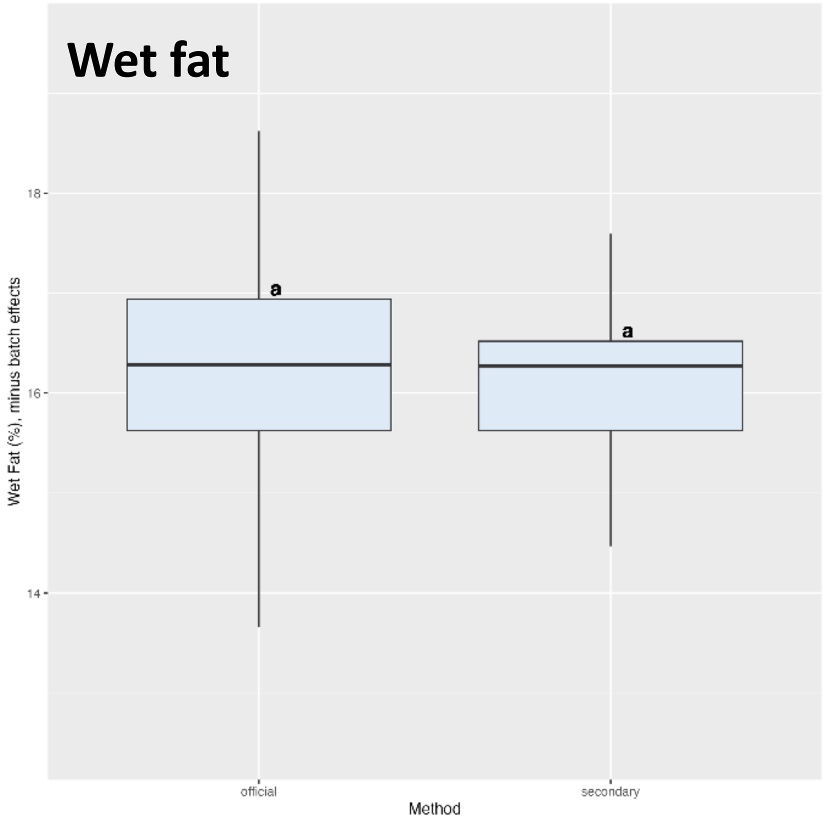
Naturally more variable and easier to be affected by packing, shipping, storage, and crushing conditions…

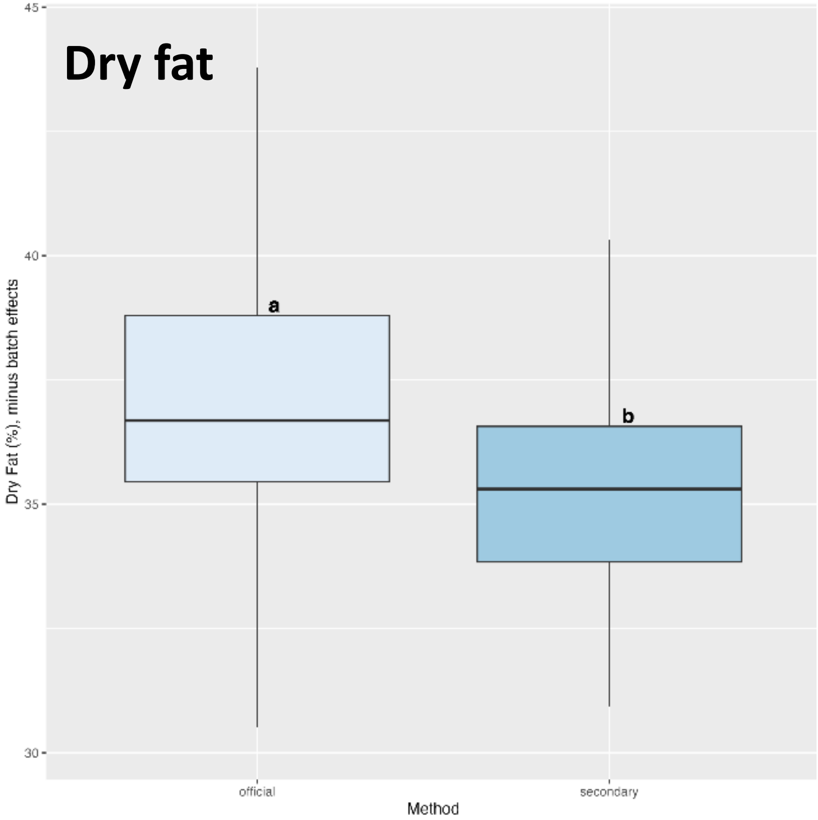
Comparison of the two methods used by the same participant

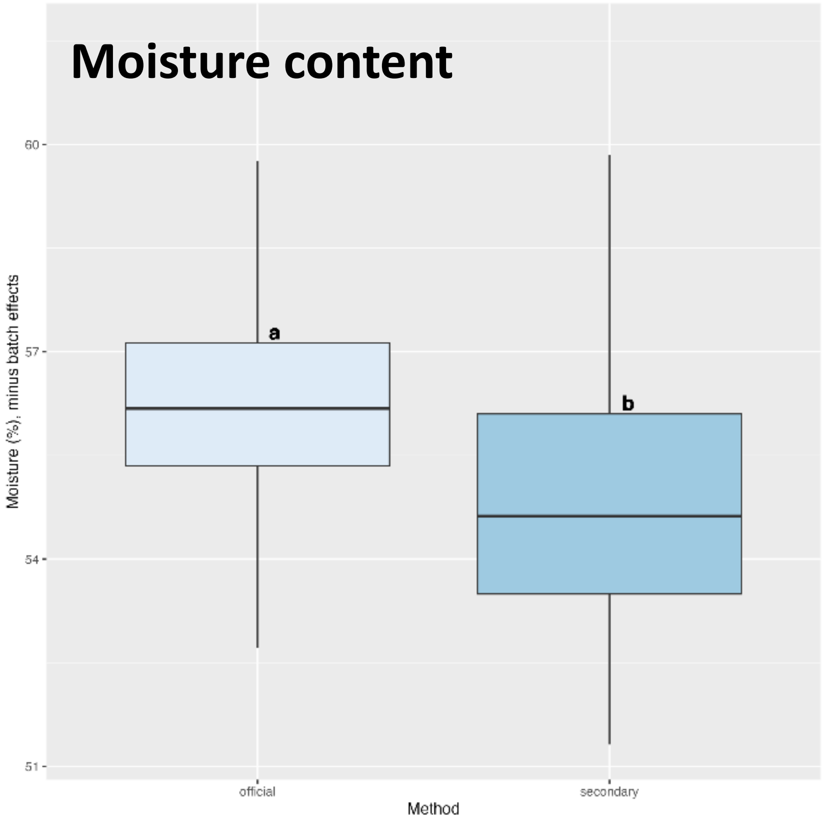




Comparison of the overall difference in two methods







* Averaging five participants for official method (left) and three participants for secondary method (right)

Wet fat: no significant difference for overall comparison

Dry fat and moisture content: secondary method results were significantly lower than official method results.

Recommendations from 2022/23 season

Increase number of participants for more industry representation and robust statistical analysis;

Include more olive varieties from different locations with varying growing conditions throughout the harvest season will enhance sample diversity and continue this work for more seasons to accommodate seasonal differences; and

Continue to work with fresh fruit sample preparer(s) to ensure their capacity to accommodate more participants, specific needs on sample size and shipping instructions participants may require.

2023/24 season:

- More participants: 3 participants for Official method and 4 participants for Secondary method; 3 participants for both methods
- More olive varieties: Arbequina, Arbosana, Koroneiki, and **Lecciana**
- More statistical comparisons: **whole fruit vs paste, different brands of NIR instruments…**

Questions?

Prof. Selina Wang:

- scwang@ucdavis.edu

Xueqi (Shirley) Li:

- spsli@ucdavis.edu

Valorization of Olive Pumace

SELINA WANG, DEPARTMENT FOOD SCIENCES AND TECHNOLOGY, UC DAVIS

Unleashing olive pomace: Transforming olive crop into the ultimate sustainability champion

SELINA WANG PHD
ASSOCIATE PROFESSOR AND VICE CHAIR
DEPARTMENT OF FOOD SCIENCE & TECHNOLOGY
UNIVERSITY OF CALIFORNIA, DAVIS

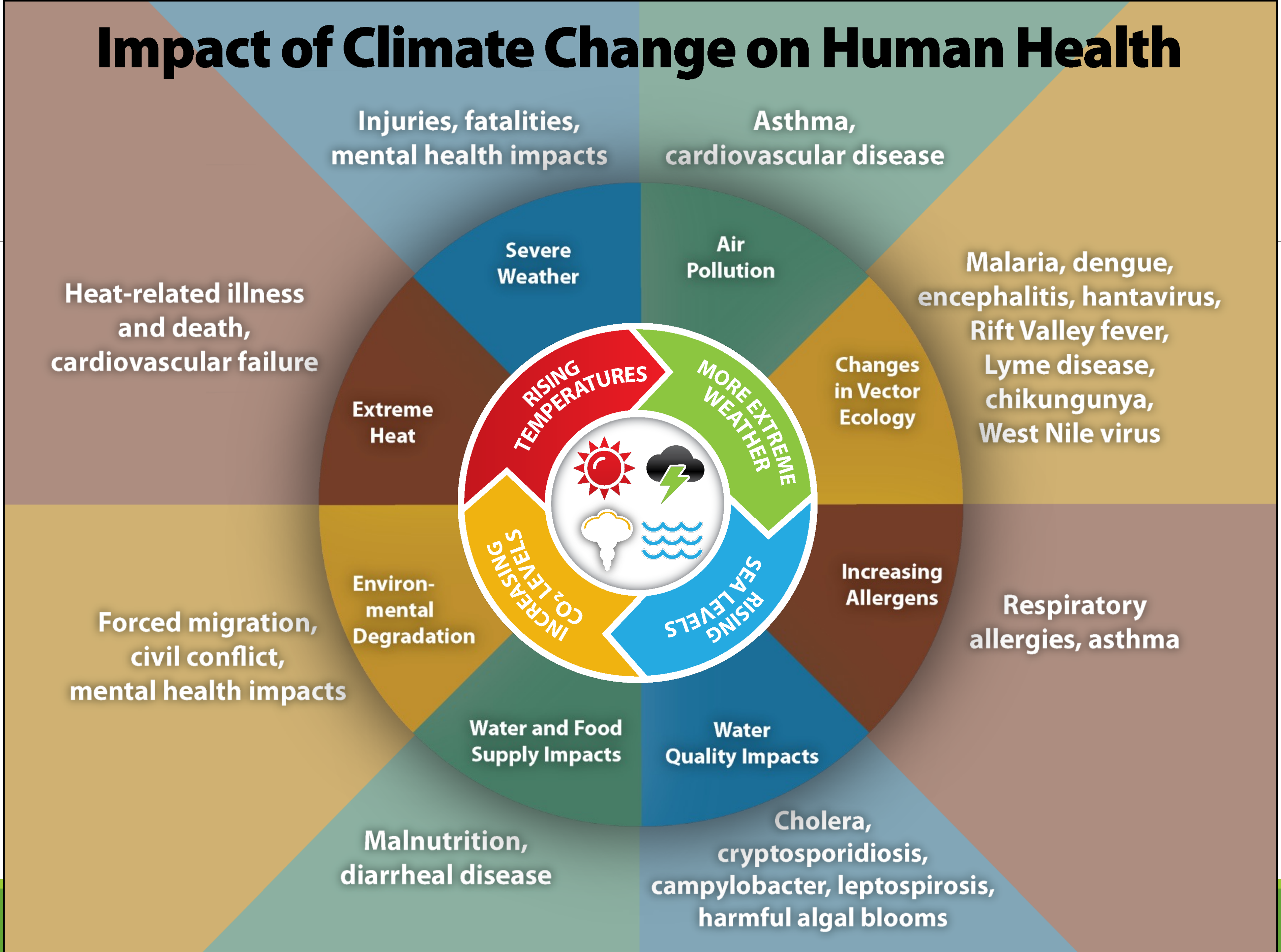
UC DAVIS COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

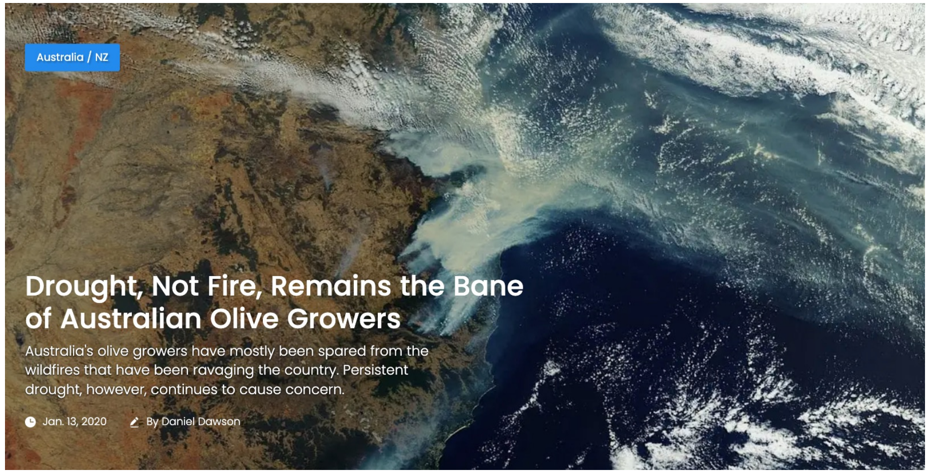
UC DAVIS FOOD SCIENCE AND TECHNOLOGY

University of California Agriculture and Natural Resources

Selina C. Wang, Ph.D.

- Identifying the important chemical markers for quality, purity and nutrition in food products
- Developing robust (faster and cheaper) detection methods so they can be easily adapted by industries
- Modifying processing methods to improve quality, purity and nutrition of products and to mitigate potential toxins
- **Valorizing agriculture byproducts to address climate change and to increase crop value and sustainability**


Impact of Climate Change on Human Health
Injuries, fatalities, mental health impacts
Asthma, cardiovascular disease
Heat-related illness and death, cardiovascular failure
Malaria, dengue, encephalitis, hantavirus, Rift Valley fever, Lyme disease, chikungunya, West Nile virus
Severe Weather
Air Pollution
Extreme Heat
Changes in Vector Ecology
RISING TEMPERATURES
MORE EXTREME WEATHER
INCREASING CO_2 LEVELS
RISING SEA LEVELS
Environ-mental Degradation
Increasing Allergens
Forced migration, civil conflict, mental health impacts
Respiratory allergies, asthma
Water and Food Supply Impacts
Water Quality Impacts
Malnutrition, diarrheal disease
Cholera, cryptosporidiosis, campylobacter, leptospirosis, harmful algal blooms



Bad Weather Ahead of Harvest Dampens Spirits of Italy's Olive Oil Producers

Extreme weather events – ranging from hail storms to flash flooding – have impacted olive growers across Italy. For many farmers, hopes of a promising harvest have washed away.

Ruinous Floods in Liguria Add to Poor Outlook for Italian Production

Oct. 20, 2014
Marco Marino

Oct. 27, 2021

Heat and Drought Hamper Olive Harvest in Morocco

Wildfires Devastate Agricultural Land in Turkey

Large areas in the south and southwest of the country have been reduced to ashes after dozens of wildfires erupted in the country.

Farmers Are Facing the Brunt of Portugal's Worsening Drought

Experts warn that the absence of significant rainfalls in the coming months will degrade water quality and strain irrigation-dependent crops, including some olive groves.

The World Needs an Oil Change

Zero Acre Farms is on a mission to remove destructive vegetable oils from the food system. And we're not going to stop until restaurant deep fryers, home pantries, and packaged foods around the world are finally free of these harmful oils and fats.

Zero Acre Cooking Oil

★★★★★ 893 Reviews

Finally, an all-purpose cooking oil with even more good fats than olive oil, a high smoke point, and a neutral taste that works in any recipe. You'll love it for a perfect sear, crispy fries, or delicious sauce. Each bottle is 16 fl oz.

More good fat than even olive oil	High smoke point, up to 485°F	Neutral taste makes flavors pop	Made from sugarcane plants
Read More	Read More	Read More	Read More

QUANTITY

1 Bottle	10% off + Free Shipping	25% off + Free Shipping
$26.99 / ea	2 Bottles	4 Bottles
	$23.39 / ea	$19.79 / ea

FREQUENCY

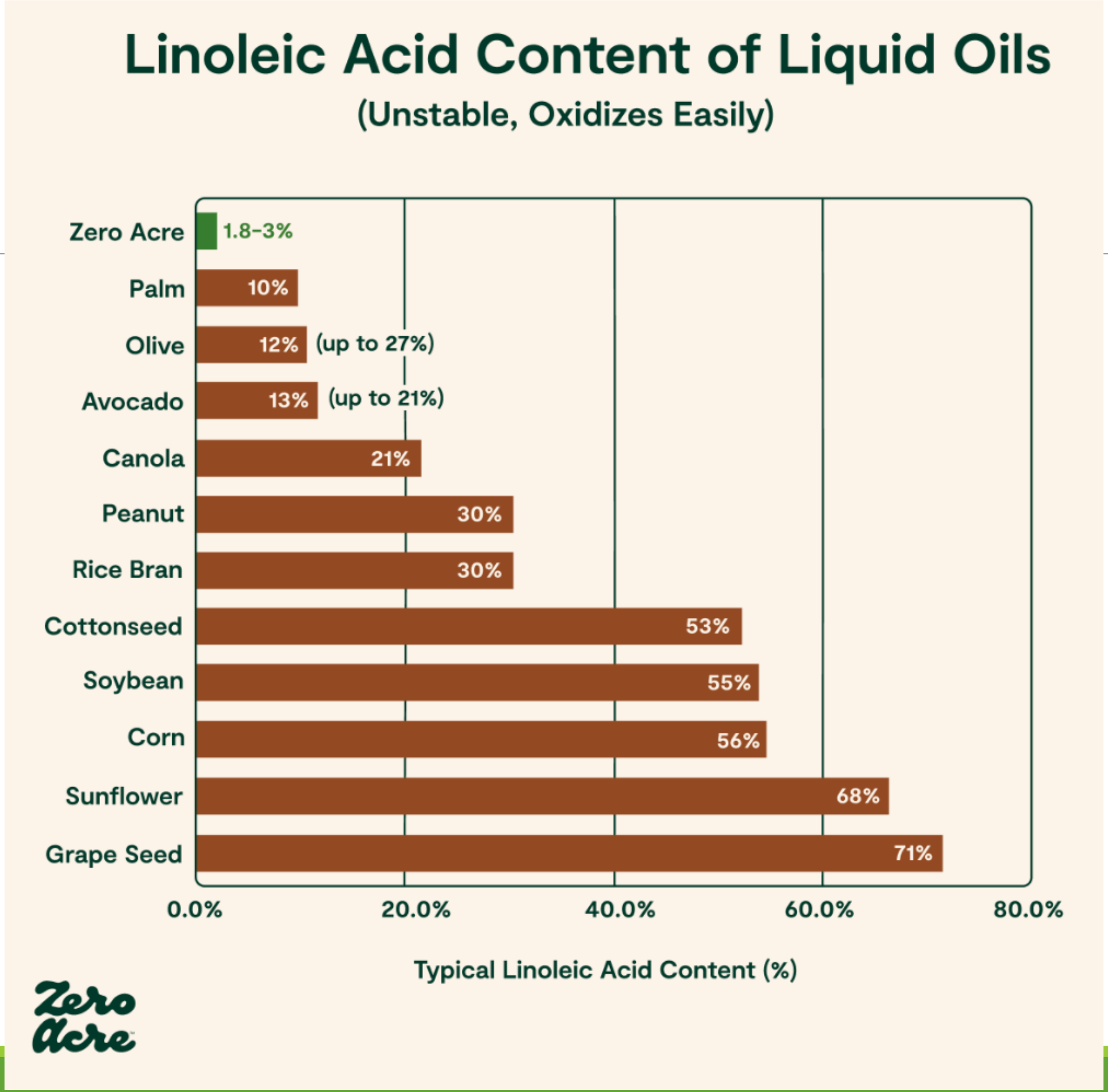
Subscribe & Save $46.78 ~~$51.98~~ Extra 10% off

HEALTH

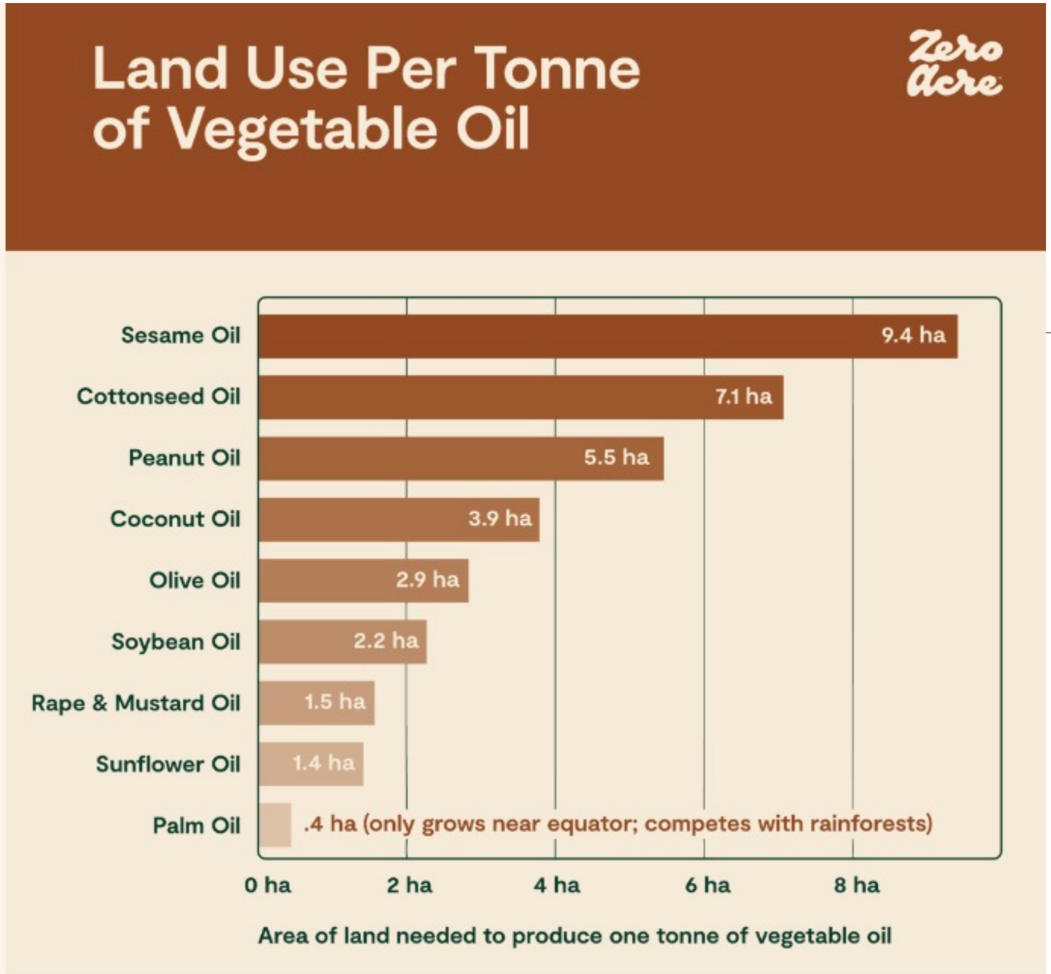
Improving human health is central to our purpose. We aim for nothing less than the reversal of widespread chronic disease and obesity rates.

SUSTAINABILITY

Health and sustainability should go hand in hand. Our goal is to slow climate change and restore millions of acres of natural ecosystems.



Linoleic Acid Content of Liquid Oils
(Unstable, Oxidizes Easily)
Zero Acre
1.8-3%
Palm
10%
Olive
12% (up to 27%)
Avocado
13% (up to 21%)
Canola
21%
Peanut
30%
Rice Bran
30%
Cottonseed
53%
Soybean
55%
Corn
56%
Sunflower
68%
Grape Seed
71%
0.0%
20.0%
40.0%
60.0%
80.0%
Typical Linoleic Acid Content (%)
Zero Acre



One of these land resources is water. The water footprint of olive oil is immense in comparison to other vegetable oils, second only to sesame oil [*]. Per ton of final product, olive oil requires 112% more water than shelled almonds which are notorious for water greed in the agriculture world [*].

Because olives are at most 20% fat, and production is done using inefficient pressure and centrifugation methods, extracting oil from them contributes to a large amount of waste that experts are still trying to determine the best way to use [*]. Every ton of olive oil produces four tons of waste that is most often used as animal feed, contributing to the continuation of unsustainable forms of factory farm animal agriculture [*].

Beyond inputs, olive oil threatens surrounding plant and animal species. In fact, olive oil threatens more species per ton of oil produced than any other vegetable oil, aside from coconut oil [*].

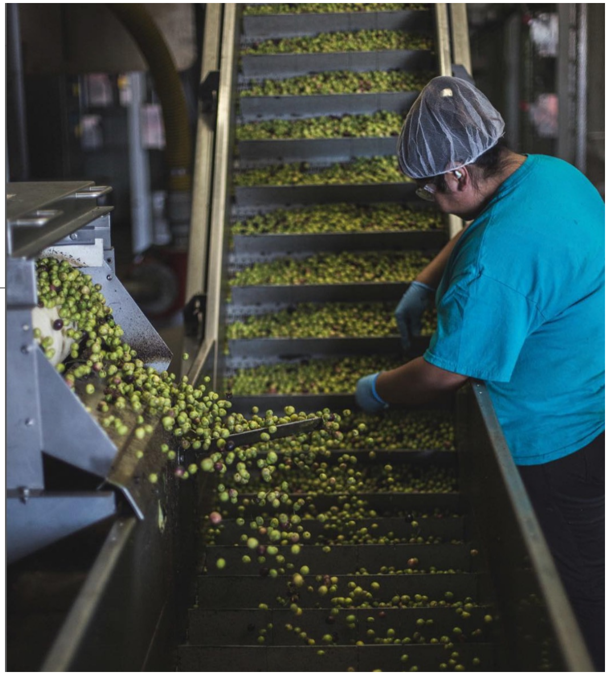
"One of these land resources is water. The water footprint of olive oil is immense in comparison to other vegetable oils, second only to sesame oil.

Per ton of final product, olive oil requires 112% more water than shelled almonds which are notorious for water greed in the agriculture world.

Because olives are at most 20% fat, and production is done using inefficient pressure and centrifugation methods, extracting oil from them contributes to a large amount of waste that experts are still trying to determine the best way to use. Every ton of olive oil produces four tons of waste that is most often used as animal feed, contributing to the continuation of unsustainable forms of factory farm animal agriculture."

"Beyond inputs, olive oil threatens surrounding plant and animal species. In fact, olive oil threatens more species per ton of oil produced than any other vegetable oil, aside from coconut oil."






Company


2012

Robert Mondavi Institute for Wine and Food Science ***$396,737***

Title: Sustainable Technologies for Olive Mill Wastewater Management

Abstract: This project will develop integrated approaches to ... prove water quality, increase water conservation, and accelerate Best Management Pr... processing waste water. In September 2011, UC Davis Olive Center assembled ... rs, processors, researchers, and manufacturers to address this i... an environmentally and economically viable integrated stra... astewater, and (2) extract high-value nutraceutic... egrated approach to olive processing ... and resin separation to carry out the ... lisseminate Best Management ... quality and byproduct value of olive

Journal of Food Science — A Publication of the Institute of Food Technologists

Food Chemistry

Phenolics and Antioxidant Capaci... Affected by Three Drying Techn...

...ve Pomace

ELSEVIER

LWT
Volume 138, March 2021, 110621

Integrated microwave- and enzyme-assisted extraction of phenolic compounds from olive pomace

Journal of Food Science — A Publication of the Institute of Food Technologists

E: Food Engineering & Materials Science

Membrane-Filtered Olive Mill Wastewater: Quality Assessment of the Dried Phenolic-Rich Fraction

Food Science +Technology — Institute of Food Science +Technology — IFST

Original Article

Spray drying of a phenolic-rich membrane filtration fraction of olive mill wastewater: optimisation and dried product quality

ACADEMIC PRESS

Integrated Processing Technologies for Food and Agricultural By-Products

2019, Pages 355-371

Chapter 14 - Olive

Rebecca Milczarek *, Douglas Larson †, Yao Olive Li ‡, Ivana Sedej *, Selina Wang §

Show more

Add to Mendeley Share Cite

https://doi.org/10.1016/B978-0-12-814138-0.00014-9 Get rights and content

Abstract

The milling of olives to make olive oil results in both aqueous (olive mill process water) and semisolid (pomace) by-product streams. Traditional methods of utilizing these by-products—land application or animal feed—may prove sufficient for small mills. However, as production for olive oil increases and environmental regulations become more restrictive, olive millers can consider the novel by-product valorization techniques which are being actively explored by researchers around the world. This chapter describes the chemical properties of olive oil and its various by-products as well as how the particular oil extraction approach (2-phase vs 3-phase) affects the properties of the by-products. Two case studies explore the economic viability of valorization of olive mill process water via filtration and the technical feasibility and commercial potential of olive pomace processed by extrusion.

Development of Natural Antimicrobial Agents from Byproducts of Olives *$446,515*

The Regents of the University of California, Davis

The pre- and post-harvest, fruit and vegetable processing industries are in need of new, natural, and environmentally sustainable antimicrobials to reduce the use of conventional chemical preservatives. This is an opportunity for the California olive oil industry since the large number of byproducts generated from the processing of olive oil are considered "waste" while, in fact, they contain phenolic compounds that have a high potential as antimicrobials. This project aims to develop natural antimicrobial treatments (sprays, dips, and/or coatings) made from olive byproducts to increase the value of the crop and the overall sustainability of the food ecosystem. The success of the project will be evaluated based on the success in discovery of antibacterial compounds from the olive byproducts, illustration of synergistic enhancement of antimicrobial activity with mild processing technologies, and adoption of the new antimicrobial technologies by industry.

Olive Pomace

Take advantage of what nature gives us

Natural sanitizers

Pre-harvest, harvesting, post-harvest, food processing applications

Bio-engineering materials

Value-added + functional ingredient

LWT - Food Science and Technology 180 (2023) 114677

Contents lists available at ScienceDirect

LWT

journal homepage: www.elsevier.com/locate/lwt

Characterization of California olive pomace fractions and their *in vitro* antioxidant and antimicrobial activities

Hefei Zhao[a], Yoonbin Kim[a], Roberto J. Avena-Bustillos[b], Nitin Nitin[a,c], Selina C. Wang[a,*]

[a] *Department of Food Science and Technology, University of California, Davis, One Shields Ave, Davis, CA, 95616, USA*
[b] *Western Regional Research Center, Healthy Processed Foods Research, Albany, CA, 94710, USA*
[c] *Department of Biological and Agricultural Engineering, University of California, Davis, One Shields Ave, Davis, CA, 95616, USA*

ARTICLE INFO

Keywords:
Olive pomace
Phytochemical omics
Phenolics
Antioxidant
Antimicrobial
Chelation
Preparative chromatography
E. coli O157:H7
L. innocua

ABSTRACT

Olive oil production yields a massive amount of byproduct, olive pomace (OP). Hexane-defatted Arbequina olive pomace from California, United States, was extracted with water and loaded to a preparative C18 chromatography. Phenolic desorption was applied by acidified methanolic-water gradients. Phenolic compound profiles and antioxidant/antimicrobial activities were determined. Results showed that the total phenolic contents of the fractions increased with the increase of the percentage of methanol in water gradients; however, the polar phenolic compound profiles generally decreased, while less-polar phenolic compound profiles increased. Oleuropein-aglycone-di-aldehyde (3,4-DHPEA-EDA) detected in water extract was not found in the acidified 35 mL/100 mL and acidified 70 mL/100 mL methanol fractions, but there was a new peak tentatively assigned as 3,4-DHPEA-EDA dimer. The *in vitro* antioxidant activities of water fractions were higher than that of higher methanolic fractions when they were compared at the same level of gallic acid equivalents; the same trend was observed for the antimicrobial activities evaluated using non-Shiga toxin-producing *Escherichia coli* O157:H7 and *Listeria innocua*. This study provides knowledge as data foundations for the practical valorization and industrial food applications of olive pomace extracts.

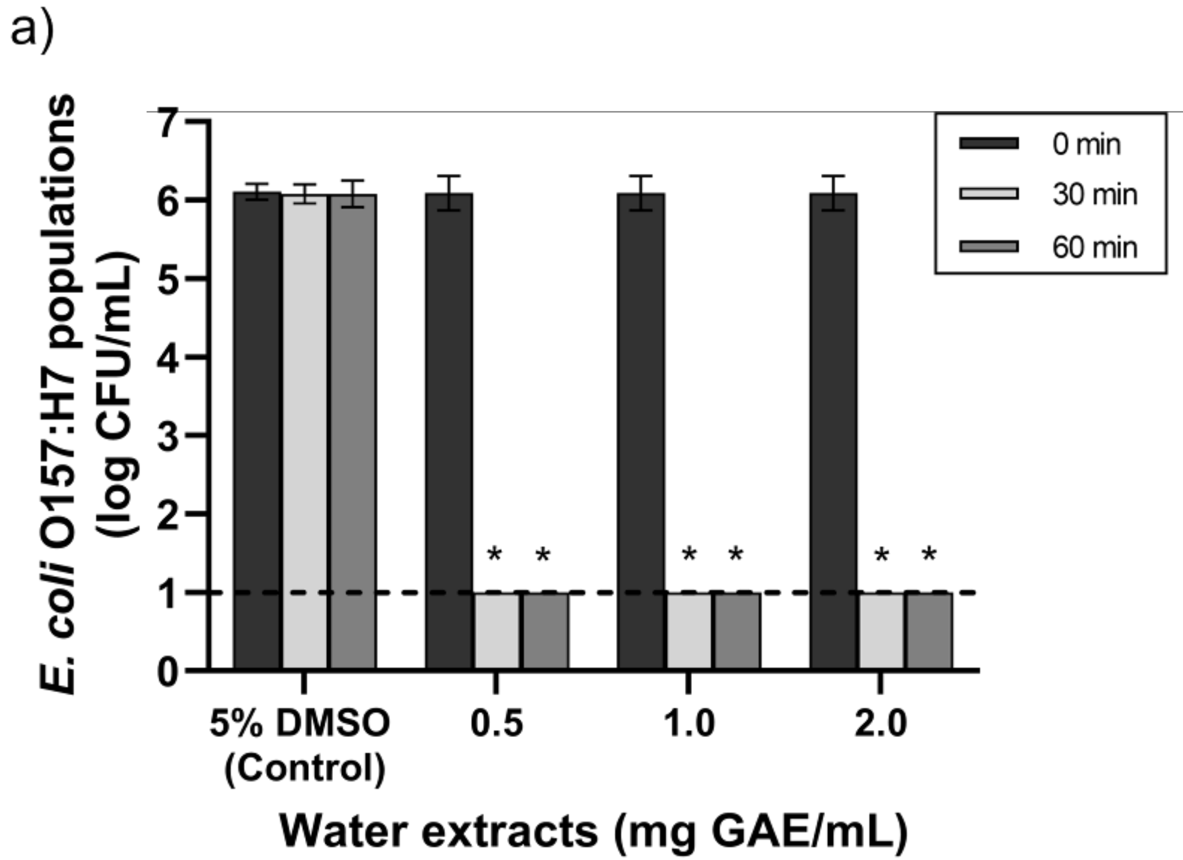
Finisher for olive
Pomace pit separation

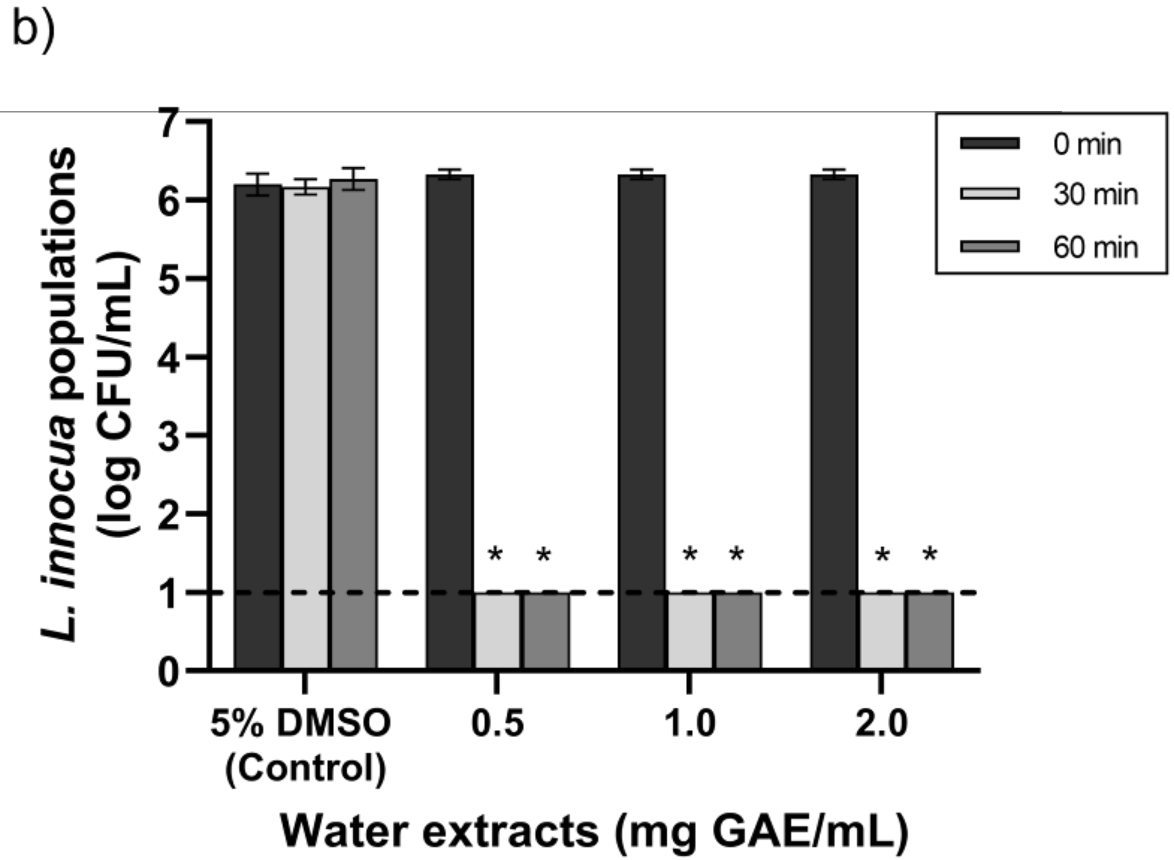
Pitted olive pomace
and broken olive pits

Drum-Dryer

Drum-dried Pitted olive pomace

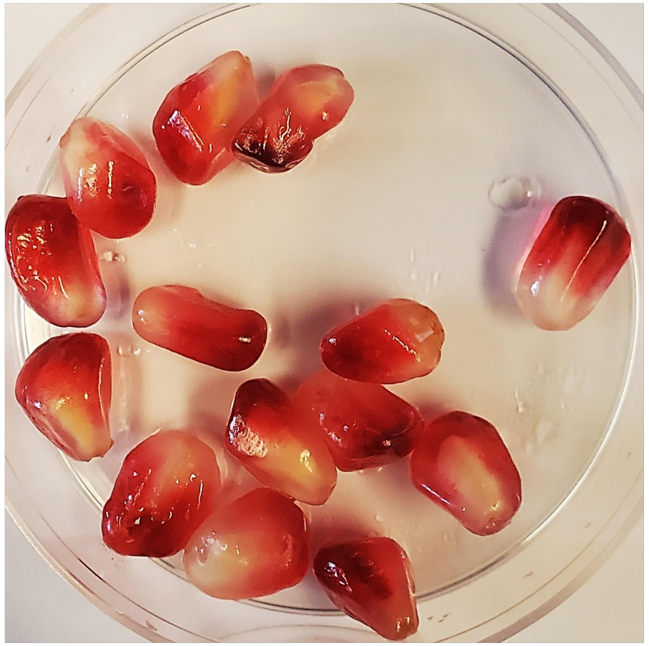
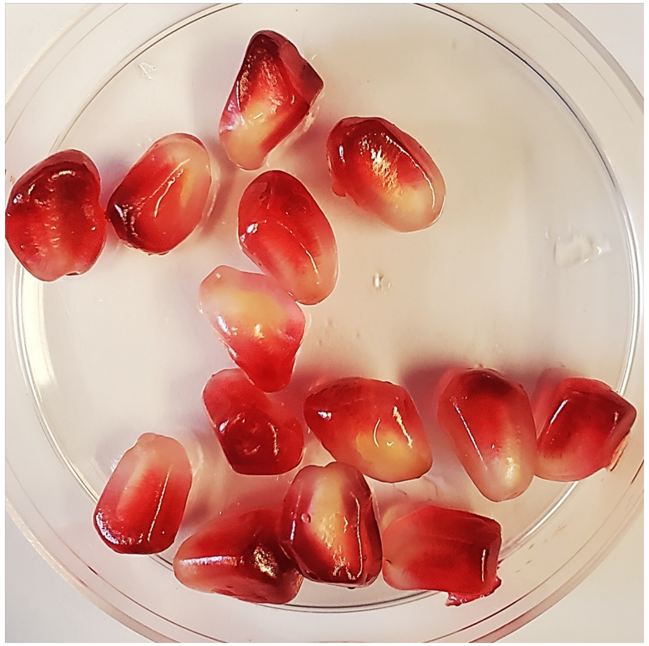
5-log reduction: inactivating 99.999% of a microbe or colony forming units





Antimicrobial activities of water extract against *E. coli* O157:H7 and *Listeria innocua*.
Populations of (a) *E. coli* O157:H7 and (b) *Listeria innouca* incubated with 0.5, 1.0, and 2.0 mg GAE/mL of water extract

Day 0

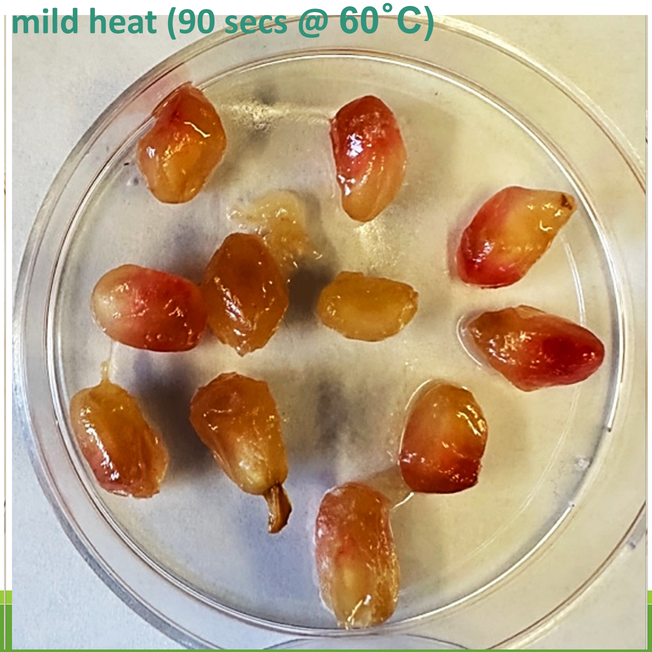
Control

Olive pomace

Olive po

mild heat (90 secs @ 60˚C)

Day 21



	Total plate populations (log colony-forming unit/g)					
	Storage time (days)					
	Initial load	0	7	14	21	28
CONTROL	3.79 ± 0.22 a	2.92 ± 0.12 ab	3.24 ± 0.25 a	4.49 ± 0.27 a	4.81 ± 0.18 a	4.45 ± 0.25 a
OPE	3.79 ± 0.22 a	2.99 ± 0.26 a	3.39 ± 0.19 a	4.44 ± 0.43 a	4.91 ± 0.30 a	4.26 ± 0.27 a
OPE + MH	3.79 ± 0.22 a	2.49 ± 0.11 b	2.14 ± 0.12 c	1.56 ± 0.24 c	2.04 ± 0.13 c	3.11 ± 0.46 b

OPE + MH → 2.77 log lower

OPE + MH → 1.34 log lower

	Yeasts and molds populations (log Colony-forming unit/g)					
	Storage time (days)					
	Initial load	0	7	14	21	28
CONTROL	3.90 ± 0.09 a	2.93 ± 0.09 a	3.49 ± 0.12 a	4.71 ± 0.20 a	4.92 ± 0.29 a	5.18 ± 0.25 a
OPE	3.90 ± 0.09 a	2.95 ± 0.23 a	3.44 ± 0.24 a	4.60 ± 0.30 a	4.71 ± 0.32 a	5.45 ± 0.22 a
OPE + MH	3.90 ± 0.09 a	2.54 ± 0.07 a	2.09 ± 0.10 c	1.60 ± 0.30 c	1.94 ± 0.30 c	3.15 ± 0.44 b

OPE + MH → 2.98 log lower

OPE + MH → 2.03 log lower

Olive Knot

Prevention

01

Collaboartion

Becky Wheeler-Dykes, Farm Advisor

02

100 Trees

Three pruning wounds on each tree: one untreated (control); one treated with Bordeaux; one treated with the olive pomace extract

03

Ochards

AQ and MN

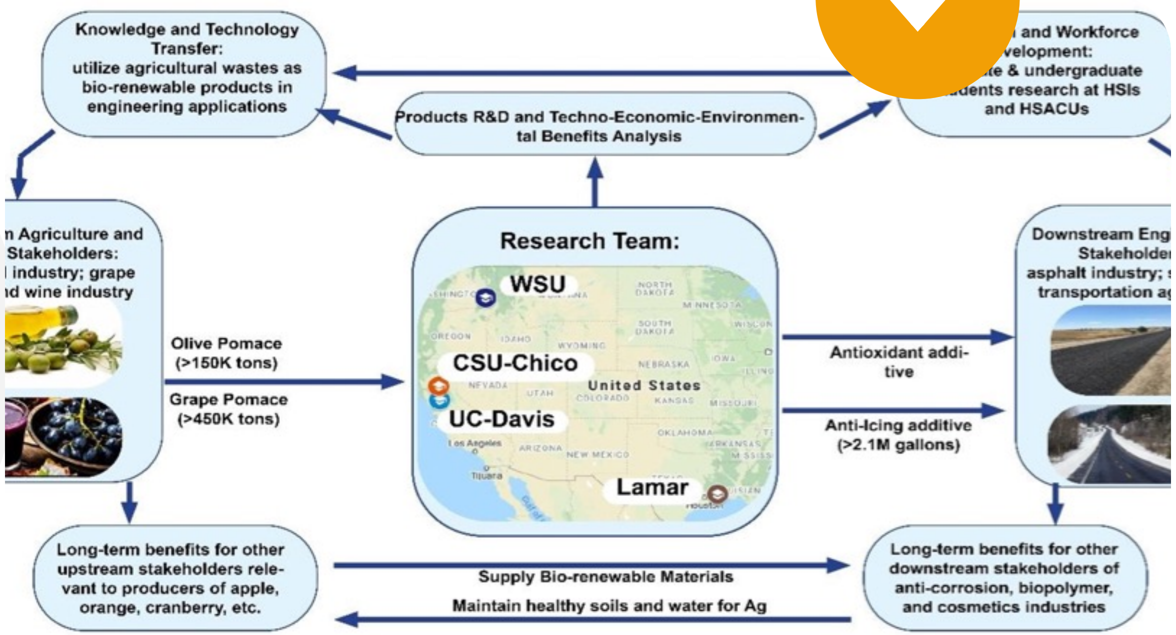
04

Timeline

October 2024 - November 2024

Roadway

Application



01

Collaboartion

CSU-Chico, WSU, UC Davis, Lamar

02

Aims

Transforming olive and grape pomaces into ntioxidants and anti-icing products, through bioprocessing and biorefining

03

Treatment

Enzymatic treatment

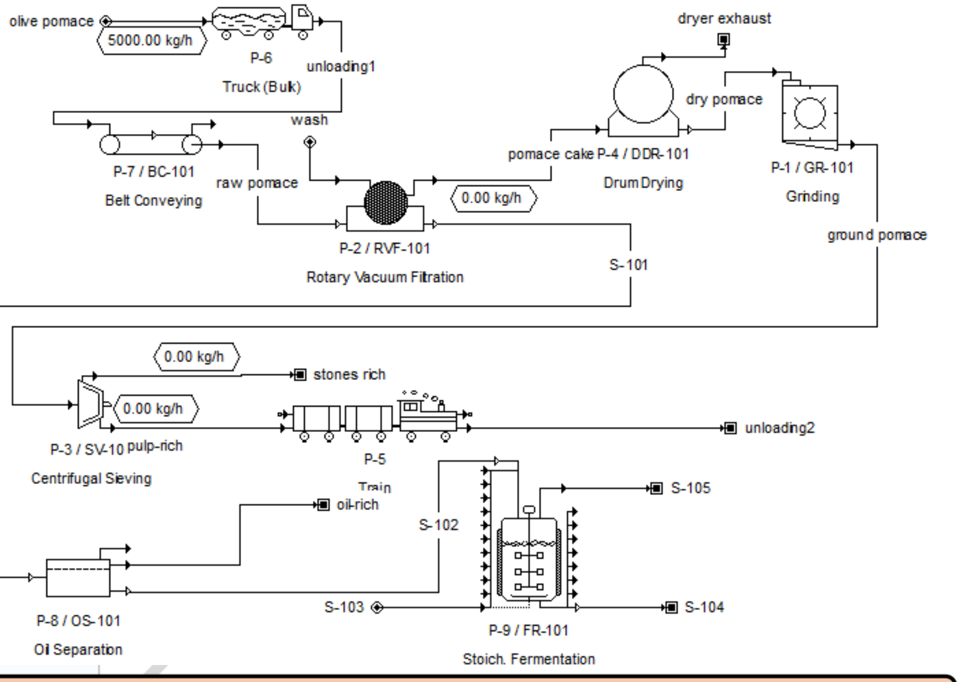
Zero-waste upcycling

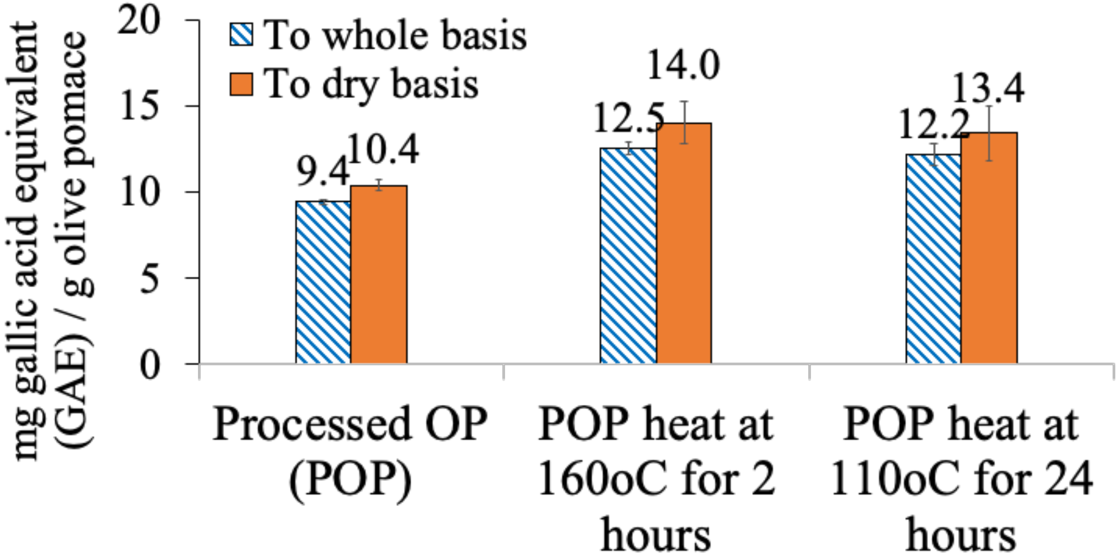
Techno-economic-environmental benefit analysis

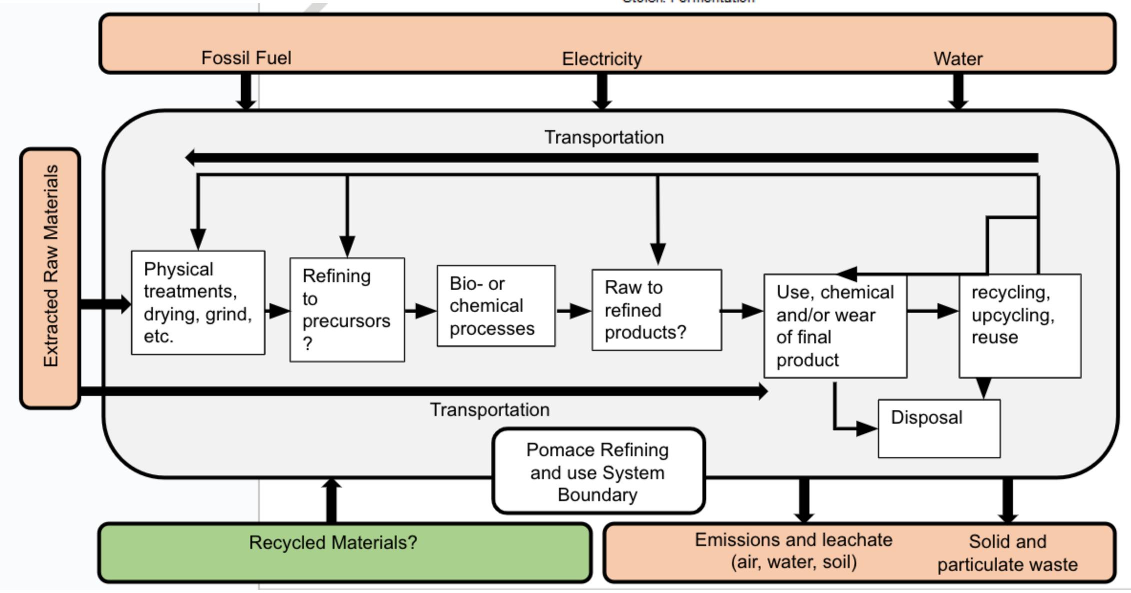
04

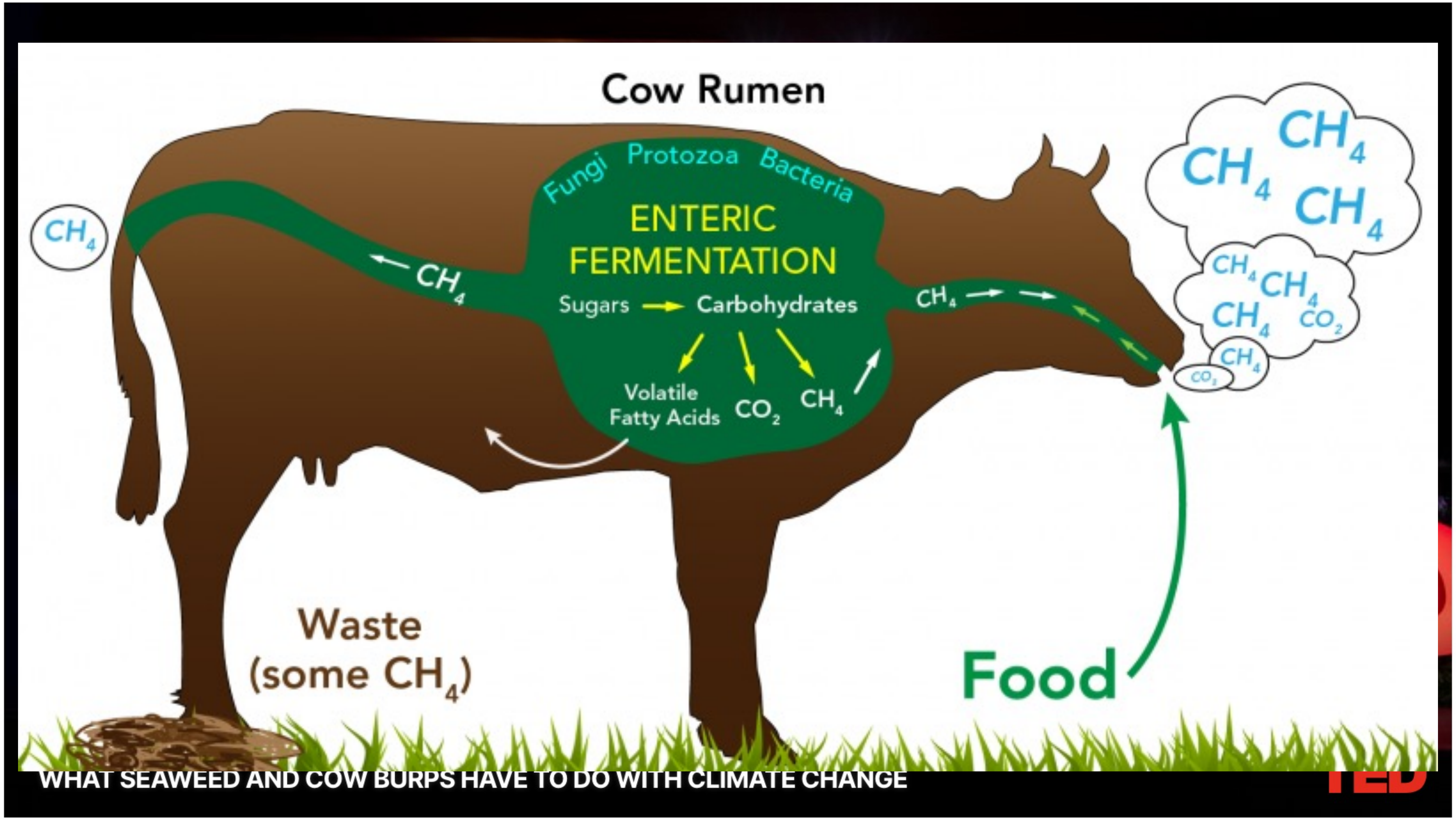
Timeline

May 2023 - April 2026


olive pomace
5000.00 kg/h
P-6
Truck (Bulk)
unloading1
wash
P-7 / BC-101
Belt Conveying
raw pomace
P-2 / RVF-101
Rotary Vacuum Filtration
0.00 kg/h
pomace cake P-4 / DDR-101
Drum Drying
dryer exhaust
dry pomace
P-1 / GR-101
Grinding
ground pomace
S-101
0.00 kg/h
stones rich
0.00 kg/h
P-3 / SV-10 pulp-rich
Centrifugal Sieving
P-5
Train
unloading2
oil-rich
S-102
S-105
S-103
S-104
P-8 / OS-101
Oil Separation
P-9 / FR-101
Stoich. Fermentation


mg gallic acid equivalent (GAE) / g olive pomace
To whole basis
To dry basis
20
15
10
5
0
9.4
10.4
12.5
14.0
12.2
13.4
Processed OP (POP)
POP heat at 160oC for 2 hours
POP heat at 110oC for 24 hours


Fossil Fuel
Electricity
Water
Transportation
Extracted Raw Materials
Physical treatments, drying, grind, etc.
Refining to precursors ?
Bio- or chemical processes
Raw to refined products?
Use, chemical and/or wear of final product
recycling, upcycling, reuse
Disposal
Transportation
Pomace Refining and use System Boundary
Recycled Materials?
Emissions and leachate (air, water, soil)
Solid and particulate waste



Livestock contributes about 14.5% to greenhouse gas emissions worldwide and about 4% in the U.S. About 5.7% of global greenhouse gases comes from enteric methane [released by ruminant animals].

Functional Foods

Animal and human

01
Goal
Reduce enteric methane emission in dairy cattles

02
Three dietary treatments
Control diet, a diet with 10% grape pomace; and a diet with 15% grape pomace

03
Results
Less enteric methane emission and more milk production with grape pomace added diet

04
Added benefits
Increased antioxidants in the milk

FUNDING

CDFA
USDA
INDUSTRY

OOCC
USDA
ARI

CDRF

COMMISSION OF CALIFORNIA

January 28, 2022

Dr. Yiming Feng
1 Grand Ave, 24-105C
Department of Food Science & Nutrition
California Polytechnic State University
San Luis Obispo, CA 93401

Dear Drs. Feng, Jung, Huang and Wang,

I would like to lend our support your 2022 Specialty Crop Block Grant Program (SCBGP) proposal entitled "*Comprehensive utilization of olive byproduct for improved economic feasibility and environmental sustainability*" to the California Department of Food and Agriculture (CDFA).

The Olive Oil Commission of California (OOCC) is a government entity of the State of California. The OOCC was established and is funded by California olive oil farmers. California olive oil handlers who produce 5,000 gallons or more are required by law to participate in the OOCC. We support California olive farmers by developing and enforcing standards, verifying California olive oil quality, promoting clear and accurate labels, and conducting research to promote health and sustainability of California oil olives.

The production of olive oil generates a tremendous quantity of byproducts each year. Currently, the olive byproducts are mainly converted to low-value cattle feed. To improve the economic competitivity of California olive oil in domestic and international marketplace, it is important to seek alternative strategies to better utilize olive byproducts. The research outcomes of your proposed work will have a significant impact on the California olive industry and ultimately benefit California olive growers and olive oil producers.

We look forward to the outcomes of this research and helping disseminate your research findings with our farmers and handlers.

Sincerely,

OLIVE OIL COMMISSION OF CALIFORNIA

June 9, 2021

Dr. Kun Zhang, California State University-Chico
Dr. Xianming Shi, Washington State University
Dr. Selina Wang, University of California-Davis
Drs. Clayton Jeffryes, Liv Haselbach, and Thinesh Selvaratnam, Lamar University

Dear Kun, Xianming, Selina, Clayton, Liv and Thinesh,

I would like to lend my support for your 2021 Agriculture and Food Research Initiative Grant proposal entitled, "Utilization of Agricultural Waste (Olive and Grape Pomaces) to Improve the Service Life and Sustainability of Roadways".

I am the Executive Director with the Olive Oil Commission of California (OOCC) which represents approximately 95% of the olive oil produced in California. We provided funds for the preliminary and feasibility study of this work titled "Develop a Commercially-Ready Natural Asphalt Modifier Using Olive Pomace to Improve Asphalt Pavement Performance" while the largest olive oil producer in California, California Olive Ranch, supplied olive pomace. The OOCC Research Committee is very supportive of this proposed project as they identify sustainability and byproduct management as an extremely high priority. We believe this project is timely and importantly, and complementary expertise of this research team is exactly what we need to conduct excellent research and extension outreach.

I urge that this project be funded to support the sustainability of agriculture sectors to find valuable and practical use for the byproducts from olive oil processing.

Sincerely,

Chris Zanobini
Executive Director

Get Connected With Us

Benchmarking Data for the Olive Oil Industry in California

KYLE BIRCHARD, INTEGRATIVE ECONOMICS LLC

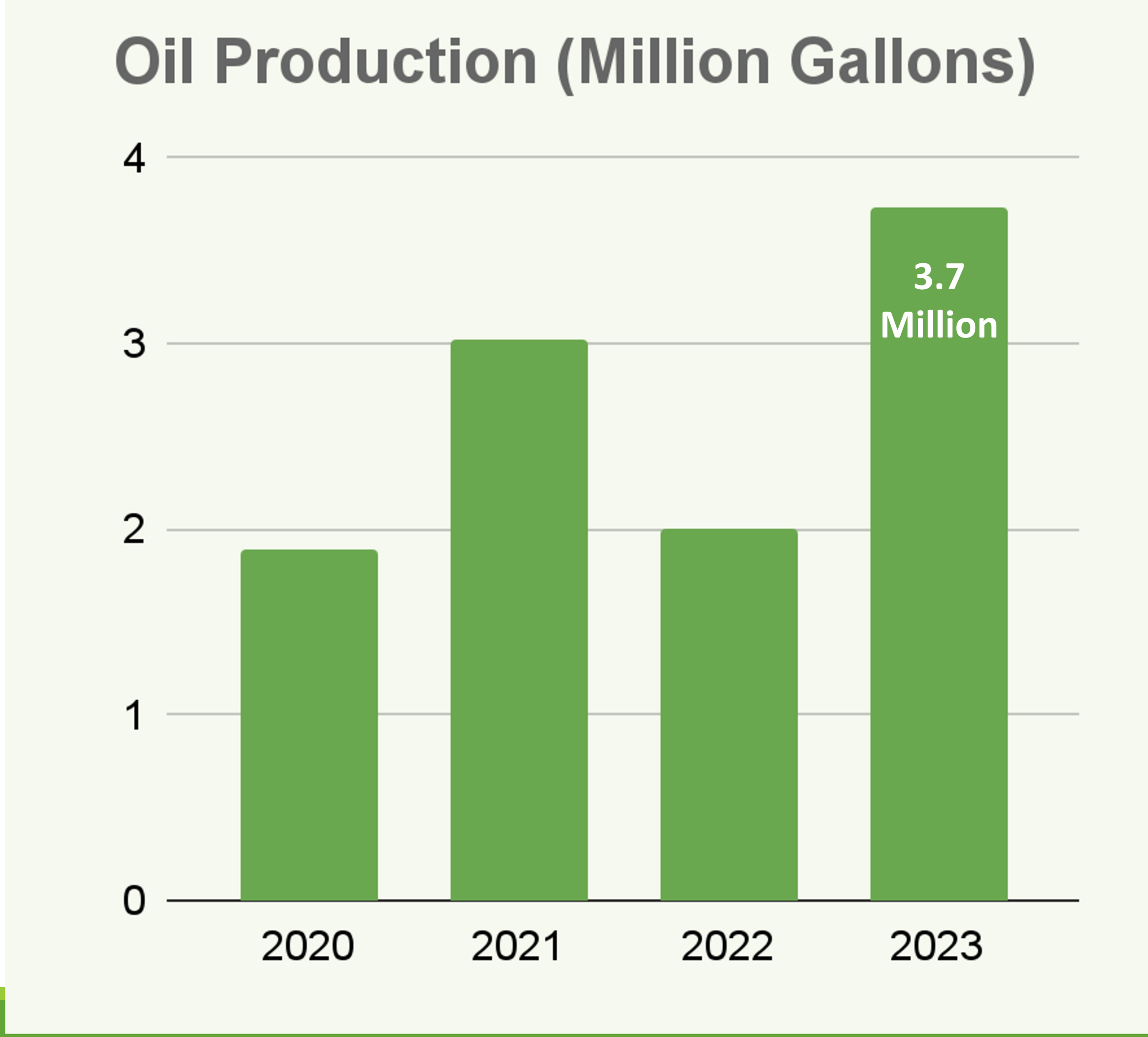
Industry Benchmarking Update

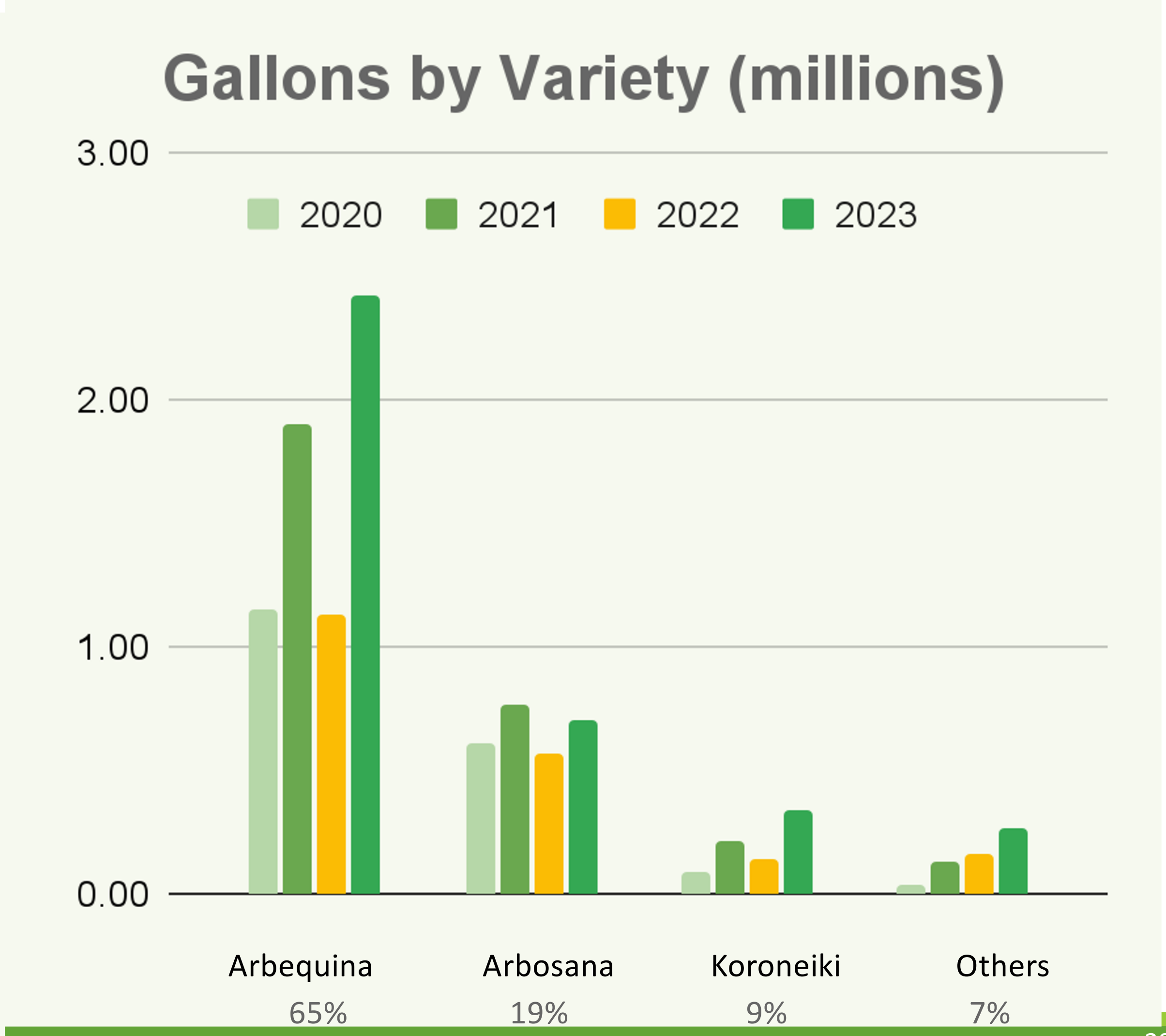
CALIFORNIA OLIVE DAY
MARCH 7, 2024

Integrative Economics, LLC

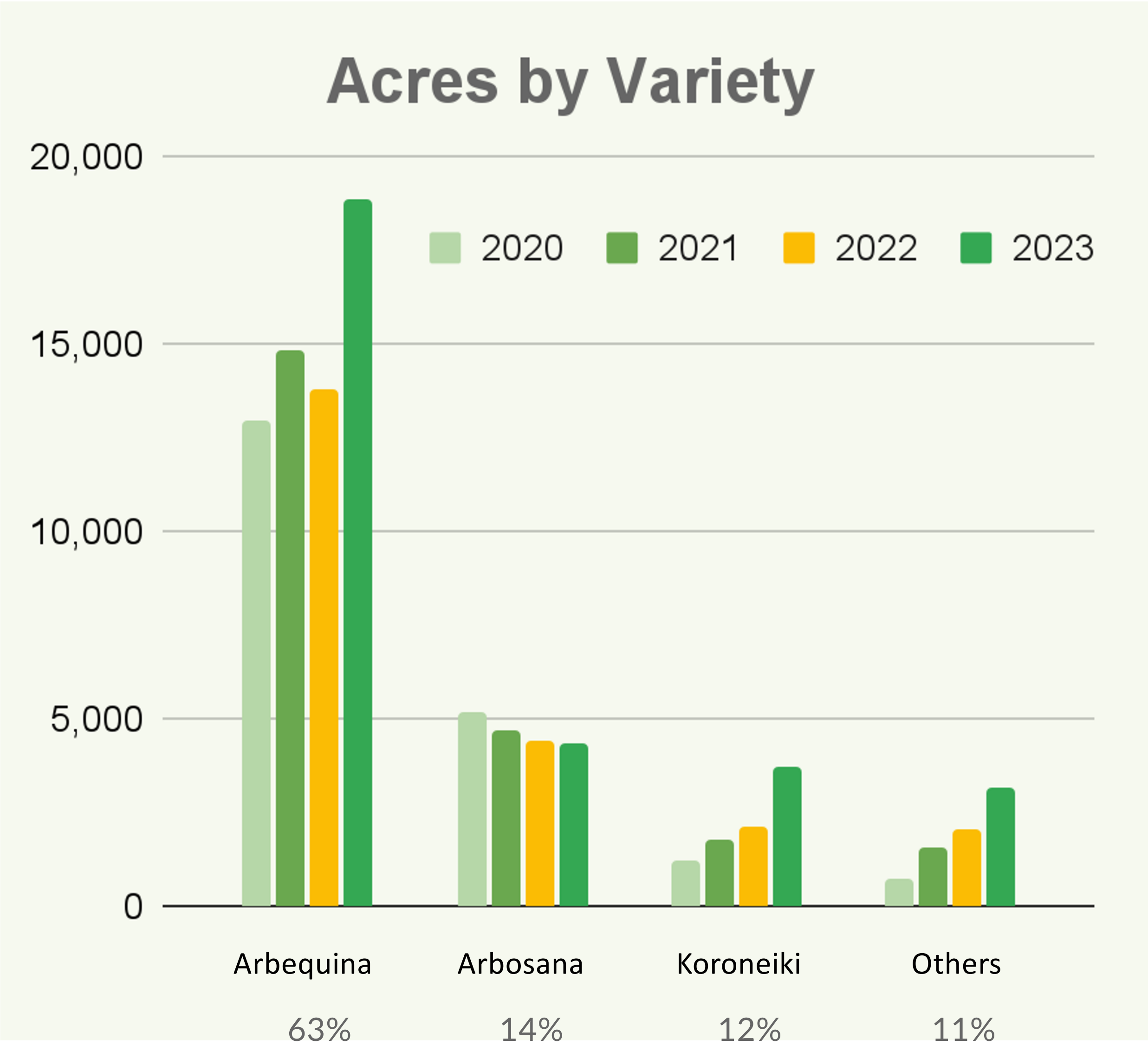
2020-2023 Reporting

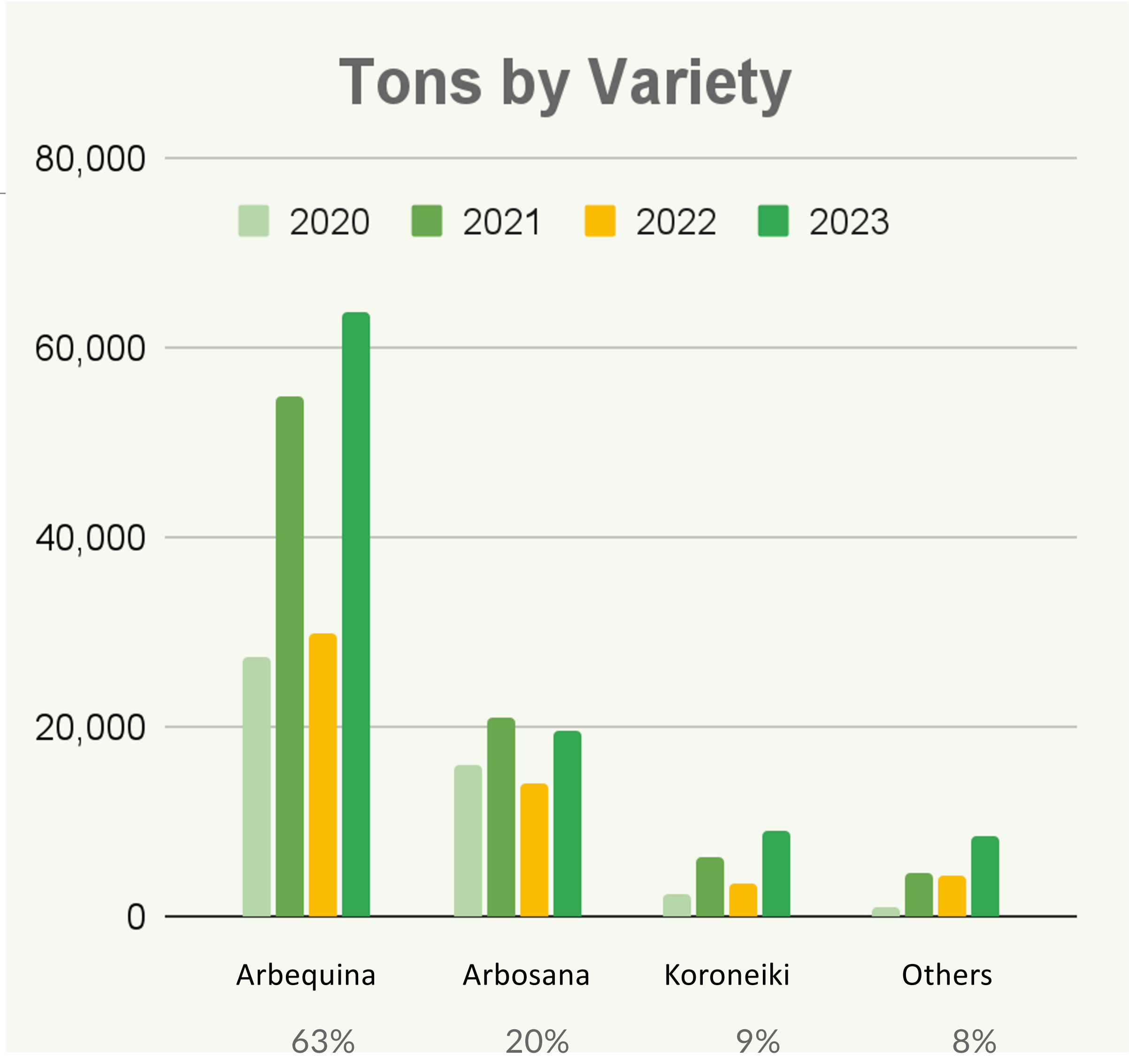
2020 - 2023 Summary

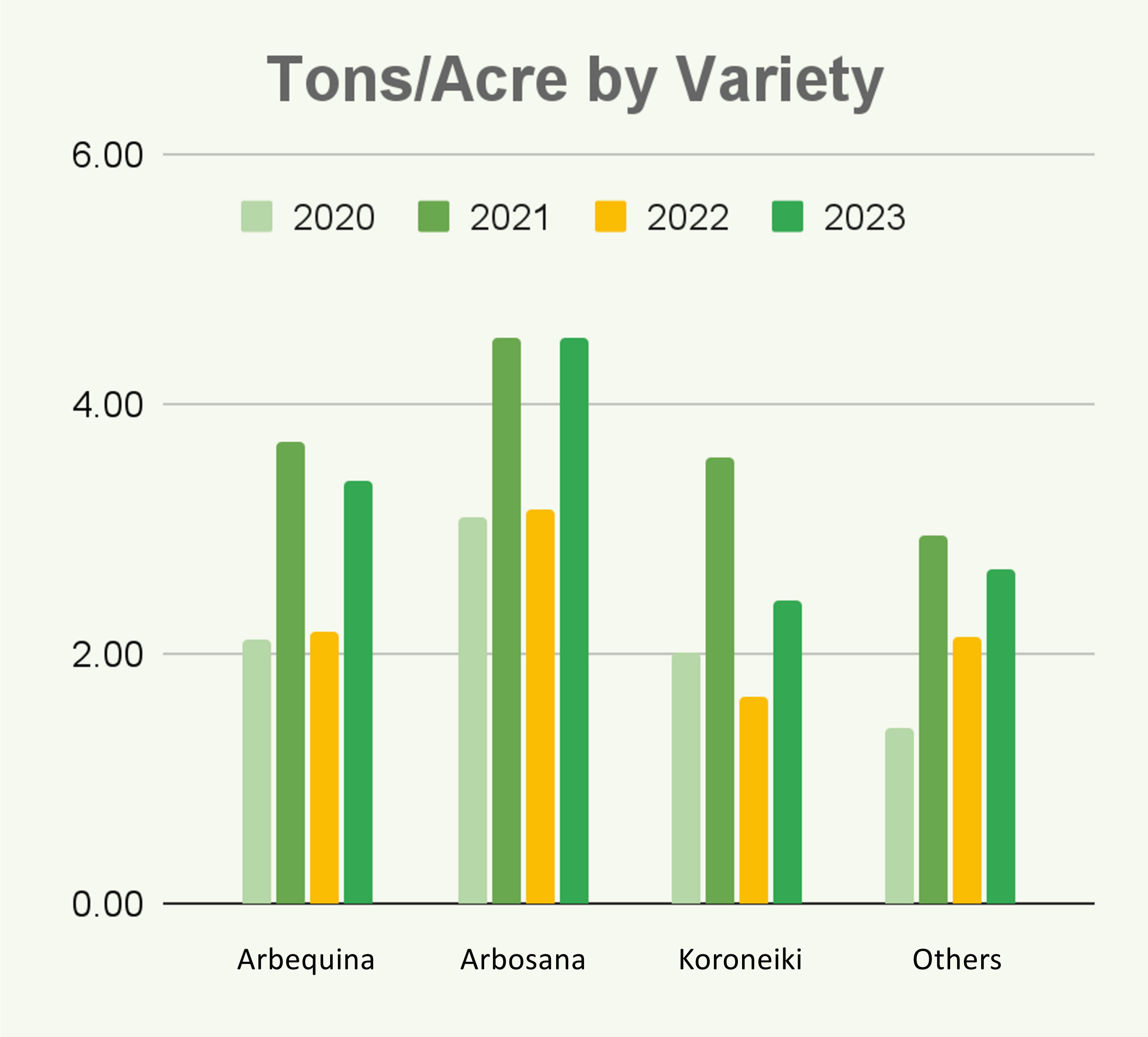


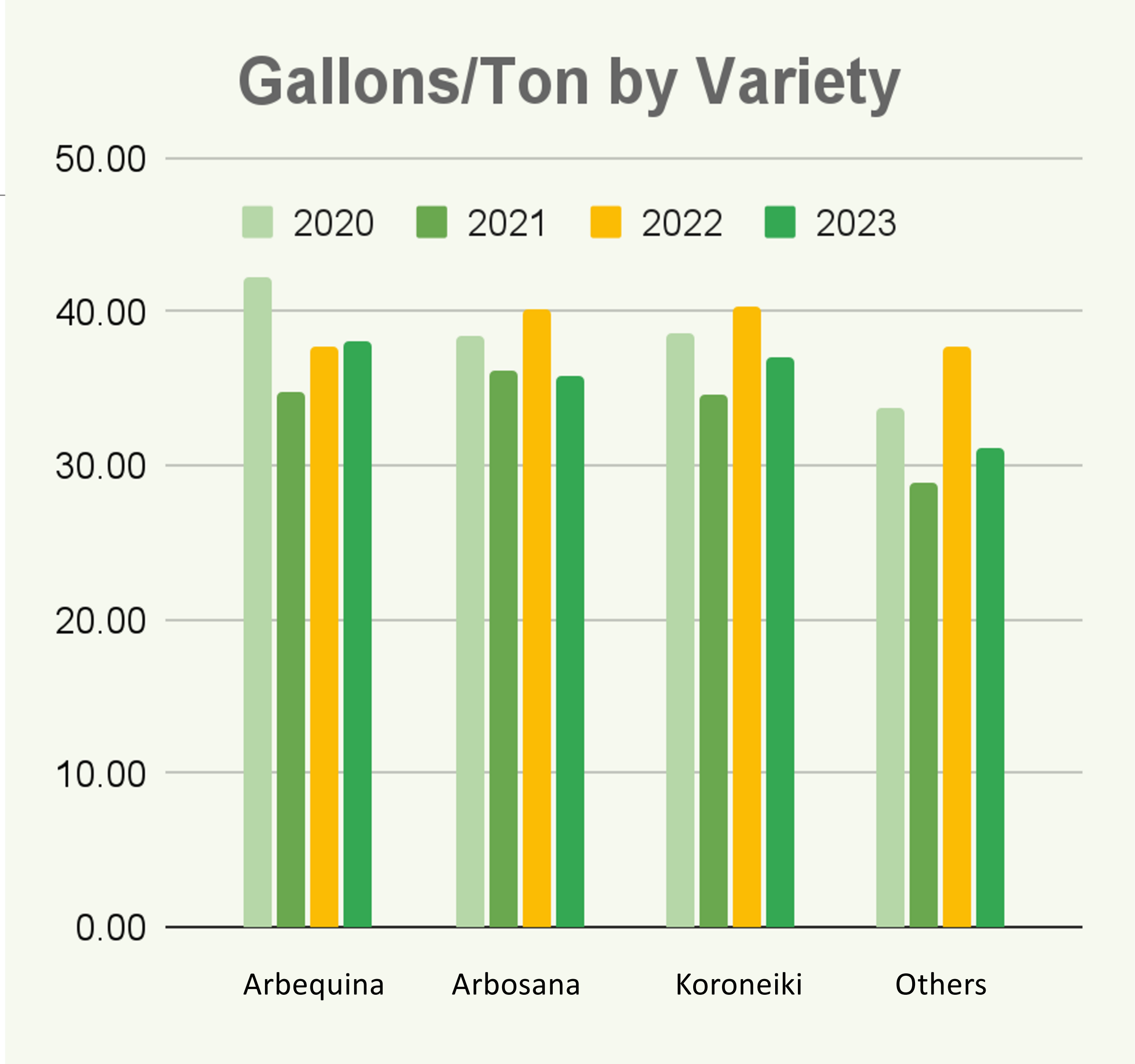


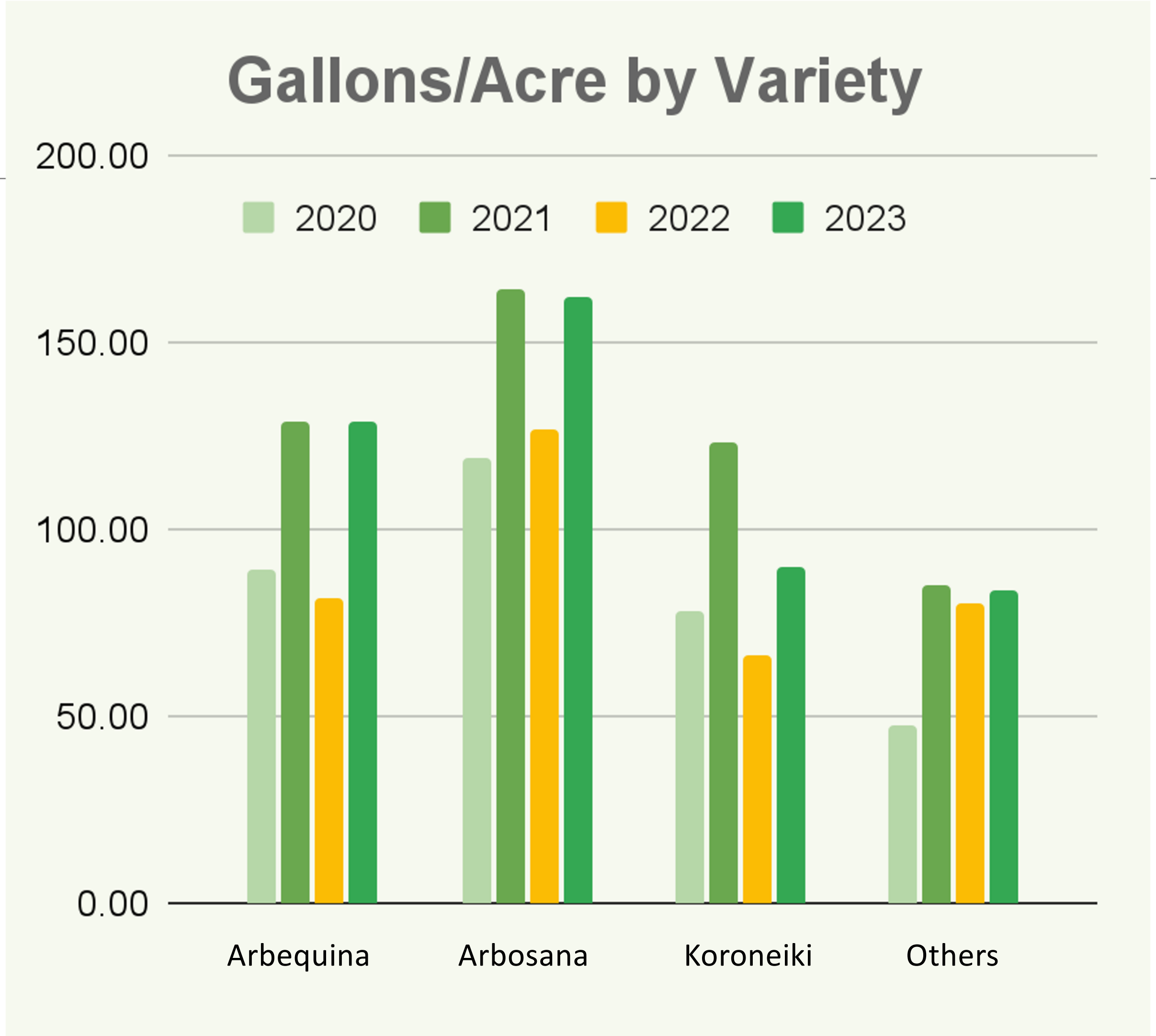
Breakdown by Variety


Acres by Variety
20,000
15,000
10,000
5,000
0
2020
2021
2022
2023
Arbequina
Arbosana
Koroneiki
Others
63%
14%
12%
11%

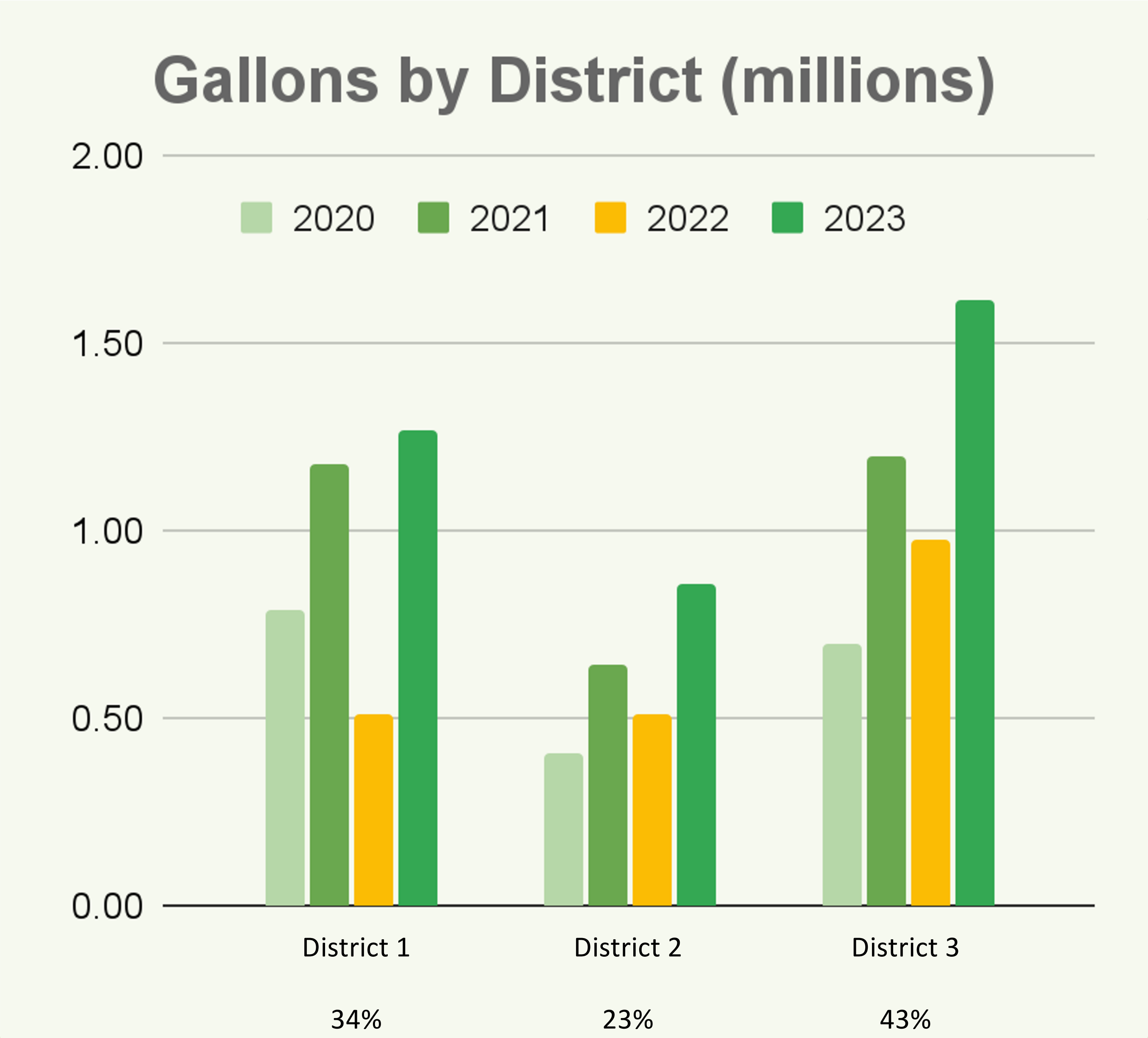

Tons by Variety
80,000
60,000
40,000
20,000
0
2020
2021
2022
2023
Arbequina
Arbosana
Koroneiki
Others
63%
20%
9%
8%


Tons/Acre by Variety
6.00
4.00
2.00
0.00
2020
2021
2022
2023
Arbequina
Arbosana
Koroneiki
Others

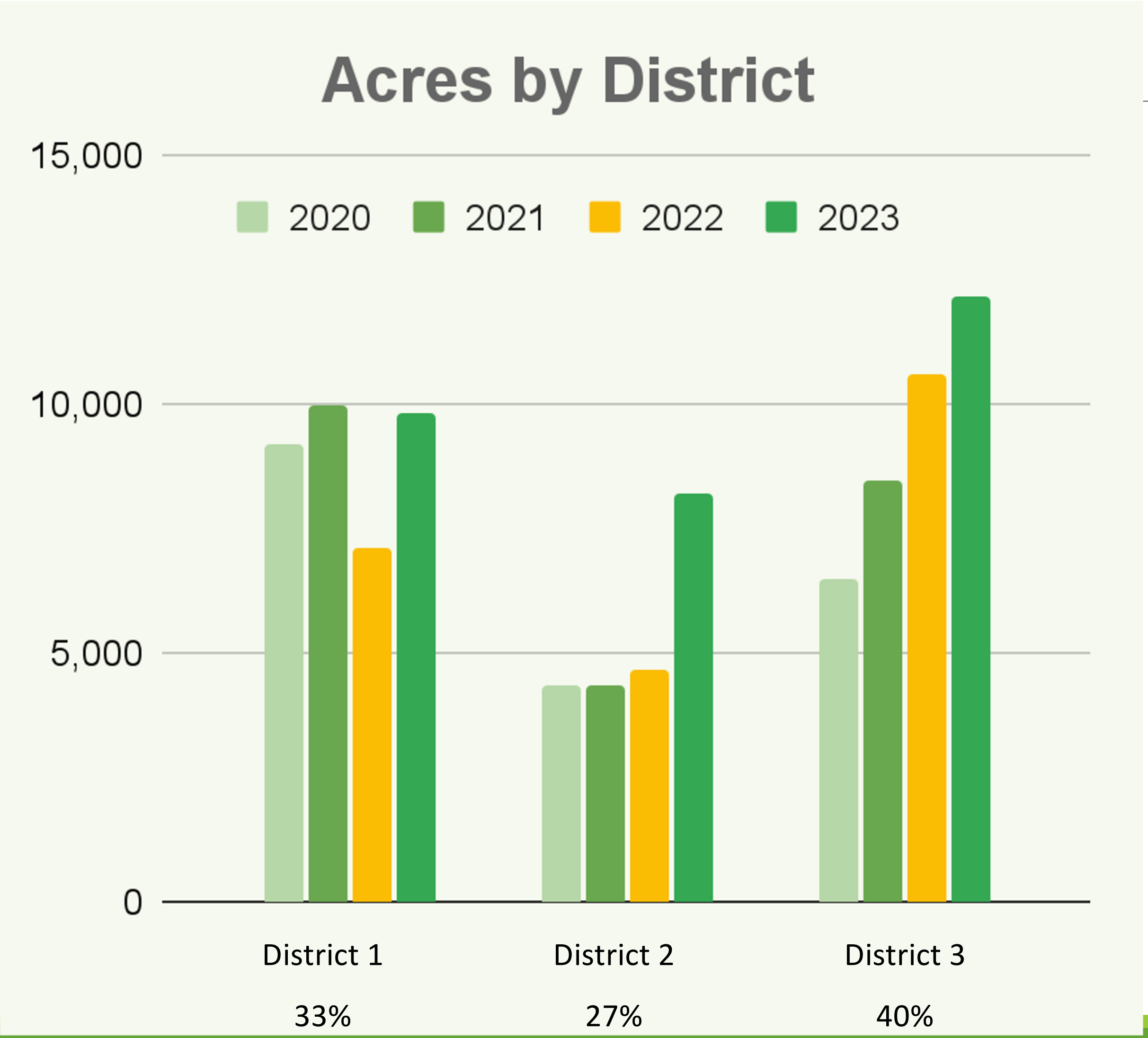

Gallons/Ton by Variety
50.00
40.00
30.00
20.00
10.00
0.00
2020
2021
2022
2023
Arbequina
Arbosana
Koroneiki
Others

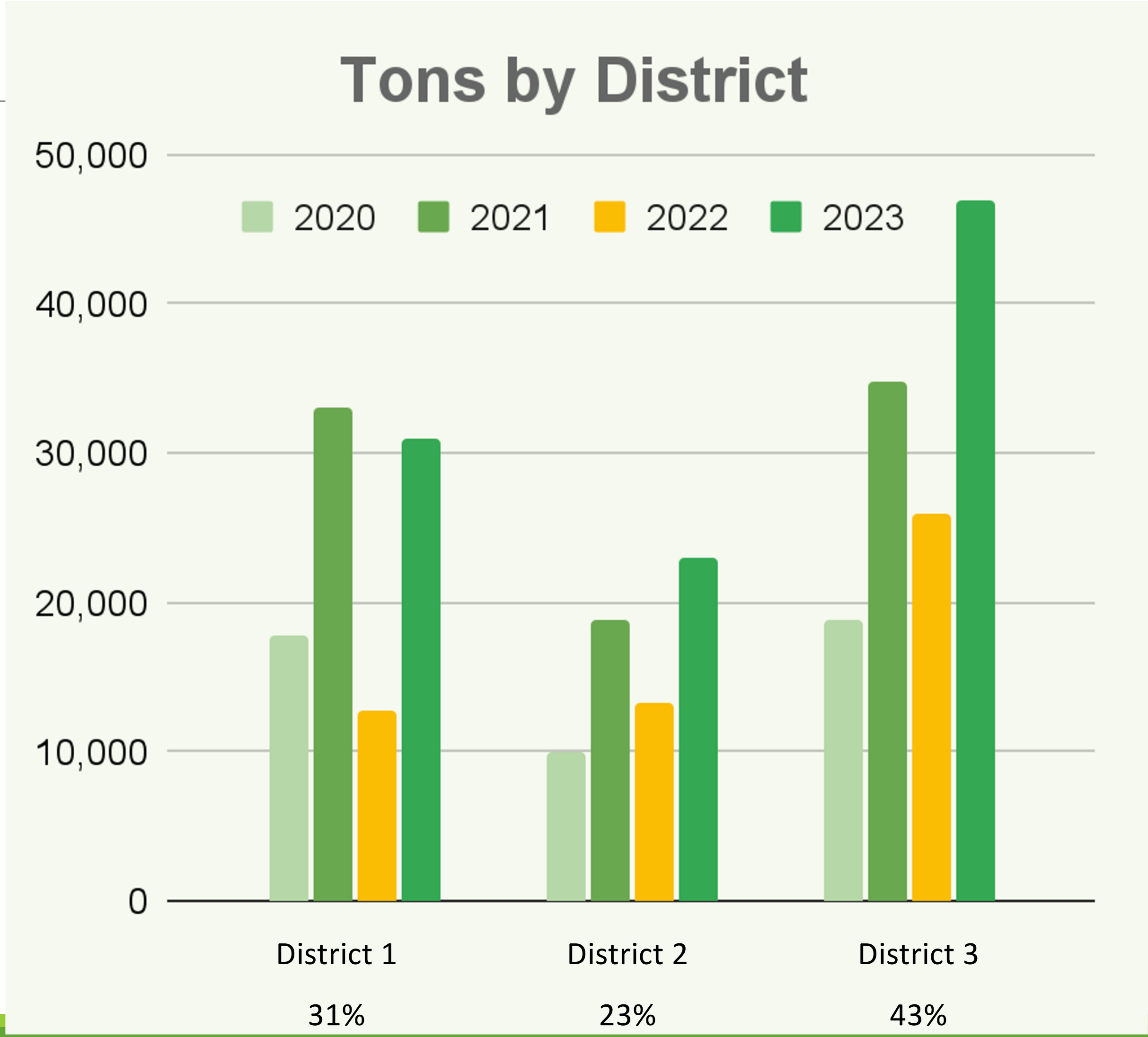

Gallons/Acre by Variety
200.00
150.00
100.00
50.00
0.00
2020
2021
2022
2023
Arbequina
Arbosana
Koroneiki
Others

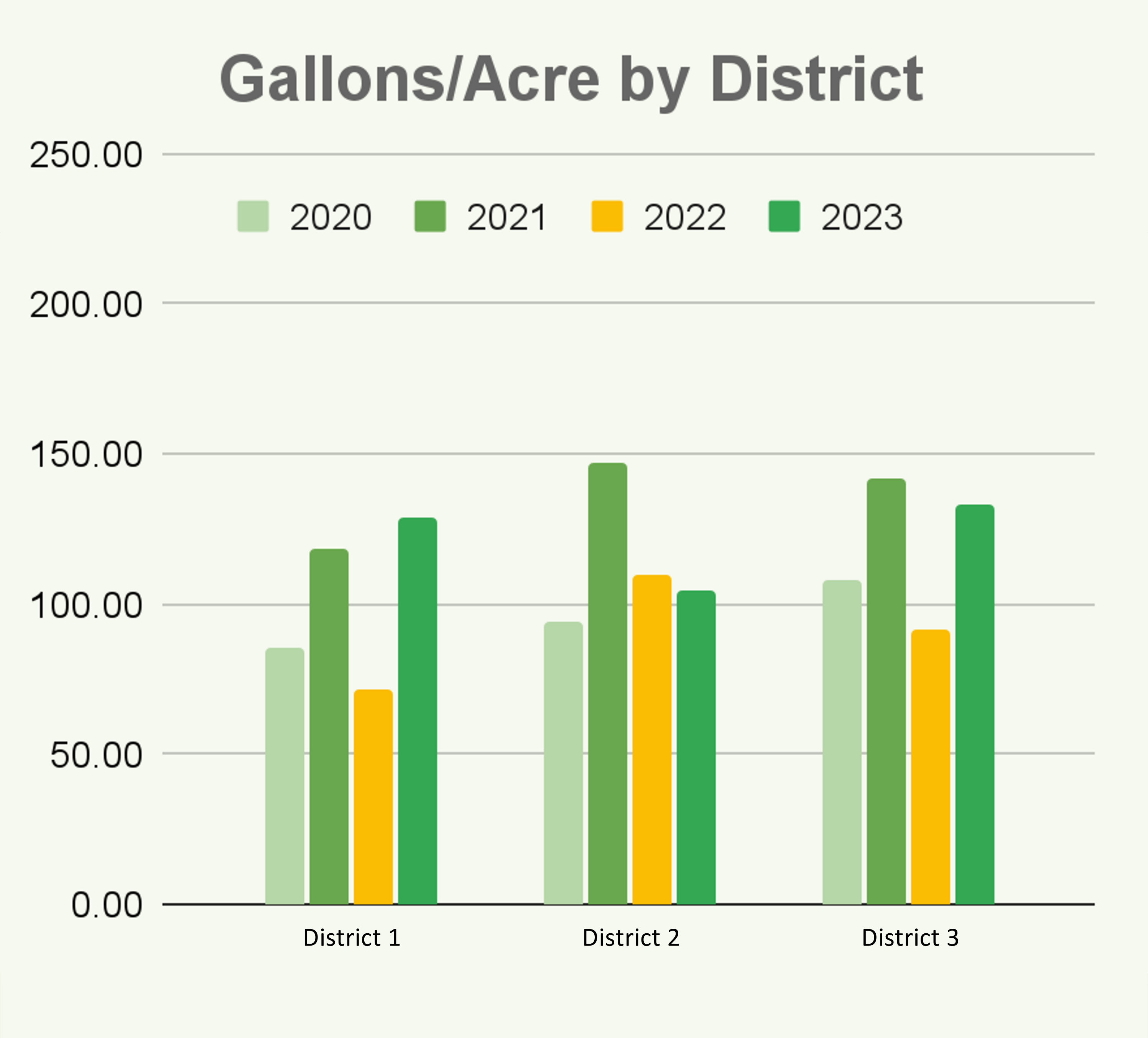
Breakdown by District


Gallons by District (millions)
2.00
1.50
1.00
0.50
0.00
2020
2021
2022
2023
District 1
District 2
District 3
34%
23%
43%

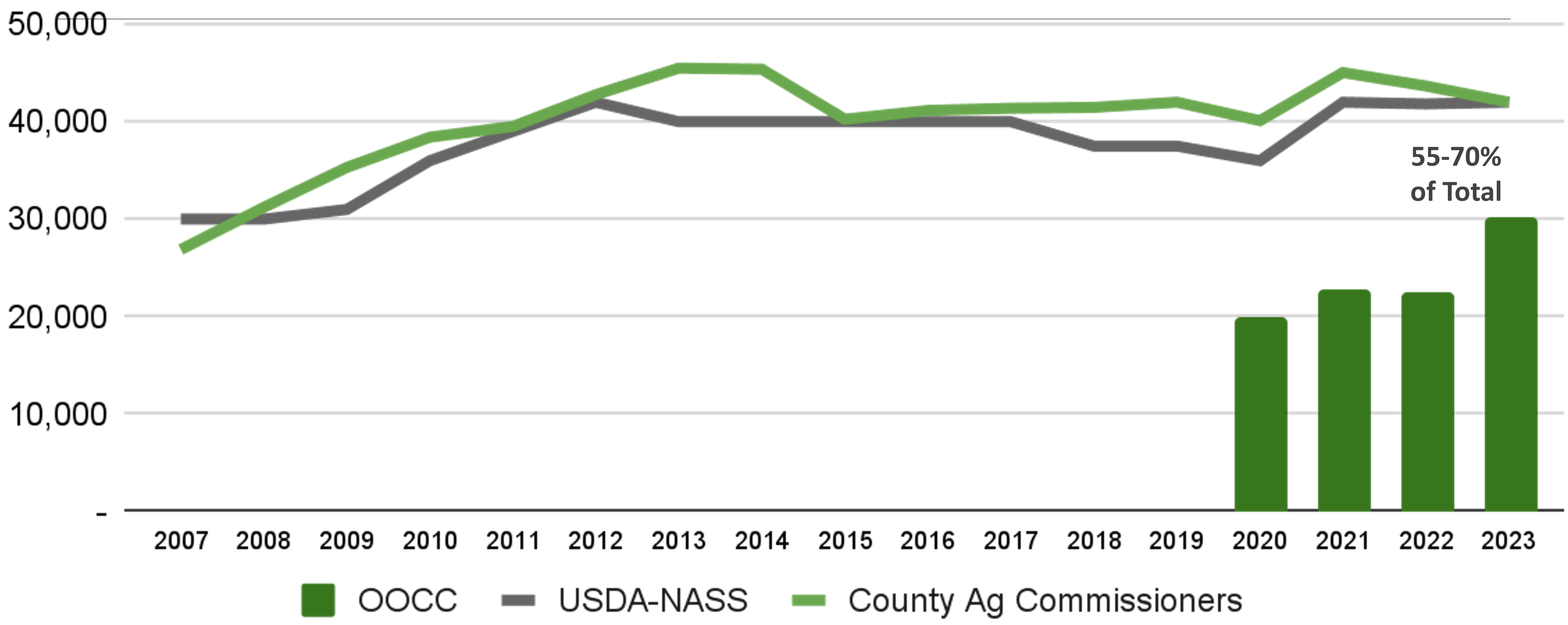

District 1
District 2
District 3
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
GLENN
BUTTE
SIERRA
NEVADA
LAKE
COLUSA
SUTTER
YUBA
PLACER
EL DORADO
Sacramento
YOLO
SONOMA
NAPA
SACRAMENTO
AMADOR
ALPINE
SOLANO
MARIN
CALAVERAS
SAN FRANCISCO
CONTRA COSTA
SAN JOAQUIN
TUOLUMNE
MONO
ALAMEDA
STANISLAUS
MARIPOSA
SAN MATEO
SANTA CLARA
MERCED
MADERA
SANTA CRUZ
FRESNO
SAN BENITO
INYO
MONTEREY
TULARE
KINGS
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
Los Angeles
ORANGE
RIVERSIDE
SAN DIEGO
IMPERIAL


Acres by District
15,000
10,000
5,000
0
2020
2021
2022
2023
District 1
District 2
District 3
33%
27%
40%


Tons by District
50,000
40,000
30,000
20,000
10,000
0
2020
2021
2022
2023
District 1
District 2
District 3
31%
23%
43%


Gallons/Acre by District
2020
2021
2022
2023
250.00
200.00
150.00
100.00
50.00
0.00
District 1
District 2
District 3

California Olive Acreage History



Acres in 2023 estimated for USDA/County Ag Commissioners

Organic Production

2022

Variety	# Entities	Acres	Tons	Gallons
Arbequina	9	412	934	28,714
Arbosana	9	639	1,456	50,386
Koroneiki	8	286	670	21,009
Other/Undetermined	28	114	213	8,098
Grand Total	**54**	**1,451**	**3,273**	**108,207**

Organic: Percent of Total, 2022

Variety	# Entities	Acres	Tons	Gallons
Arbequina	17%	3%	3%	3%
Arbosana	17%	14%	10%	9%
Koroneiki	15%	13%	19%	15%
Other/Undetermined	52%	6%	5%	5%
% of all Production	**28%**	**6%**	**6%**	**5%**

2023

Variety	# Growers	Acres	Tons	Gallons
Arbequina	7	829	2,341	83,553
Arbosana	5	253	1,155	35,889
Koroneiki	6	252	762	30,693
Other/Undetermined	75	158	335	8,708
Grand Total	**93**	**1,492**	**4,593**	**158,843**

Organic: Percent of Total, 2023

Variety	# Growers	Acres	Tons	Gallons
Arbequina	6%	4%	4%	3%
Arbosana	9%	6%	6%	5%
Koroneiki	13%	7%	8%	9%
Other/Undetermined	53%	5%	4%	3%
% of all Production	**35%**	**5%**	**5%**	**4%**

Grower Reporting by District & Variety

# Reported Growers	2020	2021	2022	2023
District 1	33	36	23	34
District 2	28	51	39	148
District 3	55	80	134	83
Total	**116**	**167**	**196**	**265**

# Reported Growers	2020	2021	2022	2023
Arbequina	80	102	89	119
Arbosana	55	57	56	55
Koroneiki	23	35	34	45
Other Varieties	22	70	112	141

Other Varieties
(In order of acres)

Mission/Manzanillo/Sevilliano
Picual
Lecciana
Sikitita

What’s next

- Online, interactive reports - coming March 2024
- Surveys for orchard age, density
- Evaluate returns on industry investment
- Additional data or reports?

OLIVE OIL
COMMISSION
OF CALIFORNIA

UC Davis Olive Center What's Going on at the Center?

JAVIER FERNANDEZ SALVADOR, UC DAVIS OLIVE CENTER

UC DAVIS Olive Center

The UC Davis Olive Center: 2024 Update

Olive Center Team

Javier Fernandez-Salvador, Ph. D

- Executive Director UC Davis Olive Center
- Agronomist, Berry, and Tree Fruit Physiology
- 5+ years as Assistant Professor Extension - OSU

Adele Amico Roxas, Ph. D

- Associate Program Director UC Davis Olive Center
- Tree Fruit Physiologist

Who We Are

The UC Davis Olive Center is a self-supporting education and research coalition formed with our table and olive oil industry supporters that is building **<u>California's crop of the future.</u>**

Our Mission

The Olive Center's mission focuses on three main areas:

- **Providing table and olive oil education and research opportunities for growers, millers, industry members, and the general public.**

Olive Center Educational Programing for 2023

UC DAVIS Olive Center

Olive Center Educational Programing for 2024

UC DAVIS Olive Center

Strategies for Nitrogen Management in Olives - Workshop


Photo credit: John Boyer

In this half day workshop our main guest instructor Prof. Arnon Dag will go over his research and findings of multiple years of nitrogen management in Olives. We will also cover the research behind using reclaimed wastewater and milling residues for fertility management, our current research and latest findings in compost and nitrogen applications in California, and lessons learned with cover crop and organic management research.

Friday March 22nd, 2024
9:00 a.m. – 12:30 p.m.

Location: UC Davis Olive Center at the RMI Sensory building
Silverado Vineyards Sensory Theater
392 Old Davis Road, Davis CA 95616

Event information and registration:
https://registration.ucdavis.edu/Item/Details/1103

UC DAVIS

For more information, please contact:
adamicoroxas@ucdavis.edu

UC DAVIS Olive Center

Olive Fly Management Workshop


Photo by Cindy Kron

Olive fly *(Bactrocera oleae)* can have a devastating effect on olive oil quality. This workshop is aimed at producers who want to learn how to manage olive fly in their orchards. We will cover the biology of the pest, its history in California, how to monitor for its presence, different control strategies used in both organic and conventional orchards, the effects of olive fly damage on the oil, and how to assess and deal with it. This workshop will be practical and interactive sharing on-the-ground experience managing this pest in California.

Location:
UC Davis Olive Center at the RMI Sensory building
Silverado Vineyards Sensory Theater
392 Old Davis Road, Davis CA 95616

Friday April 5th, 2024
9:00 a.m. – 12:00 p.m.

Event information and registration:
https://registration.ucdavis.edu/Item/Details/1129

UC DAVIS

For more information, please contact:
adamicoroxas@ucdavis.edu

Olive Center Educational Programing for 2024

UCDAVIS Olive Center

First International Olive Sustainability Conference

September 5-7, UC Davis Conference Center

Join us in this three-day event to learn from our California and International experts on:

- Latest advances in regenerative agriculture, habitat and resource conservation, efficient water and nutrient use, and climate adaptation.
- Circular economies in olive systems.
- Efficiencies in milling, use of residues and value-added for olive pomace.
- Precision Agriculture and alternative energy use in mills and orchards.
- Carbon credits and regulation.
- Economic models and market analysis for sustainable olive production
- Health, sensory and culinary applications for olive oil
- And many more topics!

UNIVERSIDADE DE ÉVORA

Universidad de Jaén

UNCUYO UNIVERSIDAD NACIONAL DE CUYO

UCDAVIS

Questions? Email us at oliveconference@ucdavis.edu

For more information regarding the event visit: https://olivecenter.ucdavis.edu/

Sponsors

CALIFORNIA OLIVE RANCH

CORTO
a NEW WORLD of FRESH

COBRAM ESTATE

Sciabica Family
CALIFORNIA OLIVE OIL & GOURMET FOODS

OLIVINO

INTERNATIONAL OLIVE COUNCIL

PIERALISI
CIRCULAR THINKING

Opportunities for Sponsorship available!

Research

- Cultivar Evaluation in SHD System.
  Giulia Marino's Lab and UC Davis Olive Center
- Nitrogen and compost management
  Andrew J Curtright and Xia Zhu Barker
- Pruning Research In SHD Systems
  Becky Wheeler-Dykes and Richard Rosecrance
- Biostimulants (industry collaboration)
- Table olive modern acreage (industry collaboration)

Assessing the Chemical and Sensory Quality Attributes of Extra Virgin Olive Oils Available in Retail Markets

UC DAVIS
Olive Center

What is the main objective of the project conducted by the UC Davis Center?

- To evaluate the chemical and sensory characteristics of California-grown and imported olive oils labeled as extra virgin in the U.S. retail market.
- This research initiative aims to assess the QUALITY of these oils and provide a comprehensive review of the most widely distributed extra virgin olive oil brands in the US retail market, building on previous studies conducted by the UC Davis Olive Center.
    - Fatty Acids (free)
    - DAG (Isomeric Diacylglycerols)
    - Peroxide Value
    - Pyropheophytines (PPPs)
    - UV Specific Extinction (Δ K; K232; K270)

How will the research project evaluate the quality of extra virgin olive oils in the U.S. market?

This evaluation will involve multiple considerations, such as:

- Sampling locations
- Retail stores with comprehensive nation-wide brand distribution
- Differences in oil origin and price
- Samples will be analyzed at an independent, accredited lab and sensory panel

➢ The project will utilize expert-led analyses, blind coding of samples, and compliance testing to ensure adherence to domestic and international standards.

Our Mission

The Olive Center's mission focuses on three main areas:

- Providing table and olive oil education and research opportunities for growers, millers, industry members, and the general public.
- **Training and educating students, growers, and producers in the industry and providing support and conducting research in all areas of olive production.**

OLEA LEARN: Student Apprentice Professional Training

This year we are launching a training and education program for students through mentor and apprenticeship opportunities, in collaboration with industry to cover all the aspects of table and olive oil production including consulting, project development, and research

UCDAVIS
Olive Center

Program Supporters

CORTO
a NEW WORLD of FRESH

CŎBRAM ESTATE

INFACO
www.infaco-usa.com

Olica

OLIVINO

XPRESSFILL
FILL YOUR PASSION

FELCO
SWISS MADE

Sciabica Family
CALIFORNIA OLIVE OIL & GOURMET FOODS

SÉKA HILLS

NEW HOLLAND
AGRICULTURE

PIERALISI
CIRCULAR THINKING

OLEA LEARN: Student Apprentice Professional Training

- **Goal**: train and produce a well-mentored pool of students that will be available to the industry and the olive workforce once they've completed their training.
- Students can gain experience with olive orchard maintenance and research, data collection, harvesting, milling, bottling, marketing, and more.

OLEA LEARN

UC DAVIS Olive Center

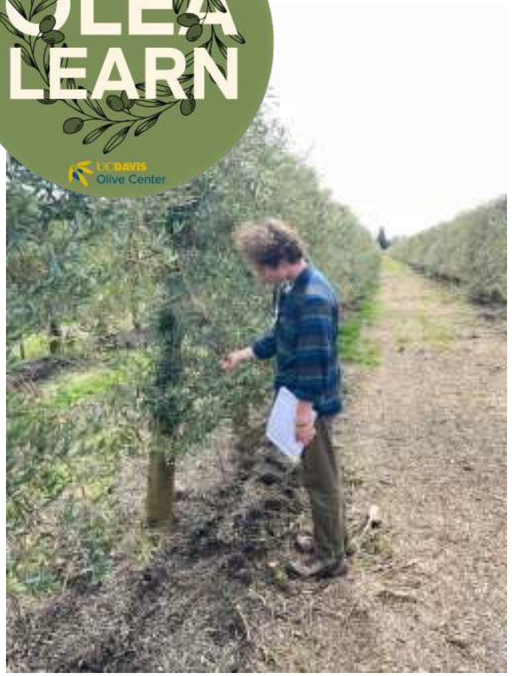


OLEA LEARN

UC DAVIS Olive Center


OLEA LEARN

UC DAVIS Olive Center



Our Mission

The Olive Center's mission focuses on three main areas:

- Providing table and olive oil education and research opportunities for growers, millers, industry members, and the general public.
- Training and educating students, growers, and producers in the industry providing support and conducting research in all areas of olive production.
- **Producing and marketing the UC Davis Brand through our campus-grown Olive Oil, including managing the Olive Research Orchards at the historical Wolfskill ranch, and milling and bottling our fruit in collaboration with industry.**









UC Davis Wolfskill Experimental Orchard, 4334 Putah Creek Rd, Winters, CA 95694 cebook: @UCDavis.OliveCenter Twitter: @UCDOliveCenter Instagram: @ucdavisolivecente

Website: https://olivecenter.ucdavis.edu

#olivecenter

#ucdavisolivecenter

UC **DAVIS**
Olive Center

Contact Adele Amico Roxas, Ph.D. **at**
adamicoroxas@ucdavis.edu

Contact **Javier Fernandez-Salvador, Ph.D.** at
jfernandezsalvador@ucdavis.edu

Thank You!

Strategies for Nitrogen Management in Olives - Workshop

UC DAVIS Olive Center

In this half-day workshop, our main guest instructor Prof. Arnon Dag will go over his research and findings of multiple years of nitrogen management in Olives. We will also cover the research behind using reclaimed wastewater and milling residues for fertility management, our current research and latest findings in compost and nitrogen applications in California, and lessons learned with cover crop and organic management research.

Friday March 22nd , 2024
9:00 a.m. – 12:30 p.m.

Location: UC Davis Olive Center at the RMI Sensory Building
Silverado Vineyards Sensory Theater
392 Old Davis Road, Davis CA 95616

Event information and registration:
https://registration.ucdavis.edu/Item/Details/1103

UC DAVIS

For more information, please contact
adamicoroxas@ucdavis.edu

AOOPA Update

KIMBERLY HOLDING, AOOPA

American Olive Oil Producers Association

Advocating for US Olive Oil Producers & Supporting Industry Growth

Olive Oil Standard of Identity (SOI)

Olive Crop Insurance Program Updates for 2024 Crop Year

- Allowing contract pricing on oil type olives
- Expanding coverage for oil type olives to Kerns, Kings, and Merced counties in California
- Updating the oil conversion factors and adding an additional variety to the oil conversion factor table

AOOPA Awarded Two CDFA Grants for Olive Oil Producers

- **CDFA Pollinator Habitat Grant** - $2M to establish various on-farm pollinator habitats (2023-2026)
- **CDFA Healthy Soils Program Block Grant Pilot** - $2.49M to implement conservation management that improve soil health, sequester carbon and reduce greenhouse gas (GHG) emissions. (2023-2027)

Climate Smart Agriculture Research

- Annual funding for smart climate agriculture research by USDA Agriculture Research Service (ARS)
  - Funding Since FY22: $1.5M

Engage Congress and US Government Agencies on Important Olive Oil Policy Issues

US Olive Oil Policy Opportunities

Olive Crop Insurance - 2024 Priorities

- Tighten up harvest/freight cost in Contract Price Option
- Add Riverside and Imperial counties
- Add Contract Pricing for Organic Olives for Oil
- Update Gallons conversion chart for all varieties, especially new varieties
- Add an Option to chose coverage for gallons or tons to align with industry trends

Climate Smart Agriculture Funding

Olive Oil Inclusive Policy & Programs

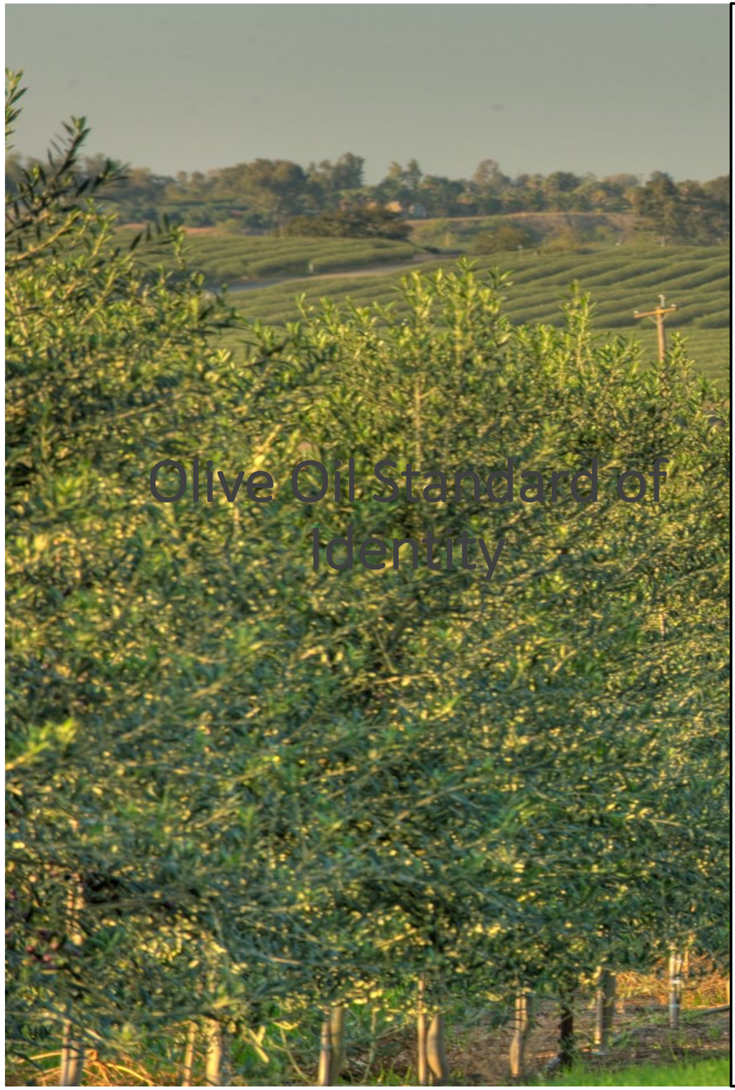
Farm Bill

Food Is Medicine – HHS Summit (Diet Related Health Cost > $1.1 Trillion)

- Food Access
- Additional Nutrition Education for Doctors and in Schools
- Food Quality & Sustainability

Olive Oil Standards

- National Standard - SOI
- International Standard - Codex



Olive Oil Standard of Identity

What is a Standard of Identity (SOI)?

- An SOI is established by U.S. Food and Drug Administration (FDA) to protect consumers
  - Describes in detail what a food must contain and/or what is optional
  - It can specify a method of production or formulation

What has been proposed by AOOPA, Deoleo, and NAOOA in the Olive Oil SOI Petition?

- Clear definitions, grades, and physico-chemical and sensory parameters for extra virgin olive oil, virgin olive oil, olive oil, and other grades.
- Labeling guidelines

What will an Olive Oil SOI do in the US Market?

✓ Create an Enforceable Standard that Applies to ALL Olive Oil Regardless of Origin

✓ Establish an Olive Oil Standard that Provides Consumer Protection

✓ Provide an Olive Oil Standard that Safeguards the value of Extra Virgin Olive Oil

✓ Close the Price Gap Between Authentic US EVOO and Imported EVOO

✓ California Maintains the Highest Global Standard = Premium Value for California Extra Virgin Olive Oil

- AOOPA and Co-Petitioners continued to engage FDA as they review proposed standard
  - Est. Timeline: 18-24 months

Thank You

Join AOOPA
CDFA Pollinator Habitat Grant &

CDFA Healthy Soils Program Block Grant Pilot

Information Session

@

1:00 -1:30 pm

Kimberly Houlding, President and CEO
khoulding@aoopa.org

Or

Jacqueline Nakashian, Grant Coordinator
industryrelations@aoopa.org

Sign up for AOOPA Newsletter
www.aoopa.org
559-940-6878

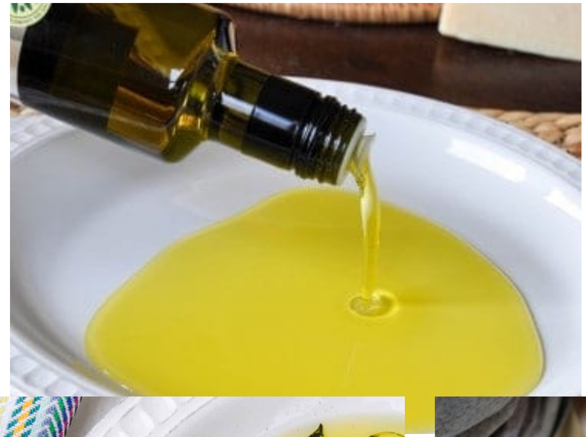
COOC Update

DAVID GARCI- AGUIRRE- CORTO

CALIFORNIA
OLIVE OIL COUNCIL
EST. 1992

California Olive Oil Council

Olive Oil Day March 7, 2024

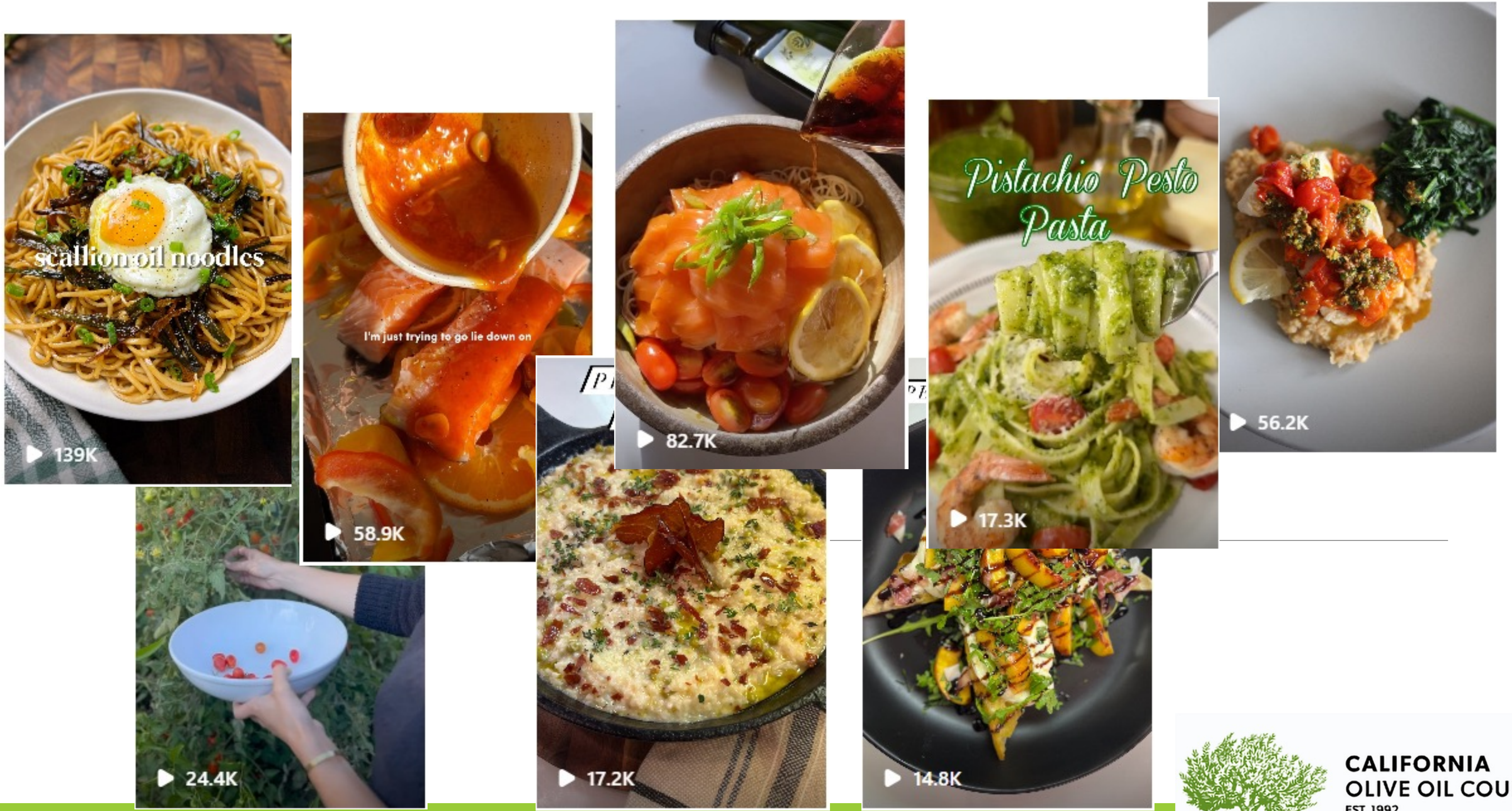






CALIFORNIA
OLIVE OIL COUNCIL
EST. 1992

4 Influencer Focused "Cookalong" Events



CALIFORNIA
OLIVE OIL COUNCIL
EST. 1992

24 Influencer Partnerships

Combined following of over 1.1 million people

Over 10 COOC Seal Certified Member Oils Featured

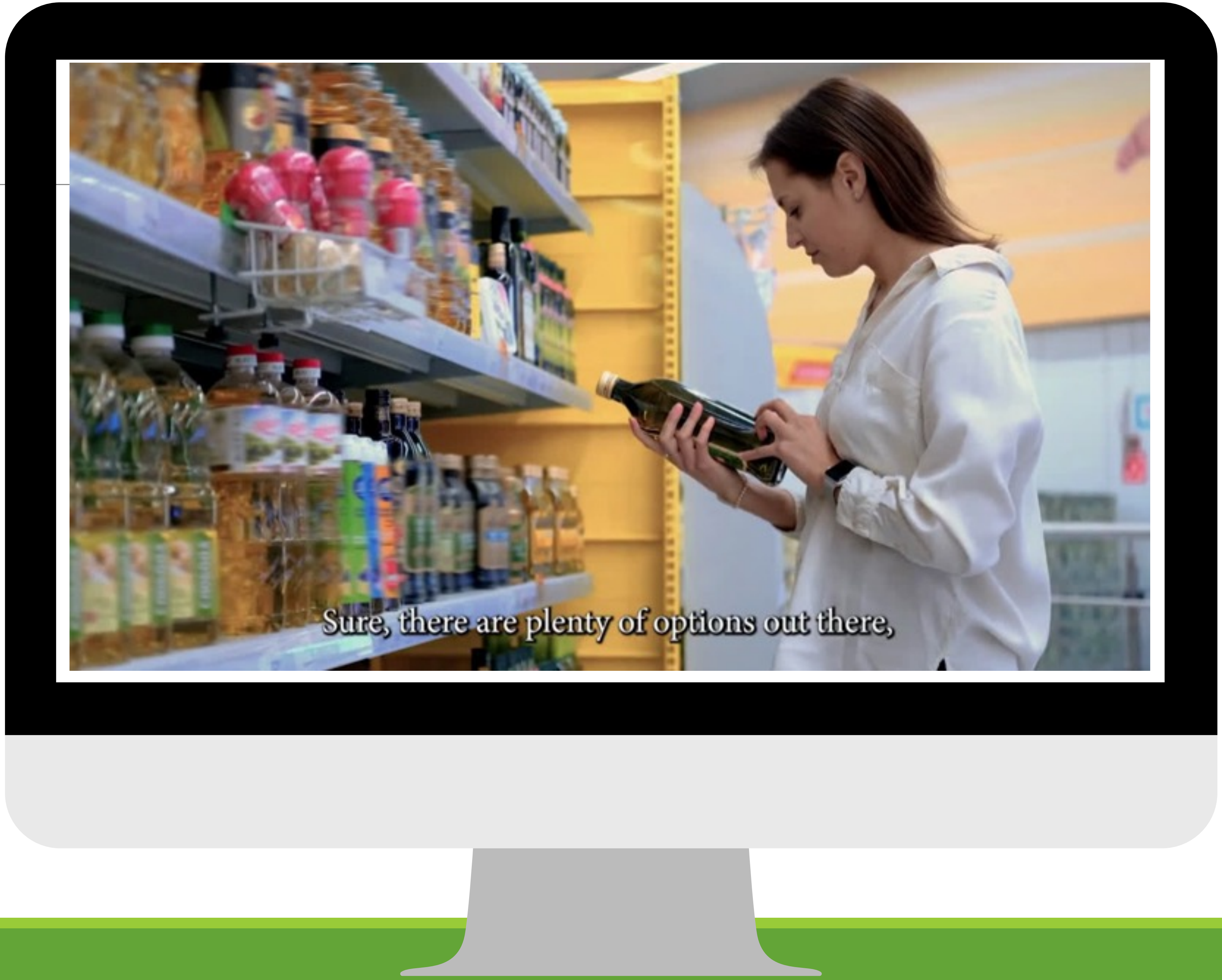
Over 130 posts on IG/FB

Combined reach of over 544,538 people

Combined COOC IG/FB following of 8k

5 Videos-3 Completed Focused On:

- Harvest
- EVOO Intensities
- Nutritional Benefits



Virtual Tasting Kit for use in PR activities:

- Publications
- Influencers
- Education

COOC OLIVE OIL TASTING

@californiaevoo www.cooc.com

A

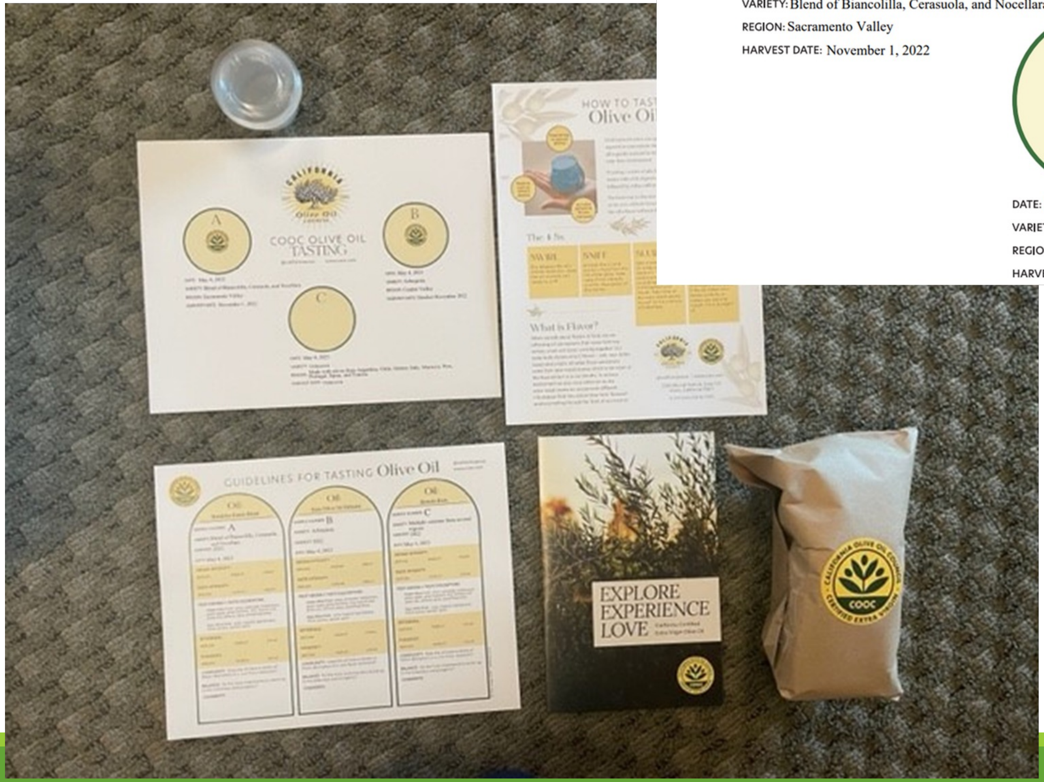
DATE: May 4, 2023
VARIETY: Blend of Biancolilla, Cerasuola, and Nocellara
REGION: Sacramento Valley
HARVEST DATE: November 1, 2022

B

DATE: May 4, 2023

C

DATE: May 4, 2023
VARIETY: Unknown
REGION: Made with olives from Ar[...] Portugal, Spain, and Tunis[...]
HARVEST DATE: Unknown



HOW TO TASTE Olive Oil

Tapered top to capture aromas

Room to swirl to release aromas

Rounded bottom to fit into one hand

Professional tasters use specially-made blue glasses that are tapered to concentrate the oil's aroma. The glass is covered and the oil is gently warmed to 82°. It is important to evaluate the oil in an odor-free environment.

If tasting a series of oils, be prepared to clean your palate between tastes with a bit of green apple (preferably Granny Smith) followed by either still or sparkling water.

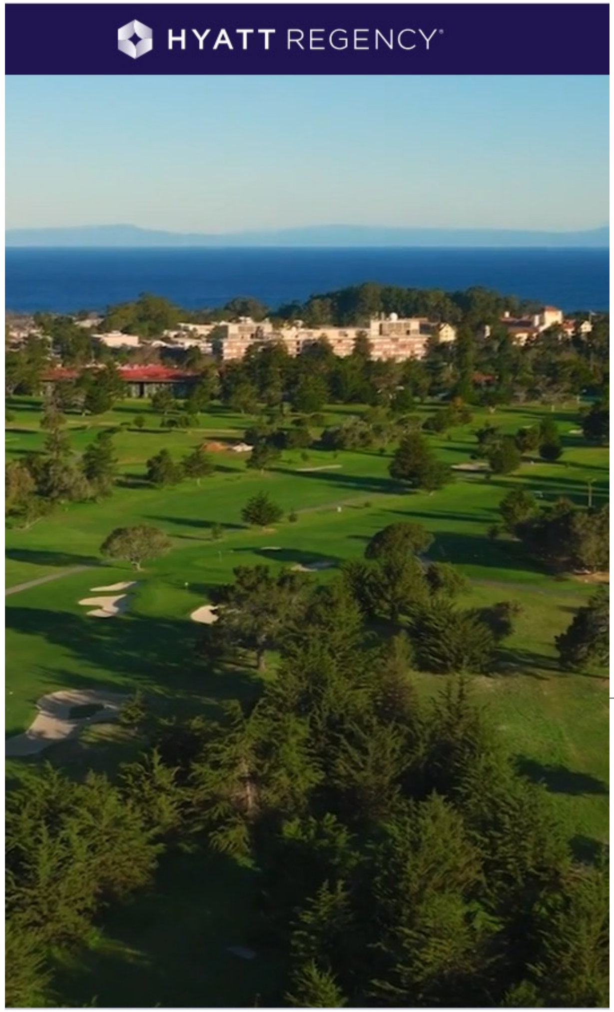
The best way to discover an oil's flavor is to sip it "neat" – meaning on its own without bread or other food. This will allow you to savor the oil's flavor without distraction.

The 4 Ss

SWIRL	SNIFF	SLURP	SWALLOW
this releases the oil's aroma molecules. Keep the oil covered until ready to sniff.	uncover the oil and quickly inhale from the rim of the glass. Take note of the intensity and the description of the aroma.	take a small sip of the oil while also "sipping" some air. This slurping action emulsifies the oil and helps to spread it throughout your mouth. Take note of the retro-nasal aroma as well as the intensity of bitterness.	an oil's pungency is judged by sensation in your throat so you much swallow at least a small amount to thoroughly evaluate it. If the oil makes your throat scratchy or makes you want to cough, it is a pungent oil.

What is Flavor?

Stay Tuned…



SAVE *the* DATE

CALIFORNIA OLIVE OIL COUNCIL
ANNUAL MEMBER MEETING

A BRIGHT FUTURE FOR CALIFORNIA EXTRA VIRGIN OLIVE OIL

MARCH | 15-17 | 2024

Hyatt Regency Monterey Hotel And Spa
1 Old Golf Course Rd, Monterey, CA 93940

Ticket Price: $600 for 1 ticket, $900 FOR 2 TICKETS

Link to Book Your Room (please reserve your room no later than Wednesday, February 7th):

https://www.hyatt.com/en-US/group-booking/MRYDM/G-CA23

OOCC Survey

8 Minutes

Olive Oil Day Survey

SCAN THE QR CODE ON THE TABLES AT LUNCH