CALIFORNIA

RIPE OLIVES

ENJOYED BY FAMILIES EVERYWHERE

CALIFORNIA OLIVE COMMITTEE

FULL COMMITTEE MEETING

Tuesday, December 11, 2018
10:00 a.m.
Double Tree Hotel • Sonoma Room • Modesto, CA

CALIFORNIA OLIVE COMMITTEE

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AGENDA

I. CALL TO ORDER

A. Roll Call – Confirmation of Quorum & Members who can vote
B. Approval of 6-13-18 Full Committee Minutes (action item)
C. Chairman's Comments

II. MARKETING SUBCOMMITTEE

A. Review 2018
B. Presentation of 2019 Plan & Budget
C. Approval of 2019 Plan & Budget (action item)
D. Delegation of Authority from the Committee to the Executive Director with oversight by the Chairman for inter-item transfers of the marketing budget (action item)

III. INSPECTION SUBCOMMITTEE

A. Review of 2018
B. Approval of 2019 Inspection Budget (action item)
C. Delegation of Authority from the Committee to the Executive Director with oversight by the Chairman for inter-item transfers of the inspection budget (action item)

IV. EXECUTIVE SUBCOMMITTEE

A. Review of 2018 Budget
B. Approval of 2019 Administrative Budget (action item)
C. Recommend to the Committee to improve USDA Section 8E of ripe olives imports not to exceed $150,000. (action item)
D. Delegation of Authority from the Committee to the Executive Director with oversight by the Chairman for inter-item transfers of the administrative budget (action item)
E. Delegation of Authority from the Committee to the Executive Director with oversight by the Chairman to obtain legal counsel for employee personnel matters (action item).
F. Delegation of Authority from the Committee to approve the use of legal counsel should one be needed with approval from the USDA. (action item)

V. **RESEARCH SUBCOMMITTEE**

A. Review 2018
B. Proposals of 2019 Projects
C. Approval of 2019 Research Budget (action item)
D. Delegation of Authority from the Committee to the Subcommittee to approve contingency fund (action item)
E. Delegation of Authority from the Committee to the Executive Director with the oversight by the Chairman for inter-item transfers of the research budget (action item)

VI. **REVIEW OF FISCAL 2019 BUDGET**

A. Approval 2019 Fiscal Budget (action item)
B. Approval 2019 Assessment Rate (action item)

VII. **OTHER BUSINESS**

VIII. **ADJOURNMENT**

CALIFORNIA OLIVE COMMITTEE

June 1, 2017 – May 31, 2019

PRODUCERS

DISTRICT #1 (Counties of Alpine, Tuolumne, Stanislaus, Santa Clara, Santa Cruz all counties north thereof)

Members	Alternates
Pablo Nerey	Carolina Burreson
Ed Curiel	Michael Silveira
Edward Garcia	Chris Henderson

DISTRICT #2 (Counties of Mono, Mariposa, Merced, San Benito, Monterey, and all counties south thereof)

Members	Alternates
Mark Hendrixson	Julia Inestroza
Mark Heuer	Bert Quezada
Rick Benson	Joan Whelan-Vanderhorst
Pat V. Ricchiuti	Galen Pfeiffer
Vito DeLeonardis	John Patterson

HANDLERS

Members	Alternates
Colleen Morris	Sergio Mendez
Tim T. Carter	Vacant
Jacob Peters	Vacant
Julia Tinsley	Phil Quigley
Janet Edwards	John Pieretti
Felix Musco	Vacant
Bill McFarland	Tracy Wood
Dennis Burreson	Scott Hamilton

CALIFORNIA OLIVE COMMITTEE

Full Committee Meeting Minutes
Wednesday, June 13, 2018
Double Tree Hotel – Modesto, CA

I. CALL TO ORDER

A meeting of the Full Committee was called to order by Mike SILVEIRA at 11:30 a.m., and the following members were present:

Members	Affiliation:
Mike SILVEIRA	GROWER
Sergio MENDEZ	BELL CARTER
Rick BENSON*	GROWER
Tim CARTER*	BELL CARTER
John PIERETTI	MUSCO
Carolina BURRESON*	GROWER
Edward GARCIA*	GROWER
Felix MUSCO*	MUSCO
Julia TINSLEY*	BELL CARTER
Jacob PETERS*	BELL CARTER
Bert QUEZADA	GROWER
Colleen SPARDA*	BELL-CARTER
Janet EDWARDS*	MUSCO
Ed CURIEL*	GROWER
Dennis BURRESON*	MUSCO
Bill MCFARLAND*	MUSCO
Mark HENDRIXSON*	GROWER
Galen PFEIFFER*	GROWER
Vito DELEONARDIS*	GROWER
Mark HEUER*	GROWER

Others Present:	
Alexander OTT	COC
Todd SANDERS	COC
Liza RAMON	COC
Peter SOMMERS	USDA
Adin HESTER	OLIVE GROWERS COUNCEL
Allison GREGG	SAMPSON, SAMPSON & PATTERSON, LLP
Elizabeth BROWN	COC
Daniel CASARES	USDA
Brenda HILL	NASS

Chris MESSER	NASS
Ed MILANESIO	GROWER
Michael HARUNTINIAN	USDA

*Denotes voting members for the Committee

With the appropriate number of members in attendance and the seating of an alternate member, a quorum was established.

MOVED by Dennis BURRESON, duly seconded by Rick BENSON, and unanimously carried THAT Tim Carter be nominated as Secretary/Treasurer. (Motion 6.13.18 #1)

MOVED by Rick BENSON, duly seconded by Bill MCFARLAND, and carried THAT the minutes of the 12-13.17 Full Committee meeting be approved. (6.13.18 #2)

MOVED by Mark HENDRIXSON, duly seconded by Rick BENSON, and carried THAT the Committee adopt modern means of communication methods, as outlined in the Federal Register Vol. 83, No. 96, to conduct Committee meetings. (6.13.18 #3)

II. MARKETING SUBCOMMITTEE

In November of 2017, the Subcommittee approved the 2018 marketing plan presented by Fleishman Hillard. The plan featured various activities including:

- Media Partner
- Media Engagement
- Asset Development
- Social Media
- Website
- Retail
- Industry Communication
- NYC Activation
- Influencer Activation

Shelly Kessen from Fleishman-Hillard presented a brief progress summary on the 2018 COC marketing activities. The presentation is also available in the meeting packet.

III. INSPECTION SUBCOMMITTEE

Each year the United States Department of Agriculture (USDA) provides the industry with an update on import inspection and inspection fees. Daniel CASARES from USDA provide information on the 2017-2018 import inspection and inspection fees. Additionally, a report on imported olives was also provided.

MOVED BY Mark HEUER, duly seconded by Bill MCFARLAND, and unanimously carried THAT the Committee adopt the 2018-2019 Incoming & Outgoing Inspection Requirements. (Motion 6.13.18 #4)

IV. REVIEW CROP ESTIMATES

MOVED BY Mark HEUER, duly seconded by Mark HENDRIXSON, and unanimously carried THAT the staff send out a hard copy survey to calculate the crop estimate with the approval of the Chairman. (Motion 6.13.18 #5)

V. EXECUTIVE SUBCOMMITTEE

A representative from Sampson & Sampson has completed the California Olive Committee's 2017 fiscal audit. Allison GREGG, from Sampson & Sampson reviewed the audit to the Committee.

MOVED BY Mark HENDRIXSON, duly seconded by Julia TINSLEY, and unanimously carried THAT the Committee approve the 2017 FY audit. (Motion 6.13.18 #6)

Each year, the California Olive Committee (COC) must approved a Marketing Policy Statement. The Marketing Policy Statement (MPS) is an annual analysis of the industry that is used by the U.S. Department of Agriculture (USDA) to determine the effectiveness of the Federal Marketing Olive Order 932 and its relationship to the requirement established by the Agricultural Marketing Agreement Act.

MOVED BY Bill MCFARLAND, duly seconded by Mark HENDRIXSON, and unanimously carried THAT the Full Committee approve 2018-2019 amended Marketing Policy Statement. (Motion 6.13.18 #7)

Every year the California Olive Committee must approve the Annual Compliance Plan (ACP). The ACP describes compliance strategies, resources and activities for the current year. USDA requires that this program be established in order for the industry to comply with the Oder and regulations. Additionally, the ACP must be in place to provide the COC the procedures needed should violations be brought forward before the Committee.

On a side note, in 2010 USDA required the Committee to file an E-Compliance Plan. The compliance plan is a USDA template staff completes for the Committee. By 2011 USDA requested the Committee to approve both the completed E-Compliance Plan and ACP Plan. Although both plans are similar and duplicative, USDA has stated that both plans have to be brought before the Committee for approval.

MOVED by Mark HEUER, duly seconded by Julia TINSLEY, and unanimously carried THAT the Committee approve the 2018-2019 amended Annual Compliance Plan and E-Compliance Plan. (Motion 6.13.18 #8)

VI. RESEARCH SUBCOMMITTEE

In 2016 the Research Subcommittee funded various projects for 2017. The final research reports, in addition to the no cost extensions, are included in the meeting packet.

Researcher	Project	Amount Funded
Ferguson & Fichtner	Investigating Anti-Oxidant to Decrease the Leaf Abscission with Ethephon Application	$39,996
Wang	Investigation of chemical and biological formation of styrene in black ripe table olives	$51,350

Wang	Comprehensive nutritional analysis of California green and black ripe table olives	**$46,350**
Preece & Ferguson	Propagating Dwarfing Olive Rootstocks and Establishing a Long Term Orchard	**$35,442**
Adaskaveg	Epidemiology and management of olive knot caused by Pseudomonas savastanoi pv. savastanoi	**$18,900**
Lovatt & Fichtner	Managing Alternate Bearing in olive with PGRs and Pruning	**$23,845**
Rosecrance & Krueger	Canopy Management, Tree Hedging and topping to Optimize Yield	**$31,075**
Lightle	Preliminary field study to identify new olive fly control materials	**$19,647**
Simpson	Northern Fly Trapping	**$6,500**
Stewart	Southern Fly Trapping	**$6,333.33**

VIII. ADJOURNMENT

Chairman Mike Silveira adjourned the meeting at 12:18 p.m.

MOVED BY Bill MCFARLAND, duly seconded by Rick BENSON, and unanimously carried that the meeting be adjourned at 12:18 p.m. (6.13.18 #9)

June 14, 2018 — Liza Ramon

Date: June 14, 2018 — Liza Ramon, California Olive Committee

SUMMARY OF MOTIONS FOR JUNE 13, 2018

Motion 6-13-18 #1 **APPROVED**

MOVED by Dennis BURRESON, duly seconded by Rick BENSON, and unanimously carried THAT Tim Carter be nominated as Secretary/Treasurer.

Motion 6-13-18 #2 **APPROVED**

MOVED by Rick BENSON, duly seconded by Bill MCFARLAND, and carried THAT the minutes of the 12-13.17 Full Committee meeting be approved.

Motion 6-13-18 #3 **APPROVED**

MOVED by Mark HENDRIXSON, duly seconded by Rick BENSON, and carried THAT the Committee adopt modern means of communication methods, as outlined in the Federal Register Vol. 83, No. 96, to conduct Committee meetings.

Motion 6-13-18 #4 **APPROVED**

MOVED BY Mark HEUER, duly seconded by Bill MCFARLAND, and unanimously carried THAT the Committee adopt the 2018-2019 Incoming & Outgoing Inspection Requirements.

Motion 6-13-18 #5 **APPROVED**

MOVED BY Mark HEUER, duly seconded by Mark HENDRIXSON, and unanimously carried THAT the staff send out a hard copy survey to calculate the crop estimate with the approval of the Chairman.

Motion 6-13-18 #6 **APPROVED**

MOVED BY Mark HENDRIXSON, duly seconded by Julia TINSLEY, and unanimously carried THAT the Committee approve the 2017 FY audit.

Motion 6-13-18 #7 **APPROVED**

MOVED BY Bill MCFARLAND, duly seconded by Mark HENDRIXSON, and unanimously carried THAT the Full Committee approve 2018-2019 amended Marketing Policy Statement.

Motion 6-13-18 #8 **APPROVED**

MOVED by Mark HEUER, duly seconded by Julia TINSLEY, and unanimously carried THAT the Committee approve the 2018-2019 amended Annual Compliance Plan and E-Compliance Plan.

Motion 6-13-18 #9 **APPROVED**

MOVED BY Bill MCFARLAND, duly seconded by Rick BENSON, and unanimously carried that the meeting be adjourned at 12:18 p.m.

*******ACTION REQUIRED*******

FROM: MARKETING SUBCOMMITTEE

SUBJECT: 2019 BUDGET

RECOMMENDATION: THAT the Committee adopt the Marketing Budget for the 2019 FY.

BACKGROUND: Each year, the Marketing Subcommittee approves a marketing plan with a contracted agency. Last year, the Committee contracted with Fleishman-Hillard (FH) to implement a marketing program and requested FH to propose a plan for 2019.

Additionally, the Committee needs to approve travel for staff, and growers to various marketing events, association fees, partnerships and international program research. These items total of $63,500 making the total marketing budget $513,500.

1) Education and Partnerships - $63,500
    a. Alliance for Food and Farming
    b. CA Grown
    c. Partnerships
    d. Travel
    e. Olive Day
    f. Trade Show PMA
    g. Crisis Communication

In addition, the Committee must approve the following:

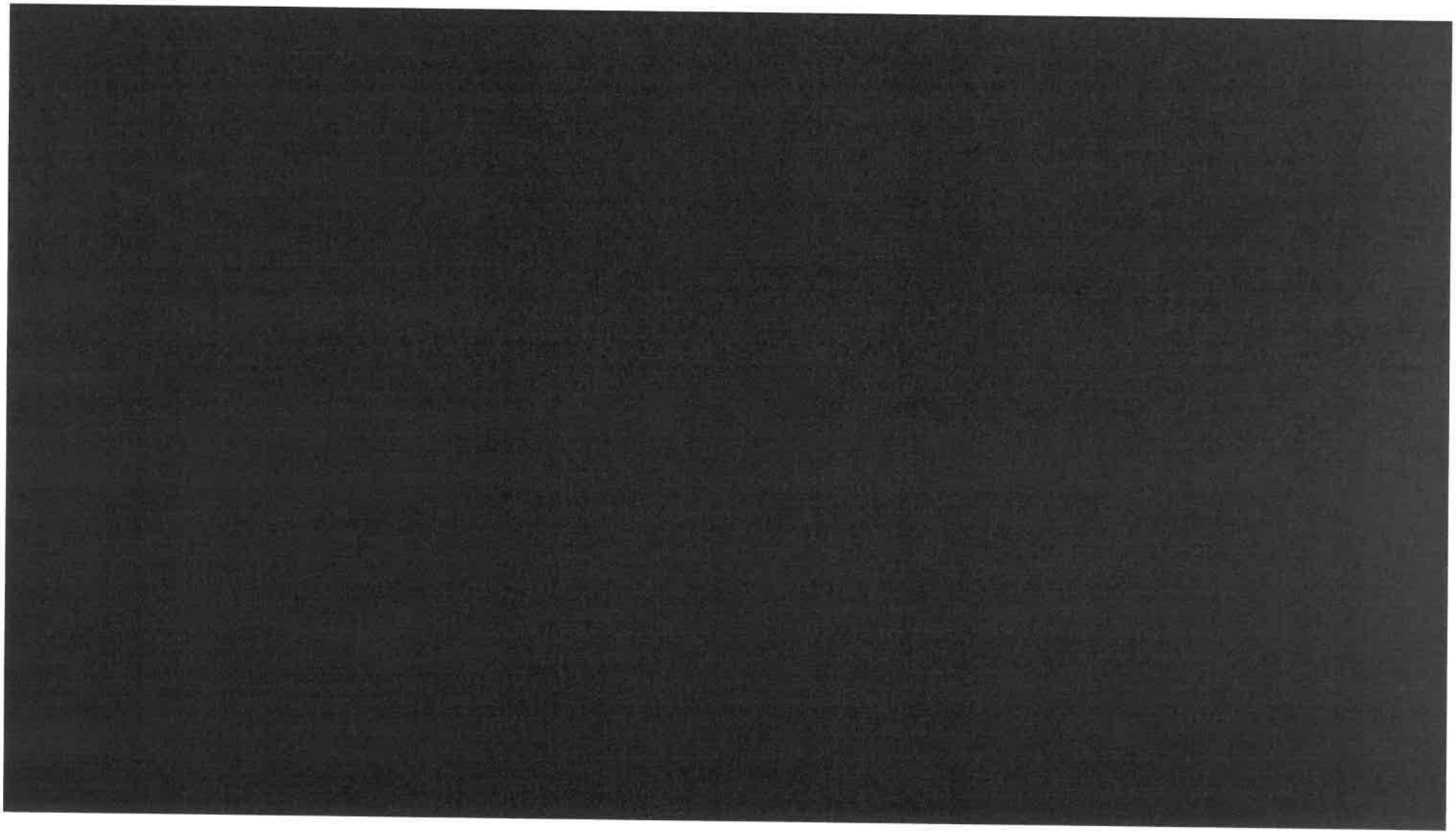
1) Budget for the 2019 season; and
2) The Committee grant authority to the Executive Director and Chairman for inter-item transfers of the Marketing Budget.

FISCAL IMPACT: $513,500 for 2019 FY

2018
PROGRAM HIGHLIGHTS

CALIFORNIA RIPE OLIVES

CALIFORNIA RIPE OLIVE GROWERS
AT THE HEART OF IT ALL...



MORE GROWER INTEGRATION...

SIMPLY RECIPES = SIMPLY AMAZING

Simply Recipes and California Ripe Olives "Summer Potluck" recipe photo contest

- 315 photos submitted, 2M impressions

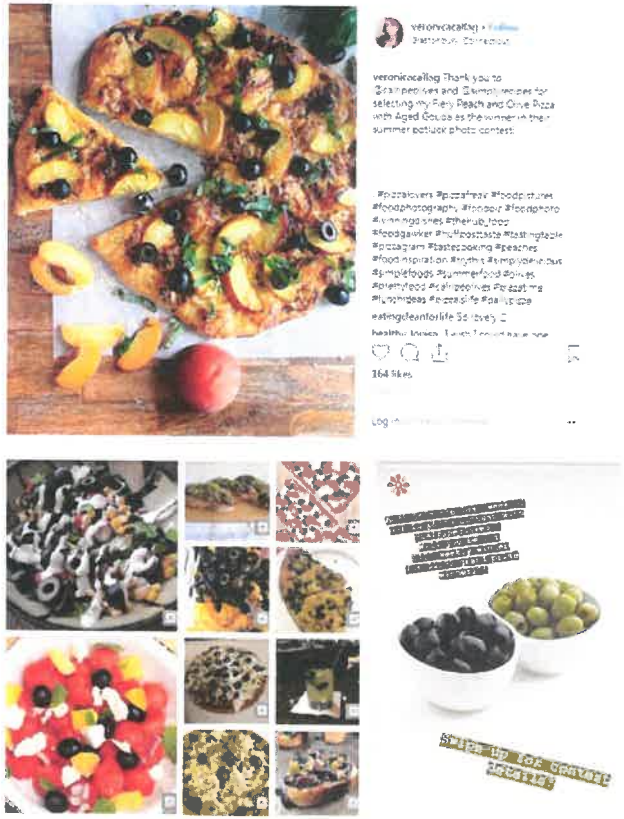
New content

- Avocado Toast with California Ripe Olives
- California Ripe Olives Rosemary Steak Skewers
- Baked Brie with California Ripe Olive Tapenade

Super Bowl site takeover

- Custom homepage content
- 6.3 million impressions!

California Ripe Olives grove tour integration



CALIFORNIA RIPE OLIVES GROVE TOUR

Grove Tour

California Ripe Olive Tasting

Panel Q&A

Hands-On Activity

Custom California Ripe Olives Dinner

9.2M anticipated impressions

102 new content items – recipes, photos, blog/social posts

Olive You Whole

kitchen confidante

The Suburban Soapbox

Naturally Ella

the forked spoon

Kroll's Korner

Simply Recipes

CALIFORNIA RIPE OLIVES GROVE TOUR

INFLUENCER ENGAGEMENT & AMPLIFICATION

kitchconfidante • Following
2 Reams

kitchconfidante I'm in my happy place...wandering through sunlit dappled olive groves with my friends at @calripeolives and building epic charcuterie boards with my newest obsession, "candied" olives! Hop on over to my #instastories and come along! #sponsored @thesuburbansoapbox

#calripeolives #icchiutifamilyfarms #californiaolives #olivegrove #californialife #bayareablogger #cheeseboard #olivelover #olivelove #kitchenconfidantetravels #centralcalifornia

Load more comments

kitchconfidante @reach_erikv Thank you! It was a blast!

lettyskitchen Yes on the candied olive recipe!!

444 likes

theforkedspoon • Following
Sacramento, California

theforkedspoon Back to the grind after spending the most wonderful day with @calripeolives on Monday I learned that canned California black and green olives are, in fact, the same exact type of olive picked from the same type of olive tree That olive trees can live well over 100 years old, and that all olives are picked green Aside from a stroll through the stillness and quiet of the beautiful olive trees, hanging out with a handful of some of the most talented food bloggers and story tellers, my favorite part was building our very own charcuterie boards...with olives, of course Whats your favorite way to enjoy olives? #sponsored #californiaolives #olives #californiaagriculture #charcuterie @icchiutifamilyfarms

theforkedspoon

284 likes

"I loved my time in the groves with you all, and I can't wait to share the experience more with my readers. Thank you for everything you did to welcome me."

What was your favorite part of the Grove Tour?

"The educational value of having access to Vince Richiutti and the brands to really dive deep into learning about olives. Also, being able to immerse ourselves in the grove was especially wonderful."

CALIFORNIA RIPE OLIVES RETAIL ADVERTISING

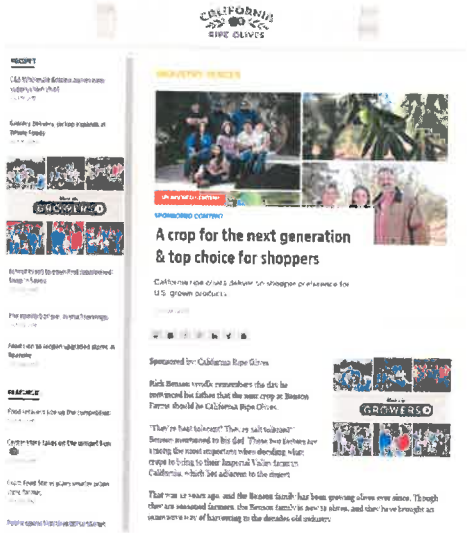
Integrating grower content and messaging into year-long advertising plan

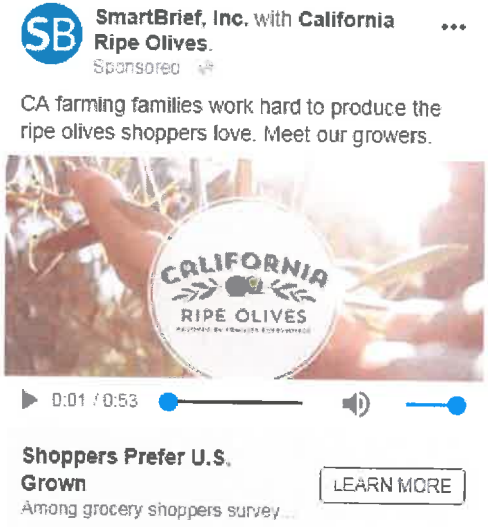
34 total ad insertions including in-book print advertisements, e-newsletters, website ads, dynamic web content and social media ads in 2018

Increased number of insertions and year-over-year impressions generated for the very comparable spend by integrating digital placements and capitalizing on value adds

California Ripe Olives
Retail Trade Ad Yearly Comparison

Year	*Insertions*	*Impressions/ Reach*	*Budget*
2016	17	498K	$100,000
2017	25	1M	$105,000
2018	34	2.7M to-date	$85,000





IMPRESSIONS TOTAL TO-DATE

626 million impressions to-date... and counting!

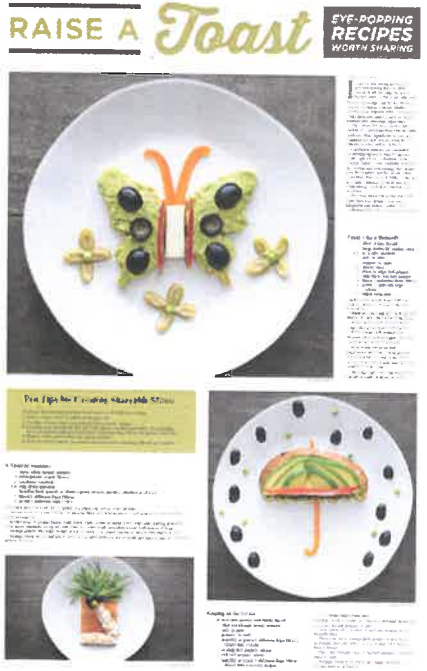
California Ripe Olives
Impressions/Reach Yearly Comparison

Year	*Impressions/Reach*
2016	303M
2017	551M
2018	626M

Family Favorites from Tree to Table

CELEBRITY PAGE

Simply Recipes



CALIFORNIA RIPE OLIVES:

2019 RECOMMENDATIONS

Presented By: FleishmanHillard | December 11, 2018

WHAT WE HEARD

Open to continuing the Simply Recipes partnership

Expand industry communication

Leverage the new California Ripe Olives logo and "Grown in California – Enjoyed by Families Everywhere" theme; it continues to resonate

Provide tiered budget

- *$600K | $450K | $350K*

OUR POINT OF VIEW

Elevate the best-of-the-best

- *Grower integration*
- *Simply Recipes site take-overs*
- *Social media influencer/blogger engagement*

Continue to bring the theme to life through it all

Make the most of existing content

Create greater alignment on program elements

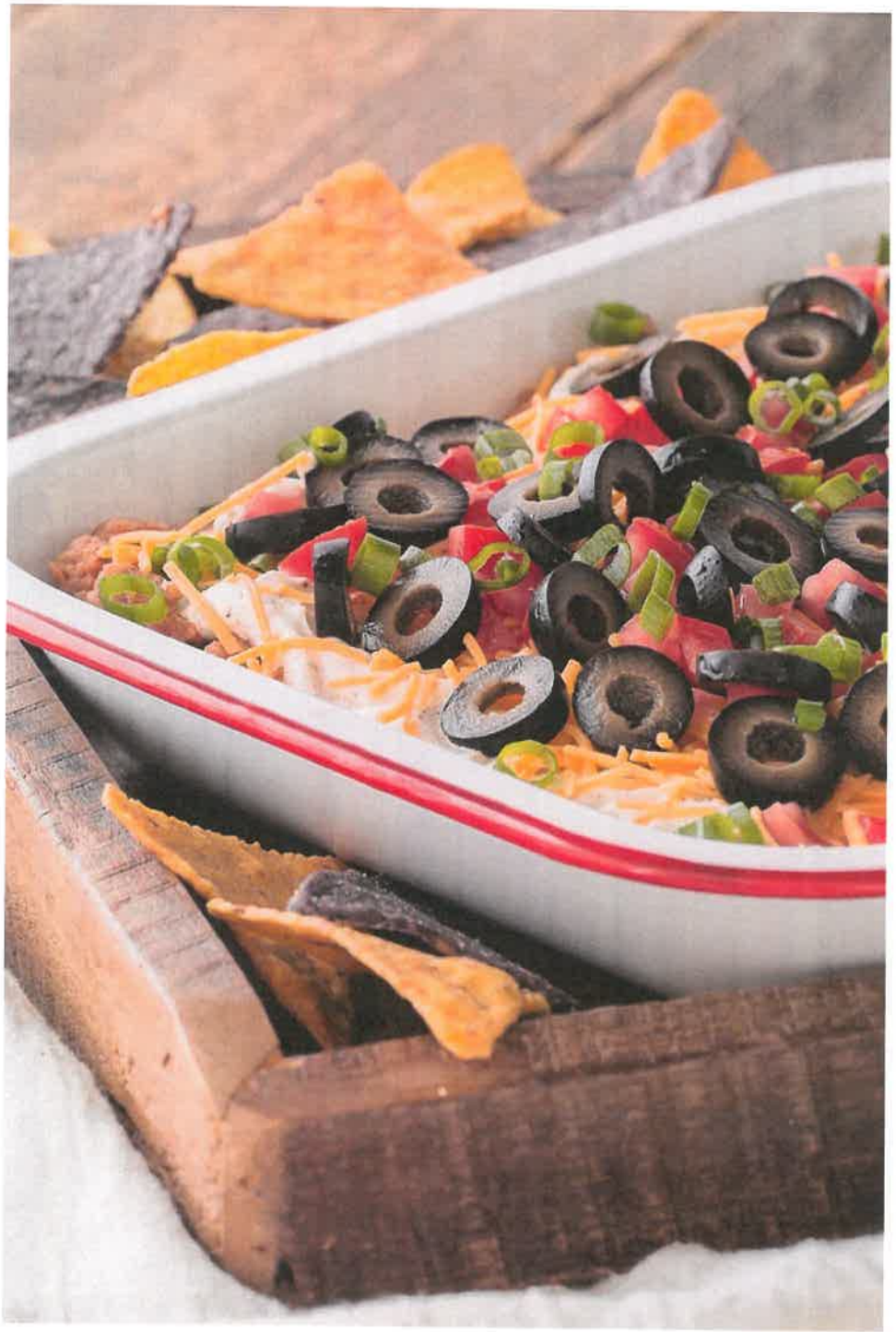
Simply Recipes site take-overs provide the biggest bang for the buck.

Let's use these high profile, well-timed takeovers to strategically align California Ripe Olive outreach throughout the year.

Let's create a series of Simply Recipes' seasonal

"PULSE POINT PACKAGES"

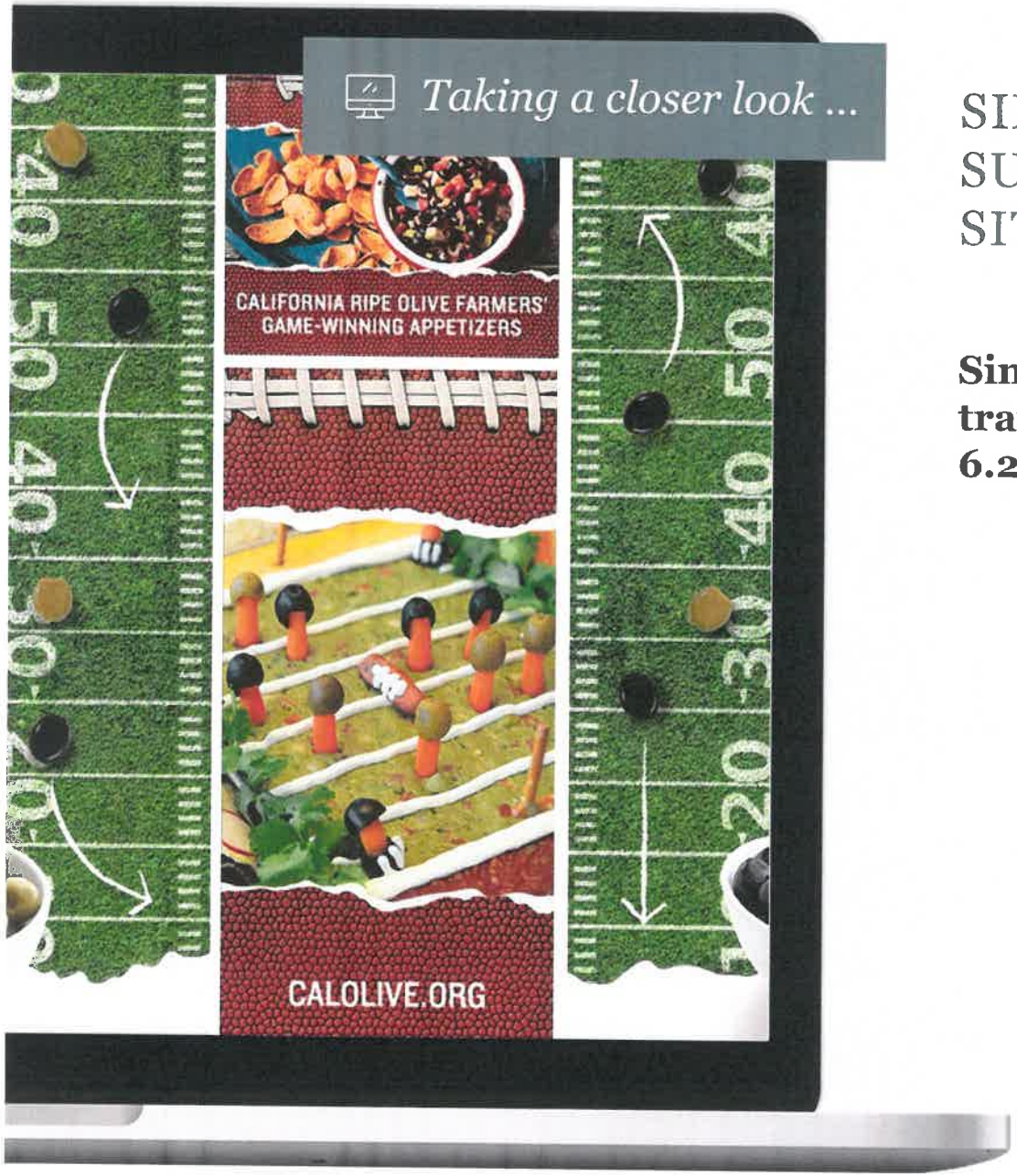
Here's what they can look like...



CALIFORNIA RIPE OLIVES & THE BIG GAME!

Pulse point package #1

- Simply Recipes
  - *Super Bowl site takeover*
- Full page food feature
  - *At-Home entertaining theme*
- Blogger ambassador activation
- California Ripe Olives asset refresh and social media integration
  - *Facebook | Instagram | Pinterest*

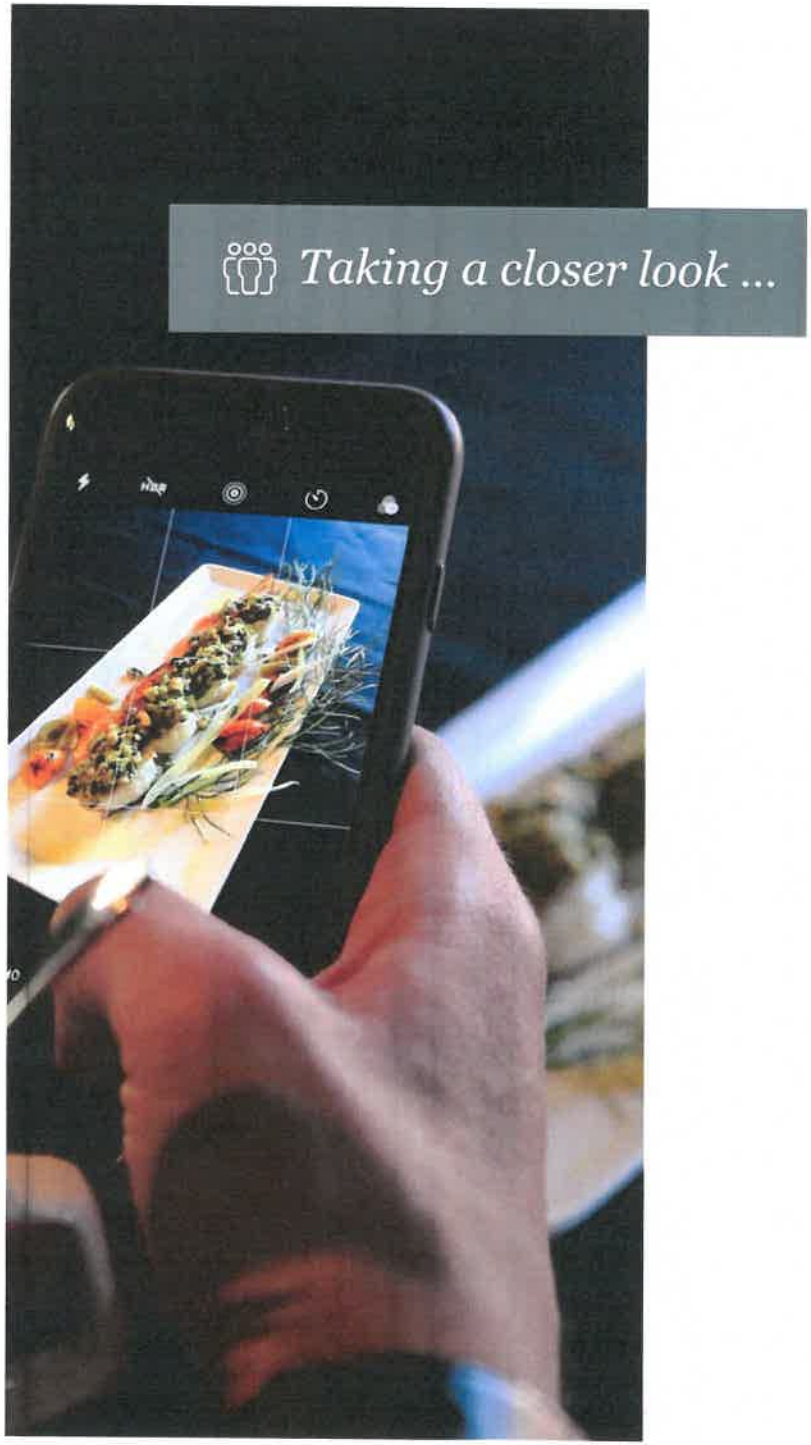


SIMPLY RECIPES SUPER BOWL SITE TAKEOVER

Simply Recipes second biggest traffic day of the year; generated 6.2 million views in 2018

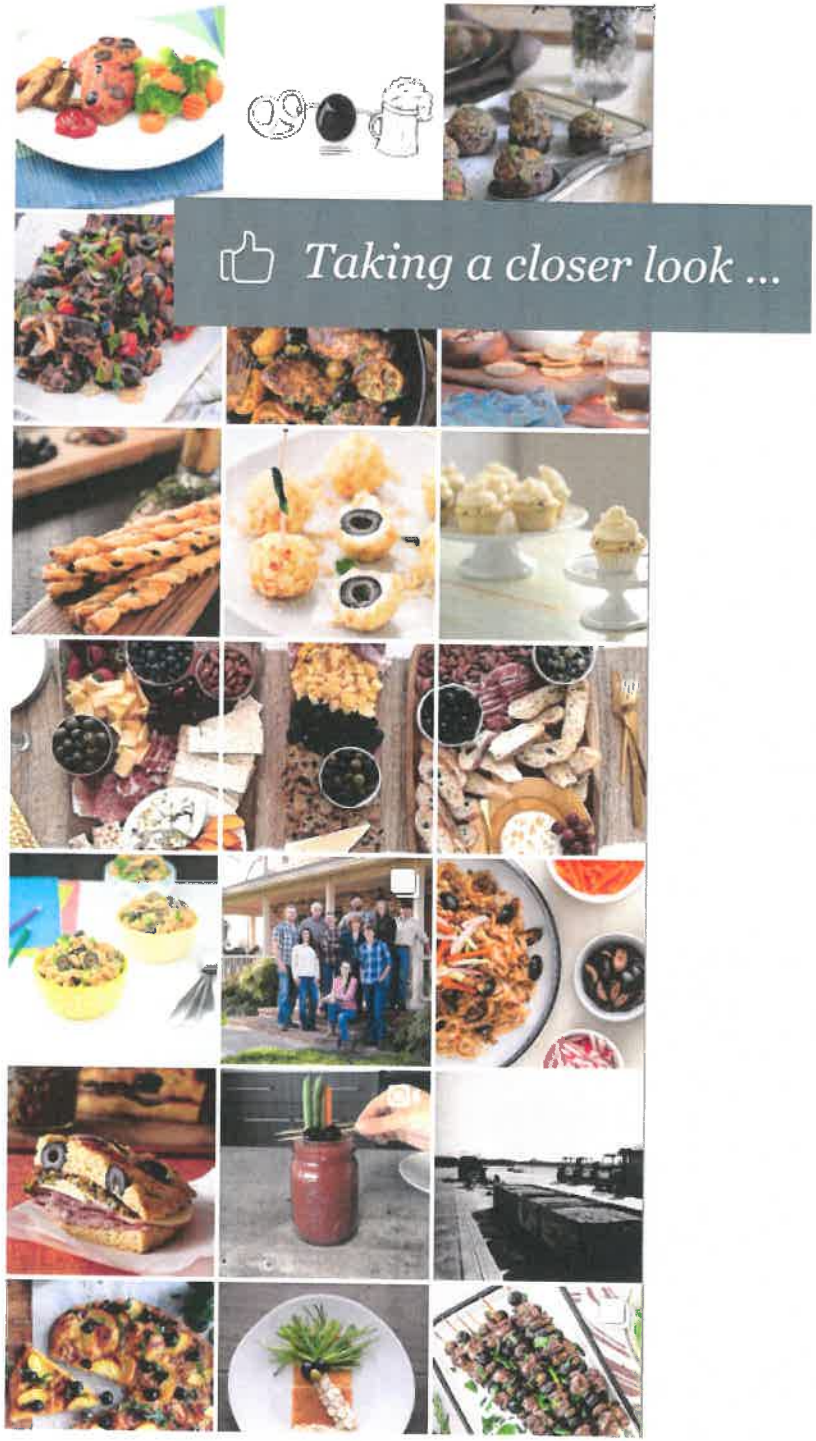
FULL PAGE FOOD FEATURE

California Ripe Olives at-home entertaining full page feature



BLOGGER AMBASSADOR ACTIVATION

Hand-select social media ambassadors to create and amplify corresponding "game day" themed content on their social media properties – blogs, Facebook, Instagram, etc.



CALIFORNIA RIPE OLIVES SOCIAL MEDIA INTEGRATION

Create updated food photography from our existing recipes that support the theme

Feature the refreshed content on our own social media properties

CALIFORNIA RIPE OLIVES & JULY 4TH FUN!

Pulse point package #2

- Simply Recipes
  - *July 4th site takeover*
- Blogger ambassador activation
- California Ripe Olives asset refresh and social media integration
  - *Facebook | Instagram | Pinterest*

CALIFORNIA RIPE OLIVES & THANKSGIVING

Pulse point package #3

Simply Recipes

- *Thanksgiving site takeover*

Full page food feature

- *Celebrate the Flavors of Fall*

Blogger ambassador activation

California Ripe Olives asset refresh and social media integration

- *Facebook | Instagram | Pinterest*

EVERYTHING FOOD CONFERENCE

California Ripe Olives activation at top-rated food blogger conference

- 700+ established and well-known food bloggers; May 1 – 4, 2019 in Layton, Utah
- Debut the Instagram-worthy California Ripe Olives lounge!
  - *Recipe sampling | Social media influencer networking*

"You absolutely need to be at Everything Food."
— Elise Bauer, Simply Recipes founder

- Influencer "speed dating" briefing sessions
- California Ripe Olives goodie bag inclusion
- "Meet a California Ripe Olive grower dinner" with up to 10 select influencers

ONGOING ACTIVATIONS

CALIFORNIA RIPE OLIVES

YEAR-ROUND ACTIVITIES

Ongoing social activation

Facebook | Instagram | Pinterest

Adapt existing grower video content into "mini videos" customized for social media

Website maintenance

Industry communications

Industry newsletter

Trade media tour/interviews with Todd Sanders and Mike Silveira

The Packer WESTERN FarmPress AgAlert

CALIFORNIA RIPE OLIVES 2019 AT-A-GLANCE

California Ripe Olives & The Big Game!

Pulse point package #1

- Simply Recipes site takeover
- Full page feature
- Blogger ambassador activation
- CA Ripe Olives social media integration and asset refresh

California Ripe Olives & July 4 Fun

Pulse point package #2

- Simply Recipes site takeover
- Blogger ambassador activation
- CA Ripe Olives social media integration and asset refresh

California Ripe Olives & Thanksgiving

Pulse point package #3

- Simply Recipes site takeover
- Full page feature
- Blogger ambassador activation
- CA Ripe Olives social media integration and asset refresh

Special Event:

Everything Food Conference

ONGOING

Ongoing social activation: Grower content/"mini videos" | **Website maintenance** |
Industry communications: Industry newsletter and ag trade media tour with Todd Sanders & Mike Silveira

BUDGET & ANTICIPATED RESULTS

CALIFORNIA RIPE OLIVES

2019 BUDGET

ACTIVITY	
California Ripe Olives seasonal "pulse point packages" (3) • Simply Recipes site takeovers • Full page food features • Blogger ambassador activation • Asset refresh	$235,000
Everything Food Conference	$85,000
Ongoing social media integration	$40,000
Industry communications	$30,000
Website maintenance	$30,000
Account management and planning	$30,000
Message training *(Covered within the 2018 program year budget)*	$0
TOTAL	**$450,000**

ANTICIPATED RESULTS

20 – 25 million+ impressions via Simply Recipes site takeovers
300 - 400 million+ impressions from full page food features
15+ million impressions and 10+ new recipes, photos and/or videos from blogger ambassadors
30 – 40 "mini-videos" for social media integration; adapted from existing grower video library
Expand social reach by 25% across collective channels – Facebook, Instagram and Pinterest
1 – 2 million impressions (via social), 350 samples served at Everything Food conference
3 – 5 California Ripe Olive industry trade articles/interviews

THANK YOU!

CALIFORNIA RIPE OLIVES

*******ACTION REQUIRED*******

FROM: INSPECTION SUBCOMMITTEE

SUBJECT: 2019 BUDGET

RECOMMENDATION: THAT the Committee adopt the Inspection Budget for the 2019 FY.

BACKGROUND: Last year, the Committee did not allocate additional dollars for inspection as electronic reporting and optical sizing projects were carried over from previous years. With the systems in place, the industry is seeing success in both the reporting and optical sizing. Adjustments and maintenance will be performed as needed for the program to maintain the integrity of the system and to ensure the technology keeps up with software and other items.

For the 2019 FY, the following items are expenditures for the Inspection program.

1. Travel - $3,000
2. ORES Maintenance - $40,000
3. Optical Sizer (misc. as needed) - $15,000

Staff has put together a history of previous Inspection Committee Budgets.

FISCAL YEAR	*2019 (Proposed)*	*2018*	*2017*	*2016*	*2015*	*2014*	*2013*	*2012*	*2011*
INSPECT	$58,000	$77,000	$98,000	$102,000	$132,000	$0	$105,000	$50,000	$75,000
Differ	(19,000)	(21,000)	(4,000)	(30,000)	132,000	(105,000)	55,000	(25,000)	25,000

The Sub-Committee must decide:

1) Approval of the 2019 Inspection Budget; and
2) Grant authority to the Executive Director with oversight by Chairman for inter-item transfers of the Inspection Budget.

FISCAL IMPACT: $58,000 for FY 2019 (Savings of $19,000 from previous year).

*******FOR YOUR INFORMATION*******

FROM: INSPECTION SUBCOMMITTEE

SUBJECT: ELECTRONIC REPORTING- OERS

BACKGROUND: In 2014, the Committee launched the Olive Electronic Reporting System (OERS). In 2015, the system was refined as the COC added additional features to aide with congestion at the scale house. These included: bin tag print outs, a new entry application, and improvements for the users of the system. In addition to the OERS system, the COC and the industry continue to capitalize on technology in an effort to provide real value by implementing usage of the Multiscan I5 Optical Sizing machines. The optical sizer cuts down on labor, processors' time, and provides a higher degree of accuracy while also decreasing subjectivity in the grading process. Going into year five of this technology's usage, we have continued confidence with the system, its functionality, and stabilization. In June of 2016, the COC was able to suspend the incoming inspection requirements in the marketing order. In turn, we were able to contract directly with CDFA by using current standards to inspect incoming fruit.

In 2018, we made number of enhancements such as: login and data transmission security including Secure Socket Layer (SSL) for the website and Strong Password. In addition, we made enhancements to COC3, COC5, and other aspects of both web and client applications.

Based on the circumstances we have faced in the previous year, we are recommending the following enhancements:

- Move database and web servers to Microsoft Cloud Azure server for optimum security and performance (highly recommended)
- Digital inventory reports from each canner
- Multi-scan integration to the COC Application
- Increased support and database maintenance.

We are proposing the following budget for 2019:

Optical sizer integration	6,000
Digital inventory reports	5,000
Enhancements	5,000
Support and Travel	12,000
Miscellaneous	10,000
Total	$38,000

*******ACTION REQUIRED*******

FROM: EXECUTIVE SUBCOMMITTEE

SUBJECT: 2019 BUDGET

RECOMMENDATION: THAT the Committee adopt the General Administration 2019 FY Budget and the following actions outlined 1 – 5.

BACKGROUND: The following is the General Administration Budget for the California Olive Committee. Exports are separated.

Staff has put together a history of previous Executive Committee Budgets.

FISCAL YEAR	*2019 (Proposed)*	*2018*	*2017*	*2016*	*2015*	*2014*	*2013*	*2012*	*2011*
ADMIN	$390,400	$401,200	$392,100[1]	$399,800	$393,500[2]	$333,800	$333,500	$415,900[3]	$324,923
$Change	(10,800)	9,100	(7,700)	6,300	59,700	300	82,400	90,977	(34,626)
Sec. 8e Improvements	150,000	-	-	-	-	-	-	-	-
Exports	$173,500	$186,000	$121,000	$85,000	$72,000	$0	$0	$0	$0
$Change	(12,500)	70,000	36,000	13,000	72,000	-	-	-	-
MAP/EMP/ ATP	$801,000	$250,000	$236,000						
$Change	551,000		236,000						

The Sub-Committee must decide:

1) Approval of the 2019 Fiscal Budget
2) Recommend to the Committee to improve USDA Section 8E of ripe olives imports not to exceed $150,000.
3) Recommend to the Committee to delegate authority from the Committee to the Executive Director with oversight by the Chairman, for Inner-Item transfer fund Authority
4) Recommend to the Committee to approve the use of legal counsel should one be needed with approval from the USDA.
5) Recommend to the Committee to the Executive Director with oversight by the Chairman to obtain legal counsel for employee personnel.

FISCAL IMPACT: $713,900 for FY 2019

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[1] $121,000 of the total budget is dedicated to the export category, and the remaining $393,100 is for general administrative costs. General admin, decreased from $399,800 in 2016 FY to $392,100 this year, whereas exports increased from $85,000 to $121,000.

[2]The Committee approved dollars for crisis communication and legal activities coupled with $72,000 for industry studies. These studies were for additional research on specific items. Legal and crisis communication will be rolled over to next year for a reserve to be created going forward.

[3] The original approved Executive Sub-Committee budget for 2012 was $335,900. However, in order to begin electronic reporting, USDA required the Committee to approve $80,000 not used in research for the 2012 FY and reallocate to the Executive Sub-Committee, otherwise the project would have to be placed on hold. The mid-year correction increased the Executive Sub-Committee budget by $80,000 to total $415,900.

GENERAL ADMINISTRATION BUDGET	Budget 2017	Budget 2018	Budget 2019	Diff.
Salaries	$ 110,000.00	$ 118,000.00	$ 118,000.00	$ -
Attorney/crisis communication	$ 25,000.00	$ 25,000.00	$ 25,000.00	$ -
Audit Fee	$ 8,500.00	$ 8,500.00	$ 8,500.00	$ -
Bookkeeper	$ 8,000.00	$ 8,000.00	$ 9,500.00	$ 1,500
Accounting Service	$ 1,900.00	$ 2,000.00	$ 2,000.00	$ -
Vacation & Sick Leave Expense	$ 5,000.00	$ 5,000.00	$ 5,000.00	$ -
FICA & Medicare Expense	$ 10,000.00	$ 11,000.00	$ 12,000.00	$ 1,000
Health Insurance	$ 25,000.00	$ 25,000.00	$ 25,000.00	$ -
Disability Insurance	$ 2,500.00	$ 2,500.00	$ 2,500.00	$ -
Pension Plan Contribution	$ 4,000.00	$ 4,000.00	$ 4,000.00	$ -
Storage	$ 1,300.00	$ 1,300.00	$ 500.00	$ (800)
Telephone	$ 5,500.00	$ 5,500.00	$ 5,500.00	$ -
Travel Committee	$ 20,000.00	$ 20,000.00	$ 12,000.00	$ (8,000)
Travel Office	$ 15,000.00	$ 15,000.00	$ 15,000.00	$ -
Travel Insurance	$ 1,800.00	$ 1,800.00	$ 1,800.00	$ -
General Insurance	$ 6,900.00	$ 6,900.00	$ 6,900.00	$ -
Insurance-members/management	$ 11,000.00	$ 11,000.00	$ 11,000.00	$ -
Postage	$ 7,000.00	$ 7,000.00	$ 7,000.00	$ -
Office supplies	$ 4,700.00	$ 4,700.00	$ 4,700.00	$ -
Maintenance	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ -
Printing - Admin	$ 11,500.00	$ 11,500.00	$ 10,000.00	$ (1,500)
Equipment, Software,Furniture	$ 4,000.00	$ 4,000.00	$ 2,500.00	$ (1,500)
Crop Estimate	$ 6,500.00	$ 6,500.00	$ 6,500.00	$ -
Misc. Admin Expense	$ 2,000.00	$ 2,000.00	$ 1,500.00	$ (500)
Education Training	$ 4,000.00	$ 4,000.00	$ 3,000.00	$ (1,000)
Crisis Communication	$ -	$ -	$ -	$ -
California Apple Commission	$ 90,000.00	$ 90,000.00	$ 90,000.00	$ -
Exports/Industry Studies	$ 121,000.00	$ -	$ -	$ -
				$ -
TOTAL G & A	$ 513,100.00	$ 401,200.00	$ 390,400.00	$ (10,800)
Enhancement and Strengthening of Section 8E	$ -	$ -	$ 150,000.00	$ 150,000.00

TOTAL FOR G&A = $390,400

TOTAL FOR EXPORTS = $173,500
TOTAL FOR SECT. 8E = $150,000

		Budget 2017	Budget 2018	Budget 2019	DIFF.
EXPORTS:					
Asia Logestica		$ 10,000.00	$ 15,000.00	$ 12,000.00	$ (3,000)
Industry Relations	TOTAL FOR	$ 15,000.00	$ 15,000.00	$ 12,000.00	$ (3,000)
BCI	MAP &	$ 45,000.00	$ 45,000.00	$ 45,000.00	$ -
Misc.	TASC DOLLA	$ 5,000.00	$ 5,000.00	$ 2,500.00	$ (2,500)
FAS/USADEC	FOR MATCH	$ 3,000.00	$ 3,000.00	$ 3,000.00	$ -
Japan		$ 10,000.00	$ 20,000.00	$ 20,000.00	$ -
India/SEA		$ 12,000.00	$ 10,000.00	$ 7,500.00	$ (2,500)
China/S. Korea		$ 15,000.00	$ 15,000.00	$ 10,000.00	$ (5,000)
Canada		$ 3,000.00	$ 3,000.00	$ 3,000.00	$ -
Fruit Logestica		$ 10,000.00	$ 15,000.00	$ 12,000.00	$ (3,000)
Mexico		$ 3,000.00	$ 5,000.00	$ 3,000.00	$ (2,000)
Management		$ -	$ 35,000.00	$ 35,000.00	$ -
ATPP		$ -	$ -	$ 8,500.00	$ 8,500
					$ -
TOTAL		$ 121,000.00	$ 186,000.00	$ 173,500.00	$ (12,500)
MAP DOLLARS					
JAPAN		$ 100,000.00	$ 100,000.00	$ 255,000.00	
SOUTH KOREA		$ -	$ -	$ 110,000.00	
CANADA		$ -	$ -	$ 90,000.00	
MEXICO		$ -	$ -	$ 120,000.00	
TOTAL		$ 100,000.00	$ 100,000.00	$ 575,000.00	REQUESTED
EMP					
India		$ 68,000.00	$ 65,000.00	$ -	
China		$ 68,000.00	$ 65,000.00	$ -	
Mexico			$ -	$ -	

	Canada		$ -	$ -
TOTAL		$ 136,000.00	$ 130,000.00	$ -

ATP

UK	$ -	$ -	$ 106,000.00
SE ASIA	$ -	$ -	$ 85,000.00
CANADA	$ -	$ -	$ 35,000.00
TOTAL			$ 226,000.00 REQUESTED
TOTAL MAP/EMP/TASC/ATP	$ 236,000.00	$ 230,000.00	$ 801,000.00 REQUESTED

*******ACTION REQUIRED*******

FROM: RESEARCH SUBCOMMITTEE

SUBJECT: 2019 RESEARCH PROJECT

RECOMMENDATION: THAT the Subcommittee approve research project for 2019.

BACKGROUND: Each year the Research Subcommittee approves various research projects funded by the Committee. The Subcommittee must which proposed projects to recommend to the Committee for funding. A budget of $343,523 is purposed based on the submitted projects.

2019 RESEARCH PROPOSALS FOR THE CALIFORNIA OLIVE COMMITTEE

TOPIC	LEADERS	AMOUNT
Canopy management, tree hedging and topping to optimize yield	Rich Rosecrance	$31,075
Evaluation of new chemistries to control Olive Fruit Fly	Debra Keenan	$25,000
Managing Alternate Bearing in Olive with PGRs and Pruning	Carol Lovatt Elizabeth Fichtner	$21,570
Control of overwintering olive fruit fly using insect pathogenic fungi	Frank Zalom Joanna Fisher	$19,678
Southern San Joaquin Valley Olive Fruit Fly Monitoring Project	Jim Stewart	$6,400
Sacramento Valley Olive Fruit Monitoring Project	Ernie Simpson	$6,500
Epidemiology and management of olive knot caused by *Pseudomonas savastanoi* pv.*savastanoi*	J. E. Adaskaveg	$16,650
Management of foliar diseases of olive (peacock spot)	J. E. Adaskaveg	$16,650
Contingency Fund		$200,000
Total		$343,523

The Committee must decide:

1) Research Budget
2) Recommend to the Committee to delegate authority to the Subcommittee to approve projects for contingency fund.
3) Recommend to the Committee to delegate authority from the Committee to the Executive Director with oversight by the Chairman, of the research budget.

FISCAL IMPACT: $343,523 for 2019 FY

CALIFORNIA OLIVE COMMITTEE

PROJECT PLAN/RESEARCH GRANT PROPOSAL

Workgroup/Department: Olive / Plant Sciences College of Agriculture, CSU Chico

Project Year 2019 Anticipated Duration of Project: 4 of 4 years

Project Title: Canopy management, tree hedging and topping to optimize yield

Project Leaders:

Rich Rosecrance, Professor, California State University, Chico. College of Agriculture, 400 West First Street, Chico, CA 95929-0310: rrosecrance@csuchico.edu

William H. Krueger: Glenn County Farm Advisor (Emeritus): whkrueger@ucanr.edu

Louise Ferguson, Extension Specialist, Department of Plant Sciences, 2037 Wickson Hall, Mail Stop II, UC Davis, 1 Shields Ave., Davis CA 95616, (530) 752-0507 [Office], (559) 737-3061 [Cell] LFerguson@ucdavis.edu

Daniele Lightle: Glenn County Farm Advisor: DLightle@ucanr.edu

Cooperating Ranches and People:

Erik Nielsen Enterprises Inc. 4453 Co Rd O, Orland, CA 95963

Dennis Burreson, Musco Olives, 17950 Via Nicolo, Tracy, California 95377

Commodity: Olive Relevant AES/CE Project No.

Year Initiated: 2016 Current Funding Request: **31,075.00**

Problems and Significance:

Mechanical Hedging

Mechanical hedging and topping can be important tool in improving harvest efficiencies by affecting return bloom, helping to maintain trees in their allotted space and reducing hand pruning costs. Typically, hedging and topping result in smaller and more compact trees. Smaller trees will facilitate hand harvest by obviating the need for tall, cumbersome ladders and likely increasing the number of bins harvested per hour. Picking crews have repeatedly commented that they prefer to harvest from mechanically hedged and topped trees than from traditionally pruned trees (Louise Ferguson, personal communication). In oil olive orchards, mechanical hedging has resulted in increased harvest efficiency and reduced alternate bearing (Charlie

Garcia, California Olive Ranch, personal communication). However, timing of mechanical hedging is critical for optimal yields. Hedging too late in the season may not provide enough time for new shoots to grow and flower buds to initiate. Earlier work that we conducted on 'Arbequina' oil olives indicated that shoot growth that occurred after early July did not produce flowers the following year. Whether 'Manzanillo' olives will behave the same is unknown. Hedging too early in the season can cause extensive vegetative growth at the expense of fruit growth. Thus, finding 'the sweet spot' for the timing of mechanical hedging is important to maximize and help regulate yields.

Mechanical Topping

Unlike hedging, mechanical topping does not reliably produce a crop on shoots that grow in response to the topping. Our trials have demonstrated that topping produced vigorous growth with limited fruit and resulted in two problems: 1) The limited fruit in the upper canopy ripened sooner than the rest of the crop, producing overripe fruit that decreased grade and value by 25%, and 2) Vigorous vegetative growth that can shade fruitwood and decrease yields, even when the tree is topped every other year. The solution appears to be to top the tree annually with a gabled cut to eliminate this overly vigorous growth and overripe fruit.

Optimizing Tree Light Interception at different tree heights, and latitudes

A program that evaluates light interception at different tree heights, row spacings, and latitudes has been developed by David Connor in Spain. This program was developed to help determine optimal tree spacing and height to maximize light interception at different latitudes. This program will assist us in our hedging and topping treatment to increase light interception and yield.

Fruit Nutrient Removal Calculator

Significant quantities of nitrogen, phosphorus and potassium are removed by harvested portions of fruit crops. Thus, the nutrient removal rate is an important consideration for making fertilizer recommendations. Inadequate fertilization and/or nutrient imbalance can prevent growers from achieving desired fruit yields and quality. Recently, we developed a macro- and micro-nutrient removal calculator for 'Arbequina' oil olives (Figure 1). Oil olives, however, are smaller and have a greater pit to flesh ratio than 'Manzanilla' table olives, which influence fruit nutrient content. An online fruit nutrient removal calculator needs to be developed for table olives.

Progress to Date:

Nickels Soil Lab

We initiated the trial at the Nickels Estate in Arbuckle in late April 2016 as a randomized complete block design with 3 treatments and 4 replicates. The treatments were: a) 10 foot topping, b) 13 foot topping and c) no topping where the primary scaffolds were cut with loppers

to outside laterals at approximately 13 feet. All trees were topped on April 25 followed by hand pruning on May 26 and 27 to thin out the tree canopy. We measured the time it took for 2 pruners to prune the 10 data trees in the center row of the 30 tree plots in all replicates of all treatments to estimate pruning costs. The 10 foot topping treatment removed significant amounts of wood and produced shorter statured trees. Trees were harvested on October 1, 2018 and samples were taken to Musco Olive to evaluate fruit size and crop value,

Pruning costs and crop yields are presented in Table 1. Trees that were topped at 10 feet resulted in lower pruning costs likely because the canopies were smaller and close to the ground than trees pruned at 13 foot. No significant differences ($p < 0.05$) were found between olive yields in 2016, 2017, or 2018; however, trees topped at 10 feet produced lower cumulative yields than trees topped at 13 feet and the non-topped control. Trees topped at either 10 or 13 feet produced a higher value crop (in terms of price per ton) than the control trees. Examination of the grading sheets indicated that topping increased the percentage of medium and large fruit compared with the untopped trees. We will be evaluating how topping affect pruning costs, return bloom, and yields in 2019

Nielsen Trial

No hedging occurred in 2018, however, tree canopies were measured and yield ratings were determined. Tree yields were very low in 2018 across all treatments, making it difficult to draw firm conclusions. In 2018, trees that were hedged in earlier in the year of 2017 yielded more than trees hedged later in the year (Table 2). Severe hedging in 2016 decreased yields in 2016 and 2017. In 2018, trees that produced poorly in 2017 improved significantly in 2018. Indeed, 40% of the variation in 2018 yields could be attributed to crop yields in 2017 (data not shown). Moderate hedging, however, reduced these large swings in yield from one year to the next, thus reducing alternate bearing. It will be interesting to see how 2016 hedging treatments affects yields in 2019, which should be a heavily cropping year.

Burrison Trial

In Spring 2017, we initiated a trial on trees planted in 2009 at Heath Burrison's orchard. The orchard is a north-south planting with a 12 in row by 18 foot between row spacing. The trial was set up as a factorial design with four hedging dates and two canopy sides (east or west) and replicated 5 times. The 10-tree plots were hedged on February 23, April 3, May 1, and June 28, 2018. Trees tend to grow slightly more on west-facing canopies than on canopies facing east. Thus, we want to evaluate the effect of canopy orientation on yield and canopy growth.

In 2018, trees produced few flowers, even fewer fruit, and very low yields. Inflorescence ratings were conducted on May 21, 2018. Time of hedging the previous year did not affect inflorescence rating (data not shown). Trees were not harvested in 2018 because yields were so low. Yields were rated prior to when the trees would have been harvested using a scale of 0 to 10 where 0 represented no crop and 10 represented and extremely heavy crop. No differences in yield were noted in 2017 or 2018 (Table 3); however, there was a trend for hedging earlier in the season producing more crop.

Hedging early in the spring also increased canopy growth (Table 3). Trees hedged in February/March and April produced greater canopy diameters than from trees hedged in June. Hedging earlier in the season allowed more time for current year shoots to regrow. Hedging breaks apical dominance and can increase canopy regrowth. We evaluated the effect of the time of hedging on canopy growth on the cut and uncut side of the tree. Hedging in February/March produced a larger canopy in the cut vs the uncut side of the tree. This indicated that hedging stimulated growth to such an extent that after being cut, shoots grew farther out in the tree row than shoots from the uncut side of the tree. Hedging later in the season, however, did not provide enough time for the canopies to grow, resulting in smaller sized canopies in the cut vs uncut side of the tree.

Olive Nutrient Removal Calculator

At fruit maturity, fruit samples were collected from eight orchards up and down the state. Fruits dried, grown, and analyzed for maco- and mico-nutrients at Dellavalle Labs, Fresno, California. We will use these data and data collected in 2017, 2018, and 2019 to develop a nutrient removal calculator.

Objectives:

We propose to:

1. Investigate the effects of timing of mechanical hedging on return bloom, yield on mature trees. The objective is to determine the optimal timing of hedging for hedgerow plantings for generating a 5-ton or more per acre annual average crop.
2. Compare the effects of a mechanical pruning program that incorporates annual topping at two different tree heights to controlling the tree height. All of the treatments would receive an every other row middle hedging. The objective is to determine the optimal hedgerow height for generating a 5-ton per acre annual average crop that can be produced with mechanical pruning. This data could then be used to evaluate the program for determining optimum tree height for hedgerow plantings.
3. Develop a web-based fruit nutrient removal calculator for 'Manzanillo' table olives

Experimental Procedures:

Experiment 1: Mechanical Hedging (Erik Nielsen's and Heath Burreson's orchard)

Hypothesis: optimal timing or mechanical hedging will not decrease yield and will facilitate mechanical harvesting.

Overall Objective: to determine the optimal timing of mechanical hedging for table olive productivity and fruit quality.

2017 Objectives:

I. Hedge Trees Monthly
II. Evaluate effect of pruning treatments on shoot growth, and return bloom and quality: perfect versus imperfect flowers.
III. Evaluate effect of pruning treatments on yield and fruit quality.
IV. Determine optimal timing of hedging treatment to facilitate high quality fruit production and return bloom.

Materials and methods:

Experimental Design:
Randomized complete block of four replications.

- Treatments: Evaluate timing by hedging the south side of the tree at monthly intervals starting in April and ending in August. Twelve trees from 4 tree rows will be hedged each month.
    - Hedging will aim to remove about 50 percent of the new growth
    - middle 10 trees of each treatment will be the data trees

- Data Collection:
- 100 fruiting and 100 non-fruiting branches will be tagged after hedging treatment
- Shoot growth will be measured at the end of the seasons
- At bloom the following season, flowering intensity (inflorescences per branch) will be determined from the tagged branches
- Following bloom, fruit set will be determined
- Measure fruit removal and yields following mechanical trunk shaking in the hedged trees.

- Data Analysis:
    - The following relationships will be evaluated statistically for the trial:
        - Effect of time of hedging on shoot growth in both fruiting and non-fruiting shoots.
        - Effect of time of hedging on flowering the next year from fruiting and non-fruiting shoots
        - Effect of time of hedging on fruit set the next year from fruiting and non-fruiting shoots
        - Evaluate the effects of the treatments of fruit removal and yields following mechanical trunk shaking.

Experiment 2: Mechanical Topping

Materials and Methods:
Experimental Plot: Nickels Estate - 2 acre 'Manzanillo' orchard established in 2002.

Hypothesis: mechanically topping hedgerow olive orchards will not decrease yield and will reduce hand harvesting costs by producing shorter statured trees.

Overall Objective: to determine the optimal row height for table olive productivity and fruit quality at a 12 X 18' orchard spacing (202 trees/acre) and develop the formulas for applying this information to different latitudes and orchard spacing.

2017 Objectives:

V. Apply two different tree height pruning treatments and compare to controlling tree height with hand pruning
VI. Install sunlight exposure monitoring cameras
VII. Evaluate effect of pruning treatments on bloom quality: perfect versus imperfect.
VIII. Evaluate effect of pruning treatments on yield and fruit quality in upper and lower canopy at harvest.
IX. Correlate hours of sunlight exposure with fruit yield and quality.

Materials and methods:

Experimental Design:
Randomized complete block of four replications: map attached

- Treatments: three pruning treatments of three, 10 tree rows
    - topped at 10 and 13 feet in February 2017 and compared to pruning to lateral branches at 13 feet using thinning cuts
    - middle row of each treatment will be the data row
    - alternate row side hedging treatments will be applied

- Data Collection:
- Five photosynthetically active radiation (PAR) monitors will be positioned on a 20' pole and installed along a transect from the trunk to the top of the tree. Measurements will be taken every 5 minutes and compared with the full sun measurement. Fruit size at each position will be determined.
- A late-season mid-day light interception measurement will be done to determine the percentage of light each treatment is intercepting.
- Trees will be harvested and fruit quality will be assessed from samples taken from the upper and lower tree canopy.
- Yields will be compared with the MatLab program that predicts optimal tree size and spacing to maximize light interception.

- Data Analysis:
    - The following relationships will be evaluated statistically for the east and west sides, within the three pruning treatments:
        - Effect of pruning treatment on intensity of inflorescence and shoot growth
        - Effect of pruning treatment on total yield and fruit quality; size and color
        - Correlation of each of the above parameters with total hours of light exposure through the season from bud swelling through harvest.

Olive Nutrient Removal Calculator

At fruit maturity, fruit samples will be collected from eight orchards up and down the state. In 2018, we collected fruit samples during an off-year. We will compare crop nutrient removal levels from fruit during on- and off-years. Fruits will be dried, grown, and analyzed for maco- and mico-nutrients. We will use these data to develop a nutrient removal calculator. Growers will input their olive yield and this web-based tool will determine the amount of macro- and micro-nutrients removed in the harvested crop, similar to what is shown in Figure 1.

Anticipated Outcomes:

Hedging and Topping Treatments

The goal of these experiments are to determine the most effective timing of canopy hedging and topping height to ensure return bloom, maximize yields, and minimize excessive vegetative growth. We anticipate that hedging and topping treatments can producer similar yields to hand-pruned trees with lower labor costs. We also anticipate the hedging and topping will significantly reduce alternate bearing.

Light Measurements in topped, hedged, and control trees

The goal of these experiments are to determine how canopy management with mechanical topping and hedging affects total hours of canopy light exposure and therefore flower production, fruit yield and quality. The ultimate goal is to demonstrate how to calculate the optimal tree height for moderate density orchards at different latitudes.

Olive Nutrient Removal Calculator

The 'Manzanillo' nutrient removal calculator will estimate nutrient removal of macro- and micro-nutrients. Removal data for the 'Manzanillo' will be incorporated into the calculator found at http://www.csuchico.edu/~rrosecrance/Model/OliveCalculator/OliveCalculator.html

BUDGET REQUEST –

Budget Year: 2019-2020	Funding Source: COC
Personnel:	
Rich Rosecrance, California State University, Chico, professor.	6,100.00
data collection and entry, harvest support. (~87 hrs @ $69/hr)	
Student (summer and fall; 375 hours at $12/hr)	4,500.00
Fringe @ 8.8%	932.00
Independent Contractor - Bill Krueger: Glenn County Farm Advisor (emeritus):	6125.00
Technical Support - data collection and entry, harvest support.	

	Sub 1	**17,657.00**
Equipment Supplies & Expenses:		
Light measurement, timelapse cameras, field scale equipment		3,600.00
	Sub 2	**3,600.00**
Pruning and Harvesting Costs: (based on previous year's cost)		
Hand pruning, brush shredding: Nickels Estate		1,500.00
Mechanical harvest (ENE Inc.) at Nickels Estate:		1,500.00
Hand harvest at Nickels Estate (post mechanical harvest)		1,000.00
Nutrient Analyses (18 samples x $56/sample)		1,000.00
Miscellaneous harvest supplies: water, gloves, tarps, buckets		1,000.00
	Sub 3	**6,000.00**
Experimental Travel Costs:		
Travel support for plot set-up, data collection, harvesting. (8 months X 4 RT/month @ 120 miles/trip X .55/mile)		2,338.20
	Sub 4	**2,338.20**
Facilities and Admin @ 5%		**1479.80**
TOTAL BUDGET		**31,075.00**

Scope of Work

Dr. Richard Rosecrance:
Responsible for overall coordination of the project, applying pruning treatments, executing harvest trials, developing fruit nutrient calculator, data collection and analysis and writing final report.

Bill Krueger, Louise Ferguson, and Dani Lightle: Responsible for assisting in the mechanical pruning treatment in Orland and Nickels trial and co-coordinator of harvesting the trials.

External Contractors: contracts to be secured after funding.

Pruning Contract at Nickels Soils Laboratory: Colusa, California
Hillary Nielsen Porter
ENE Inc.
4453 County Road O
Orland CA 95963
ENE@EneInc.com
Office: 800-844-9409
FAX: 530-865-4845

Figure 1. Nutrient removal calculator for 'Arequina', 'Arbosana', and 'Koroneiki' olive oil cultivars. Data will be collected to include 'Manzanillo' in the fruit nutrient removal calculator.

Table 1. Relationship between topping height and pruning costs, 'Manzanillo' olive yields, fruit value, and return at Nickels Estate.

Treatment	Pruning Costs 2016* ($/a)	Pruning Costs 2017 ($/a)	Pruning Costs 2018 ($/a)	Pruning Cost Cumulative	Yields (t/a) 2016	Yields (t/a) 2017	Yields (t/a) 2018	Yields Cumulative (t/a) (2016 - 2018)	Average Value ($/t 2016-2018)
Topped at 10'	500 a**	237 a	219	956 a	2.01	3.78	2.03	7.82 b	1360 a
Topped at 13'	885 b	317 b	275	1477 b	3.57	5.27	2.49	11.33 a	1344 a
Control	930 b	304 b	320	1554 b	4.65	4.37	3.44	12.46 a	1310 b
P value	0.045	0.026	Ns	0.042	0.091	0.241	Ns	0.050	0.007

*pruning costs based on time needed to prune the trees multiplied by $11/hr. not sure that would be enough now, probably should be minimum wage plus 40% for overhead
**different letters in the same column indicate significance $p < 0.05$.

Table 2. Nielsen trial, Effects of hedging date and severity of hedging on 'Manzanillo' olive yields.

Hedging Date	Severity of Hedge*	Yield Rating 2016	Yield Rating 2017	Yield Rating 2018
No Hedge	NA	6.5 a	7.0 ab	3.6 b
24-May-16	Moderate	7.2 a	7.4 a	2.5 c
27-Apr-16	Moderate	7.1 a	7.1 ab	2.6 c
27-Apr-16	Severe	3.7 b	6.7 ab	2.4 c
15-Jul-16	Moderate	6.1 ab	6.3 ab	3.4 bc
15-Jul-16	Severe	5.5 ab	5.3 bc	3.6 b
1-Mar-17	Moderate		5.1 bc	4.1 ab
3-May-17	Moderate		4.1 c	4.2 ab
29-Mar-17	Moderate		4.3 c	3.8 ab
3-May-17	Moderate		5.1 bc	3.6 b
P value		.041	0.0001	.046

* Moderate = approximately 8.5 feet from trunk; Severe = approximately 6.5 feet from trunk.
Different letters in the same column indicate significance $p < 0.05$

Table 3. Burreson trial, Effects of hedging date on 'Manzanillo' olive yields and canopy growth.

Cut Date	Yields (t/a)	Yields Ratings*	Canopy Diameter (ft)		Growth in cut vs non-cut side of tree** (ft)
	2017	2018	2017	2018	2017
Feb/Mar	8.9	1.5	9.2 ab	9.6 b	0.43 a
April	9.1	1.5	9.1 ab	8.9 bc	-1.1 b
May	7.9	1.3	9.0 ab	8.6 bc	-1.7 b
June	7.8	1.3	8.2 b	8.3 c	-2.1 b
Control	9.4	1.5	10.3 a	12. 4 a	
p-value	0.17	0.51	0.004	0.002	0.0006

*rating scale 0 to 10, 0 = no crop and 10 = extremely heavy crop.
**Difference in growth between cut and not cut side of the tree.
Different letters in the same column indicate significance $p < 0.05$

PRIMARY PI SIGNATURE PAGE: UNIVERSITY OF CALIFORNIA

Originator's Signature	Date
Department Chair/County Director	Date
Liaison Officer	Date

Project Year: 2019 *Anticipated Duration of Project: 2-3 years*
Principle Investigator: Debra Keenan, Research 2000
Project Title: Evaluation of new chemistries to control Olive Fruit Fly

Justification Background

The Olive Fruit Fly, *Bactrocera oleae*, has become a serious pest in olives. It was first seen in 1998 in Los Angeles. It quickly spread to the olive growing regions and has become a pest. The olive fruit fly causes a huge economic threat to the olive growers in the state. The larvae feed on the inside of the fruit. The larvae destroy the pulp and allow entry of secondary pests. The fruit rots and can cause the quality of the oil to degrade and cause the fruit to drop. Feeding damage can cause premature fruit drop and reduce fruit quality for both table olive and olive oil production. Large numbers of rotting fruit on the ground can create an unwelcome mess, especially in landscaped situations.

GF-120 NF Naturalyte Fruit Fly Bait, an organically acceptable product containing the biologically produced insecticide spinosad, recently has received registration for use on olives in California. GF-120 attracts olive fruit fly adults, which feed on the bait, and causes adult mortality. GF-120 is concentrated and needs to be diluted with water at 1:1.5 to 1:4 (GF-120 NF: water) before application. Follow label instructions for methods of dilution. GF-120 applications should commence when olive fruit fly adults are captured on the monitoring traps or at least 2 to 3 weeks before pit hardening. Repeat applications every 7 days until harvest when flies are captured on monitoring traps. GF-120 should be applied at a 2.5 to 7.5 ounce dilute spray per tree using a 1:1.5 dilution or at a 5 to 15 ounce dilute spray per tree using a 1:4 dilution with very large droplet size. Droplets should be 5 millimeters or more in size and uniformly dispersed around the tree. Other materials will be applied according to the label.

Data to Collect: Scout for adult flies that emerge from March to May and attack olives remaining on trees from the previous season. During early summer (June) as temperatures and day length increase and few mature fruit remain on trees, female flies do not lay eggs. Although few olives are present from the previous crop to host the egg laying, the adults remain active, and they may disperse to new locations such as citrus orchards or vineyards. By late June to the beginning of July as the new olive crop develops, females begin to lay eggs and are attracted to the fruit. Although eggs may be laid in small fruit, the larvae do not successfully develop until the ripening fruit grows to sufficient size. Eggs are laid just under the fruit's skin, often creating a dimple or brown spot. Will observe for the dimple or brown spot. The use of baited traps will be used to determine presence of the pest.

Research Objectives

1. Trap for the presence of the fruit fly. The most efficient trap for monitoring the olive fruit fly is the glass or plastic McPhail-type trap baited with torula yeast lures. Yellow sticky traps baited with sex-pheromone lures (attractive to male flies) and/or ammonium carbonate, ammonium bicarbonate food bait (attractive to both sexes) also are commonly used to monitor olive fruit fly populations, but these generally are less efficient than McPhail traps.
2. Apply materials to the olives for control of the olive fruit fly. Find new chemistries to control the pest. This will aid in resistance management.

Research 2000

Olive fruit fly control. Efficacy program to combat resistance.

Protocol Olive ID:FF OC
Trial ID:OFF-OC
Project ID:

Location:

Trial Year: 2019 (year 2)

By:Debra Keenan Research 2000

Study Director: COC

Trt	Treatment	Rate	Appl	Volume	Mix unit
1	Untreated				
2	GF120	1 fl oz/item	ABCDEF		
3	Danitol	16 fl oz/a	AB	100 GAL/AC	20 gallons
4	Harvanta FB GF 120	16 fl oz/a 1 fl oz	ABCDEF	100 GAL/AC	20 gallons
5	Harvanta FB GF 120	24 fl oz/a 1 fl oz	ABCDEF	100 GAL/AC	20 gallons
6	Assail FB GF 120	8 fl oz/a 1 fl oz	ABCDEF	100 GAL/AC	20 gallons
7	Avaunt FB GF 120	4 oz/a 1 fl oz	ABCDEF	100 GAL/AC	20 gallons
8	Avuant FB GF 120	5fl oz/a 1 fl oz	ABCDEF	100 GAL/AC	20 gallons
9	Minecto Pro FB GF 120	12 fl oz/a 1 fl oz	ABCDEF	100 GAL/AC	20 gallons
10	Sivanto FB GF 120	14 fl oz/a 1 fl oz	AB	100 GAL/AC	20 gallons
11	Lorsban FB GF 120	4 fl oz/a 1 fl oz	ABCDEF	100 GAL/AC	20 gallons
12	GF120 Harvanta Asail Danitol	1 fl oz/item 16 fl oz/a 8 fl oz/a 16 fl oz/a	ACE B D F	100 GAL/AC 100 GAL/AC 100 GAL/AC	20 gallons 20 gallons 20 gallons

3. Find alternatives to the current program. This will allow for resistance management and allow for the olive growers to have more tools to control the olive fruit fly.

4. Provide efficacy data to support registration of new products for the control of olive fruit fly.
5. Updated treatment list from 2018, program will have GF 120 applications if flies are not present.

Benefits to the industry.

Management of Olive Fruit Fly is very labor intensive. Currently growers do not have a lot of tools for the control of this pest. Researching new tools and new chemistries will help the growers. New tools will give them more ways to control this pest. The olive fruit fly poses a severe economic threat for the state's commercial olive growers. By finding new ways to control the pest industry may be able to register these products. New tools will allow for control of the pest and resistance management. The most effective strategy to combat insecticide resistance is to do everything possible to prevent it occurring in the first place. Crop specialists recommend Insect Resistant Management programs as one part of a larger IPM approach covering three basic components: monitoring pest complexes in the field for changes in population density, focusing on economic injury levels and integrating multiple control strategies.

Budget Request

Item	Total budget
Set up, spray, and evaluate the list of materials in the proposal – site 1 with crop purchase	$ 12,500.00
Set up, spray, and evaluate the list of materials in the proposal – site 2 with crop purchase	$ 12,500.00
Total	$ 25,000.00

The costs include the data to be compiled in a format that is acceptable to Department of Pesticide Regulation. Also will help determine which insecticides that should be targeted for registration.

This is the second of three years. In the following years the materials that are favorable in the screening will be looked at in greater depth.

Principle Investigator: Debra Keenan 10-12-2018

CALIFORNIA OLIVE COMMITTEE

PROJECT PLAN/RESEARCH GRANT PROPOSAL

Project Year: 2019 Anticipated Period of Performance: 1 year; this is the second year of the necessary 2 crop-years to assess treatment effects on the cumulative yield of alternate bearing olive trees

Project Title: Managing Alternate Bearing in Olive with Plant Growth Regulators (PGRs) and Pruning

Project Leaders: Elizabeth Fichtner and Carol Lovatt

EF-Farm Advisor, Orchard Systems, Cooperative Extension, 4437 S. Laspina St., Tulare, CA 93274; Phone: 559-684-3310; Fax: 559-685-3319; Email: ejfichtner@ucanr.edu

CL-Professor of Plant Physiology, Emeritus & Professor in the Graduate Division, Botany and Plant Sciences-072, UC Riverside, CA 92521-0124; Phone: 951-827-4663; Fax: 951-827-4437; Email: carol.lovatt@ucr.edu

Cooperators: Kurt Schmidt, Lindcove Research and Education Center, 22963 Carson Avenue, Exeter, CA 93221; Phone: 559-592-2408, ext. 153; Email: krschmidt@ucanr.edu

Commodity: Olive Relevant AES/CE Project No.: 4556-H

Year Initiated: 2018 Anticipated Duration of Project: 2 crop years 2019 request: $21,570

Problems and Previous Research Accomplishments: ***Problem.*** Alternate bearing (AB), production of a heavy "on-crop" (high yield, ON-trees) followed by a light "off-crop" (low yield, OFF-trees), occurs in perennial fruit and nut crops, as well as forest species (where it is called "masting"). For tree fruit crops, alternating high and low yields cause significant economic problems. In ON-years, trees produce a large number of small size fruit with reduced commercial value. In OFF-years, trees produce large fruit, but in some cases a significant proportion of the fruit are too large and have reduced economic value, further exacerbating the problem that there are too few commercially valuable fruit in OFF-crop years to provide growers with a good income. For olive, the ON-crop takes longer to mature, attain size and accumulate oil. The delayed harvest further reduces floral intensity the following spring. It is important to note that the lack of fruit in the OFF-crop year, if more or less industry-wide, has a negative economic impact on every step in the production chain from farm to consumer, including orchard management, harvesting, packinghouse operation, manufacture of value-added products, marketing, and consumer prices, which jeopardizes the stability and sustainability of tree-crop commodity-based industries such as olive. Since the major factor initiating AB is an extreme climate event (excessively high or low temperature, excessive winter rain causing soil hypoxia etc.) that ultimately reduces yield and initiates AB, there is a reoccurring need for a management strategy to mitigate the severity of AB. ***Previous Research Accomplishments.*** Our research confirmed that the ON crop of fruit inhibits summer vegetative shoot growth, reducing the number of nodes that can bear floral buds the following spring (Sibbett, 2000) and was the first to document that the ON crop causes bud abscission of existing putative floral buds through harvest, inhibits the transcription of genes necessary for flower development even after harvest,

and reduces spring bud break the year following the ON-crop (Fichtner and Lovatt, 2018; Fichtner et al., 2017). For ON-crop trees, the severity of these effects is greater for bearing shoots, the majority of shoots on ON-crop trees, than non-bearing shoots. Further, plant growth regulator (PGR) treatments, which increase return bloom on non-bearing shoots, are not effective on bearing shoots. Only non-bearing shoots on ON-crop trees, which are in the minority, contribute a significant number of inflorescences to spring bloom following the ON-crop year (Fichtner and Lovatt, 2018; Fichtner et al., 2017). Taken together, these results provide evidence that increasing the number of non-bearing shoots on ON-crop trees is required to increase return bloom and yield the following year. ***Current accomplishments.*** Our current research is testing the efficacy of a PGR chemical flower thinning treatment (naphthaleneacetic acid [NAA], ALCO® Olive Stop™; AMVAC Corp., already registered for use on olive) at full bloom and mechanical pruning (hedging) after fruit set. Each treatment is applied to one side of the tree one year and the other side of the tree the next year, with topping each year. The goal is to equilibrate yield at a production level equaling 60% to 70% of the ON-crop yield annually to produce a greater 2-year cumulative yield than results from the ON-/ OFF-crop cycle of alternate bearing trees over the same 2-year period. Thus, the first objective is to even out the 2-year cumulative yield of alternate bearing 'Manzanillo' trees, which presently produce 80% of the 2-year yield in the ON-crop year and only 20% in the OFF-crop year. Our goal is for 50% of the 2-year cumulative yield to be produced each year of the 2-year cycle. Once achieved, the second objective is to maintain annual yield at 60% to 70% of the average yield for the ON-crop year in the orchard in order to increase overall yield, maintain commercially valuable fruit size, increase the percentage of green fruit, and to increase income over multiple successive cropping years. Thus far, using NAA to reduce inflorescence number or pruning to reduce fruit number on one side of the tree starting in the ON-crop year and repeating the treatment on the opposite side of the tree the following year, we have achieved 2-year cumulative yields that are distributed ~60% in the ON-crop year and ~40% in the following OFF-crop year, with no significant reduction in 2-year cumulative yield. Our results this year identified the potential to further increase yield in year 2, the year following the ON-crop year, by keeping the contribution of the OFF-crop side of the NAA-treated and pruned trees and delaying the treatment of the second side of the tree an additional year, i.e., by applying the treatments every other year, instead of annually. Thus, in 2019, we will also test the efficacy of pruning one side of the tree in one year and then the other side of the tree every other year rather than annually, again initiating the treatment in the ON-crop year.

2019 Objectives and Anticipated Outcomes: ***2019 Objectives.*** The research proposed for 2019 has three goals: Goal 1- to even out AB so there is a good crop annually by switching crop production from one side of the tree to the other side of the tree annually or every other year; Goal 2 - to sustain production each year at a level equal to 60% to 70% of the average ON-crop yield for an orchard, which will improve fruit size and the proportion of green fruit (both aspects of fruit quality are crop load dependent), so growers have a stable and good income annually; and Goal 3 - to provide growers with a means to mitigate AB when it reoccurs. These goals will be achieved using 'Manzanillo' olive trees in a block, which includes 'Barouni' olive trees as the pollenizer planted at a ratio of one to ten, at the Lindcove REC in Exeter, CA, to meet three objectives. All trees are topped to maintain uniform tree height. ***Objective 1*** – (a) To reduce crop load (total number of fruit per tree) by removing inflorescences with a foliar application of the plant growth regulator (PGR) NAA (ALCO® Olive Stop™; AMVAC Corp., already registered for use on olive) applied at full bloom at the manufacture's suggested rate; and (b) removing fruit by pruning (mechanical hedging) one side of a second set of ON-crop 'Manzanillo' olive trees.

Thereafter, the treatments are used to remove inflorescences or fruit on alternating sides of the tree annually. ***Objective 2*** – To apply the treatments to the second side of the tree every other year to obtain the crop contributed by the OFF-side of the tree in order to further increase total yield in the year following the ON-crop (year 2) (this objective was initiated in 2018, so in 2019 we will be able to assess the contribution the OFF-crop side of the tree to total yield in year 2 and thus to 2-year cumulative yield). ***Objective 3*** – To compare the efficacy of using NAA to remove inflorescences versus pruning (hedging) to remove fruit and to compare applying each treatment to the other side of the tree annually versus every other year in order to provide growers with a strategy to mitigate alternate bearing each time it is initiated. The final strategy will be one that succeeds in achieving annual yields that are significantly greater than OFF-crop yields and equal to 60% to 70% of the average ON-crop yield for an orchard with the two year cumulative yield distributed equally in each year of a 2-year cycle. **Please note the following benefits of the proposed treatments**. (1) By chemically thinning only half of the tree with NAA in any given year, the impact of over-thinning on yield if a heat wave occurs is reduced. (2) In our experiment, pruning is delayed to after fruit set to enable growers to evaluate the crop set by their trees before deciding how much fruit to remove. This allows a grower to tailor the degree of pruning to accommodate years with a poor fruit set in spite of a heavy bloom. (3) Reducing crop load on only one side of the tree reduces the negative effect of any subsequent adverse effects on fruit set and final yield over treating both sides of the tree in a given year. (4) Since the treatments increase the number of non-bearing shoots per tree, they will improve the efficacy of PGR treatments that increase summer vegetative shoot growth and spring bud break to increase floral intensity following the production of the ON crop and also the efficacy of PGR treatments designed to improve fruit set or size or delay fruit blackening (Fichtner and Lovatt, 2018; Fichtner et al., 2017). (5) In addition to shifting fruit into more commercially valuable size categories, evening out alternate bearing will ensure a greater proportion of green fruit (reduced proportion of black and partially black fruit) at harvest, which in some years is significant (2017). Both fruit size and percent green fruit are crop load-dependent, with OFF-crop trees producing fruit that are too large and have a greater proportion of black or partially black fruit.

Anticipated Outcomes.

- We will have data on the impact of different degrees of fruit thinning on only half of the tree on total yield, which will enable us to estimate the impact that over-thinning due to a heat wave would have on final yield, i.e., we will have some indication of the risk associated with the application of chemical thinning agents to only half of the tree.
- We will learn whether NAA inflorescence removal supports better summer vegetative shoot growth and return bloom and return yield than fruit removal by pruning (hedging).
- We will learn whether delaying pruning (hedging) to after fruit set to give growers the opportunity to evaluate their potential crop load to make a decision to prune or not to prune or how severely to prune, which is especially important in years with poor fruit set in spite of good blooms, is efficacious or has negative consequences.
- Specifically, we will learn whether pruning at the end of June (versus May) is effective or too late for stimulating summer vegetative shoot growth to increase return bloom and yield.
- Through these comparisons, potential benefits can be verified, e.g., fruit removal in June before pit hardening increases floral bud retention and flowering, or potential problems can be identified, e.g., June pruning causes loss of carbohydrates resulting in poor shoot growth, small fruit size or too much shoot growth, leading to competition and small fruit size (these potential problems have not encountered thus far with the late June pruning).

- We will have data establishing the year-to-year variability in yield encountered using NAA to remove inflorescences versus pruning to remove fruit.
- We will have data to support or refute that reducing crop load on one side of the tree starting in the ON-crop year using the PGR thinning agent NAA or pruning (hedging) increases yield in the following OFF-crop year sufficiently to even out AB and provide growers with a good annual income the following year.
- The data will document whether reducing crop load on alternate sides of the tree should be done each year or every other year to sustain good yields and grower income annually.
- The harvest data will quantify the effect that removing fruit on one side of the tree and then other side annually or every other year has on average fruit size, fruit size distribution (pack out), proportion of black versus green fruit, and crop value.
- The data will document the potential efficacy of the treatments to reduce the severity of alternate bearing (Alternate Bearing Index; ABI) in 'Manzanilo' olive orchards in California
- We anticipate that one or more of the strategies being tested will successfully mitigate alternate bearing and increase 2-year cumulative yield and grower income and thus, will be a strategy that can be successfully employed starting with the ON-crop each time alternate bearing is initiated by an adverse climate event or cultural problem and results in an OFF crop, which is then followed by and ON crop.

Select References:

Chao, Y.Y. 2014. Alternate Bearing in Olive (*Olea europaea* L.). MS Thesis. University of California, Riverside, CA.

Fichtner, E., Lovatt, C.J. 2018. Alternate bearing in olive. Acta Hortic. 1199:103-108. doi:10.17660/ActaHortic.2018.1199.17

Fichtner, E.J., Y.Y. Chao, L. Ferguson, J.S. Verreynne, L. Tang and C.J. Lovatt. 2017. Repeating cycles of ON and OFF yields in alternate bearing olive, pistachio and citrus trees — *Different mechanisms, common solutions*. Acta Hort. (in review)

Pearce, S.C. and S.Dobersek-Urbanc. 1967. The measurements of irregularity in growth and cropping. J. Hort. Sci. 42(3):295–305.

Sibbett, S. (2000). Alternate bearing in olive trees. California Olive Oil News. 3(12),1

BUDGET REQUEST: (Carol J. Lovatt)

Budget Year: 2019 Funding Source: COC

Labor:	**(Line 1)**		**$6,287**
Salary: T Khuong @ $60,300/yr x 5% = $3,015; Lab Asst. 1 @ $16.80/hr. x 100 hr. = $1,680		$A	$4,695
Benefits: TK= $3,015 x 51% = $ 1,538 Lab Asst. 1 = $1,680 x 3.2% = $54		$B	$1,592
Subtotal 1	**Line 1 subtotal:**		**$6,287**
Supplies, Equipment:	**(Line 2)**		**$5,253**
Supplies: *(be specific. Examples include tape, tags, buckets, traps, safety, chemicals, etc)*		$C	$0
Equipment: (*be specific. Examples include balances, meters, devices, etc*)		$D	$0
Individual contractors: Recharge to Lindcove REC – use of olive orchard, irrigation, weeding, pruning, pest control, application of PGRs = $5,253 (actual under new rates; includes harvest)		$E	$5,253
Subtotal 2	**Line 2 subtotal**		**$11,540**
Travel:	**(Line 3)**		**$2,487**
Vehicle Use: 5 roundtrips to Exeter (520 mi x 5 = 2,600 mi x $0.6014/mi = $1,564; UCR vehicle Rental 10 days x $47.268/day = $473; $90/day per diem (Lindcove REC trailer, plus meals) for 1 person x 5 trips (1.5 days each) = $450		$F	$2,487
Meeting attendance: (*be specific. anticipated travel to meetings such as COC meetings, professional society meetings*)		$G	$0
Subtotal 3	**Line 3 subtotal**		**$14,027**
Subcontracts: Elizabeth Fichtner	**(Line 4)**		**$6,000**
Collaborator A: Elizabeth Fichtner		$H	$6,000
Subtotal 4	**Line 4 subtotal**		**$20,027**
UCR Total	**(Line 5)**		**$14,027**
UCR Overhead on $14,027 @ 11% IDC	**(Line 6)**		**$1,543**
(Total to primary PI – Carol Lovatt)	**(Line 7)**		**$15,570**
TOTAL BUDGET REQUEST	**Line 4+Line 7**		**$21,570**

PRIMARY PI SIGNATURE PAGE: UNIVERSITY OF CALIFORNIA

Carol J Loratt — 10/25/2018

Originator's Signature — Date

Patricia Spence — 10/25/2018

Department Chair/County Director — Date

Liaison Officer — Date

SUBCONTRACT BUDGET REQUEST: (*Elizabeth Fichtner*)

Budget Year: 2019 Funding Source: COC

Labor:	**(Line 1)**	**$4855.61**
Salary *(Junior Specialist at 7% FTE)*		$3495.76
Benefits (*38.9%*)		$1359.85
Sub 1		**$4855.61**
Supplies, Equipment:	**(Line 2)**	**$200.00**
Supplies: *(be specific. general field supplies (flagging tape, pruners, buckets, gloves. etc)*		$200
Sub 2		**$5055.61**
Travel:	**(Line 3)**	**$349.80**
Vehicle Use: (*Mileage from Tulare, CA to/from Modesto for COC meetings; 280 miles round trip @ $0.535/mile. Request partial funds ($200) toward attendance of Pomology Conference in Davis in March 2019.This is approximately 1/3 of the cost of attending the meeting; other costs would be contributed by walnut and pistachio accounts to share costs across main commodities that I serve.*		*$349.80*
Sub 3	**(Line 4)**	**$5405.41**
UCD/ANR/UCR Overhead @ 11%	**(Line 5)**	**$594.59**
Sub 4 (Total Subcontract)	**(Line 6)**	**$6000.00**

(Add Line 6 to primary PI budget in subcontract section 'H' and 'I')

SUBCONTRACT SIGNATURE PAGE: UNIVERSITY OF CALIFORNIA

Originator's Signature	10/25/18 Date
Acting Department Chair/County Director	10/25/18 Date
Liaison Officer	Date

University of California
Entomology and Nematology

PROJECT PLAN/RESEARCH GRANT PROPOSAL

Project year 2019-20. Anticipated duration of project 1 year

Project leader Frank Zalom and Joanna Fisher Location UC Davis

Cooperating Personnel Danielle M Lightle (Orchard Systems Advisor) and Emily Symmes (Area IPM Advisor) UC Cooperative Extension

Project Title Control of overwintering olive fruit fly using insect pathogenic fungi

Keywords Olive fruit fly, pest management, insecticide resistance management, overwintering population, insect pathogenic fungi

Commodity Olive Relevant COC Project No. Click here to enter text.
Budget requested for 2019-2020:

Overview

Olive fruit fly, *Bactrocera oleae*, is the most important insect pest of California table olives. Until recently, its management has primarily relied on a single product, the spinosad bait GF-120, for which resistance has been documented. Additional control strategies are needed. Particularly useful would be those that target the overwintering generation. We propose using fungal insect pathogens to control overwintering olive fruit fly populations. If successful, this control strategy would require minimal input (1-2 sprays per year) and utilize commercially available products. A similar strategy for olive fruit fly control has been tested in Spain and has shown promising results. We want to see if the approach might be effective under California climatic conditions and with products that are already registered in California.

The problem and proposed solutions

The olive fruit fly (OLF), can cause significant crop loss and damage in California table olive production systems and there is zero tolerance for larvae in table olives (Burrack, 2011). Feeding of the OLF larvae in the developing olive destroys the pulp, can cause premature fruit drop, and leads to fruit rot due to the entry of bacteria and fungi (Zalom et al., 2009). Until recently, its management has relied almost exclusively on the use of a single product, GF-120, a bait containing the insecticide spinosad. GF-120 must be applied multiple times during the growing season to keep populations below economically damaging levels. However, spinosad resistance in California olive fruit fly populations was first reported in 2007 (Kakani et al. 2010). Continued use of GF-120 bait could lead to the development of widespread resistance and eventually the loss of olive fruit fly control in many CA olive growing regions. The pyrethroid insecticide fenpropathrin (Danitol) has been registered more recently for olive fruit fly control. However, pyrethroids are well known to disrupt scale and mite biological control in other systems where they are used, leading to secondary pest outbreaks (Cobourn et al., 2014). Overuse of pyrethroids frequently leads to the development of resist pest populations, and this has already been documented in some European olive growing regions (Pavlidi, 2018). We believe the management strategy we are proposing has the potential to provide growers with

another control option that could be used to help address current issues with insecticide resistance to GF-120 and disruption by pyrethroid insecticides.

The fungi *Metarhizium brunneum* and *Beauveria bassiana* are insect-specific pathogens and commercial insecticide formulations containing these fungi are available. We propose testing the use of insect pathogens to control overwintering OLF larvae and pupae in the fall and potentially emerging adults in the spring. We would evaluate Met52, a *M. brunneum* based product, and two *B. bassiana* based products that contain different strains of the fungus, BioCeres and Mycotrol. The fungi would be applied to the soil prior to larval drop in the fall and a second time prior to adult emergence in the spring. A similar strategy has been tested in Spain, to control olive fruit fly, using *Metarhizium brunneum* (Yousef et al., 2017). When the fungi were applied twice per year it significantly reduced the number of OLF emerging in the Spring and being caught in traps by 50-70%. We will test the *M. brunneum* and the two *B. bassiana*-based products to determine which fungal strain has the highest virulence for controlling OLF. These products were chosen because they are either already registered in California for use on olives (Mycotrol) or already registered for other subtropical tree crops thus only minor label extensions would be needed for full registration. For our proposed study, we can easily obtain experimental use permits for Met52 and BioCeres. If our experiments indicated that one or both, of these products are effective, we would request a label extension which we are highly optimistic would be granted since the products are already registered on subtropical crops, they are biologicals and in this instance are not even being applied when olive fruit are present before harvest.

Emergence of overwintering OLF in Spring directly contribute to the population that will affect fruit later in the season. The use of insect pathogenic fungi to reduce the number of overwintering OLF has the potential to significantly reduce the size of the next season's OLF population, saving growers money and reducing the amount of in season pesticide that is needed. This control method does not rely on OLF attraction to a bait or trap. Instead insects are targeted when and where their location is known. The majority of OLF larvae pupate within the first 3 cm of the soil surface (Dimou et al., 2003). It is likely that pupating larvae will contact the fungi in the soil since it was found that more than 50% of *M. brunneum* and 87% of *B. bassiana* remained in the first 5 cm of the soil profile regardless of soil type (Storey and Gardner, 1988, Yousef et al., 2018). Finally, utilizing entomopathogenic fungi requires minimal labor or equipment since the products can be applied with commonly available ground spray booms, further reducing growers' management costs. The fungi, *M. brunneum* and *B. bassiana*, are endemic to the soil and depending on soil conditions, can persist in soil from weeks to months (Yousef et al., 2017; Zimmerman et al., 2017). Due to the ability of these fungi to persist in the soil only 1-2 spray applications per year will likely be needed and use of the fungi could significantly reduce the number of GF-120 and pyrethroid applications that are needed to achieve additional control if needed during the growing season.

Three objectives will be addressed through this research: (1) determine the virulence and application rate of *M. brunneum* and *B. bassiana* based products needed to kill OLF, (2) evaluate capacity of applied fungi to persist in CA olive orchards, and (3) assess efficacy of using insect fungal pathogens to control overwintering OLF under CA field conditions.

Objectives and anticipated outcomes

(1) Determine the virulence and application rate needed to kill olive fruit fly, B. oleae, larvae and pupae using commercially available insect pathogenic fungi.

Outcome. Efficacy of Met52, BioCeres and Mycotrol in controlling olive fruit fly larvae and pupae. Determine how long it takes the fungi to kill larvae and pupae and the optimal application rate.

(2) *Evaluate the capacity of insect pathogenic fungi to persist in olive orchards under California field conditions*

Outcome: Determine how long commercially available insect pathogenic fungi persist in the soil in olive orchards. Use this information to determine the number of sprays needed to control overwintering olive fruit fly.

(3) Assess the efficacy of using insect pathogenic fungi for the control of overwintering olive fruit fly larvae and pupae using field cage trials.

Outcome: Efficacy of using insect pathogenic fungi to control overwintering olive fruit fly larvae and pupae. Assess use of fungal sprays to reduce spring adult emergence.

Plans and Procedures:

Activities	Timeline
Obj. 1: *Determine the virulence and application rate needed to kill OLF larvae and pupae using commercially available insect pathogenic fungi.* Establish time to death and the lethal dose of Met 52, BioCeres and Mycotrol against OLF larvae and pupae in a laboratory assay. Test each product at several application rates. Spray soil with fungi, allow larvae to drop into soil and determine time to death.	**September-November 2019**
Obj. 2: *Evaluate the capacity of insect pathogenic fungi to persist in olive orchards under California field conditions* Spray plots on a grower's farm and in an untreated UC Davis experimental olive orchard with the product identified in Obj. 1. Take soil samples monthly and extract and quantify living fungi using standard insect pathology methods (plate soil on media selective for *M. brunneum* and *B. bassiana*).	**October 2019-May 2020**
Obj. 3. *Assess the efficacy of using insect pathogenic fungi to control overwintering OLF larvae and pupae using field cage trials*. Conduct a cage field trial on a grower's farm and in an untreated UC Davis experimental olive orchard. Place cages beneath tree canopies. Spray soil surface with the product and at the rate identified in Obj.1. Treat control plots with water. Following spray, place infested olives on soil surface in cages and allow larvae to drop into soil to burrow and pupate. At several time points following treatment, dig up soil under a subset of the cages and determine larval and pupal mortality. Assess the efficacy of 1 vs. 2 sprays by spraying the soil under a subset of cages a second time, in the Spring, prior to adult emergence. Monitor cages for adult emergence and assess survival of overwintering OLF.	**October 2019-May 2020**
Disseminate research findings. Research findings will be disseminated through grower meetings, talks, trade journals and peer-reviewed journal articles	**Fall 2020-ongoing**

BUDGET REQUEST Budget Year 2019-20

Funding Source

Salaries and Benefits			
Student Assistant	20 hr/wk for 32 wks @$12/hr		$ 7,680
Employee benefits (1.5%)	1.5%		$ 115
Subtotal		**Sub 1**	**$ 7,795**
Supplies and Expenses			
Rearing Supplies			$ 600
Fungal persistence assay supplies	soil corers, plastic bags, vials, petri dish turntable, spreaders		$ 576
Media (fungal persistence assay)	216 plates @ $2.73/ plate		$ 590
Field cages	144 @ $30/cage		$ 4,320
Growth chamber maintenance			$ 400
Subtotal		**Sub 2**	**$ 6,486**
Travel	**(1 mi @ 54.5 cents/mi)**		
Travel to field sites	2 sites, 25 trips=5475 mi		$ 2,984
Collect infested fruit	2 trips = 216 mi		$ 118
Travel to extension meetings	2 trips = 633 mi		$ 345
Subtotal		**Sub 3**	**$ 3,447**
Subtotal			$ 17,728
Indirect Costs	11% of budgeted costs	**Sub 4**	**$ 1,950**
Cumulative Total			**$ 19,678**

Department account number _____

Originator's Signature _____ Date 10/19/2018

Joanna Fiske Date 10/19/2018

Entomology and Nematology Department Chair _____ Date 10/22/2018

Liaison Officer _____ Date

References

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PROJECT PLAN/RESEARCH GRANT PROPOSAL

Project year: 2019 Anticipated Duration of the project: April –November 2019

Project Leader: Jim Stewart Location: Tulare County
Mailing Address: PO Box 1095, Exeter CA 93221
Phone: (559) 730-6243 FAX: (559) 592-4105 E-mail: jsagipmc@verizon.net

Project Title: Southern San Joaquin Valley Olive Fruit Fly Monitoring Project

Cooperating personnel: Bert Quezada, Doug Bigham, Laura Doskocil

Keywords: Olive Fruit Fly, Monitoring, Traps,
Commodity: Olive

PROBLEM AND ITS SIGNIFICANCE:

The monitoring of Olive Fruit Fly (OLFF) in commercial olive groves in the Southern San Joaquin Valley started in 2001. OLFF is potentially the most significant insect pest in commercial Olive.

OBJECTIVES:

The objective of this project would be to continue the monitoring program of adult OLFF in commercial olive groves in the Southern San Joaquin Valley. Detection and seasonal monitoring of OLFF and the accurate timing of control measures, primarily bait sprays, would be the goal of this project. Correlation of fly collections with fruit susceptibility to infestation would indicate to growers when initial bait treatments should be applied. In addition, monitoring would continue to give growers information on the general OLFF population. This information would specific for only the groves being monitored and would be available to growers to aid in making OLFF management decisions in their respective groves in the area being trapped.

PLANS AND PROCEEDURES:

. The locations will be Ivanhoe, Woodlake, Exeter, South Exeter, Tonyville, West Lindsay, Strathmore, Porterville and Terra Bella. In addition, a site in the city of Visalia would also be monitored. All of these sites are in Tulare County where a high percentage of the commercial olives are located in the Southern San Joaquin Valley. Many of the sites have been monitored starting in 2001. All traps will be in place by March 29, 2019. The traps will be read and reported by April 5, 2019 and continue on a weekly basis. Two yellow panel traps with ammonium carbonate bait and male pheromone will be used per site. Traps will be serviced and OLFF counted weekly. Reports detailing the number of male and female Olive Fruit Fly found at each location will be submitted to the California Olive Committee and interested parties within 24 hours on a weekly basis during the project. The program will end November 15, 2019.

BUDGET REQUEST

Budget year: April 1, 2019-December 1, 2018

Funding Source: California Olive Committee
Nutrien Ag Solutions
Ag IPM Consultants, Inc.

Salaries and benefits:		$15,600.00
Supplies:		
Traps, bait and pheromone		1,200.00
Travel:		
Mileage to trap sites		2,400.00
Equipment:		0.00
	TOTAL	$19,200.00

Funding would be split equally between the above listed funding sources.

Total funding from the California Olive Committee would be: $6,400.00

James R. Stewart
Project leader
Ag IPM Consultants, Inc
PO Box 1095, Exeter CA 93221
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Bert Quezada
Senior Pest Control Advisor
Ag IPM Consultants, Inc
PO Box 1095, Exeter CA 93221
Phone: (559) 936-0102
Fax: (559) 592-4105

Ern's Pest Control

Project Plan/ Research Grant Proposal

Project Year: 2019

Project Leader: Ernie Simpson
Mailing Address: 320 County Road 15 Orland, California 95963
Phone: 530-865-9829 Cell: 530-518-4685
E-mail: ernsimp17@sbcglobal.net

Cooperator: Dani Lightle, Orchards Advisor, UC Cooperative Extension, Orland

Commodity: Olive

Problem and its Significance:

Since the detection of Olive Fruit Fly in California in 1998, it has been a concern to olive growers in commercial orchards; preventative sprays are necessary. Trapping to monitor the Olive Fruit Fly populations in individual orchards is recommended. This will allow growers and PCA's to follow trends to their orchards and help evaluate spray program efficacy. Having an idea of area-wide population trends will help growers and PCA's interpret the results from their orchards.

Objectives:

1: Provide timely information to area growers regarding area-wide olive fruit fly population trends.
2: Continue to develop a historical perspective of olive fruit fly populations for the area.

Plans and Procedures:

Starting in early April plastic McPhail traps using Torula yeast tablets dissolved in water as the bait will be placed in one tree at 12 sites (6 in Glenn County and 6 in Tehama County). The same sites that have been used in previous years will be monitored again to allow for comparison of current years trap catches to previous years. Earlier work in Glenn and Butte Counties has shown that the plastic McPhail traps catch more flies than the commonly used yellow panel trap. Traps will be checked and flies counted weekly. The results will be reported via email to the COC for further distribution. Trapping results will be reported as male and female flies for individual traps and combined by site. Trapping and reporting will be continued through October or until table olive harvest has concluded.

Budget Request

Budget Year: 2019

Funding Source: California Olive Committee

Salaries	$4735
Supplies and Expenses: Trapping Supplies	$ 365
Travel 2545 mi.	$1800
This may vary due to fuel prices	
Total	$6500

Originator's Signature _____

Ernie Simpson

AES/CE MAR 84

Workgroup: Olive
Department: Plant Pathology/UCR

University of California
Division of Agricultural Sciences
PROJECT PLAN/RESEARCH GRANT PROPOSAL

Project Year: 2019 Anticipated Duration of Project: 3rd of 4 years

Principal Investigators: J. E. Adaskaveg

Cooperating: D. Thompson, H. Förster, and K. Nguyen

Project Title: Epidemiology and management of olive knot caused by *Pseudomonas savastanoi* pv. *savastanoi*

Keywords: Bactericides, copper enhancing compounds, antimicrobial natural products, biological controls

JUSTIFICATION/ BACKGROUND

Pseudomonas savastanoi pv. *savastanoi* (*Psv*), the causal agent of olive knot, is a serious disease of olives (*Olea europaea*) throughout all olive growing regions of the world (8). The pathogen enters through wounds causing outgrowths (knots, tumors, galls) predominately on trunks, branches and twigs. Olive knot is one of the most economically important diseases of olives. Infection may lead to tree defoliation, dieback, and reduced vigor, which ultimately lowers fruit yield and quality (6). *Psv* can survive epiphytically on olives but the main source of inoculum is bacteria living within knots (7). Large quantities of bacterial ooze can be exuded when knots become wet. This exudate is disseminated by rain, wind, insects, birds, as well as human activity. The opportunistic pathogen takes advantage of wounds caused by natural leaf abscission (4), frost, and hail, as well as cultural practices such as pruning and harvesting. These latter practices also lead to direct mechanical damage of the knots, exposing and spreading inoculum to healthy tissue. After entering its woody host, the pathogen induces knot formation through the production of indoleacetic acid (IAA) and cytokinins (2). In California, infections occur mostly during the rainy season (late fall, winter, and spring) but knots do not develop until new growth starts in the spring. Infections can occur at low temperatures (-5° C) and thus, wetness is the main limiting factor for the disease. None of the currently grown olive cultivars is resistant to the pathogen (5).

Control of olive knot is difficult, and growers rely on applications of copper-based bactericides as the only effective foliar treatment. Manual application of cresol- and xylenol-based compounds (Gallex) to individual knots can eliminate the pathogen but is unfeasible on a commercial scale due phytotoxicity when applied as an air-blast foliar treatment. Copper has been extensively used in olive production for many years for the control of diseases such as peacock spot and olive knot. Reliance on a single active ingredient has led to our detection of copper resistance in *Psv* strains from a commercial olive orchard. Still, the incidence of copper resistance is currently very low, accounting for only 2% of the total strains collected in different olive growing regions of California. When resistant strains were inoculated to Arbequina and Manzanillo olive wounds, application of copper provided reduced or no control as compared to inoculation with a sensitive strain. Copper-resistant strains caused less disease on leaf scars as compared to Cu-sensitive strains, but still resulted in a high incidence of disease especially at higher inoculum concentrations. Therefore, there is a potential risk of copper resistance spreading with the continued and sole use of copper. This necessitates the development of new bactericides or copper-activity-enhancing materials to overcome resistance. The latter strategy has proven to be effective for walnut blight management where copper resistance in *Xanthomonas arboricola* pv. *juglandis* is common and copper-mancozeb mixtures have provided exceptional control for many years. Mancozeb can no longer be registered on new crops but other copper-enhancing alternatives can be evaluated. Salicylidene benzoylhydrazone (SBH) was recently discovered to display synergism when combined with copper against *Alternaria solani* causing early blight of tomatoes. We performed preliminary tests with this molecule with promising results using several genera of phytopathogenic bacteria including *Psv*. Low concentrations of metallic copper combined with SBH were highly inhibitory in vitro against a copper-resistant *Psv* strain while copper or SBH by themselves at the same concentrations were not effective. In field trials in 2018 on managing olive knot, however, a SBH derivative (DAS-1) did not improve the

performance of copper. If additional derivatives of SBH are supplied by Dow AgroSciences, these will be tested in 2019.

Other potential bactericides were made available to us by agrochemical registrants in 2018. These include experimental inhibitors of type III secretion systems in plant pathogenic bacteria. These compounds are novel in their mode of action. They act on the mechanism that delivers bacterial proteins into the host cells that are vital for *Pseudomonas* species to cause disease. We tested three experimental type III secretion system inhibitors in the field but they performed poorly as compared to copper and kasugamycin treatments. Additional inhibitors may become available for 2019 studies.

We have been instrumental in the development of the new agricultural antibiotic kasugamycin (commercial name Kasumin) for several bacterial diseases of agronomic crops in the United States. Kasugamycin has high activity against *Erwinia* (1) and *Pseudomonas* species and moderate activity against *Xanthomonas* species and other plant pathogenic bacteria. We found it to be the most promising new treatment for preventing olive knot in our extensive field studies. Although we previously reported that kasugamycin had reduced efficacy when treating leaf scars that were made by the removal of green healthy leaves, we discovered that kasugamycin was much more effective in controlling olive knot on naturally formed leaf scars and thus, would be a beneficial treatment during spring leaf drop. Kasugamycin was first federally registered on pome fruits. In 2018, it received California registration on pome, cherry, and walnut crops. Registration on olives, peaches, and almonds is pending for late 2019. The petition for Kasumin on olive was still in the IR-4 program this summer and the final report and submission to the EPA are pending in the fourth quarter of 2018. Kasugamycin would greatly complement current copper sprays and could be used in rotation or mixtures with copper. Oxytetracycline was also submitted to IR-4 and is in the field trial phase of the IR-4 program for establishing tolerances. We will conduct additional studies with oxytetracycline to potentially improve its efficacy by using selected UV-protecting adjuvants. New antibiotic registrations find little acceptance with regulatory agencies, and we are currently in discussion with EPA to develop a science-based approach on the use of antibiotics in plant agriculture.

In addition to developing conventional chemical compounds, we continued our research of food additives as possible new modes of action for managing olive knot. Several food additives that are considered 'generally recognized as safe' (GRAS) have antimicrobial properties. They are often naturally produced molecules of gram-positive *Streptomyces* species. Although these compounds are typically applied to food products as preservatives, they have potential for controlling plant diseases when applied as a foliar treatment. Integration of these alternative materials with conventional treatments may improve disease control, reduce the risk of resistance development, and provide olive growers with more resources for managing olive knot. In 2018, we evaluated nisin, Ɛ-poly-L-lysine, and two organic acids in field trials but disease control was not comparable to that of copper or kasugamycin treatments. In laboratory assays, however, low rates of organic acids and Ɛ-poly-L-lysine, and higher rates of nisin were toxic to Psv when bacterial cells were exposed for a short period of time demonstrating their effectiveness. Therefore, improvement in field performance will be necessary and is ongoing in this project. Potential strategies for optimizing these compounds may include the addition of adjuvants or buffering agents (9), or the use of these materials in mixed treatments with conventional products. This information is still valuable because rotational programs could be developed with different modes of actions for different phases of the disease, i.e., leaf scars or lateral wounds occurring during leaf drop or harvest and pruning, respectively. These materials are registerable as conventional and possibly organic treatments.

RESEARCH OBJECTIVES

1) **Evaluate new bactericides, potential enhancers of copper activity, food additives, GRAS sanitizers, and other experimentals against *Psv***
   a) Laboratory in-vitro sensitivity studies: copper mixtures with new SBH derivatives as they become available; nisin, Ɛ-poly-L-lysine, and the GRAS sanitizers lactic and citric acid alone or combination and in mixtures with selected adjuvants (see below).
   b) Field efficacy studies with new bactericides in comparison with kasugamycin for the management of olive knot caused by copper-sensitive and -resistant strains of *Psv*.
      i) Potential enhancers of copper activity - new SBH derivatives.
      ii) Type III secretion system inhibitors (as they become available)
      iii) Oxytetracycline formulations in combination with selected UV-protecting adjuvants.

iv) Nisin and Ɛ-poly-L-lysine alone, in combination with each other, or in mixtures with antimicrobial acids (e.g., lactic, citric, and other acids), chelators (e.g., EDTA), sodium diacetate, buffers (to neutralize acidic carbohydrates), as well as emulsifiers (e.g., dextran) and proprietary fatty acids.

3) Continue to support the registration of the antibiotics kasugamycin and oxytetracycline

a) Administrative support to EPA and other regulatory agencies about registration concerns for kasugamycin and other bactericides

b) Optimizing the efficacy of oxytetracycline under field conditions (UV blockers and stabilizers) as it goes through the registration process at IR-4.

PLANS AND PROCEDURES

1) Evaluate new bactericides, potential enhancers of copper activity, food additives, GRAS sanitizers, and other experimentals against *Psv*.

a. To evaluate the in vitro toxicity of SBH, nisin, Ɛ-poly-L-lysine, and the GRAS sanitizers lactic and citric acid alone or combination with each other and selected adjuvants (see below), the spiral gradient endpoint (SGE) method will be used where bacterial strains are exposed to a bactericide concentration gradient on a single agar plate. To evaluate SBH and other derivatives as they become available as new potential enhancers of copper activity against *Psv*, a dilution plate method will be combined with the SGE method. Agar media will be amended with fixed concentrations of copper. Subsequently, SBH and derivatives of SBH will be applied to the plates in radial concentration gradients using a spiral plater. Suspensions of *Psv* strains will be streaked radially onto the amended media. This will allow the determination of minimal inhibitory values for *Psv* at different ratios of copper and SBH derivatives. These data will then be used to calculate appropriate field rates.

b. Copper-SBH mixtures, Type III secretion system inhibitors, and oxytetracycline will be tested in the field on Arbequina and Manzanillo olives at UC Davis. Treatments will be compared to Kasumin and copper by themselves. We also plan to use combinations of different compounds (e.g., nisin + Ɛ-poly-L-lysine, nisin + lactic acid, etc.) and adjuvants to determine if the field efficacy can be optimized. Adjuvants will include chelators (e.g., EDTA), antimicrobial acids (e.g., lactic, citric, and other acids), chelators (e.g., EDTA), sodium diacetate, buffers (to neutralize acidic carbohydrates), as well as emulsifiers (e.g., dextran) and proprietary fatty acids. Plants will be wounded with lateral and leaf scar wounds. Lateral wounds on 1-2-year-old twigs will be made using a scalpel by removing the bark and exposing cambial tissue. Leaf scars will be made by pulling leaves off the same twigs. In addition, wounds from natural leaf drop will be used. Treatments will be sprayed onto wounds, allowed to air-dry, and inoculations will be done with a suspension of copper-sensitive or -resistant *Psv* strains. SBH derivatives will be applied using rates based on the laboratory tests. Oxytetracycline will be used in combination with new UV-protecting adjuvants because it is especially vulnerable to UV-degradation. The efficacy of treatments will be assessed as the percent incidence of knots forming on treated, inoculated wounds as compared to wounds that are treated with water and inoculated (i.e., controls).

2) Continue to support the registration of the antibiotics kasugamycin and oxytetracycline. An inter-commodity and industry group will continue to work with the Minor Crop Farmer Alliance to recommend an EPA policy change towards the use of antibiotics in plant agriculture. Specifically, a new internal EPA Guidance Document (GD) for use of antibiotics in plant agriculture needs to be developed based on science. Historically, EPA GD 152 for registration of antibiotics in animal husbandry is used for all requests in agriculture. Additionally, we will continue to work with a USDA working group to address CODEX initiatives for establishing policies on all antibiotic use in agriculture including animal and plant uses.

Benefits to the industry

For management of olive knot, in addition to cultural methods, sanitation practices, and the labor-intensive Gallex, only copper materials and the natural product Regalia are currently available. We obtained improved performance of copper when applications were made within 24 h of wounding events (e.g., harvesting, pruning, hail storms, freezing) as compared to later applications, and with high labeled rates of copper. In our previous

research, we showed that copper resistance is currently only found locally where copper has been used for many years. Because copper-resistant strains of *Psv* were found to be virulent and likely competitive, and because they were not genetically clonal, there is a risk of further spread of copper resistance. Therefore, alternatives are needed for a sustainable and effective management program for many years ahead. We initiated the registration of the new agricultural antibiotic kasugamycin that was registered in 2014 on pome fruits, and in 2018 on pome fruits, cherry, and walnuts in California. The olive registration is pending in late 2019 together with almonds and peaches. Oxytetracycline is still in the registration process through the IR-4 program. Kasugamycin showed high activity against olive knot especially in mixtures with copper. Mancozeb as a mix partner with copper was considered by us and the industry, but EPA has denied any new registrations. In 2018, we evaluated new copper activity-enhancing compounds that, however, were not effective; therefore, possible additional derivatives of SBH will be evaluated in 2019 in cooperation with a US registrant (Dow AgroSciences). Working with Brandt Corp., we also tested Zinkicide, a nanoparticle zinc product in mixed treatments with copper and found it to have moderate activity. Thus, we will continue to explore and evaluate potential bactericide products that can be registered under current regulatory policies. Compounds that inhibit the bacterial Type III secretion system and prevent infection are critical to the survival of *Psv*. We also aim to optimize the natural GRAS products nisin, ε-poly-L-lysine, and the sanitizers lactic and citric acid in combination with adjuvants such as sodium diacetate, buffers (to neutralize acidic carbohydrates), and emulsifiers (e.g., dextran) to enhance the antimicrobial activity and persistence in managing olive knot. The registration of several materials for olive knot management will allow the implementation of anti-resistance strategies and will prevent over-use of any single mode of action bactericide. Still, integrated practices will be critical for the successful management of the disease. Any bactericide treatment will be most effective when pathogen population levels are at a minimum and the host is less susceptible.

References

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4. Hewitt, W. B. 1939. Leaf scar infection in relation to the olive knot disease. Hilgardia 12:41-66.
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8. Young, J.M., 2004. Olive knot and its pathogens. Australasian Plant Pathology 33:33–39. doi:10.1071/AP03074
9. Chheda, A. H., and Vernekar, M. R. 2015. A natural preservative epsilon-poly-L-lysine: fermentative production and applications in food industry. Intern. Food Research J. 22:23-30.

Budget Request:
Funding Source: California Olive Commission and California Olive Oil Commission

Budget Request with UC indirect costs:

Budget Year: 2019 Funding Source*:	OOC	COC	Total Budget
Salaries and Benefits: Post-Docs/RAs	7,000	7,000	14,000
Lab/Field Ass't	1,000	1,000	2,000
Subtotal	8,000	8,000	16,000
Employees' Benefits**	4,500	4,500	9,000
Subtotal	12,500	12,500	25,000
Supplies and Expenses	0	0	0
University Land and Orchard charges	1,000	1,000	2,000
Operating Expenses/Equipment Travel	0	0	0
Travel	1,500	1,500	3,000
Direct Cost Totals Total	**$15,000**	**$15,000**	**$30,000**
Off Campus IDC @ 11%		1,650	1,650
Total Budget Requested	**$15,000**	**$16,650**	**$31,650**

J. E. Hasbrouck

Originator's Signature (PI) Date: Oct. 30, 2018

Katherine Borkovich

Dept. Chair (Riverside Campus) Date: Oct. 30, 2018

Liaison Officer Date:

AES/CE MAR 84

Workgroup: Olive
Department: Plant Pathology/ UCR

University of California
Division of Agricultural Sciences
PROJECT PLAN/RESEARCH GRANT PROPOSAL

Project Year: 2019 Anticipated Duration of Project: 2nd year of 3 years

Principal Investigators: J. E. Adaskaveg

Cooperating: H. Förster, D. Thompson (UC Riverside)

Project Title: Management of foliar diseases of olive – A. Olive knot (see previous submission) and B. Evaluation of new fungicides for control of olive leaf spot (Supplemental Proposal)

Keywords: Chemical and biological control

JUSTIFICATION/ BACKGROUND

Olive leaf spot or peacock spot, caused by the fungus *Fusicladium oleagineum* (syn. *Spilocea oleaginea, Venturia oleaginea*), is a sporadic disease of olive trees in California. In years with favorable environmental conditions, an orchard may lose 9 to 15% of its leaves and 10 to 20% of the fruiting twigs if the disease is not managed. Excessive leaf loss can also result in more olive knot because leaf scars are sites for bacterial infection. Symptoms most commonly develop on the leaf blade but are also found on petioles, fruit, and fruit peduncles (stems). At first, lesions are inconspicuous, superficial, sooty blotches. Later they become dark green to black circular spots containing mycelium and conidia (Fig. 1), and spots are surrounded by yellow halos. These lesions resemble the spot on the tail of a peacock, and hence the name peacock spot. With numerous lesions, the leaf becomes chlorotic and falls.

Leaves in the lower canopy are more severely affected where the humidity is higher, resulting in greater defoliation. Defoliated twigs often die later in the summer. Leaf infections occur on the upper surface and seldom penetrate beyond the epidermal layer. Once the leaf drops, however, the fungus colonizes the internal leaf tissues forming a dense mass of stromatic tissue. The sexual state of the pathogen has not been observed. Olive cultivars vary in their susceptibility. Mission is the most susceptible followed by Manzanillo and to a lesser extent Sevillano, but all cultivars are generally susceptible.

Leaf drop occurs mostly in late spring and summer. Infected leaves remaining on the tree start sporulating along the margins of lesions in the fall. Rainfall and wind-driven rain are the main dissemination methods; whereas wind alone is not effective in detaching and disseminating conidia. In California, lesions start forming in the fall and winter, but most disease develops in the spring. Rainfall is essential for infections to occur regardless of the season. Temperature is important but often is not limiting the development of the pathogen. High temperatures are more limiting to spore germination and mycelial growth than low temperatures. The optimum temperature for growth of the fungus is 21°C, but growth can occur at 6 to 28°C. The minimum duration of leaf wetness for spore germination is 48 h at 16°C, 24 h at 20°C, or 36 h at 24°C. The incubation period is 12 to 19 days over a temperature range of 10°C to 25°C.

Currently available chemicals for managing the disease are copper and lime sulfur. Bordeaux mixtures or fixed coppers are commonly used to prevent copper injury. Lime sulfur can also eradicate the fungus in leaf tissue but lime sulfur is difficult to work with and requires extra protective equipment for workers. Other fungicides such as zineb are effective but no longer available. Timing of fungicide treatments in California include a postharvest application and an early spring application. Others, however, have indicated that spring treatments are less effective. Use of copper treatments at these time periods corresponds with olive knot management timings. With more regulations concerning the use of copper (new copper limits for agricultural uses) and lime sulfur, alternative fungicides are needed that are highly efficacious and persist for extended time periods to prevent infections over the winter and spring when rainfall results in infection periods. In 2018,

Ziram and Inspire Super were approved for residue trials at the IR-4 National Food Use Workshop in September for registration on olives. Strong support was provided based on the after-harvest and winter season usage with expected zero to limit-of-detection residues on the crop in the following harvest season. Ziram is a FRAC Code M3, whereas Inspire Super is a FRAC Code 3/9. Thus, integration of multi-site modes of action for both products was also established as an effective anti-resistance strategy. Research on these and other fungicides needs to continue to identify potential products.

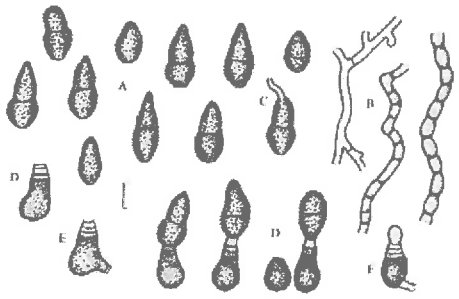

Fig. 1. *Fusicladium oleagineum.* A - conidia. B - superficial septate hyphae, C - germinating conidium, D - conidiogenous cells with several conspicuous annellations, E – percurrent proliferating conidiogenous cell, F - conidiogenous cell arising from a hypha. Scale = 10 μm.

OBJECTIVES

1. Evaluate the performance of new and older fungicides in field trials.
   a) Dithiocarbamates (ziram), chlorinated hydrocarbons (chlorothalonil), and phthalimides (captan) (FRAC Groups – M3, M4, M5), DMIs (FG 3), polyoxins (FG 19), or mixtures such as FG 3/9, and FG 3 + 19.
   b) Evaluate proprietary fatty acids to improve performance of fungicides (pesticides).
2. Evaluate application timing of selected treatments.
   a) Fall, spring, or fall and spring.
3. Evaluate new fungicides for their in vitro activity.
   a) Determine the in vitro activity of selected fungicides that are effective in field trials.

PLANS AND PROCEDURES

1. *a,b. Evaluate the performance of new and older fungicides in field trials.* In studies in a commercial olive orchard where the disease is known to occur and in an experimental orchard at UC Davis, fungicides including ziram (FG M3), captan (FG M4), chlorothalonil (FG M5), difenoconazole (FG 3), and polyoxin-D (FG 19), or mixtures such as difenoconazole/cyprodinil (FG 3/9) and difenoconazole+polyoxin D (FG 3+19) will be applied using an air-blast sprayer. Additionally, proprietary fatty acids that improve pesticide performance will also be evaluated in combination with selected treatments (e.g., Inspire Super, polyoxin-D, etc.). There will be four replications for each treatment in a randomized complete block design. Disease incidence and severity will be evaluated in late spring. Data will be analyzed statistically using ANOVA procedures and mean separation procedures of SAS 9.4.

2. *Evaluate application timing of selected treatments.* In field studies, selected fungicides will be applied at different timings to compare fall vs. spring or fall + spring timings. There will be four replications for each treatment in a randomized complete block design for a factorial experiment. Disease incidence and severity will be evaluated in late spring. Data will be analyzed statistically using ANOVA procedures and mean separation procedures of SAS 9.4.

3. *Evaluate new fungicides for their in vitro activity.* Isolates of the pathogen will be obtained from several locations. To evaluate the in vitro toxicity of selected new fungicides with efficacy in field trials, the SGE method will be used. Agar media will be amended with fungicides in radial concentration gradients using a spiral plater. Suspensions of spores or mycelial strips will be placed radially onto the amended media. This will allow the determination of EC_{50} values for each fungicide and isolate using a computer program.

BENEFITS TO THE INDUSTRY

Little information is available on the management of peacock spot although the disease is widely distributed and causes sporadic losses in olive growing regions of California. Chemical management is currently based on the use of copper and lime sulfur, two materials that are increasingly being restricted by regulatory agencies at the state and federal levels. Thus, the evaluation of the efficacy and timing of new and older fungicides is needed to provide the industry with alternative treatments for peacock spot management. With Ziram and Inspire Super (difenoconazole+cyprodinil) accepted into the IR-4 program in September 2018, registrations are planned, and efficacy data needs to be expanded. Due to the small acreage of olive production in California, registration of any new material will be limited to registrants that are willing to cooperate and to registration processes though the IR-4 program. UPI (ziram) and Syngenta (Inspire Super) were very agreeable to our proposals for their respective products on olive. Still, the registration process will take several years to complete.

REFERENCES

1. Teviotdale, B. 2005. Diseases of olive. Pages 119-122 in: Olive Production Manual, 2nd Edition, G. S. Sibbett and L. Ferguson, technical editors. University of California ANR, Publication No. 3353.
2. Ogawa, J. M., and English, H. 1991. Diseases of Temperate Zone Tree Fruit and Nut Crops. University of California, DANR, Publication No. 3345.

Budget Request: (Supplemental to the Olive Knot Proposal)

Budget Year: 2019
Funding Source: California Olive Commission

Salaries and Benefits:	Post-Docs/RAs		9,000
	Lab/Field Ass't		0
	Subtotal		9,000
	Employees' Benefits		5,000
		Subtotal	14,000
Supplies and Expenses			0
Equipment and University Land and Orchard charges			0
Operating Expenses/Equipment Travel (Davis Campus only)			0
Travel (include $500 for each Farm Advisor travel costs)			1,000
Department Account No. _____		**Total**	**15,000**

James E. Adaskaveg
Originator's Signature (PI) Date: Oct. 30, 2019

Katherine Borkovich
Dept. Chair, Kathy Borkovich (Riverside Campus) Date: Oct. 30, 2019

Liaison Officer _____ Date: _____

*******ACTION REQUIRED*******

FROM: CALIFORNIA OLIVE COMMITTEE

SUBJECT: 2019 BUDGET

RECOMMENDATION: THAT the Committee adopt the 2019 FY Budget.

BACKGROUND: The following is the total 2019 FY Budget.

TOTAL 2019 BUDGET

BUDGETS	MARKETING	RESEARCH	INSPECTION	EXECUTIVE	EXPORT	TOTAL
2019	**$450,000 $63,500**	**$143,523**	**$58,000**	**$563,900**	**TBD**	**$1,278,923**
Extras to be discussed		***$200,000**		****$150,000**		**$1,628,923**
% Budget	31.5%	21.1%	3.5%	43.8%		100%

*$200,000 is being discussed for acrylamide & any additional research.
**Additional item to be brought before the board for approval. Item totals $150,000.

HISTORIC BUDGET, TONNAGE, & ASSESSMENT COMPARISON

FISCAL YEAR	2019 (Proposed)	2018	2017	2016	2015	2014	2013	2012	2011
Previous	$1,278,923 $1,628,923	$1,795,477	$1,752,366	$1,525,415	1,296,731	1,129,682	$1,289,198	$1,197,291	$2,203,909
$ Difference	$(166,554)	$43,111	$226,951	$228,684	$167,049	$(159,516)	$91,907	$(1,006,618)	$1,273,986
Tonnage	17,953	90,188	63,000	77,977	37,119	90,790	78,179	26,944	167,000
Assessment Rate		24.00	$26.00	$26.00	$26.00	$15.21	$21.16	$31.32	$16.61

FISCAL IMPACT: $1,628,923 for FY 2019 with $68,994.40 for no-cost research extensions from 2018.