CALIFORNIA APPLES

California Apple Commission

ANNUAL REPORT

2021-2022

2021-2022

ANNUAL REPORT

CALIFORNIA APPLE COMMISSION

2565 ALLUVIAL AVE., SUITE 152

CLOVIS, CA 93611

(P) (559) 225-3000

(F) (559) 456-9099

WWW.CALAPPLE.ORG

TABLE OF CONTENTS

SECTION IV- PEST, DISEASE, & STANDARDIZATION

SECTION V- CALIFORNIA APPLE EXPORT MARKETS

SECTION VI- CA APPLE DOMESTIC AND EXPORT STATISTICS

SECTION VII- APPLE INDUSTRY COMMUNICATIONS

MESSAGE FROM THE EXECUTIVE DIRECTOR

Todd W. Sanders
Executive Director

The 2021-2022 season proved to be another successful year for the California apple industry despite several challenges. Although the economic repercussions from the pandemic are still present, regulations began to lift moving us one step closer to operating normally again. Unfortunately, many issues have continued to carry over. Increased production costs, lack of labor, supply chain disturbances, and the ongoing drought continue to affect day to day operations for growers and handlers.

This past year, the Commission has continued our partnership with California Grown and the Specialty Crops Block Grant Program to expand the California Apple Commission's educational outreach. On the research side, we have been exploring the use of Sterile Insect Techniques to control invasive pests. At the Commission, we will continue to be an advocate for the California apple growers and handlers through our research, education, export, and government relation programs.

More details on the Commission's programs can be found in the following pages within this report. Additionally, the Commission will continue to manage and oversee the California Blueberry Association, the California Blueberry Commission, the California Olive Committee, the Olive Growers Council of California, the California Wild Rice Advisory Board, and the newly acquired California Olive Oil Council (2021). This complements the Commission's philosophy of managing other commodities to share resources and capabilities while also driving costs down.

On behalf of the California Apple Commission, I am pleased to present to you the 2021-2022 annual report. As always, thank you for your continued support of the California Apple Commission, and we look forward to serving you in the next year.

Sincerely,

Todd W. Sanders
Executive Director

CHAIRMAN'S CORNER

The California Apple industry continued to push past the challenges presented by the COVID-19 pandemic during the 2021-2022 season. As the economy and the industry as a whole was beginning to recover, the California Apple Commission addressed these issues and, as always, put the growers first. The main goal of the California Apple Commission is to provide significant assistance to the growers and handlers of the industry. The 2021-2022 annual report highlights the various work that the Commission has completed throughout the year. Despite the obvious challenges that have been brought on by the COVID-19 pandemic that have continued to affect the industry, the Commission has been working diligently to properly assist the California apple industry.

An important highlight of the year is the active engagement the Commission had on federal and state legislative and regulatory priorities, including the passing of the California Apple Commission sponsored SB-982 bill. SB-982 authorizes the California Apple Commission to enforce an organic apple certification program that would prevent the use of prohibited substances in organic apple production. This bill protects the integrity of the California organic apple industry.

As we begin the 2022-2023 season, please do not hesitate to utilize the Commission and the resources they provide. Once again, I want to close by thanking the California apple growers, handlers, and board members for their hard work and continued support of the California Apple Commission. It continues to be a pleasure to serve as Chairman, and I wish you a safe and successful upcoming season!

Sincerely,

Jeff Colombini
Chairman

CALIFORNIA APPLE COMMISSION STAFF

TODD SANDERS
EXECUTIVE DIRECTOR
TSANDERS@CALAPPLE.ORG

ELIZABETH CARRANZA
DIRECTOR OF TRADE AND TECHNICAL AFFAIRS
ECARRANZA@CALAPPLE.ORG

ELISE OLIVER
DIRECTOR OF OPERATIONS AND RESEARCH
EOLIVER@CALAPPLE.ORG

JANETTE RAMOS
OFFICE MANAGER
JRAMOS@CALAPPLE.ORG

SERAPHINA BEDOYAN
INTERN
INTERN@CALAPPLE.ORG

LINDSEY SWALL
INTERN
INTERN@CALAPPLE.ORG

LESLIE HOVSEPIAN
BOOK KEEPER
BOOKKEEPER@CALAPPLE.ORG

BOARD OF DIRECTORS 2021-2022

District 1	District 2	District 3
PRODUCER MEMBER **Kelley Hansen** Mt. Dennison Orchards Term: 7/2020-6/2024	**PRODUCER MEMBER** **Chris Britton** BK Partners Term: 7/2018-6/2026	**PRODUCER MEMBER** **Jeff Colombini** Lodi Farming Term: 7/2017-6/2025
PRODUCER MEMBER **Zea Sonnabend** Fruitilicious Farm Term: 7/2020-6/2024	**PRODUCER MEMBER** **Virginia Hemly Chhabra** Greene and Hemly Term: 7/2018-6/2026	**PRODUCER MEMBER** **Steve Chinchiolo** Riverbend Orchards Term: 7/2018-6/2025
HANDLER MEMBER **Bill Denevan** Viva Tierra Term: 7/2017-6/2026	**HANDLER MEMBER** **Doug Hemly** Greene and Hemly Term: 7/2020-6/2023	**HANDLER MEMBER** **Tim Sambado** Prima Frutta Term:7/2017-6/2026
ALTERNATE MEMBER **VACANT** Term: 7/2020-6/2026	**ALTERNATE MEMBER** **VACANT** Term: 7/2020-6/2026	**ALTERNATE MEMBER** **VACANT** Term: 7/2020-6/2026
	PUBLIC MEMBER **Dr. Steve Blizzard** Term: 7/2017-6/2026	

Please note that CAC Board structure officially changed on April 8, 2022. The following pages contains additional details on the restructure.

CAC BOARD OF DIRECTORS RESTRUCTURE

On December 14, 2021, the California Apple Commission Board of Directors unanimously voted to restructure the Board to consist of one Statewide District and to modify Commission membership to consist of six producer members, two handler members, two alternate members, one public member, and one alternate public member.

Because the concentration of fresh apple production has consolidated to a particular region in California, restructuring to a statewide district allows more producers who are eligible and interested to serve, to now participate on the Board of Directors. With the previous presence of three districts, producers located in the district with the vast majority of fresh apple production may have been precluded from serving due to the limit on how many Directors could be from that given district.

Restructuring ensures that the Commission will obtain a quorum to maintain their function in the areas of research, education, exports, etc.

The following page contains the official concurrence from the California Department of Food and Agriculture (CDFA), authorizing the above mentioned modifications.

If you have any questions, please do not hesitate to reach out to the Commission office.

BEFORE THE STATE OF CALIFORNIA

DEPARTMENT OF FOOD AND AGRICULTURE

In the matter of concurring in modifications to the number and boundaries of districts and the membership of the California Apple Commission as recommended by the Commission to the California Department of Food and Agriculture	**Concurrence by the Department of Food and Agriculture in Modifications to the Number and Boundaries of Districts and the Membership of the Commission Provided in the California Apple Commission Law**

WHEREAS, the California Apple Commission Law (Law), being Chapter 13.5 (commencing with Section 75501) of Part 2, Division 22 of the Food and Agricultural Code, authorizes the establishment and operation of the California Apple Commission (Commission), and

WHEREAS, the Department of Food and Agriculture of the State of California (Department) oversees the activities of the Commission pursuant to and by virtue of authority vested in it by said Law, and

WHEREAS, Section 75514(b) of said Law requires concurrence by the Department when the Commission's Board of Directors, by a two-thirds vote, recommends a modification to the number of districts and their boundaries provided in Section 75514(a) of said Law, and

WHEREAS, Section 75531(c) of said Law requires concurrence by the Department when the Commission's Board of Directors, by a two-thirds vote, recommends a modification to the Commission membership when there is one statewide district, provided that there shall be no less than six producer members and one handler member, and

WHEREAS, the Commission's Board of Directors, at its meeting on December 14, 2021, recommended by a unanimous vote of seven members present at the meeting, representing 70 percent of the full Commission membership of 10 total positions, to modify the number of districts and their boundaries provided in Section 75514(a) of said Law to one statewide district and to modify the Commission membership to consist of six producer members, two handler members, two alternate members, one public member, and one alternate public member, and

WHEREAS, the Department has found that the recommended modifications have been recommended by not less than two-thirds of the Commission's Board of Directors, as required by Sections 75514(b) and 75531(c) of said Law, and that the proposed changes are proper and equitable and will tend to effectuate the declared purposes of the Law and help ensure proper representation on the Commission;

NOW THEREFORE, the Department of Food and Agriculture of the State of California, acting pursuant to and by virtue of the authority vested in it by the California Apple Commission Law, does hereby concur in the modifications to the number and boundaries of districts and the membership of the Commission provided in the California Apple Commission Law.

DATED: April 8, 2022

JOE MONSON, Branch Chief
Marketing Branch
Department of Food and Agriculture

2022 0203 | 2022 0408 | 1507

NEW BOARD OF DIRECTORS 2021-2022

	STATEWIDE PRODUCERS	
PRODUCER MEMBER **Kelley Hansen** Mt. Dennison Orchards Term: 7/2020-6/2024	**PRODUCER MEMBER** **Chris Britton** BK Partners Term: 7/2018-6/2026	**PRODUCER MEMBER** **Jeff Colombini** Lodi Farming Term: 7/2017-6/2025
PRODUCER MEMBER **Zea Sonnabend** Fruitilicious Farm Term: 7/2020-6/2024	**PRODUCER MEMBER** **Virginia Hemly Chhabra** Greene and Hemly Term: 7/2018-6/2026	**PRODUCER MEMBER** **Steve Chinchiolo** Riverbend Orchards Term: 7/2018-6/2025
HANDLER MEMBER **Bill Denevan** Viva Tierra Term: 7/2017-6/2026	**HANDLER MEMBER** **Doug Hemly** Greene and Hemly Term: 7/2020-6/2023	**HANDLER MEMBER** **Tim Sambado** Prima Frutta Term:7/2017-6/2026
ALTERNATE MEMBER **VACANT** Term: 7/2020-6/2026	**ALTERNATE MEMBER** **VACANT** Term: 7/2020-6/2026	**ALTERNATE MEMBER** **VACANT** Term: 7/2020-6/2026
	PUBLIC MEMBER **Dr. Steve Blizzard** Term: 7/2017-6/2026	

CALIFORNIA APPLE ACREAGE TOTALS

County	Acreage
Amador	1.2
Butte	20
Calaveras	9.05
Contra Costa	10.25
El Dorado/Alpine	831
Fresno	120
Humboldt	35
Inyo/Mono	5
Kern	445
Kings	3.18
Lassen	3.5
Los Angeles	2
Madera	71
Marin	2.3
Mariposa	6
Mendocino	216
Merced	2
Monterey	20
Napa	5.79
Nevada	17.5
Placer	48
Sierra	1.1
Riverside	22
Sacramento	528
San Benito	330
San Bernadino	255
San Diego	133
San Joaquin	1,730
San Luis Obispo	152.5
San Mateo	27.76
Santa Barbara	60
Santa Clara	117
Santa Cruz	2,014
Shasta	17
Siskiyou	26
Solano	2.43
Sonoma	2,118
Stanislaus	352
Sutter	8
Tehama	12
Tulare	71.46
Tuolomne	117.3
Ventura	416
Yolo	98.8
TOTAL	**10,483.105**

USING 2022 DATA

STATEMENT FOR ACTIVITIES

FISCAL YEAR ENDED JUNE 30, 2022

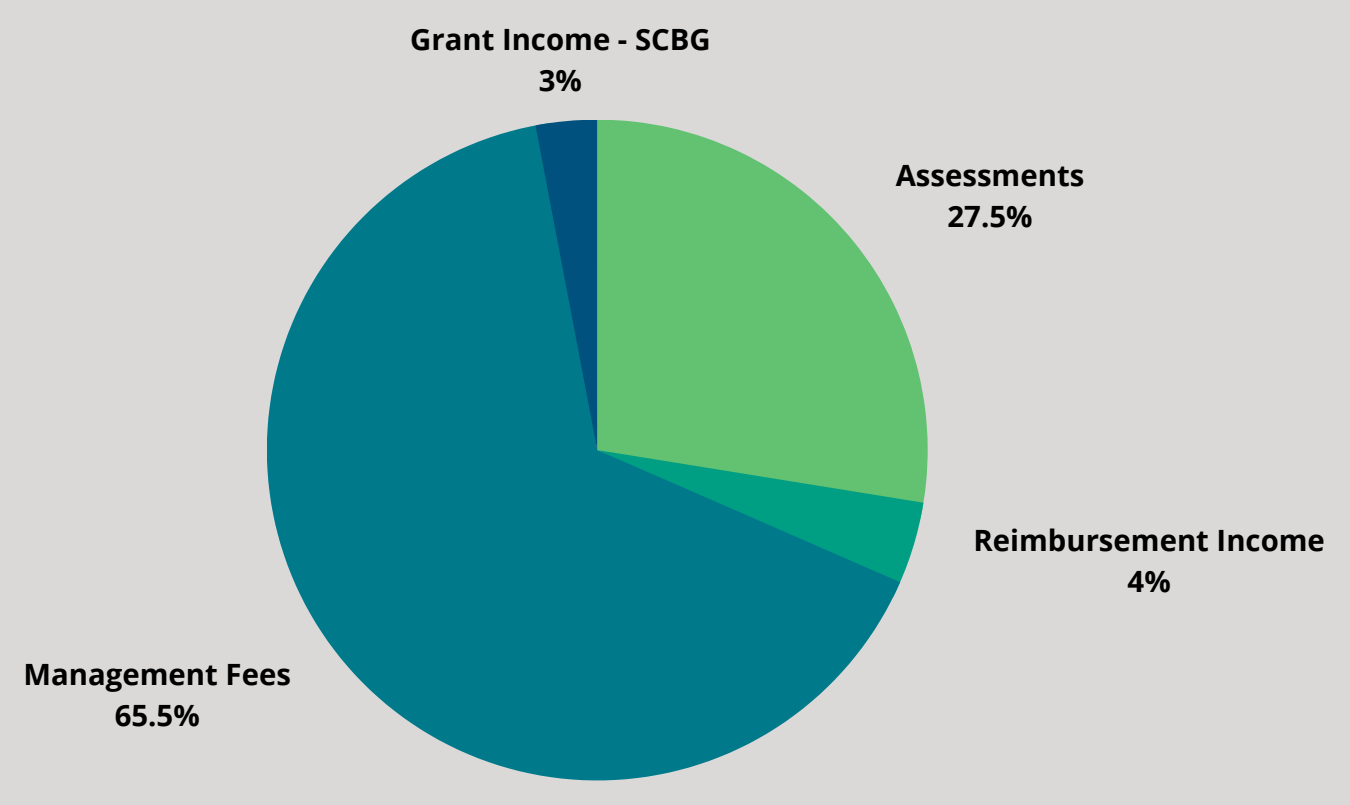
ASSETS	
• CASH	$1,651,428
• ACCOUNTS RECEIVABLE	$66,061
• PREPAID EXPENSES	$7,749
• PROPERTY AND EQUIPMENT NET OF ACCUMULATED DEPRECIATION OF $10,886 IN 2022 AND $11,010 IN 2021	$4,307
• RIGHT TO USE LEASED ASSET, NET OF ACCUMULATED AMORTIZATION OF $120,614 IN 2022 AND $86,720 IN 2021	$129,299
TOTAL ASSETS	**$1,858,844**
LIABILITIES	
• ACCOUNTS PAYABLE	$66,639
• PAYROLL AND RELATED LIABILITIES	$1,338
• UNEARNED REVENUE	$9,166
• LEASE LIABILITY	34,456
TOTAL CURRENT LIABILITIES	**$111,599**
NET POSITION	
• UNRESTRICTED	$1,639,339
NET POSITION	**$1,639,339**
TOTAL LIABILITIES AND NET POSITION	**$1,858,844**

STATEMENT OF REVENUES

REVENUES

• ASSESSMENTS	$221,835
• GRANT INCOME - SCBG	$24,119
• MANAGEMENT FEES	$527,083
• REIMBURSEMENT INCOME	$32,219
• OTHER	$0

TOTAL REVENUES **$805,256**

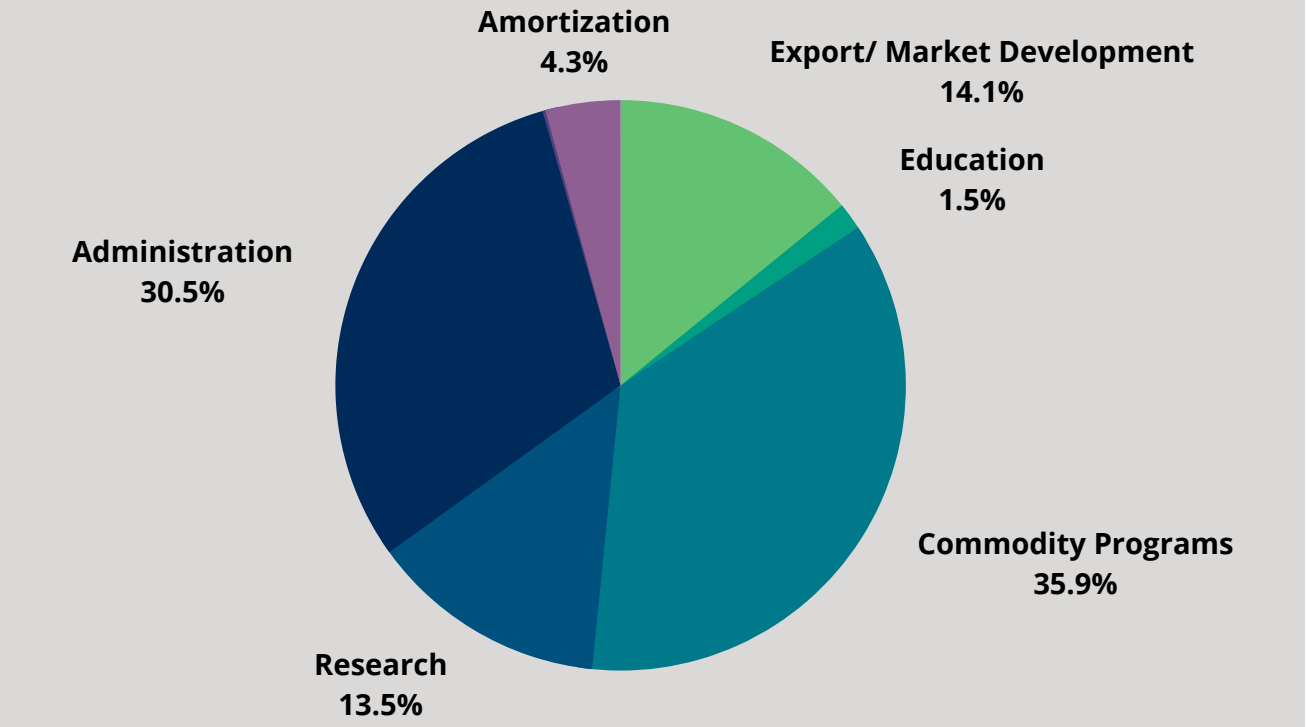


STATEMENT OF EXPENSES

EXPENSES

• EXPORT/MARKET DEVELOPMENT	$112,637
• EDUCATION	$12,239
• COMMODITY PROGRAMS	$286,531
• RESEARCH	$107,263
• ADMINISTRATION	$243,444
• DEPRECIATION	$1,342
• AMORTIZATION	$33,894

TOTAL EXPENSES **$797,350**



CHANGES IN NET POSITION **$6,249**

NET POSITION, BEGINNING OF YEAR, **$1,633,090**

NET POSITION, END OF YEAR **$1,639,339**

CALIFORNIA APPLE RESEARCH PROJECTS

2021-2022 FINAL REPORTS

In 2021-2022, the California Apple Commission focused on four areas of research, two of which were continuations from the prior year. Each of these research topics will continue to be areas of focus for the future as well.

In summary, our current projects are as follows:

1) Evaluation of new bactericides for controls of fire blight of apples caused by Erwinia amylovora and evaluation of new postharvest fungicides for pome fruits—**Dr. Jim Adaskaveg**

2) Trials on California Apples to test ProTone as an Organic Apple Thinner—**Valent U.S.A. LLC**

3) Sterile Codling Moth Release On California Apple Acreage—**M3 Agriculture**

4) Apple Rootstock Breeding Program Field Trials—**Dr. Genarro Fazio**

Project Title	**Amount**
Evaluation of Bactericide...	$23,000[1]
Trials on California Apples to test ProTone...	$20,000
Sterile Codling Moth Release....	$33,000[2]
Apple Rootstock Breeding Program....	$0[3]
FISCAL IMPACT FOR 2021/2022:	**$76,000**

[1] Research done by Dr. Adaskaveg will be done on both organic and conventional apples.
[2] The CAC partnered with the Pear Pest Management Research Fund for this research project.
[3] The CAC received a 2020 Specialty Crop Block Grant to conduct this project in conjunction with USDA-ARS.

Annual Report – 2021-22

Prepared for the California Apple commission

Project Title:	Evaluation of new biological controls for management of fire blight of apples caused by *Erwinia amylovora* and evaluation of new natural products as organic postharvest fungicides for pome fruits
Project Leader:	Dr. J. E. Adaskaveg, Department of Plant Pathology and Microbiology, University of California, Riverside CA 92521.
Cooperators:	D. Thompson, D. Cary, and H. Förster

SUMMARY

Fire blight management

1. Antibiotic and copper resistance surveys for populations of *Erwinia amylovora* in California pome fruit growing areas were continued in 2021.

   Only 10 strains were obtained from 6 locations in Yuba Co. and 3 locations in Lake Co. All 10 strains were sensitive to streptomycin, oxytetracycline, and kasugamycin. No strains were available from locations where high oxytetracycline resistance was detected in recent years. Results for 2022 strains are pending.

   a. High incidences of moderate resistance (MIC <25 ppm) to streptomycin were detected in previous years in orchards in Sacramento Co., but moderate resistance was recently also found in Lake Co. Strains with high resistance (MIC>100 ppm) to streptomycin are less common. Streptomycin should be used strategically, and our findings stress the importance of resistance management with mixtures or rotations, limiting the number of applications per season (ideally one), and the development of new alternatives.

   b. Strains with high resistance (>100 ppm) to oxytetracycline were detected for the first time in Sacramento Co. in 2018, 2019, and 2020, and these were also highly resistant to streptomycin. Oxytetracycline resistance at this level in *E. amylovora* has never been reported from other locations. In pear flower inoculation studies, these resistant strains were virulent, and in co-inoculations, they were competitive in the presence of sensitive strains. Studies to characterize the molecular mechanism of resistance are ongoing.

2. Five field trials on the management of fire blight were conducted on cv. Granny Smith, and on Bartlett, Comice, and apple-pears.

   a. **Antibiotics:** The conventional antibiotics streptomycin, oxytetracycline (using new formulations of Mycoshield and FireLine), and kasugamycin continued to perform well and were the most effective and consistent treatments. Kasumin is currently considered a conventional treatment, however, efforts are underway to obtain an organic registration. The compound is a natural substance that is commercially produced by fermentation. In contrast to streptomycin and oxytetracycline, it has very minimal or no usage in human medicine. Ningnanmycin (Ninja) was moderately to not effective. Thus, increasing the rate in this year's as compared to last year's studies did not improve efficacy.

   b. **Natural products:** Cinnerate (evaluated for the first time in 2022) and Thymox (also evaluated in 2021) were the most promising products. They could become alternatives in organic apple production but should be continued to be evaluated for best treatment strategies. Alum (potassium aluminum sulfate) showed very good efficacy in the two apple studies with efficacy statistically similar to the antibiotics but was less effective in two pear studies.

   c. **Biocontrols:** Double Nickel and Serenade benefit when mixed with a copper product such as Cueva or MasterCop. A treatment with a bacteriophage (Agriphage) on inoculated apple-pear flowers was ineffective

Postharvest decay control

1. In three experimental packingline studies, natamycin (Uniguard) provided good to very good control against blue mold, gray mold, and Alternaria rot, but mixture treatments with Scholar, Inspire (difenoconazole), Penbotec, as well as the premixture Academy were mostly more effective. Because half rates were used in the mixture treatments, they are still cost-effective.
2. An experimental pre-treatment of fruit with a plant sterol binder significantly improved the efficacy of natamycin in laboratory studies. Possibly, a pre-treatment of fruit on the packingline can render natamycin highly and consistently effective against blue mold, but this pre-treatment may also improve efficacy against the other decays.

Based on the current moderate efficacy of natamycin, it should not be used by itself for managing decays of pome fruits but should be applied in a premixture with other fungicides. Although efficacy is not improved as compared to using Scholar, Academy, or Penbotec by themselves, adding natamycin represents an excellent resistance management strategy. Resistance to natamycin has not been reported previously to any *Penicillium* species, although the compound has been registered for food uses for over 20 years. Initially, the submission of natamycin to the NOSB was denied, but in 2021, the USDA-AMS that oversees the NOSB approved organic use that resulted in OMRI certification of some formulations (e.g., Zivion-S and -M) and the BioSpectra certification is pending.

INTRODUCTION

Epidemiology and management of fire blight. Fire blight, caused by the bacterium *Erwinia amylovora*, is one of the most destructive diseases of pome fruit trees including apples. In the spring, flowers are infected through natural openings in nectaries of flowers, leaves, and stems. From the flower, the bacteria spread into the peduncle, spur, and twig where it causes a canker. Infections of petioles and young shoots can also lead to cankers. During warm, humid environments, infected tissue can ooze or exude droplets consisting of bacterial cells that function as new inoculum that can infect healthy plant tissues. Inoculum is spread by wind, rain, insects, birds, or by contaminated pruning tools. Secondary infections may occur throughout the growing season. The pathogen overwinters in cankers, dead flower buds, and diseased fruit.

Current chemical control programs for fire blight are based on frequent bactericide applications that are best used as contact (protective) treatments to prevent infections. Conventional copper compounds as pre-bloom or early-bloom applications are only effective when disease severity is low to moderate. They may cause fruit russeting and therefore, labeled rates are at low amounts of metallic copper equivalent (MCE) that limit the effectiveness. New re-formulated copper products that can be used at reduced MCE rates and that cause less phytotoxicity are available. Badge X2, CS-2005, Cueva, and MasterCop are OMRI-approved, and the latter two are often more effective. Contributing to the low efficacy of copper is the low to moderate level of copper insensitivity in pathogen populations that we detected in our surveys. Moreover, copper resistance is adaptive in response to the presence of copper. Because only few treatments are permitted for organic apple production, research on OMRI-approved copper and other products needs to be continued.

The antibiotics streptomycin (STR), oxytetracycline (OTC), and kasugamycin can only be used in conventional pome fruit production. They continue to perform well at many locations, and new, more concentrated formulations of OTC have recently been made available. Resistance, however, has developed at some locations to two of the antibiotics. The incidence of resistance to STR in California orchards has been fluctuating from very high to low in our surveys between 2006 and 2021 and was mostly found in Sacramento Co. Reduced sensitivity to OTC has only been found sporadically, and these isolates did not persist. However, in 2018 to 2020, we detected highly resistant strains at several locations, and these strains were also highly resistant to STR. We are currently determining the molecular mechanism for this resistance.

Kasugamycin (Kasumin) that is produced by fermentation is the most recent antibiotic registration. It differs from other naturally produced antibiotics that it is not being used in human and animal medicine. Thus, it has been submitted to the NOSB for approval as an organic treatment but has been denied. Perhaps requesting the USDA-AMS to consider kasugamycin for OMRI-certification can be pursued similar to the arguments made for natamycin and polyoxin-D which are now OMRI-listed biofermentation products with little to no use in human or animal medicine. Resistance in *E. amylovora* to kasugamycin has not been found to date among

hundreds of strains evaluated from different pome fruit growing areas in California. A new natural antibiotic, ningnanmycin, was evaluated by us in 2021 on pear and showed moderate efficacy. This compound was included in our 2022 trials using higher rates.

Among non-antibiotic alternatives, the biocontrol and fermentation product treatments Blight Ban A506 (*Pseudomonas fluorescens* strain A506), Bloomtime Biological (*Pantoea agglomerans* strain E325), Serenade (*Bacillus subtilis* strain QST 713), and Double Nickel (*Bacillus amyloliquifaciens* strain D747) have been inconsistent over the years in their performance in our trials and were most effective at low inoculum levels and less favorable micro-environments. Among the biocontrols, Blossom Protect (*Aureobasidium pullulans*) has been the most effective and consistent in our and others' studies under less to moderately favorable disease conditions, however the buffer component may cause russetting. Efficacy of the Serenade ASO formulation was improved in mixtures with copper (Cueva or MasterCop). Research needs to be continued to evaluate new biocontrols as well as additives. Bacteriophage products have had low efficacy in our trials, and in 2022, another product (Agriphage) was evaluated. Biocontrols are most effective when they are actively growing on the plant. Several mechanisms have been described for control of plant diseases by biocontrol agents including: (1) Competition; (2) Antibiosis or biochemical inhibition; (3) Site exclusion; (4) Parasitism; and (5) Induction of host resistance.

In previous research on apple, use of the OMRI-approved LifeGard to complement copper and other treatments as a systemic acquired resistance (SAR) inducer was unsuccessful. The non-organic compound acibenzolar-S-methyl (Actigard) was also shown to be inconsistent in previous trials on pear, although it was reported as effective on apple in other parts of the country. Therefore, we are evaluating other bactericide alternatives such as the natural fermentation compounds lactic acid, ε-poly-L-lysine (EPL), and nisin that have known anti-bacterial activity and are used as US-FDA-approved food preservatives. Other natural products evaluated in 2022 (several for the first time; Table 1) were based on thyme oil (Guarda, Thymox, Thyme Guard), cinnamon oil (Cinnerate) or extracts of an agave (QAM) or a yeast (CWP), or they were comprised of potassium aluminum sulfate (Alum) or capric/caprylic acids (Dart). Other compounds evaluated included riboflavin (TDA-NC1), peroxyacetic acid (Oxidate), the fungicide dodine (Syllit), and copper formulations (Cueva, MasterCop). Many of these potentially could qualify as biopesticides with the EPA and ultimately as organic compounds with the NOSB and OMRI. Our goal is to develop effective rotational programs for organic farming with the use of copper, biopesticides, food preservatives, and OMRI-approved natural products. We also work on conventional programs with the use of antibiotics alone or in mixtures with copper, biologicals, or natural products during bloom or as cover sprays during early fruit development.

Management of postharvest decays. Apples like many other pome fruits can be stored for prolonged time using the correct storage environments. Still, postharvest decays caused by fungal organisms can cause economic losses that limit profitability in marketing the fruit. The major postharvest pathogens of apples include *Penicillium expansum, Botrytis cinerea, Alternaria alternata*, *Mucor piriformis*, and *Neofabraea* spp. causing blue mold, gray mold, black mold, Mucor decay, and bull's eye rot, respectively. In California, the former three are most common. There is a deficiency of available postharvest biocontrols and natural products to prevent decays in storage. BioSave 100 is one of the only materials currently available in the United States, but it is not very effective. Other biological products have been registered in other countries.

In our studies we demonstrated that the food preservative natamycin is effective against a spectrum of postharvest pathogens including those causing gray mold, Rhizopus rot, Mucor rot, and Alternaria decays, but it was not always highly effective. Natamycin is registered as a biopesticide for stone, citrus, pome, and some subtropical fruits and is sold as BioSpectra, CeraFruta, or Uniguard (but not all products are registered on all crops). This compound was federally approved by the US-Food and Drug Administration (FDA) as a food additive to prevent mold growth, including *Penicillium* species, on dairy (e.g., cheese and yogurt) and meat products for many years. Over all the years in use, resistance in *Penicillium* species against natamycin has not occurred. Working with producers and registrants a first submission request for approval of natamycin as an organic postharvest treatment unfortunately was rejected by the NOSB in 2019. However, the OMRI listing of natamycin is pending on the OMRI website based on the recent USDA-AMS approval. Natamycin is 'exempt from tolerance' by the US-Environmental Protection Agency (EPA). Codex is currently developing a similar category for these types of biopesticides. Therefore, our goal is to continue to

evaluate natamycin and other new postharvest fungicides such as an organic formulation of polyoxin-D for the management of postharvest decays of apples.

Table 1. Bactericides and additives evaluated in field studies on fire blight 2022

Category	FRAC Code	Active ingredient	Trade name/Code
Antibiotics	24	kasugamycin	Kasumin 2L
	41	oxytetracycline	FireLine 45, Mycoshield NUP-17010
	25	streptomycin	FireWall
	---	ningnanmycin	Ninja
Natural products	BM 01	Thyme oil	Guarda
	BM 01	Thyme oil	Thymox
	BM 01	Thyme oil	Thyme Guard
	BM 01	cinnamon oil	Cinnerate
	BM 01	potassium aluminum sulfate	Alum
	BM 01	agave extract	QAM
	BM 01	capric/caprylic acids	Dart
	BM 01	yeast extract	CWP
Biocontrols	BM 02	*Aureobasidium pullulans*	Blossom Protect
	BM 02	*Bacillus amyloliquefaciens* D747	Double Nickel 55
	BM 02	*Bacillus subtilis* QST 713	Serenade ASO
	BM 02	Phage	Agriphage
Food preservatives	---	KFD-623-EPL (ε-poly-L-lysine)	food additive
	---	KFD-622-NSN (nisin)	food additive
Other antimicrobials	M01	copper octanoate	Cueva
	M01	copper-sulfate pentahydrate	MasterCop
	U12	dodine	Syllit
	---	riboflavin	TDA-NC1
	---	peroxyacetic acid	Oxidate

OBJECTIVES FOR 2021-2022

Fire blight research

1. Evaluate the efficacy of treatments for managing fire blight.
   - A. Laboratory in vitro tests with copper and zinc products in combination with antibacterial food additives (lactic acid, Ɛ-poly-L-lysine, and nisin), natural organic acids (capric acid and capric/caprylic acid mixtures), new and biologicals (yeasts and bacteria).
   - B. Field trials with protective air-blast spray treatments:
     - i. Kasugamycin in combination with organic treatments to support organic petition to NOSB.
     - ii. New formulations of copper (e.g., Badge X2, CS-2005, Cueva, MasterCop) zinc, and chlorine dioxide in combination with food additives (lactic acid, poly-L-lysine, nisin), and biocontrols (e.g., Serenade ASO, Double Nickel 55) or natural products (Alum, EF-400, BacStop, ET-91, Gargoil, Guarda, RejuAgro, TDA-NC-1) as new antibacterial strategies.
     - iii. Bacterial phage-mixture products in combination with other biological control treatments (i.e., Blossom Protect) to provide an integrated strategy (pending agroindustry cooperation).

Postharvest research

2. Comparative evaluation of new postharvest fungicides
   - A. Evaluate natamycin (BioSpectra, Cerafruta, Uniguard), other new postharvest fungicides such as organic formulations of polyoxin-D, and Academy at selected rates against gray mold, blue mold, Alternaria decay, and bull's eye rot and compare to fludioxonil.
   - B. Evaluate mixtures of these compounds and new formulations of natamycin to improve performance of the fungicide.

PLANS AND PROCEDURES

Isolation of *E. amylovora* and bacterial culturing. Samples with fire blight symptoms were obtained in the spring of 2020 from 6 locations in Yuba Co. and 3 locations in Lake. Infected plant material (fruit, stems, pedicels, twigs) was cut into small sections and incubated in 1 ml of sterile water for 15 to 30 min to allow

bacteria to diffuse out of the tissue. Suspensions were streaked onto yeast extract-dextrose-$CaCO_3$ agar (YDC) and single colonies of *E. amylovora* were transferred. A total of 17 strains were obtained and evaluated for their sensitivity to antibiotics.

Laboratory studies on the management of fire blight using protective treatments. Flowering twigs of ornamental pear (*Pyrus calleryana*) from the UCR campus were placed into 100-ml Erlenmeyer flasks containing water with 20 ppm gibberellic acid. Flowers were treated (for treatments see Fig. 1) using a hand sprayer and were spray-inoculated with a STR/OTC-sensitive isolate of *E. amylovora*. There were 3 replications of 2 or 3 twigs for each treatment. Twigs were covered with plastic bags, and the incidence of fire blight was determined after 7 days based on the number of blackened flowers of the total number of flowers evaluated.

Field studies on the management of fire blight using protective treatments. Air-blast field studies on the relative efficacy of protective treatments were conducted in experimental cv. Granny Smith and Fuji apple orchards at the Kearney Agricultural Research and Extension Center (KARE). Three applications were done starting at king bloom and followed by full bloom and petal fall treatments. Treatments included single compounds and mixtures (*see* Figs. 2,3). Incidence of blight was assessed in mid-May based on the number of infected flower clusters of approximately 100-200 or 50-100 clusters evaluated for each of the four three-tree replications. Additionally, potential phytotoxic effects of the treatments (e.g., fruit russeting and leaf burn) were evaluated. For comparison, field studies were also conducted on cvs. Bartlett and Comice pear, as well as on cv. Shinko apple-pear with some overlapping treatments to the apple studies. Comice trees were inoculated with *E. amylovora* (1 x 10^6 cfu/ml) after the second of two applications, and Shinko trees were inoculated after the first (1 x 10^6 cfu/ml) and third (2 x 10^6 cfu/ml) applications. Data were analyzed using analysis of variance and LSD mean separation procedures of SAS 9.4.

Efficacy of new postharvest fungicides for managing apple decays in storage. In experimental packingline studies with cvs. Granny Smith and Fuji apples, the Uniguard formulation of natamycin was evaluated by itself and in mixtures with Scholar (fludioxonil), Inspire (difenoconazole), and Penbotec (pyrimethanil). Penbotec by itself and Academy (fludioxonil+difenoconazole) were also included as treatments. Fruit were wound-inoculated with *P. expansum* (TBZ-resistant; 500,000 spores/ml), *B. cinerea* (100,000 spores/ml), or *Alternaria alternata* (100,000 spores/ml) 15-17 h before treatment. Treatments were done by T-jet application that were followed by a CDA application with carnauba-based fruit coating. Fruit were then incubated at 20C for 10-15 days.

RESULTS AND DISCUSSION

Survey of antibiotic and copper sensitivity in* E. amylovora *strains from California in 2021. Ten fire blight samples were made available in 2021 for our annual resistance monitoring in *E. amylovora*. All strains were determined to be sensitive to STR, OTC, and kasugamycin (Table 2). Unfortunately, the low number of samples obtained this year is not representative, and this may have been due unfavorable environmental conditions in orchards. Low rainfall and drought during the spring of 2021 contributed to low disease incidence. Furthermore, locations in Sacramento Co. where we found strains with high resistance to both OTC and STR in 2018 to 2020 were not re-sampled, and no information on the persistence of these strains could be obtained. Because 2021 was generally a low-disease year for fire blight, reduced selection pressures (i.e., applications with OTC and STR) possibly may have resulted in the decline of these isolates. A larger number of samples was obtained in 2022, and data for these are pending.

Strains with high OTC-STR resistance of >100 ppm were detected for the first time in Sacramento Co. in 2018, and again in 2019 and 2020. OTC resistance at this level in *E. amylovora* has never been reported from other locations worldwide and is a serious concern if we over-rely on OTC due to STR resistance and high cost of alternative treatments. Resistance development to OTC in pathogen populations was considered a low risk due to the ephemeral residues of the antibiotic. Over-reliance on OTC combined with frequent, alternate row applications in short intervals may have contributed to high resistance. Our findings indicate that antibiotics should be used strategically in management programs. The importance of resistance management cannot be overstressed. Antibiotics should only be used in mixtures or rotations, the number of applications of each per season should be limited to two, and new alternatives (e.g., early season copper, biologicals) should be used and developed.

Table 2. Sensitivity of *E. amylovora* strains from pear orchards in California to streptomycin, oxytetracycline, and kasugamycin in 2021

Orchard or block (No. isolates)	County	Minimum inhibitory concentration (ppm)		
		Streptomycin	Oxytetracycline	Kasugamycin
1 (1)	Yuba	0.412	0.274	14.58
2 (1)	Yuba	0.387	0.242	13.75
3 (1)	Yuba	0.412	0.258	11.55
4 (1)	Yuba	0.353	0.310	12.24
5 (1)	Yuba	0.425	0.310	7.68
6 (1)	Yuba	0.399	0.228	15.45
7 (1)	Lake	0.563	0.291	20.67
8 (1)	Lake	0.467	0.242	15.90
9 (2)	Lake	0.375	0.208	18.40

Sensitivity was determined using the spiral gradient endpoint method. All isolates were considered sensitive to the three antibiotics.

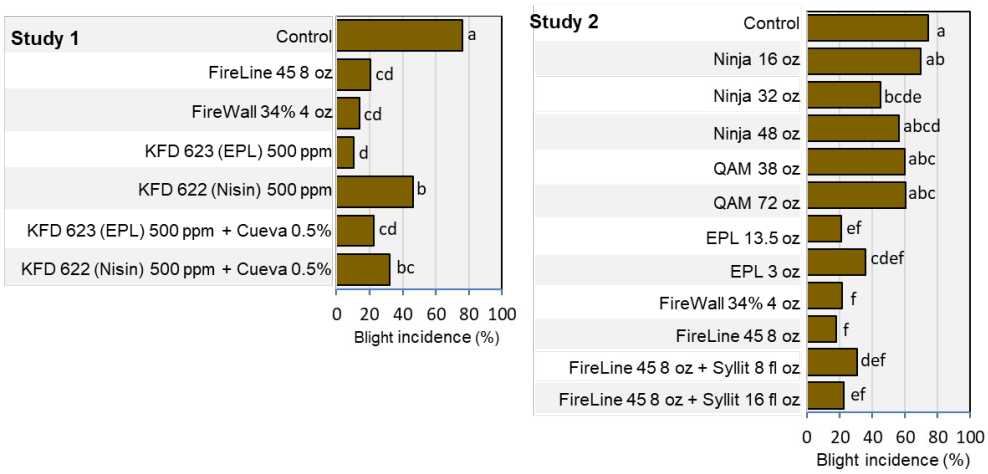
Studies on the characterization of the molecular mechanism of high STR-OTC resistance are ongoing. STR resistance in these isolates was found to be based on the presence of *Str*A-*Str*B genes that in moderately resistant isolates are present on a plasmid, whereas OTC resistance is based on the presence of a *tet* gene that has 98% homology with a gene from *Pantoea agglomerans* and other members of the Enterobacteriacae. Genes for resistance to both antibiotics appear to the located on another new plasmid in high STR-OTC-resistant strains. In pear flower inoculation studies, we found STR-OTC-resistant strains to be competitive with wild-type sensitive strains. It is currently not known, however, if these new resistant strains will persist in the absence of selection pressures (i.e., applications with OTC and STR).

Laboratory studies on fire blight using protective treatments. On ornamental pear flowers, a new formulation of EPL (KFD 623) reduced blight to the lowest incidence, similar to FireWall and FireLine, whereas a new formulation of nisin was significantly less effective (Fig. 1, Study 1). The addition of Cueva to either of the food preservatives did not significantly change their efficacy, however, that of EPL was numerically decreased and that of nisin was increased. In the second study, the new antibiotic ningnanmycin (Ninja) and the agave extract product QAM showed little or no efficacy, however a treatment with non-formulated EPL again significantly reduced the incidence of blight with similar efficacy to FireWall or FireLine (Fig. 1 Study 2). Addition of the fungicide dodine (Syllit) to FireLine did not improve-efficacy.

Field studies on fire blight using protective treatments. A total of five field studies on fire blight management were conducted on cvs. Granny Smith and Fuji apple, and on cvs. Bartlett, Comice, and Shinko apple-pears. In all studies, treatments with the conventional antibiotics STR, OTC, or kasugamycin numerically resulted in the lowest incidence of blight, but several alternative treatments showed promising results with efficacy statistically similar to the three conventional antibiotics.

Antibiotics. On Granny Smith, Kasumin by itself was similarly highly effective as the new NUP-17010 formulation of Mycoshield (mixed with Dart), and both significantly reduced the incidence of blight from 17.8% in the control to 2.8% (Fig. 2). On Fuji apple, Kasumin was as effective as the Kasumin-Syllit mixture and significantly reduced blight from 19.4% in the control to between 1.5 and 1.8%, while the new formulation of FireLine and FireLine-Syllit had incidences of 3.3% and 5.0%, respectively (Fig. 3). Thus, the addition of Syllit did not improve efficacy. On Bartlett pear, however, disease was lower using Kasumin-Syllit (4.0 strikes/tree) than for Kasumin by itself (13.3 strikes/tree), while control trees had 25.2 strikes/tree (Fig. 4). In comparison, 1.8 strikes/tree were found on trees treated with Kasumin-FireWall and 4.8 strikes/tree for NUP-010-Dart. Thus, the effect of Syllit in improving the efficacy of antibiotics was inconsistent, similar as we previously established for LI-700. Kasumin is currently considered a conventional treatment, however, efforts are underway to obtain an organic registration. The compound is a natural substance that is commercially produced by fermentation of *Streptomyces* species. In contrast to STR and OTC, it has very minimal or no usage in human and veterinary medicine. Thus, an organic registration seems plausible similar to other biofermentation products certified as organic and that are not used in animal and human medicine (i.e., polyoxin-D and natamycin - *see* Postharvest treatments below). The new antibiotic Ninja (ningnanmycin) was moderately effective in the two apple studies (Figs. 2,3), but not effective on Bartlett pear (Fig. 4). Increasing the rate in this year's as compared to last year's studies did not improve its efficacy.

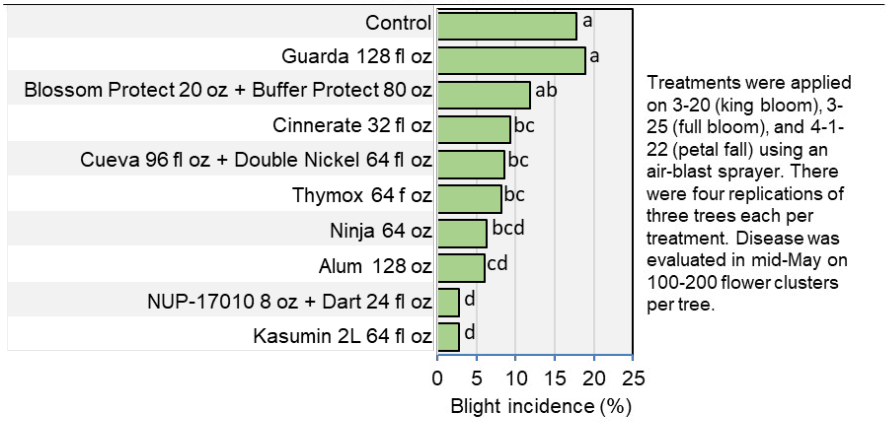
Fig. 1. Efficacy of bactericides for management of fire blight of ornamental pear flowers in laboratory studies, 2022



Flowering twigs of ornamental pear (*Pyrus calleryana*) were placed into 100-ml Erlenmeyer flasks containing water with 20 ppm gibberellic acid. Flowers were treated using a hand sprayer and were spray-inoculated with a strep/oxy-sensitive isolate of *E. amylovora*. Twigs were covered with plastic bags, and the incidence of fire blight was determined after 7 days based on the number of blackened flowers of the total number of flowers evaluated.

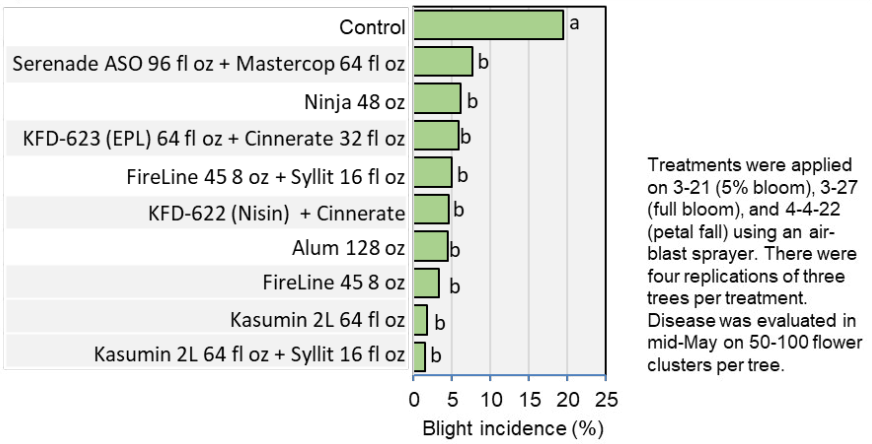
Natural products. Cinnerate and Thymox were moderately effective on Granny Smith apple, however, Guarda a thyme oil product like Thymox, was not effective (Fig. 2). On Bartlett pear, Cinnerate was one of the most effective treatments, but the thyme oil product Thyme Guard did not reduce the disease as compared to the control (Fig. 4). In an inoculation study on apple-pear with a disease incidence of 42% in the untreated control, Cinnerate and Thyme Guard were moderately effective (Fig. 6). The agave extract QAM was not effective on Bartlett pear (Fig. 4) and only numerically reduced the disease in an inoculation study with Comice pear (Fig. 5).

Fig. 2. Efficacy of bactericides for management of fire blight of Granny Smith apples, Fresno Co. 2022



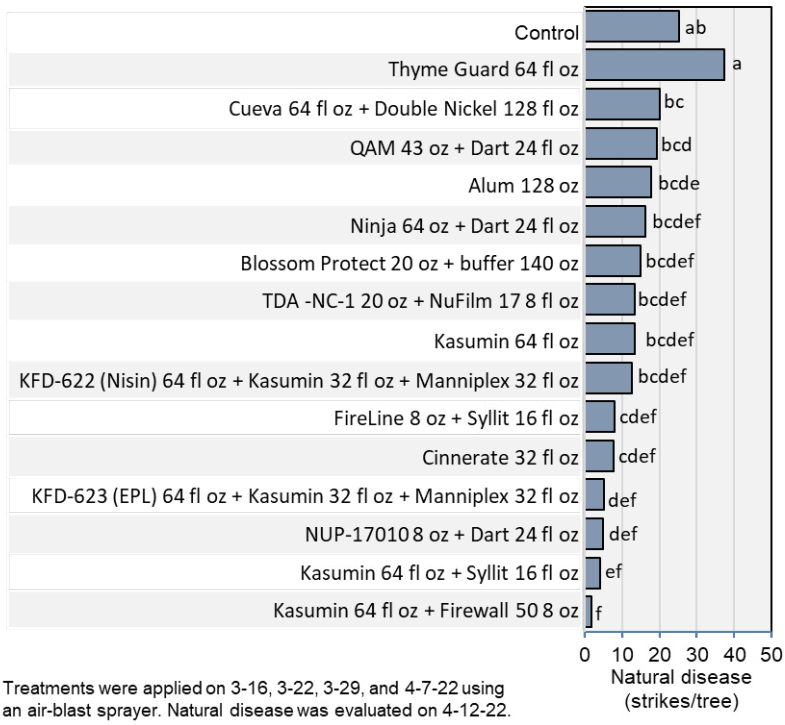
Treatments were applied on 3-20 (king bloom), 3-25 (full bloom), and 4-1-22 (petal fall) using an air-blast sprayer. There were four replications of three trees each per treatment. Disease was evaluated in mid-May on 100-200 flower clusters per tree.

Fig. 3. Efficacy of bactericides for management of fire blight of Fuji Smith apples, Fresno Co. 2022



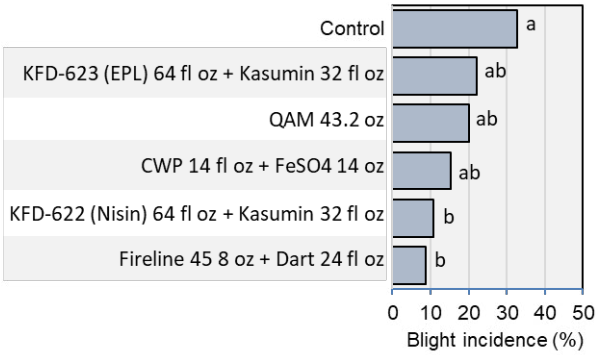
Treatments were applied on 3-21 (5% bloom), 3-27 (full bloom), and 4-4-22 (petal fall) using an air-blast sprayer. There were four replications of three trees per treatment. Disease was evaluated in mid-May on 50-100 flower clusters per tree.

Fig. 4. Efficacy of bactericides for management of fire blight of cv. Bartlett pears, Live Oak, 2022



Treatments were applied on 3-16, 3-22, 3-29, and 4-7-22 using an air-blast sprayer. Natural disease was evaluated on 4-12-22.

Fig. 5. Efficacy of new bactericides for management of fire blight of cv. Comice pear after inoculation in a field study at UC Davis 2022

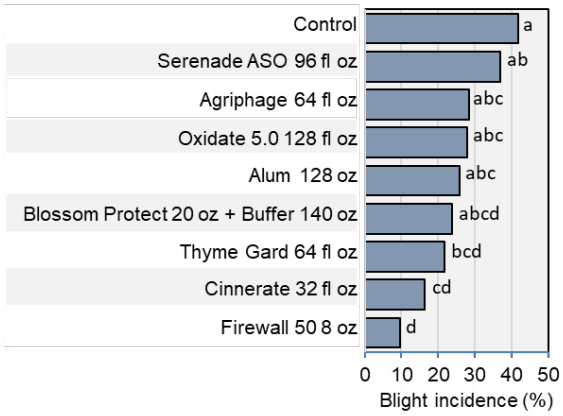


Treatments were applied using an air-blast sprayer on 3-15-22 (20-50% bloom) and 3-22-22. Trees were inoculated with *E. amylovora* (1 x 10^6 cfu/ml) after the second application. Disease was evaluated on 4-6-22.

Potassium aluminum sulfate (Alum) showed very good efficacy in the two apple studies with efficacy statistically similar to the antibiotics (Fig. 2,3) but was not effective on Bartlett pear (Fig. 4) and in the inoculation study on apple-pear (Fig. 6). We and others evaluated this product previously with good results. The yeast extract CWP was only used in an inoculation study with Comice pear and numerically reduced by 50% from the control (Fig.5). In summary, among natural products, Cinnerate (evaluated for the first time in 2022) and Thymox (also evaluated in 2021) were the most promising products, and they could become alternatives in organic apple production.

Biocontrols. Double Nickel mixed with Cueva provided moderate efficacy on Granny Smith apple (Fig. 2) but was not effective on Bartlett pear (Fig. 4). Serenade ASO mixed with MasterCop showed good efficacy on Fuji apple (Fig. 3), but by itself, was not effective in the inoculation study on apple-pear (Fig. 6). Blossom Protect did not perform well in three studies where it was included (Figs. 2, 4, 6). No fresh product was available in 2022 and 2021 product was used; this likely was the reason for its poor efficacy in 2022. A treatment with a bacteriophage (Agriphage) in the inoculation study with apple-pear was ineffective (Fig. 6).

Fig. 6. Efficacy of bactericides for management of fire blight of cv. Shinko apple pears after inoculation, UC Davis, 2022



Treatments were applied on 3-15, 3-16, and 3-22-22 using an air-blast sprayer. Trees were inoculated with *E. amylovora* after the first (1 x 10^6 cfu/ml) and third (2 x 10^6 cfu/ml) applications. Disease was evaluated on 3-30-22.

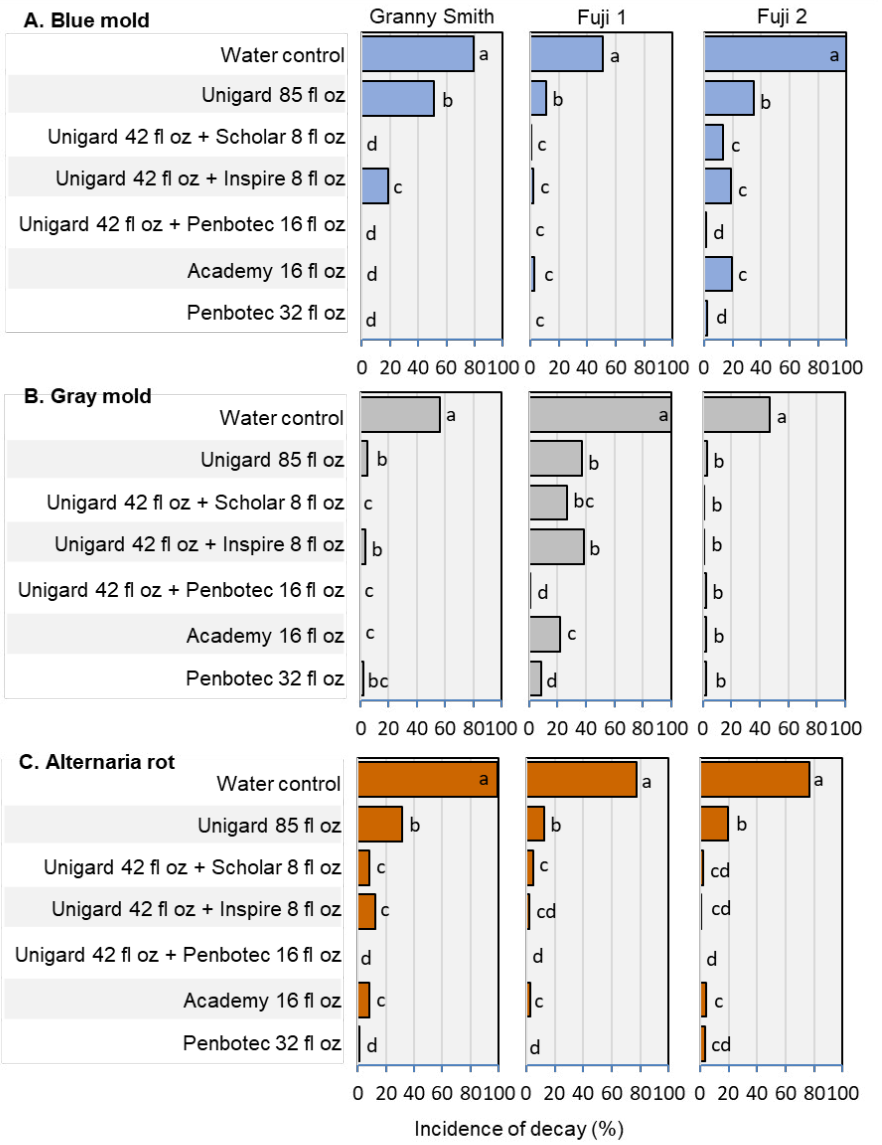
Food preservatives. In an effort to improve efficacy of the new formulations of EPL (KFD-623) and nisin (KFD-622), they were used in selected mixtures in 2022 studies. In mixture with Cinnerate, they both provided good control on Fuji apple (Fig. 3). EPL mixed with Kasumin at 32 fl oz and Manniplex was very effective on Bartlett pear (Fig. 4), but EPL-Kasumin was not effective in the inoculation study with Comice pear (Fig. 5). In this latter study, the Nisin-Kasumin mixture significantly reduced the incidence of blight from the control. Thus, performance of the two food preservatives is still not high and inconsistent, although we used agricultural formulations that aimed to improve efficacy. The inconsistency of results obtained makes it difficult to lay out a path forward with these compounds. Still, efforts should be continued because both nisin and ε-poly-L-lysine are eligible for biopesticide registration with the US-EPA.

Other antimicrobials. The riboflavin product TDA-NC1 only numerically reduced disease from the control in the Bartlett per study (Fig. 4), and Oxidate did not significantly reduce blight incidence as compared to the control in the apple-pear study (Fig. 6).

Conclusion for fire blight management. The efficacy of the three registered antibiotics STR, OTC, and kasugamycin was again high and consistent. Among biological treatments, Blossom Protect (based on previous years' studies) and essential oils showed acceptable commercial efficacy, and the latter are the most promising of the new alternative products evaluated. Other biological treatments to be considered are liquid copper formulations such as Cueva and MasterCop, and these can be mixed with biocontrol treatments such as Double Nickel and Serenade. Alum showed good efficacy only in the two apple studies. Because it does not cause any known OSHA hazards and is not considered a dangerous substance, it deserves continued evaluation under California conditions. New alternative treatments may need to be applied more frequently to obtain the high efficacy and consistency of the conventional antibiotics.

Evaluation of postharvest treatments using single-fungicides, mixtures, and pre-mixtures. Postharvest studies again focused on the efficacy of the natural compound natamycin that is currently registered as a biopesticide with tolerance exemption status by the US-EPA. In three experimental packingline studies with inoculated apple fruit, we compared the Uniguard formulation of natamycin by itself, at half rate in combination with half rates of Scholar, Inspire (difenoconazole), or Penbotec, and with Academy (fludioxonil + difenoconazole) and Penbotec at full rate. Uniguard by itself was highly to moderately effective against blue mold, gray mold, and Alternaria rot (Fig. 7). There was no relationship between apple cultivar used and effectiveness. For blue mold (Fig. 7A) and Alternaria rot (Fig. 7C), all other treatments were still significantly more effective than Uniguard. In the three studies, decay was reduced to zero or near zero incidences using Penbotec and Uniguard-Penbotec. For gray mold, all treatments were highly effective in the Granny Smith study and in one of the Fuji studies, reducing decay by over 95% (Fig. 7B). In the second Fuji study, only Penbotec and Uniguard-Penbotec provided high efficacy, whereas that of the other treatments was only good to moderate. Thus, Uniguard provided very good decay control, but the mixture treatments were mostly more effective. Because half rates were used in the mixture treatments, they are still cost-effective.

Fig. 7. Evaluation of postharvest treatments for managing postharvest decays of Granny Smith and Fuji apple in experimental packingline studies



Fruit were wound-inoculated with *P. expansum* (TBZ-resistant; 500,000 spores/ml), *B. cinerea* (100,000 spores/ml), or *A. alternata* (100,000 spores/ml). After 15-17 h, treatments were done by T-jet application that was followed by CDA application with carnauba-based fruit coating. Fruit were then incubated at 20C for 10-15 days.

Overall, Uniguard was most inconsistently effective against blue mold. Previously, we found natamycin not to be effective against blue mold on apple-pear (i.e., Asian pear) and four other pear cultivars (e.g., Bartlett, Bosc, Comice, and D'Anjou). This is the first time that we observed differential activity of a fungicide on different fruit crops against the same pathogen despite demonstrated in vitro toxicity that is similar of that to *B. cinerea* and *A. alternata*. We conducted laboratory fruit studies to elucidate the reason for this differential activity against blue mold. The mode of action of natamycin is binding to fungal ergosterol that results in destabilization of the fungal membrane and subsequent inhibition of growth. We found that pre-treatment of pear fruit with a plant sterol-binding compound significantly enhanced natamycin activity against blue mold. Our hypothesis is that because *P. expansum* contains a higher amount of sterols in its membranes than the other decay fungi and some of the natamycin in the treatment is being bound to plant sterols in the fruit wounds, natamycin binding to fungal sterols is incomplete. Possibly a pre-treatment of fruit on the packingline can render natamycin highly and consistently effective against blue mold, but this pre-treatment may also improve efficacy against the other decays.

Based on the current moderate efficacy of natamycin, it should not be used by itself for managing decays of pome fruits but should be applied in a premixture with other fungicides. Although efficacy is not improved as compared to using Scholar, Academy, or Penbotec by themselves, adding natamycin represents an excellent resistance management strategy. This strategy is especially important in the use of Penbotec where resistance in decay pathogens has developed at some locations. Resistance to natamycin has not been reported previously to any *Penicillium* species, although the compound has been registered for food uses for over 20 years. Initially, the submission of natamycin to the NOSB was denied, but in 2021, the USDA-AMS that oversees the NOSB approved organic use that resulted in OMRI certification of some formulations (e.g., Zivion-S and -M). Currently, certification of the DSM-Pace International postharvest formulation, BioSpectra, for apple and other fruit crops is pending. Other registrants such as Janssen Pharmaceutica and Cerafruta will pursue their natamycin labels for both conventional and organic use.

2021 Evaluation of ProTone (ABA) for Reducing Fruit Set and Subsequently Increasing Fruit Size on Apples in California

Introduction

ProTone® SG (EPA Registration No. 73049-461) contains 20% w/w s-abscisic acid (ABA), a plant growth regulator found naturally in plants. ProTone SG can be used to stimulate apple fruit abscission, removing fruit from the tree to increase size of the retained fruit.

ABA plays a role in several physiological processes, especially water relations. When a plant is under stress a plant produces abscisic acid in and this is a cue to the plant to close its stomata. If a plant is stressed or if it is sprayed with ABA stomata close, resulting in a significant reduction in photosynthesis. This in turn results in a carbon deficit in the plant. In the case with pome fruit, this happens for a long enough period during the time when developing fruit are competing for photosynthate, fruit abscission will be initiated.

Unlike all other commercial chemical thinners federally registered for post-bloom use on apples, ProTone SG is OMRI certified for use in organic production.

Materials and Methods

In 2021, replicated field trials were conducted across multiple trial sites and varieties in commercialapple production regions of California (Table 1).

ProTone SG was applied using either single or sequential treatments applied during early to late post-bloom stages (8-20 mm average fruit diameter) in a spray water volume equivalent to 100 gallons per acre. ProTone SG was applied at rates ranging between 16.6 and 33.2 ounces of formulated product per acre. Each trial consisted of one to 10 tree plots, replicated six times, arranged in a randomized complete block design.

All ProTone SG treatments were applied in combination with labeled rates of an organo-silicone surfactant (Syl-Coat or Kinetic) and Tri-Fol Acidifying Agent. The pH of the spray solution was adjusted to 5.0 to 5.5 with Tri-Fol. Applications were made using a back-pack mist blower, calibrated to deliver 100 to 150 gallons per acre, depending on canopy size. No mixing issues were reported in any of the trials.

Trial assessments included one or more of the following: a) leaf chlorosis/phytotoxicty; b) reductions in fruit set; c) increases in individual fruit weight.

Table 1. ProTone SG apple thinning trial information.

Trial No.	Variety	Trial Location	ProTone SG Rates (oz/acre)	Appl. Date(s)	Appl. Timing(s)
2021SJAKK047	Modi	Linden, CA	0, 16.6, 33.2	04/29/2021	18-19 mm
2021SJAKK048	Pink Lady	Linden, CA	0, 16.6, 33.2	04/23/2021	16-17 mm
2021SJAKK052	Granny Smith	Modesto, CA	0, 16.6, 33.2	04/19/2021	12-14 mm
2021SJAKK053	Golden Delicious	Boonville, CA	0, 33.2 (X1), 33.2 (X2)	05/04/2021 05/20/2021	8-10 mm 18-20 mm

Individual Trial Observations

2021SJAKK047 - *Modi*:

		5/11/2021	5/26/2021	5/26/2021	8/19/2021
		12 DAT	27 DAT	27 DAT	112 DAT
		% Leaf Chlorosis	# Fruit/100 Clusters	% Dropped Fruit	Avg. Fruit Wt. (g)
1	Untreated Control	0	197.7 a	26.9 c	109.7 b
2	ProTone 16.6 oz/ac	0	183.2 ab	44.8 b	113.6 ab
3	ProTone 33.1 oz/ac	0	160.2 b	53.0 a	118.7 a

Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

- This trial was conducted near Linden, CA on a young block of *Modi* apples planted on a trellis system with 12 ft between rows and 3 ft in-row spacing.
- Treatments were applied using a spray volume of 100 gallons per acre.
- No phytotoxicity was observed at any point and no mixing issues were encountered.
- Pre-treatment counts on 4/28/2021 showed statistically similar fruit counts between plots.
- Fruit counts per 100 clusters on 5/26/21 demonstrated fewer fruit following treatment 3) ProTone at 33.1 oz/acre). Although ProTone at 16.6 oz/acre resulted in numerically fewer fruit compared to the untreated control, it was not statistically significant.
- Calculated % fruit drop was significantly higher in the treated plots compared to the untreated. There was also a significant rate response observed, between the ProTone treatments.
- Individual fruit weights at harvest demonstrated significantly larger fruit following treatment with ProTone at 33.1 oz/acre. Although ProTone at 16.6 oz/acre resulted in numerically larger fruit, it was not significantly different, compared to the untreated control.

2021SJAKK048 – *Pink Lady*:

		5/6/2021	5/20/2021	5/20/2021	10/6/2021
		13 DAT	27 DAT	27 DAT	166 DAT
		% Leaf Chlorosis	# Fruit/100 Clusters	% Dropped Fruit	Avg. Fruit Wt. (g)
1	Untreated Control	0	290.2 a	17.1 b	118.3 b
2	ProTone 16.6 oz/ac	0	248.3 b	26.9 a	120.3 b
3	ProTone 33.1 oz/ac	0	247.8 b	28.9 a	133.0 a

Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

- This trial was conducted near Linden, CA on a mature block of *Pink Lady* apples planted on a 14 ft row and 8 ft in-row spacing.
- Treatments were applied using a spray volume of 150 gallons per acre.
- No phytotoxicity was observed at any point and no mixing issues were encountered.
- Pre-treatment counts on 4/19/2021 showed statistically and numerically similar fruit counts between treatments.
- On 5/20/2021, fruit counts were statistically lower in the Protone treatments than the untreated, and calculated percent fruit drop was significantly higher.
- Individual fruit weights at harvest demonstrated significantly larger fruit following treatment with ProTone at 33.1 oz/acre. Fruit weights were similar between the untreated control and ProTone applied at 16.6 oz/acre.

2021SJAKK052 – *Granny Smith*:

		5/3/2021	5/10/2021	5/10/2021	8/27/2021
		14 DAT	21 DAT	21 DAT	130 DAT
		% Leaf Chlorosis	# Fruit/Clusters	# Dropped Fruit	Fruit Wt. (lbs/100 fruit)
1	Untreated Control	0	3.03 a	154.3 c	25.3 c
2	ProTone 16.6 oz/ac	0	2.25 b	170.7 bc	27.9 b
3	ProTone 33.1 oz/ac	0	1.97 c	206 b	29.6 a
4	Sevin XLR 1 qt/ac	0	1.85 c	267.5 a	30 a

Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

- This trial was conducted near Modesto, CA on a mature block of *Granny Smith* apples planted on a 15 ft between-row spacing and 18 ft in-row spacing between trees.
- In addition to the ProTone treatments, Sevin XLR (4 lbs/gal carbaryl) at a labeled rate of 1 quart per acre, was included for comparison as a commercial standard.
- Treatments were applied using a spray volume of 100 gallons per acre.
- No phytotoxicity was observed at any point and no mixing issues were encountered.
- On 5/10/2021, fruit/ cluster counts were statistically lower in the Protone and Sevin XLR treatments as compared to the untreated control. There was a significant rate response observed, between the ProTone treatments.
- The number of dropped fruit was significantly higher in the plots treated with ProTone at 33.1 oz/acre. Although ProTone at 16.6 oz/acre resulted in a numerical increase in dropped fruit compared to the untreated control, it was not statistically significant.
- Fruit weights recorded at harvest demonstrated significantly larger fruit following treatment with ProTone at 16.6 and 33.1 oz/acre. There was a significant rate response observed, between the ProTone treatments.

2021SJAKK053 – *Golden Delicious*:

		6/4/2021	6/18/2021	9/22/2021	9/22/2021
		31, 15 DAT-AB	45, 29 DAT-AB	141, 125 DAT-AB	141, 125 DAT-AB
		1-5 Leaf Chlorosis Rating*	1-5 Leaf Chlorosis Rating*	# Fruit/Tree	Avg. Fruit Wt. (g)
1	Untreated Control	1.0 b	1.0 a	818.8 a	73.5 b
2	ProTone 1 X 33.1 oz/ac	1.5 b	1.2 a	435.7 b	96.2 a
3	ProTone 2 X 33.1 oz/ac	3.0 a	1.5 a	308 b	107.2 a

* 1= none; 2= sight; 3=moderate; 4=heavy; 5= severe

Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

- This trial was conducted near Boonville, CA on a mature block of *Golden Delicious* apples planted on a 18 ft between-row spacing and 12 ft in-row spacing between trees.
- ProTone was applied at a rate of 33 oz/acre as either a single treatment (treatment #2) at 8-10 mm average fruit diameter, or as sequential treatments (treatment # 3), applied at 8-10 mm and 18-20 mm average fruit diameter.
- Treatments were applied using a spray volume of 100 gallons per acre for both application timings.
- Leaf phytotoxicity symptoms (leaf yellowing) was obvious at 15 days following the second ProTone application. No fruit phytoxicity was observed at this time. By 21-days following the second application of ProTone, slight leaf yellowing was observed in the trees treated with sequential applications of ProTone, statistically, the phytotoxicity ratings were equal across all treatments.
- Upon evaluating number of fruits per tree, a strong statistical separation was evident between Tr#1 (UTC) and the two ProTone treatments. Further, a numerical reduction in fruit set was evident between Tr#2 (Protone at A) and Tr#3 (Protone at AB).

- ProTone treatments resulted in significant increases in fruit size, as compared to the untreated control. Tr#1 (UTC) averaged 73.5 grams per apple, resulting in a Count 150 box. Tr #2 (ProTone 1X) averaged 96.2 grams per apple, giving a 110 Count for a 24 lb box. Tr# 3 (2X ProTone) averaged 107.2 grams per apple, which translates to 100 Count for a 24 lb box of fruit.

Conclusions:

In 2021, ProTone SG (ABA) was evaluated in replicated trials were conducted across multiple locations on various applevarieties commonly grown in California.

ProTone SG demonstrated acceptable crop safety, with no phytotoxicty observed in three of the four trials. In one trial on *Golden Delicious*, low to moderate leaf chlorosis was observed upon the initial evaluation. Leaf chlorosis was transient in nature and was no longer significant by the second evaluation.

Significant reductions in fruit set were observed following treatments with ProTone SG. Although not always statistically significant (P=0.05, LSD), ProTone numerically reduced crop load in a consistent and rate responsive manner. As expected, fruit set reductions resulting from the ProTone SG treatments translated in significant increases in fruit size, thus improving fruit quality and value.

Organic apple growers in California currently have no post-bloom chemical thinning agents available to them and must rely solely upon blossom thinning with lime- sulfur and/or extensive and costly hand-thinning. The influence on ProTone SG can provide California apple growers a user-friendly, post-bloom apple thinner for use in organic production.

post-bloom applications of ProTone SG. Symptoms were only observed on trials with *Buckeye Gala*. When observed, leaf chlorosis and abscission appeared to be transient in nature.

Organic apple growers in California currently have no post-bloom chemical thinning agents available to them and must rely solely upon blossom thinning with lime- sulfur and/or extensive and costly hand-thinning. The influence on ProTone SG on the carbohydrate deficit of the tree can provide apple growersa user-friendly, post-bloom apple thinner for use in organic production.

2021 Pilot Releases of Sterile Codling Moth Via Unmanned Aircraft Systems over California Apple Orchards

M3 Agriculture Technologies

Introduction

Codling moth (*Cydia pomonella)* is a key agricultural pest, impacting apple and pear industries both domestically and internationally. Domestically, the apple industry produces over 10 billion pounds of fruit annually (Agricultural Marketing Resource Center, 2021). California state is the fifth largest producer of apples in the U.S., with almost 14,000 acres of land dedicated to apple production. Californian apple production accounts for over $100 million in apple sales annually (California Apple Commission, 2021). Codling moth infestations require prompt and thorough treatment (Lo et al., 2021). Left unchecked, they decrease apple harvest by 30-50% (Balasko et al, 2020).

Recent literature points to greatly reduced efficacy of chemical pest management techniques in lepidopteran pests (Bosch et al, 2017). Increased insecticide use over the years has led to resistance, as seen with the rise in enzymatic metabolism processes and target-site mutations in codling moth (Ju et al., 2021). Climate change further exacerbates this issue, as increasing degree day accumulation (Chen et al, 2015). These changes have ultimately led to third or fourth generations of CM annually. Alternative control techniques will be required moving forward; likely a combination of classical and novel technologies. Sterile insect technique (SIT) process involves the mass-rearing and sterilization of adult moths. This technique is generally considered a highly sustainable and eco-friendly pest control approach (Tan et al, 2013). Sterile moths are subsequently released in targeted locations to mate with the wild codling moth populations, effectively reducing the offspring of future generations.

Since 1992, the Okanagan-Kootenay Sterile Insect Release (OKSIR) Program mass reared sterile codling moth as an alternative pest management solution to reduce the use of traditional chemical pesticides (Okanagan-Kootenay Sterile Insect Release Program, 2021). A recent AW-IPM program using SIT in New Zealand reduced wild codling moth populations by 67% to 99% (Bouritz and Vreysen, 2021). Historically, programs such as the Pink Bollworm Eradication Program used small fixed wing crewed aircraft (Grefenstette et al, 2009) to release sterilized insects (Tan and Tan, 2013). Currently, OKSIR utilizes a combination of all terrain vehicles and fans for ground release and recently adopted UAS into their workflow (Esch et al, 2021). The use of crewed aircraft; however, is expensive and requires massive scales before such an approach is economically viable. M3 Agricultural Technologies, alongside USDA APHIS developed Unmanned Aircraft Systems (UAS) or *drones*, as a novel method for releasing sterilized insects. UAS not only allows SIT to reach previously inaccessible locations, but also more efficiently and effectively treats their crops with more targeted releases. When comparing conventional ground release and UAS methods, aerial release at 35m above ground saw a recapture rate 40-70% higher than that of ground release (Esch et al, 2021).

Over the course of the 2021 growing season, The California Apple Commission, three growers and M3 Agriculture Technologies assessed the use of SIT as a means of achieving suppression of wild codling moth populations. The team used a Hermes V.2 UAS (Fig. 1) to release sterile insects over apple orchards. The Hermes V.2 was developed for the release of sterile insects (Moses-Gonzales et al, 2021).

Materials and Methods

Sterile Moths

24 to 48 hours prior to release, M3 personnel in Omak, WA travelled to the OKSIR facility in Osoyoos, British Columbia, Canada to pick up sterilized codling moth. Torpor was maintained throughout the cold chain via a series of boxes and storage techniques developed by OKSIR and M3 Agriculture Technologies. The moths were held overnight at M3's Omak, WA facility in a large cooler to maintain torpor. 100 petri dishes, each containing roughly 800 sterile insects (50/50 male/female) or 23 grams of moths, were shipped in Uline containers containing ice packs the next morning to Elk grove, CA near Sacramento,CA release sites. The moths arrived in Elk Grove, CA approximately 24 hours after departing from Omak, WA. Upon arrival, sterile codling moth were transferred from the Uline shipping box to an active cooler (Fig. 2) for travel to the release sites. Once at the release site, sterile codling moth were loaded into a specially designed 3D printed canister (Fig. 3). This canister was developed by M3 Agriculture Technologies for the release of sterile codling moth. The release device was mounted under the Hermes V.2 and released sterile moths into the orchards. Sterile insects were released weekly at a rate of 800 sterile moths/acre for 20 weeks over the course of this study.

Moth Release

Prior to operations, the Remote Pilot in Command (PIC) checked for Notices to Airmen, or *NOTAMs* and weather reports to confirm optimal flight conditions. Upon arriving at the release site, the Remote PIC setup the aircraft and established communications through flight management software. The Remote PIC loaded the Geo-Fence to the Hermes V.2 via the flight management software. The Geo-Fence is a digital fence with preloaded geographic boundaries. These boundaries keep the aircraft fenced into a geographical area in the event that connection is lost between the operator and Hermes V.2 UAS. After loading the Geo-Fence, the Remote PIC uploaded a pre-programmed mission specific to each site. Once the flight plan was uploaded and moths were transferred to the special canister under the UAS, the remote PIC manually launched the UAS to 30m Above Ground Level (AGL). After reaching 30m, the Remote PIC switched to auto-pilot. The UAS ascended to the target release altitude of 35m AGL for the duration of the release.

Unmanned Aircraft System

This study used a custom built hexacopter airframe with Pixhawk 2.1 flight controller and custom mounting brackets named the Hermes V.2 UAS (M3 Consulting Group LLC.) (Fig. 1) . The Hermes V.2

is considered a small UAS (<55 lbs.) (14 CFR § 107.3, 2017). Table 3 contains further aircraft specifications. All flights were conducted in accordance with 14 CFR part 107. For more information on the safe operation of UAS in the National Airspace System, including how to receive a part 107 Remote Pilot Certificate, please visit https://www.faa.gov/uas/.

Trial Sites

This study was conducted in California's major apple growing region just outside of Sacramento. Three sites of various acreage were selected; Site A (Fig. 4), Site B (Fig. 5), and Site C (Fig. 6) were 53, 17, and 30 acres respectively. Site A and C were fully organic growers while Site B is transitioning from conventional to organic growing practices. Table 2 details the dates of releases, as well as issues that shifted the release schedule. Table 3 provides high level field metrics. Of the three sites, only site A reported data that distinguished between the sterile and wild populations.

Results

UAS based releases effectively distributed sterile codling moth into targeted California orchards over 20 weeks. There are multiple generations of codling moth annually, with an average of two to three flights each growing season. The grower at Site A had a variety of apple and pears growing, with trap data for each variety. While there were some moths noted in April, all of the trap sites experienced a peak in codling moth numbers in late May. The initial release of sterile moths was delivered on April 27th, in anticipation of this peak. Trapping protocols varied site to site and some sites did not distinguish between sterile and wilds. In future years of this assessment, trapping data should be collected by M3 personnel or trained observers. As seen by the trap data, this late season peak quickly stabilized and traps contained a mix of both wild and sterile moths. Additional years will be required to track wild population change over time in addition to damage reduction in blocks.

Discussion

This report presents initial data related to the release of sterile codling moth throughout California orchards using UAS as the release method. The gravity fed release device used in this study was developed specifically for codling moth SIT, and consistently meters out 2,000 moths per ha over 40 acres in under 5 minutes. This device works extremely well with codling moth as these insects pull in their legs during cold transport and release.

While data was collected from multiple field sites, data uniformity precluded the analysis of sites B and C. Field data submitted from these two field sites did not distinguish between wild type and sterile codling moth. Mass reared, sterile codling moth are fed an artificial diet with a calco red dye included in the diet. This dye serves as a marker to distinguish between sterile and wild type insects in traps. Future trap collection should distinguish between wild and sterile moths. Ultimately, the best assessment of the economic impact of sterile insect release is the assessment of damage between blocks that use sterile insects and those that lack sterile insects.

UAS based swath width and release altitude were identified and refined by Esch et al (2021). Esch et al. (2021) found the majority of moths were recaptured within 50 m of the release route. UAS released codling moth were recaptured at 40-70% higher rates compared to ground release methods.

Classically, the release of sterile insects as a means of suppressing wild populations typically requires three to five years to demonstrate efficacy in field blocks. Data from M3 Agriculture Technologies programs in Washington state demonstrate a 30-90% reduction of wild codling moth populations after two years of sterile insect release via UAS. The increased efficacy of UAS is based primarily on the reduction of mechanical damage caused by aerial release of cessna aircraft and ground release systems in addition to optimized cold chain transport techniques.

While M3 received anecdotal insights that damage was reduced in blocks that received sterile insects, the collection of damage data from blocks that received sterile insects in comparison to blocks that did not receive sterile insects (check blocks) are required for additional years to verify the efficacy of sterile insect release in California.

Additional years of sterile insect release focusing on damage as the primary indicator of wild population suppression are recommended. While trap recapture data is important for understanding the week to week population dynamics from an entomological and management perspective, a reduction in damage is the ultimate economic indicator of success for California apple growers.

As M3 continues to grow and scale operations related to Sterile Insect Technique, the team seeks to develop small, modular facilities to support small scale programs deploying SIT as a part of an Area Wide Integrated Pest Management Program. M3 anticipates developing modular facilities in the near term with targets of 1,000-5000 acres per modular production facility. As SIT demonstrates its efficacy over the next two years, M3 can develop rearing capacity in the region to reduce cost and potentially improve performance of sterile insects for California growers.

Acknowledgments

M3 Agriculture Technologies wishes to acknowledge the support of the California Apple Commission, in addition to the growers who volunteered their orchards and field data to support the analysis of the Sterile Insect Technique. The researchers also wish to acknowledge the hard work and dedication of the OKSIR program in Osoyoos, BC, Canada.

LIST OF FIGURES

Figure 1: Hermes V.2 UAS. This UAS was used for the 20 week release trials.

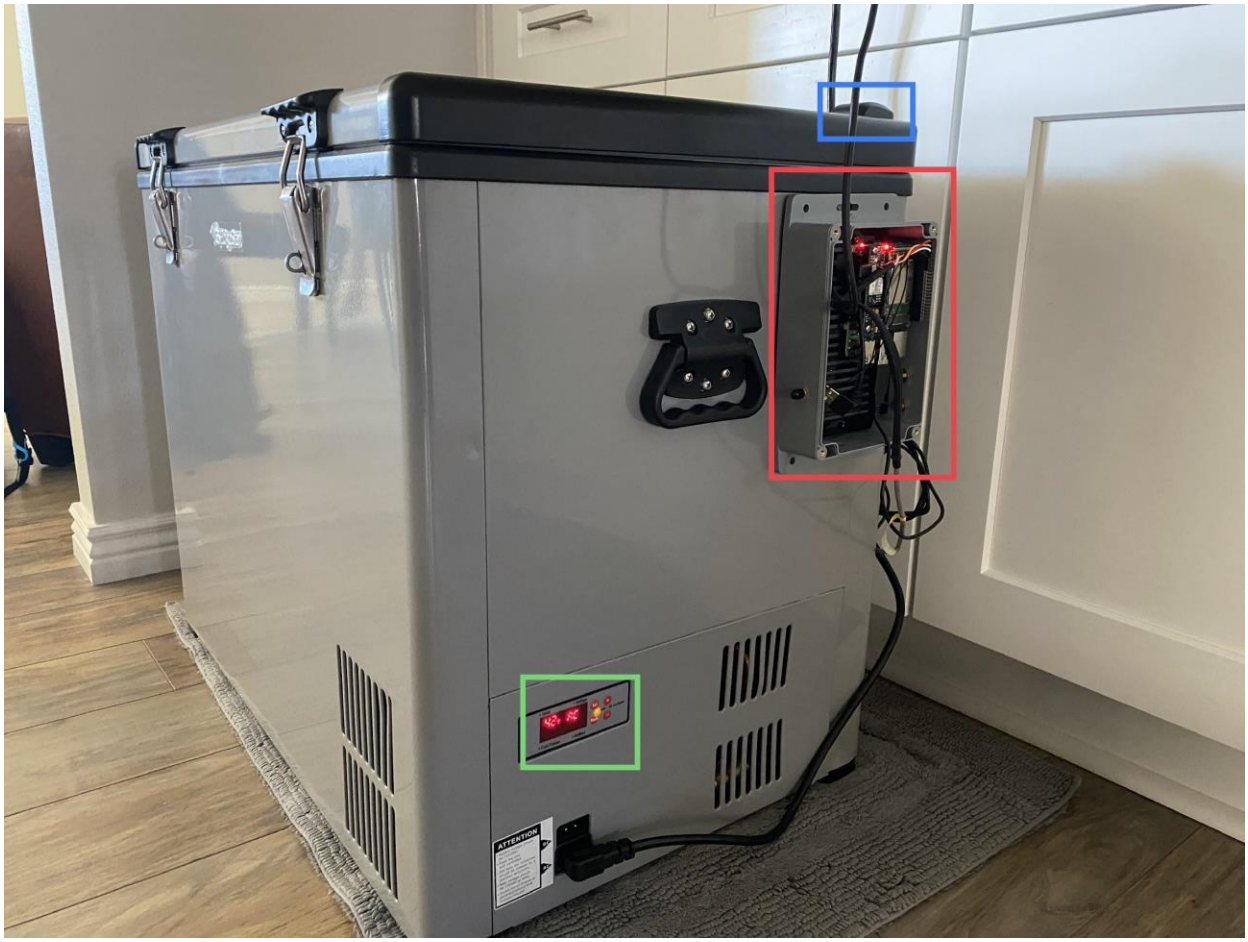


Figure 2: Active cooler unit. Red: Able Temp Cloud connected monitoring device. Blue: GPS receiver. Green: LCD display for cooler.

Figure 3: M3 Agriculture Technologies 3D printed release container filled with sterile codling moth.

Figure 4: Site A orchard with flight plath. Site A was located in Sacramento county, 25 miles to the Southwest of Sacramento. Site A was 53 acres, received 53 dishes and required a total fight time of 12 minutes.

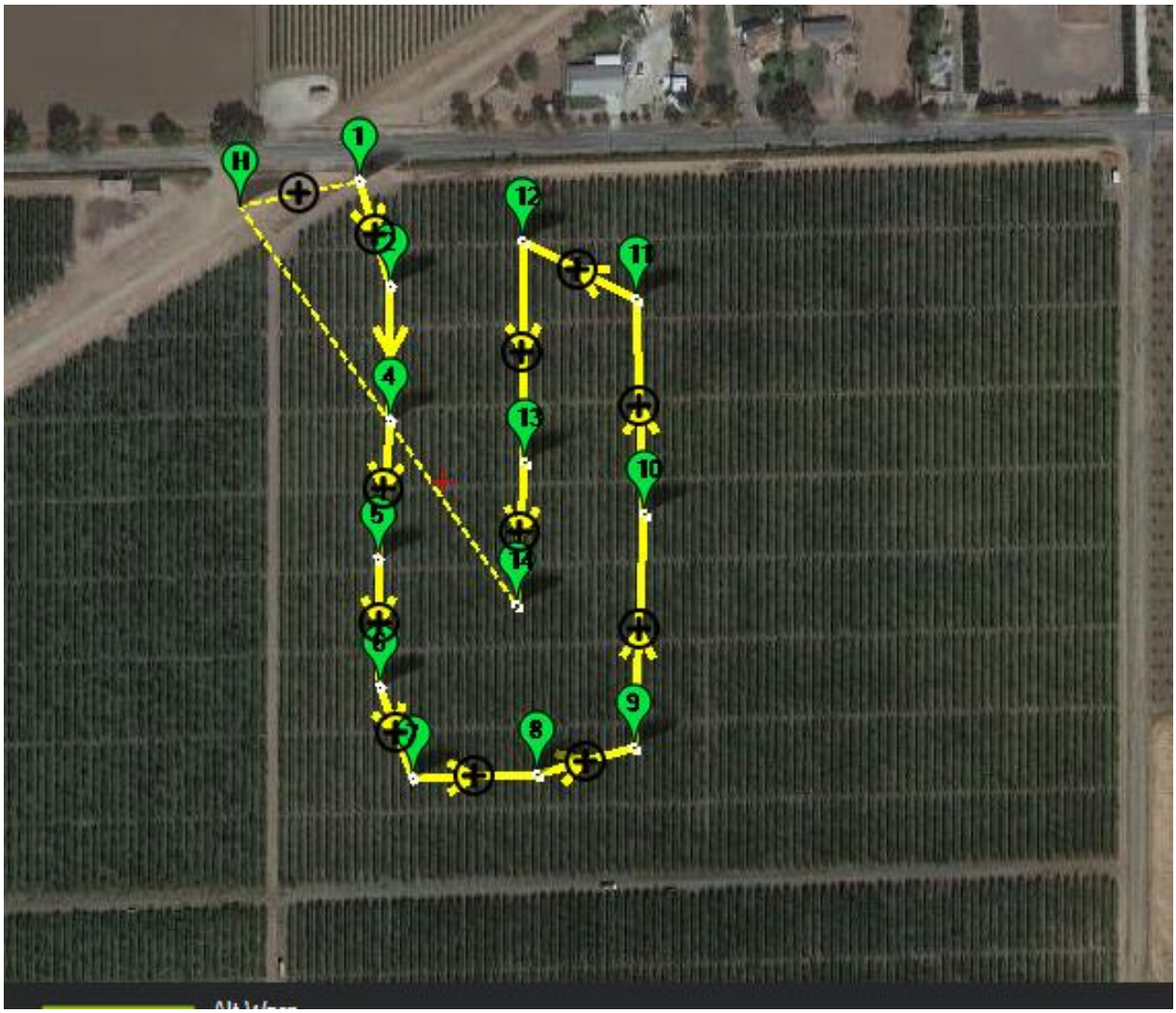


Figure 5: Site B orchard with flight plath. Site B was located in San Joaquin county, 44 miles to the South of Sacramento. Site B was 17 acres, received 17 dishes and required a total fight time of 7 minutes.

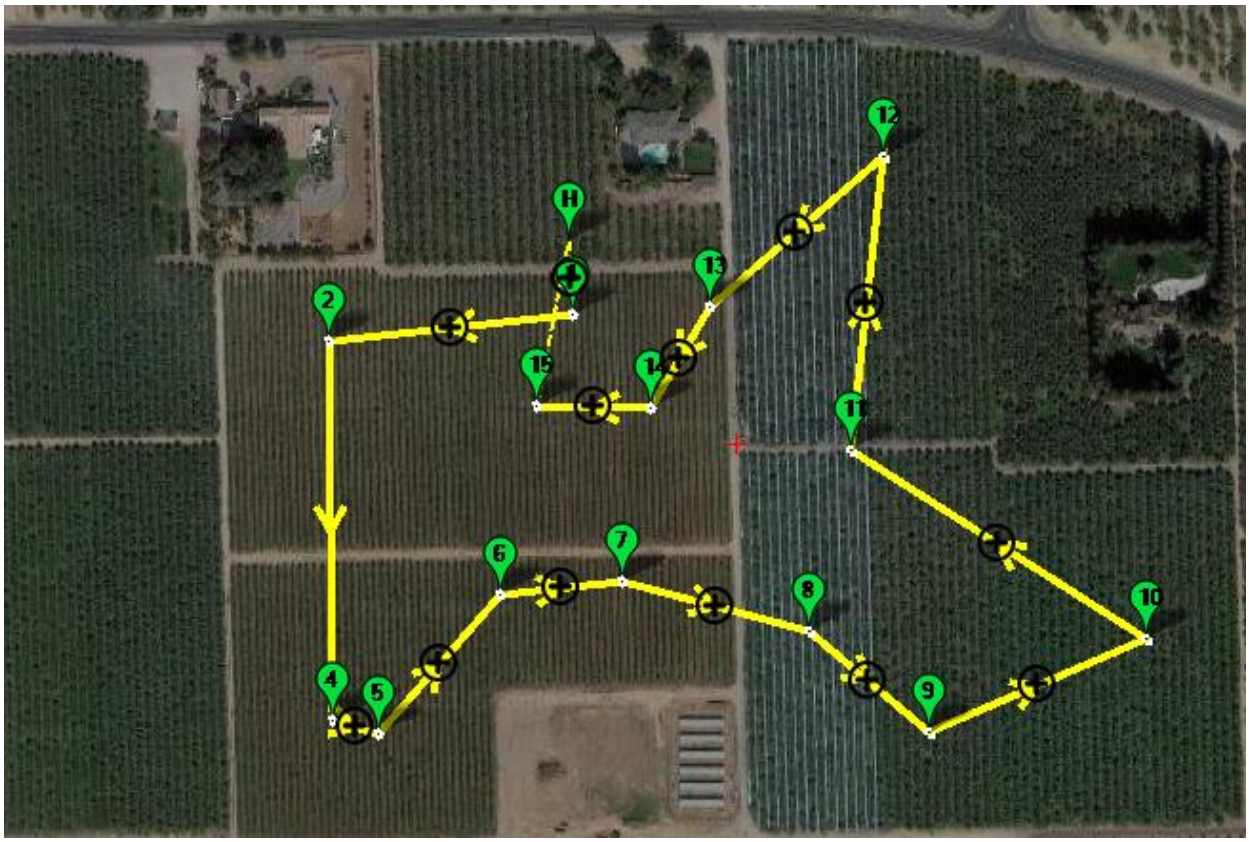


Figure 6: Site C orchard with flight plath. Site C was located in San Joaquin county, 69 miles to the South of Sacramento. Site C was 30 acres, receiving 30 dishes and a total fight time of 8 minutes.

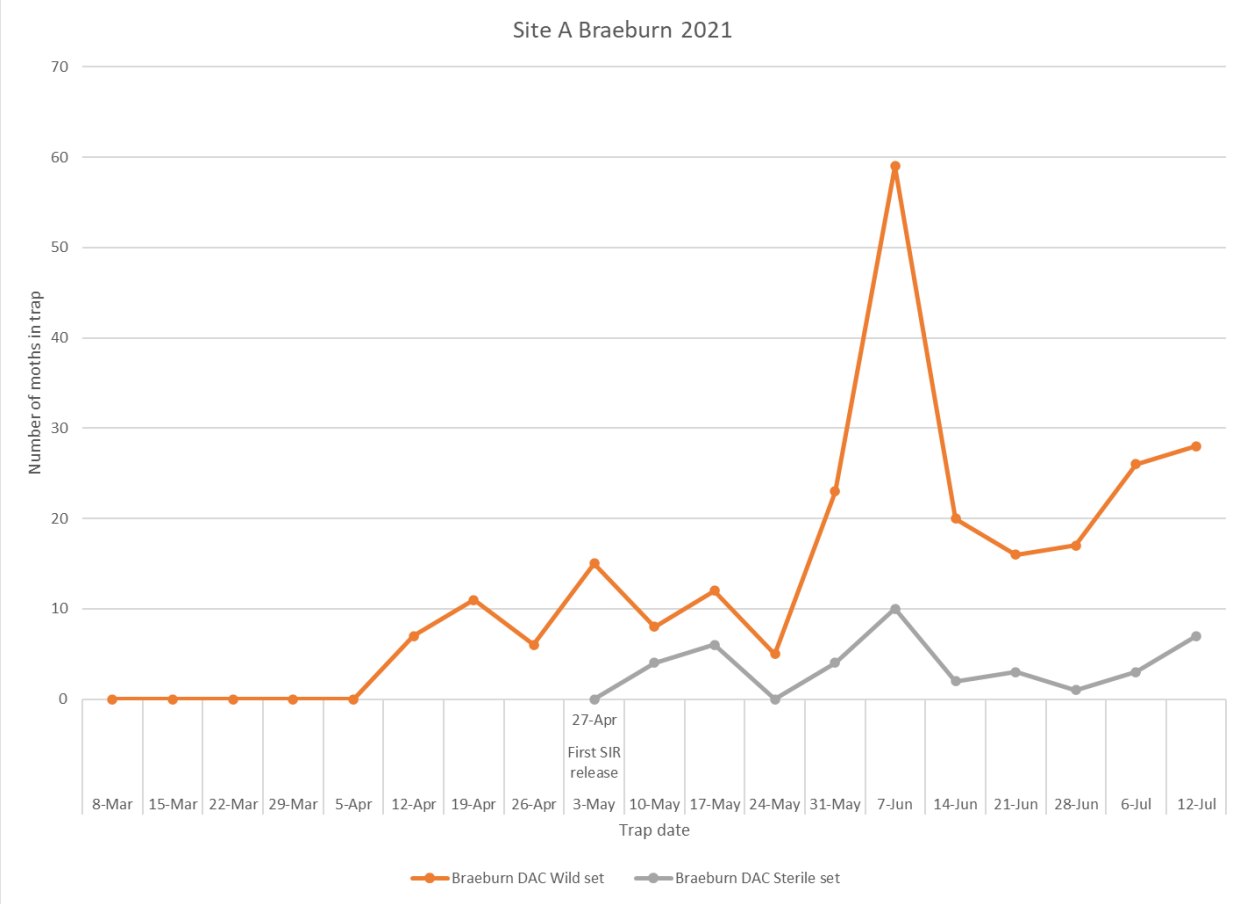


Figure 7 Site A: Block containing Braeburn.

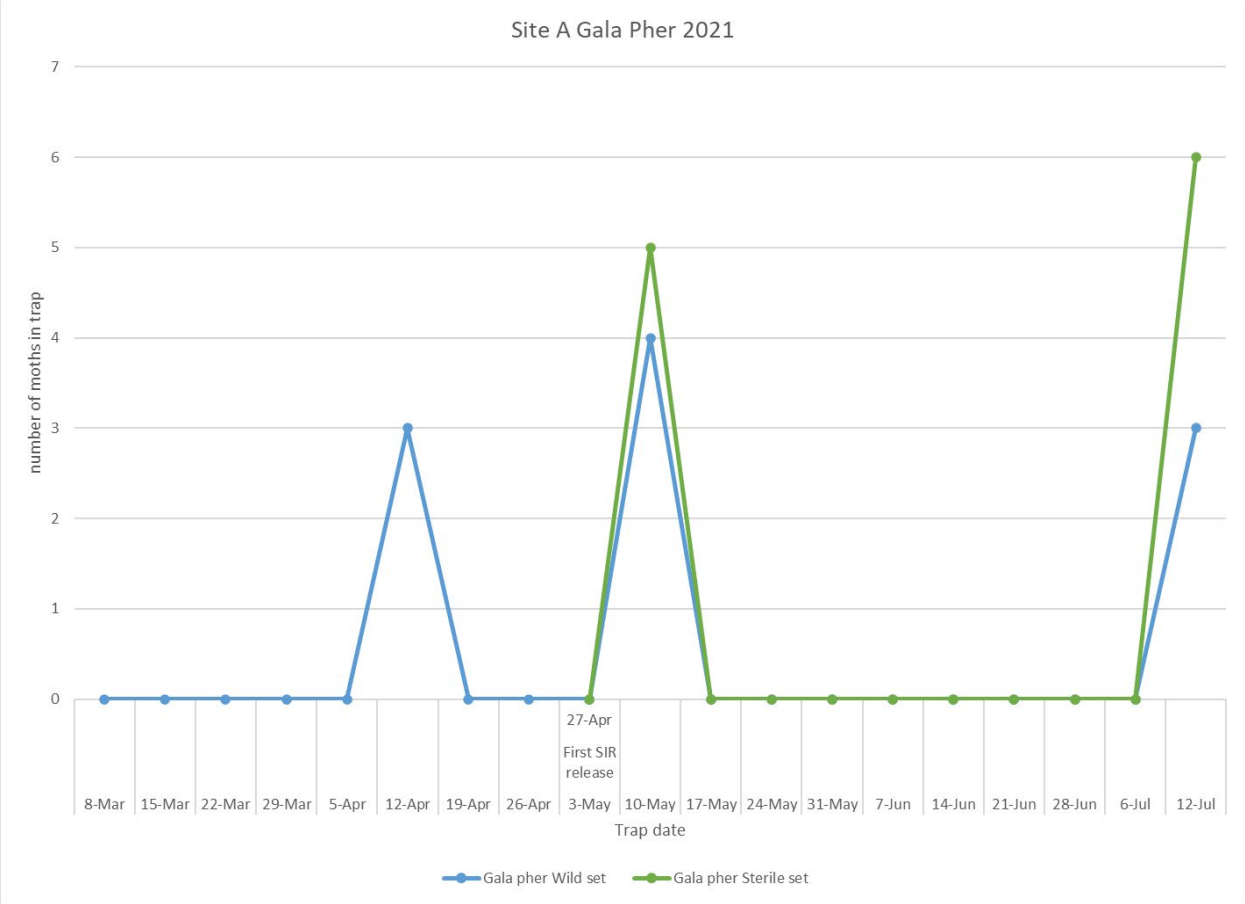


Figure 8: Site A: Block containing Gala.

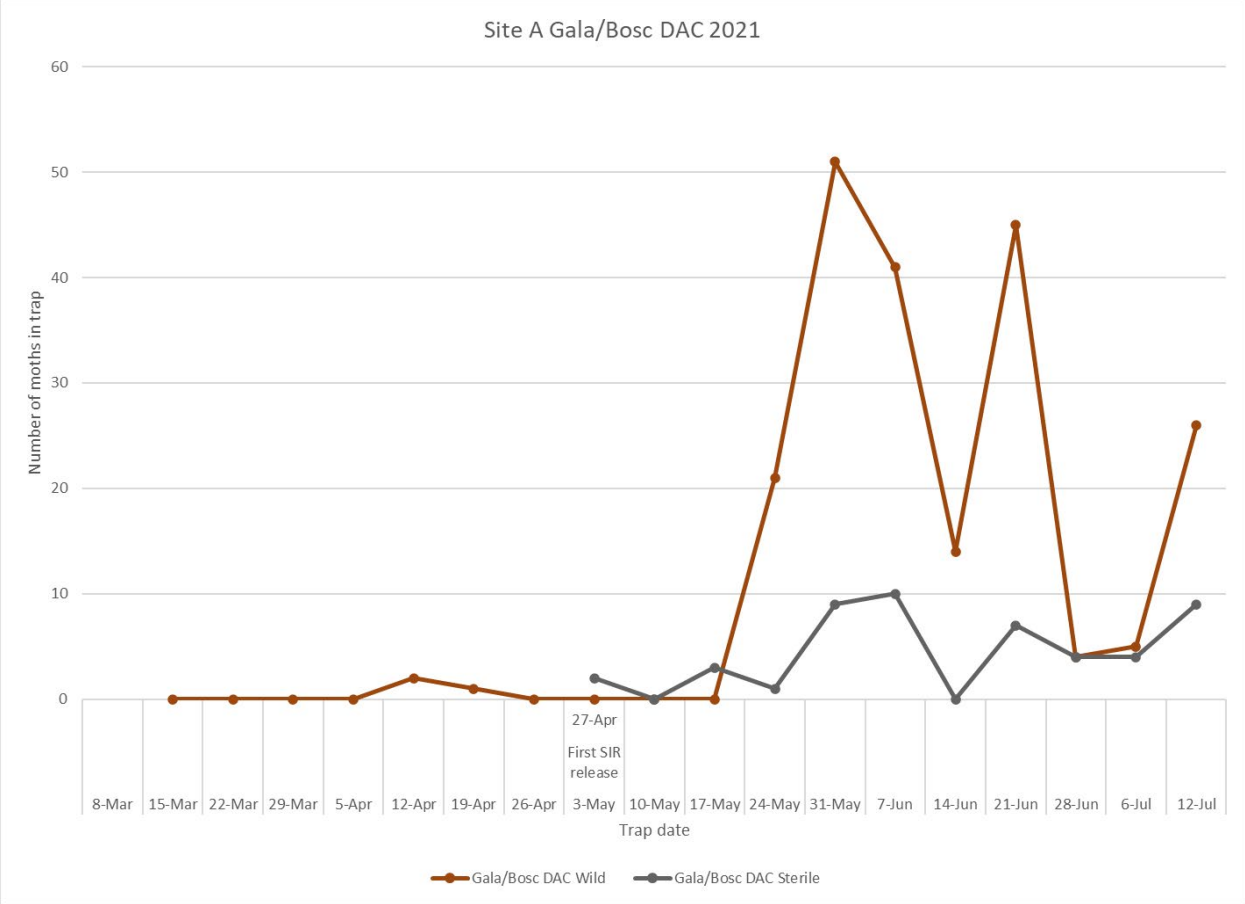


Figure 9: Site A: Block containing Gala & Bosc.

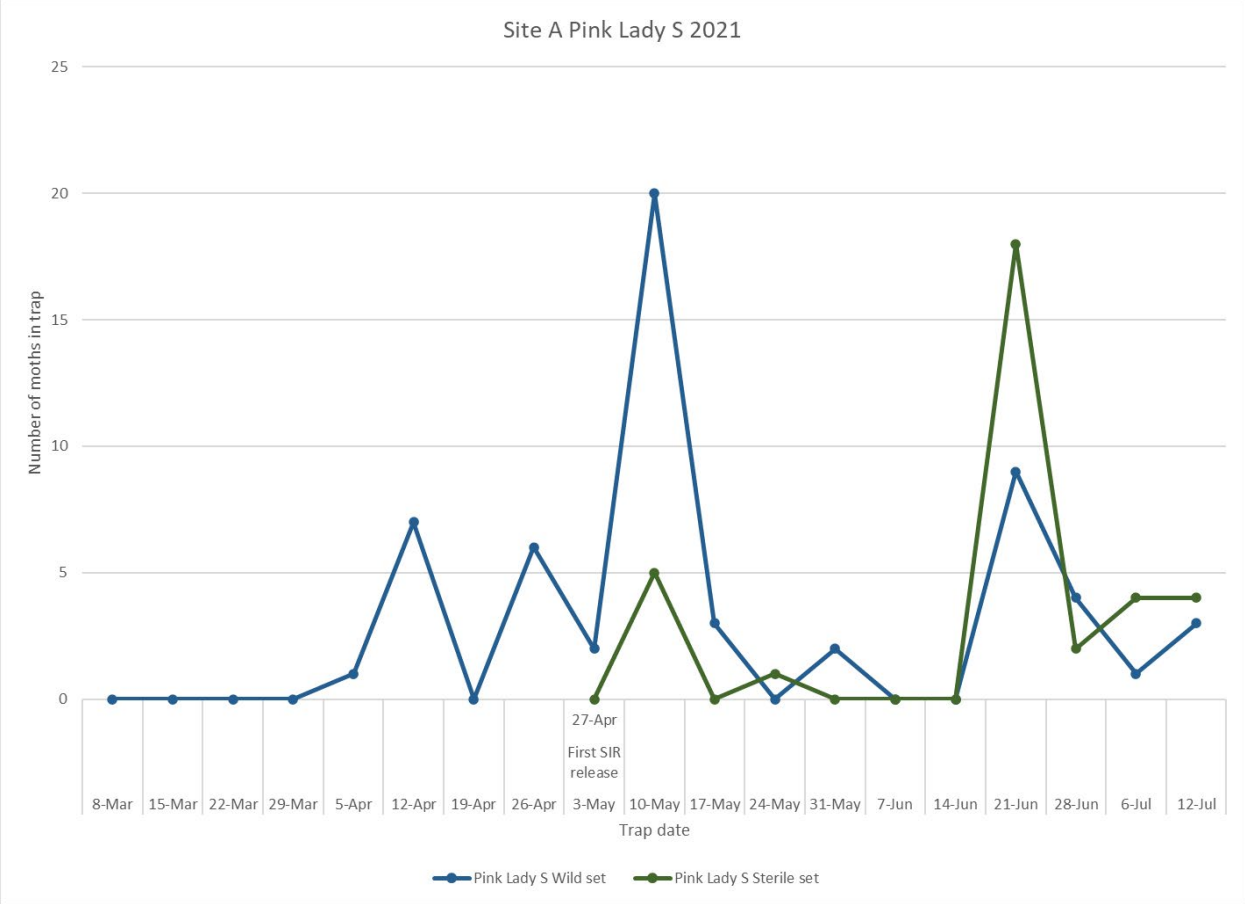


Figure 10: Site A: Block containing Pink Lady.

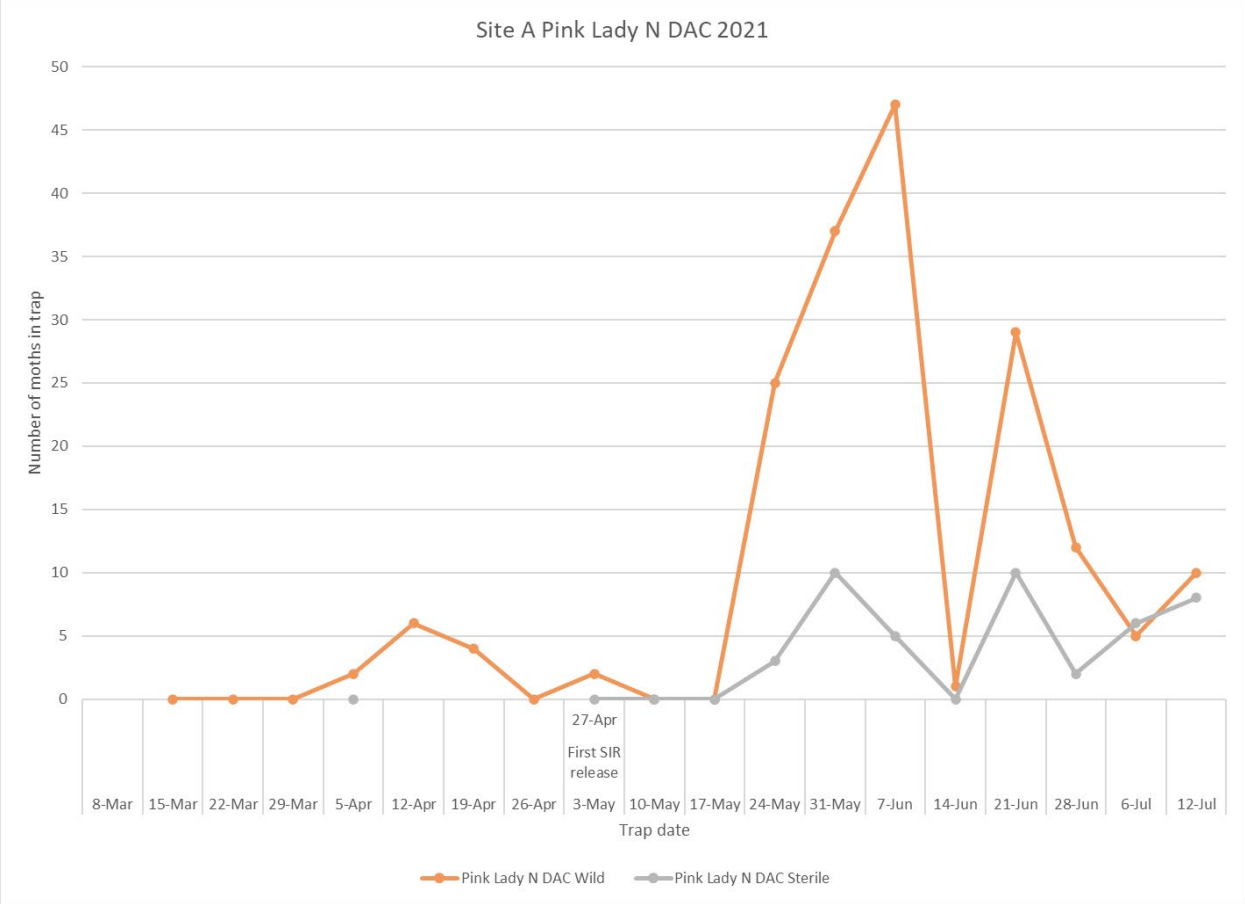


Figure 10: Site A containing Pink Lady

LIST OF TABLES

UAS specifications	
Specifications	Hermes V.2
Flight control	Pixhawk 2.1
Flight duration (minutes)	8–22
Landing gear width at skids (mm)	469–610
Ready to fly weight with no payload (kg)	6.48
Recommend payload (kg)	5
Motors	6
Max Power per motor (watts)	1000
Electronic speed controllers	6
Compass	External
Battery LiPO: cell count (S) and capacity (mAh)	(6S) 10,000–17,000

Prop size (mm) and material	470–508 (Carbon Fiber or Polymer)
Transmitter Band(MHz)	2400
Telemetry Band (MHz)	2400

Table 1: Specifications of UAS utilized over the course of this study.

Release Dates			
Date	Site 1 (A- Green & Hemly)	Site 2- (B- Colombini)	Site 3 (C- Chinchiolo)
April 27, 2021	X	X	X
May 4, 2021	X	X	X
May 11,2021	X	X	X
May 18,2021	X	X	X
May 25, 2021	X	X	X
June 2, 2021**	X	X	X
June 8,2021	X	X	X
June 15,2021	X	X	X
June 22,2021	X	X	X
June 29,2021	X	X	X
July 7,2021 **	X	X	X
July 13,2021	X	X	X
July 20,2021	X	X	X
July 28, 2021*	X	X	X
August 4, 2021*	X	X	X
August 10,2021	X	X	X
August 17,2021	X	X	X
August 25, 2021*	X	X	X
August 31,2021	X	X	X
Sept 8, 2021**	X	X	X

* July 28, Aug 4, Aug 25 were delayed from UPS for fire weather or USDA production issues

** June 2 (Memorial Day) , July 7 (4th of July), & Sept 8 (Labor Day), were all shifted one day due to federal holidays on the Monday of each week. UPS does not ship on federal holidays.

Table 2: List of release days by location. “X” signifies the releases were completed on the corresponding date.

Field Metrics			
Site Name	Acres	Dishes (800 insects m/f)	Flight Duration (min)
Site A	53	53	12
Site B	17	17	7
Site C	30	30	8

Table 3: Table two details key metrics related to each field site. Each site received one dish containing 800 roughly 50:50 male:50 ratio of sterile codling moth.

References

OKSIR Mission & Vision
Codling Moth / Apple / Agriculture: Pest Management Guidelines / UC Statewide IPM Program (UC IPM) (ucanr.edu)
California Apple Commission - Home- California Apples (calapple.org)
Apples | Agricultural Marketing Resource Center (agmrc.org)
Alternative air vehicles for sterile insect technique aerial release - Tan - 2013 - Journal of Applied Entomology - Wiley Online Library
Sterile Insect Technique (SIT) and Its Applications (nih.gov)
Operational Parameters for the Aerial Release of Sterile Codling Moths Using an Uncrewed Aircraft System (nih.gov)
Insects | Free Full-Text | Pest Management Challenges and Control Practices in Codling Moth: A Review | HTML (mdpi.com)
Insecticide resistance in the Cydia pomonella (L): Global status, mechanisms, and research directions - ScienceDirect
Lo et al, 2021 https://academic.oup.com/jee/article/114/5/1917/6307120
Chen et al, 2015 The Influence of Diurnal Temperature Variation on Degree-Day Accumulation and Insect Life History (plos.org)
Bosch et al, 2017 Monitoring resistance of Cydia pomonella (L.) Spanish field populations to new chemical insecticides and the mechanisms involved - Bosch - 2018 - Pest Management Science - Wiley Online Library
PINK BOLLWORM ERADICATION PLAN IN THE U (psu.edu) **USDA APHIS 2009**

Apple Rootstock Research in California – Report Fall 2022

The main objective for this project was to develop on-farm field trials at diverse apple grower locations throughout California featuring novel and yet to be released apple rootstocks. This entailed the preparation of nursery apple trees with commercially available scions and featuring apple rootstocks that have the potential to increase productivity, be more amenable to mechanization and offer more disease resistance to fire blight and replant disease. Apple nursery trees were prepared at Cameron Nursery featuring Royal Red Honeycrisp, MAIA L, Aztec Fuji, Premier Honeycrisp, and Simmons Gala. Field trial locations included Springville, Watsonville, Lodi, Visalia, Maricopa, and Courtland (CA). Apple rootstocks included G.213 (the low chill disease resistant rootstock), G.11, G.41, G.890, G.969, and G.210. In the Fall of 2022 we visited four field trials (Prima Frutta, Lodi Farming, Cuyama Orchards and Family Tree Farms) to monitor the health and growth of the trees and to share some information about the rootstock scion combinations. Every planting was different, in the sense that each location was managed in a different way (organic, conventional, replant in place, V-trellis, Slender Spindle, Tall Spindle, etc.) exposing the trees to very different environment with regards to soils, water availability, nutrients (fertilizers), and climate. Survival of the trees was above 98% at all location with the exception of the Prima Frutta location which experienced tree losses in certain scion combinations. Trees at Family Tree farms had been randomized and experienced very good extension growth and may be able to carry a crop in 2023. Electronic devices (Google Pixel) preloaded with Field-Book App were delivered to some locations. We are in the process of developing field maps so that images and other data can be loaded through the app. The plan is to come back every two years to monitor growth at these locations and perhaps develop recommendations for rootstocks adapted to different environments. A new set of nursery trees featuring newly released apple rootstocks is being developed at Sierra Gold Nursery specifically for trees under organic management to be planted in Fall 2023 or Spring 2024.

2022-2023 FUTURE RESEARCH

1) Evaluation of new bactericides for controls of fire blight of apples caused by Erwinia amylovora and evaluation of new postharvest fungicides for pome fruits—**Dr. Jim Adaskaveg**

2) Study on Mechanically Mass Harvesting of Cling Peaches (apples are included)—**Dr. Stavros Vougioukas**

3) Apple Rootstock Breeding Program Field Trials—**Dr. Genarro Fazio**

4) Effect of irradiation on transcriptome of 'Granny Smith' apples—**Dr. Anu Prakash**

Project Title	**Amount**
Evaluation of Bactericide...	$21,000 [1]
Mechanically Mass Harvesting...	$0 [2]
Apple Rootstock Breeding Program	$0
Effect of irradiation...	$1,500 [3]
FISCAL IMPACT FOR 2022/2023:	**$22,500**

[1] Research done by Dr. Adaskaveg will be done on both organic and conventional apples.

[2] The CAC has partnered with the California Pear Advisory Board for this research project. The research includes apples and is applicable to our industry as well. Dr. Stavros received a NIFA grant, meaning this project is of no cost to the CAC.

[3] This amount was donated by the California Apple Commission for apples that will be used in the study.

AES/CE MAR 84

Workgroup: Apple
Department: Plant Pathology/UCR

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

Project Year: 2022-23 Anticipated Duration of Project: 3rd year of 3 years

Principal Investigators: J. E. Adaskaveg
Cooperating: D. Thompson, D. Cary, and H. Forster

Project Title: Evaluation of new biological controls and natural products for management of fire blight caused by *Erwinia amylovora* and postharvest decays of apple

Keywords: Biological control, natural products, organic treatments

JUSTIFICATION/ BACKGROUND

Epidemiology and management of fire blight. Fire blight, caused by the bacterium *Erwinia amylovora*, is one of the most destructive diseases of pome fruit trees including apples. The disease is indigenous to North America but has spread worldwide. In the spring, flowers are infected through natural openings in nectaries and pistils. From there, the bacterium spreads into the peduncle, spur, and twig where it causes a canker. During warm, humid weather, ooze droplets consisting of new inoculum are exuded from peduncles and other infected tissues. Inoculum is spread by wind, rain, insects, birds, or by contaminated pruning tools. Secondary infections may occur throughout the growing season. The pathogen overwinters in cankers, flower buds, and diseased fruit.

Current chemical control programs for fire blight are based on protective schedules using available compounds t. Conventional copper compounds are only effective when disease severity is low to moderate. They may cause fruit russeting and therefore, are labeled at low amounts of metallic copper equivalent (MCE) that are at the limit of effectiveness. New re-formulated copper products that can be used at reduced MCE rates and that cause less phytotoxicity are available. Some products are OMRI-approved including Badge X2, CS-2005, Cueva, and MasterCop. Among these, Cueva and MasterCop have been often more effective without causing phytotoxicity. Contributing to the low efficacy of copper is that low to moderate levels of copper insensitivity in pathogen populations have been detected in our surveys. Because only few treatments are permitted for organic apple production, research on OMRI-approved copper and other products needs to be continued.

The antibiotics streptomycin, oxytetracycline, and kasugamycin can only be used in conventional pome fruit production. Kasugamycin (Kasumin) is produced by fermentation of the bacterium *Streptomyces kasugaensis* and may potentially become organically approved by the NOSB because it is not used in human or animal medicine. Recently, natamycin, a biofermentation product like kasugamycin that is mostly used as a postharvest treatment of various crops (see below), was OMRI approved. Resistance in *E. amylovora* to kasugamycin has not been found to date among hundreds of strains evaluated from different pome fruit growing areas in California. The incidence of resistance to streptomycin in California orchards has been fluctuating from very high to low in our surveys between 2006 and 2020. Previously, reduced sensitivity to oxytetracycline was only found sporadically, and isolates were not competitive to wild-type strains. However, from 2018 to 2020, we detected high resistance at several locations. These strains were also highly resistant to streptomycin and carried oxytetracycline resistance genes resembling those that were previously described from non-plant pathogenic epiphytic bacteria such as *Pantoea agglomerans*. Apparently, these genes have jumped between bacterial genera. In co-inoculation studies, we determined that these resistant strains were competitively fit in the presence of wild-type sensitive strains. Current research is ongoing in molecularly characterizing resistance to oxytetracycline and test if the genetic determinants are transferable by conjugation.

Among non-antibiotic treatments for fire blight control, the biocontrols Blight Ban A506 (*Pseudomonas fluorescens* strain A506), Bloomtime Biological (*P. agglomerans* strain E325), and Double Nickel 55 (*Bacillus amyloliquifaciens*), as well as Serenade, a fermentation product of *Bacillus subtilis* (strain QST 713), performed inconsistently over the years in our trials and were most effective at low

inoculum levels and less favorable micro-environments. The ASO liquid formulation of Serenade showed higher efficacy in mixtures with copper such as Cueva. Research will need to be continued with new copper products or other additives. The biocontrol Blossom Protect (*Aureobasidium pullulans*) has been very effective under less to moderately favorable disease conditions, and it is one of the most consistent biologicals that we have evaluated. Biocontrols are most effective when they are actively growing on the plant. Several mechanisms have been described for biocontrol agents that lead to the control of the pathogenic agent including: (1) Competition; (2) Antibiosis or biochemical inhibition; (3) Site exclusion; (4) Parasitism; and (5) Systemic-acquired resistance.

Previous research on apple and pear demonstrated that the non-organic acibenzolar-S-methyl (Actigard) and the OMRI-approved LifeGard (Certis) systemic acquired resistance (SAR) treatments were inconsistent when used alone or in combination with copper. Therefore, we are evaluating other bactericide alternatives such as the natural fermentation compounds lactic acid, ε-poly-L-lysine, and nisin that have known anti-bacterial activity and are used as US-FDA-approved food preservatives. Other compounds under evaluation are ningnanmycin, capric acid (decanoic acid), and capric/caprylic acids in mixtures with different products. In 2021, the plant extract products Thymox, Guarda, and Cinnerate as well as Alum ($KAl(SO_4)_2 \cdot 12H_2O$) and TD-NC-1 (riboflavin) provided very good blight control on apple and/or pear. All these potentially could qualify as biopesticides with the EPA and ultimately as organic compounds with the NOSB and OMRI. Therefore, we continue to try to improve their efficacy by using selected additives. For ε-poly-L-lysine and nisin, we are currently consulting with a formulation chemist with a major registrant. These products may be registered in the future, and some are part of an IR-4 program that includes this research project to test novel potential solutions for diseases that are difficult to manage such as fire blight.

In a recent international fire blight meeting, information was discussed concerning the pending registration of several mixtures of bacterial phages for reducing *E. amylovora* population levels. These types of treatments continue to be unsuccessful in our previous as well as last year's studies. Other researchers have also shown that new composite phage products do not meet expectations, however, mixtures of the phages with biological controls such as *Aureobasidium pullulans* (e.g., Blossom Protect) gave a higher level of control than using either product alone (i.e., phages or *A. pullulans*). Our goal is to develop effective rotational programs for organic farming practices with the use of copper, biologicals, and innovative strategies such as registering kasugamycin, food preservatives, and potential phages as OMRI approved natural products. We also will work on conventional programs with the use of antibiotics alone or in mixtures with copper, biologicals, or natural products during bloom or as cover sprays during early fruit development.

***Management of postharvest decays*.** Apples like other pome fruits can be stored for some period of time using the correct storage environments. Still, postharvest decays caused by fungal organisms can cause losses that are economically detrimental to storing and marketing of fruit. The major postharvest pathogens of apples include *Penicillium expansum, Botrytis cinerea, Alternaria alternata*, *Mucor piriformis*, and *Neofabraea* spp. causing blue mold, gray mold, black mold, Mucor decay, and bull's eye rot, respectively. In California, the former three are most common. There is a deficiency of postharvest biocontrols and natural products that are available to prevent decays in storage. BioSave 100 is one of the only materials currently available in the United States, but it is not very effective. Other products like Aspire have been discontinued. Still, new biological products have been registered in other countries.

In our studies we demonstrated that the food preservative natamycin is effective against a spectrum of postharvest pathogens including those causing gray mold, Rhizopus rot, Mucor rot, and Alternaria decays, but it was not highly effective against blue mold. Natamycin was registered as the biopesticide BioSpectra 100SC on stone and citrus fruits but not pome fruit. This fungicide has been federally approved by the US-Food and Drug Administration (FDA) as a food additive to prevent mold growth, including *Penicillium* species, on dairy and meat products for many years in the United States. Over all the years in use, resistance in *Penicillium* species against natamycin has not occurred. Working with DSM, the producer, and Pace International, the registrant, we submitted a letter of support to the NOSB for approval of natamycin as an organic postharvest treatment of fruit crops. Although the submission was initially denied, in 2021. USDA-AMS approved organic use that resulted in OMRI certification of some formulations of natamycin for organic use, and postharvest fruit formulations are

pending. Other registrants of natamycin will pursue conventional and organic registrations. Natamycin is 'exempt from tolerance' by the US-EPA. Codex is currently developing a similar category for these types of biopesticides. Therefore, our goal is to continue to evaluate natamycin and other new postharvest fungicides such as an organic formulation of polyoxin-D for the management of postharvest decays of apples.

Objectives for 2022-23

Fire blight research

1. Evaluate the efficacy of treatments for managing fire blight.
   - A. Laboratory in vitro tests zinc products in combination with antibacterial food additives (lactic acid, Ɛ-poly-L-lysine, nisin, and Alum-potassium aluminum sulfate), natural organic acids (Dart-capric/caprylic acid mixtures, Cinnerate-cinnamon oil/potassium oleate), natural products (QAM-agave extract), and other new biologicals (yeast and yeast extract).
   - B. Field trials with protective air-blast spray treatments:
     - i. Kasugamycin and new formulations of oxytetracycline in combination with organic treatments to support organic petition of these products to NOSB or via USDA - AMS.
     - ii. New formulations of copper (e.g., CS-2005, Cueva, MasterCop) and zinc in combination with food additives (lactic acid, poly-L-lysine, nisin), biocontrols (e.g., Serenade ASO, Double Nickel 55), or natural products (Alum, Cinnerate, Thymox, Gargoil, TDA-NC-1) as new organic antibacterial strategies.
     - iii. Bacterial phage-mixture products in combination with other biological control treatments (i.e., Blossom Protect) to provide an integrated strategy (pending agroindustry cooperation).

Postharvest research

2. Comparative evaluation of new postharvest fungicides
   - A. Evaluate Scholar, Penbotec, and Academy (difenoconazole mixed with fludioxonil) compared to several potential organic formulations of natamycin (BioSpectra, Cerafruta, Unigard), and approved organic formulations of polyoxin-D (Oso) and natamycin (Zivion-M and -S) at selected rates against gray mold, blue mold, and Alternaria decay.
   - B. Evaluate mixtures of these compounds to improve performance of postharvest fungicide treatments.

Plans and Procedures

Laboratory assays and small-scale field trials to evaluate the efficacy of treatments for managing fire blight. In laboratory assays, we will evaluate cinnamon oil/potassium oleate (Cinnerate), Alum-potassium aluminum sulfate (Alum), antibacterial food additives such as lactic, poly-L-lysine, and nisin mixtures, QAM, and capric/caprylic acids for their toxicity to *E. amylovora* in laboratory assays. Growth will be compared between non-amended and amended media, and the most effective additives will be selected for field trials.

In small-scale blossom assays using ornamental pear flowers, treatments using the copper products CS-2005, MasterCop, and/or Cueva, and the biological treatments Alum, Blossom Protect, Cinnerate, QAM, and Serenade, will be applied to during bloom using small field sprayers. Copper treatments will be mixed with newly identified, food grade-additives (e.g., lactic acid, poly-L-lysine, and nisin) based on laboratory results. Additionally, Thymox, Gargoil, and TDA-NC-1 will be evaluated based on availability. After a selected time, blossoms will be spray-inoculated with *E. amylovora* (10^6 cfu/ml), and disease will be evaluated based on the number of diseased blossoms per replication.

Field studies on the management of fire blight using protective treatments during the growing season. Air-blast sprayer field studies on the relative efficacy of protective treatments will be conducted in experimental apple orchards at KARE and UC Davis. Four applications will be done (at pre-bloom, 10-20%, 60-80% full bloom, and petal fall). The relative efficacy of protective treatments will be evaluated including new formulations of copper (e.g., CS-2005, Cueva, MasterCop) and zinc in combination with food additives (lactic acid, poly-L-lysine, nisin), biocontrols (e.g., Serenade ASO), or natural products (e.g., Alum, Cinnerate) essential oils (e.g., Thymox, Gargoil) and other products (e.g., TDA-NC-1) as new organic antibacterial strategies. Based on laboratory results, these products will be evaluated alone or in selected mixtures to develop integrated programs for resistance management. Incidence of new blight infections on blossoms and leaves in addition to potential phytotoxic effects of the treatments (e.g., fruit russeting) will be evaluated. Application timings will be determined based on temperature, rainfall, and host development.

Treatments will be replicated on four to eight trees. Data for chemical and biological control will be analyzed using analysis of variance and LSD mean separation procedures of SAS 9.4.

Efficacy of new postharvest fungicides for managing apple decays in storage. Fruit (cvs. Granny Smith and Fuji apple) will be treated similar to commercial practices concerning harvest, handling, packing, and temperature management of fruit. Fruit will be wound-inoculated with conidial suspensions of *P. expansum, B. cinerea,* or *Alternaria alternata* and treated after selected times. Potential organic formulations of natamycin (BioSpectra 100SC, Cerafruta, Unigard) and an organic formulation of polyoxin-D (i.e., Oso) will be evaluated by themselves and in mixtures with other fungicides (e.g., fludioxonil, fludioxonil/difenoconazole) in experimental packingline trials at Kearney Agricultural Center at selected rates. Four replications of 24 fruit will be used for each treatment. For the new fludioxonil-difenoconazole pre-mixture (i.e., Academy), we will compare the efficacy of different application methods (in-line drench, CDA, and T-Jet). Treatments will be compared to fludioxonil. Data will be analyzed using analysis of variance and averages will be separated using least significant difference mean separation procedures of SAS 9.4.

Benefits to the industry

Fire blight research. With removal of antibiotics as treatments for organic production due to their use in human medicine and animal agriculture, research on organic alternatives is desperately needed for apple production. Kasugamycin is not used in human medicine or veterinary science, has a different MOA from other antibacterial products, and is organically produced by fermentation, however, getting NOSB approval as an organic treatment is difficult. Furthermore, with the limited number of materials available to organic pome fruit growers, new OMRI-approved active ingredients are needed for managing fire blight in an integrated approach. Our research project has identified biologicals with consistent and inconsistent performance as well as growth enhancers that may improve their overall performance. Information from this research project will help to develop integrated programs using rotations or mixtures of organic compounds (e.g., copper), biologicals (Serenade, Blossom Protect, etc.), food-grade, antibacterial additives such as EPL and nisin, essential oils (Thymox, Cinnerate), and possibly residual oxidizers such as TDA-NC-1 to effectively manage the disease. Alum and Cinnerate are among newer products that have become available. Thus, we are testing innovative solutions for managing fire blight potentially without antibiotics for the organic apple industry. This information is being posted on the UCIPM website and in apple industry newsletters.

Postharvest decay management research. Packers have to develop management programs using new fungicides for control of gray mold, blue mold, Alternaria rot, and other decays of apple. The challenge to the industry is to store fruit and provide decay-free, wholesome fruit to local and distant markets over an extended period. For this, decay management programs for apple need to be developed and continually adapted based on new organically certified fungicides that will allow rotations and mixtures to optimize control of postharvest fungal pathogens. The development of several effective postharvest fungicide treatments including materials that are exempt from tolerance (i.e., natamycin) and are OMRI-certified (i.e., polyoxin-D, natamycin) will greatly decrease losses of fruit from various decays during storage in a durable program that will be effective for many years. Thus, information from this research directly benefits growers and packers by identifying and registering new materials, as well as developing improved application practices for control of postharvest diseases of apples.

References

1. Van Der Zwet, T., and Keil, H.L. 1979. Fire Blight - A Bacterial Disease of Rosaceous Plants. United States Department of Agriculture, Handbook No. 510.200 pp.
2. Vanneste, J. (ed.). 2000. Fire Blight: The Disease and its Causative Agent, *Erwinia amylovora.* CAB International, Oxford. 384 pp.

Budget Request:
Budget Year: 2022-2023.
Funding Source: _____ Apple Commission of California _____

Salaries and Benefits:	Post-Docs/SRA		7,000
	Lab/Field Ass't		1,000
	Subtotal		8,000
	Employees' Benefits		5,200
		Subtotal	13,200
Supplies and Expenses*			6,000
Equipment			0
Operating Expenses/Equipment Travel (Davis Campus only)			0
Travel			2,000
Department Account No. _____		**Total**	**21,200**

* - Costs include expenses of $6,000 for maintaining an apple orchard at the Kearney AgCenter.

Originator's Signature: _____ Date: 6-10-2022

Department Chair: _____ Date: 6-10-2022

Liaison Office: Date:

Effect of irradiation on transcriptome of 'Granny Smith' apples

Hagop Atamian, Jose Jesus Ornelas Paz, Anuradha Prakash

Food Science Program, Chapman University, Orange, CA

Our research program focuses on the use of irradiation for phytosanitary treatment of apples to limit the spread of destructive pests such as the light brown apple moth (*Epiphyas postvittana*) and the oriental fruit moth (*Grapholita molesta*). Ionizing irradiation is a highly effective non-thermal phytosanitary treatment that is gaining popularity worldwide, especially in Australia, as it is an environmentally friendly technique of pest and pathogen control that is chemical-free. Irradiation does, however, impact the physiology of the fruit and elicit radiation-induced oxidative stress. In current work we are exploring the transcriptomic responses of 'Granny Smith' apples subjected to x-ray irradiation, both immediately after exposure and after 90-day cold storage. We are also relating transcriptome responses to chemical and physical markers in the fruit.

Acknowledgements: We would like to thank the California Apple Commission for providing apples to support this research. This project was supported with funding from a TASC grant from USDA-FAS.

APPLE EDUCATION

APPLE EDUCATION SUMMARY

The California Apple Commission strives to provide educational information for classrooms throughout California. Throughout 2021-2022, the California Apple Commission worked with the California Foundation for Agriculture in the Classroom to develop updated informational fact sheets, coloring pages, and other information specific to the California apple industry.

The Commission's goal through the educational sponsorship is to create agriculture awareness in classrooms and create a basis for the appreciation of the importance of agriculture in the everyday lives of students. The Commission will continue to make a positive impact on the way students view agriculture and the world around them.

The Foundation provides educational resources for students and facilitates outreach to California teachers and their students who have an interest in California agriculture. Their website provides books and videos for students, as well as pamphlets, lesson plans, and informational fact sheets for teachers to use in their classrooms. The learning materials provided on their website are created with all grade levels in mind, assuring the most effective learning material. The California Foundation for Agriculture in the Classroom foundation also funds scholarships and grant opportunities for students in the agriculture industry. To learn more about what the Foundation has to offer, please visit their website: http://learnaboutag.org/index.cfm.

Included in the following pages is an updated California apple fact sheet, Ag. Bite lesson plan, and CA apple poster featuring CAC Board Member, Kelley Hansen. This information will be distributed to schools in California and other educational institutes as well as featured on the California Foundation for Agriculture in the Classroom website.

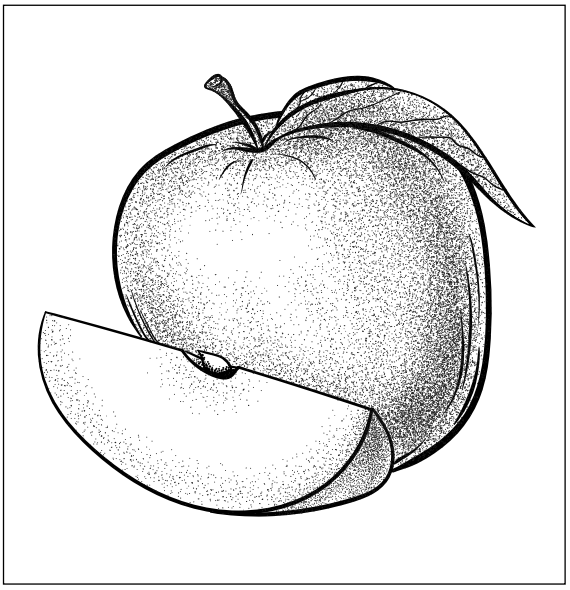
LearnAboutAg.org
California Foundation for Agriculture in the Classroom

Commodity Fact Sheet

Apples

Information compiled by the California Foundation for Agriculture in the Classroom

How Produced – Grafting, a horticultural technique that joins two plant structures together, is the first step in apple production to ensure that rootstock and varieties will bare fruit. Once planted, it takes four to five years for the tree to produce the first fruit and will produce fruit for up to 100 years. Most apple varieties are self-sterile, meaning they are unable to pollinate themselves and thus rely upon cross-pollination. The most commonly used pollinator is crab apples (also known as wild apples) in which pollination takes place in the spring, when trees are in blossom. Once pollinated, blossoms fall to the ground and small apples begin to grow in the blossom's place.



During spring and summer, apple trees require frequent watering. Apple trees can tolerate a great deal of heat if they have sufficient water. The apple crop is harvested by hand in the fall. To insure crop production for the following year, trees must be pruned yearly in the winter to promote new vegetative growth.

History – The first documented history of apples dates back to 300 B.C. in the Persian Empire, where the cultivation and enjoyment of apples was an essential part of civilized life. In the 1400s apples were rediscovered and in the 1500s regained popularity again as a common commodity. During this time, European settlers of the Americas brought with them their English custom varieties, and the first apple orchard was planted in America. William Blackstone was the first pilgrim to plant apples trees grown in the United States in the Massachusetts Bay Colony in 1629.

In the early 1800s, stories began circulating about John Chapman, better known as Johnny Appleseed, who traveled across the Ohio Valley carrying bags of apple seeds. Venturing westward, he planted seeds and grew apple trees wherever he roamed to ensure that settlers living in the western frontier would have nutritious apples to eat. Apples have a place in more recent history, too. In 1962, the first American to orbit the Earth carried pureed applesauce to consume during the flight.

Varieties – The apple, scientifically known as Malus domestica, is a member of the rose family. California has almost 13,000 acres dedicated exclusively to apple production. California grows four main varieties: Gala, Fuji, Granny Smith, and Cripps Pink. Within the United States, roughly 2,500 varieties of apples are grown. The top 10 apple varieties grown within the United States are Red Delicious, Golden Delicious, Fuji, Granny Smith, Rome Beauty, McIntosh, Idared, Jonathan, Gala, and York Imperial.

Commodity Value – The United States' 7,500 apple producers grow approximately 240 million bushels of apples each year on 322 thousand total acres of land. The wholesale value of the United States apple crop is approximately $4 billion annually. Worldwide, the United States ranks second to China in apple production. California ranks fourth in U.S. apple production, generating 12% of the national apple crop which is approximately 1.5 to 2.5 million (40lb.) boxes of apples per year. Seventy-five percent of the apples produced in California will be shipped domestically and 10% to 15% are exported. Canada, Malaysia, Mexico, Taiwan, and Panama are five of the 27 global destinations California exports to.

Top Producing Counties – The major apple production areas are in the San Joaquin Valley with San Joaquin, Fresno, and Madera counties being the leading producers. Historically, apple production was limited to the coastal mountains, the Sierra foothills, and in the Southern California mountains. Recently apple production has expanded into the Central Valley with new plantings of Granny Smith, Fuji, Gala, and other varieties. Coastal apple producing counties, like Sonoma, Santa Cruz, and San Luis Obispo, primarily produce apples for juicing.

Nutritional Value – One medium-sized apple provides 20% (five grams) of the daily requirement for dietary fiber, 8% of the daily requirement for vitamin C, and is a healthy source of potassium. One apple has approximately 80 calories and contains no fat, cholesterol, or sodium.

For additional information:
California Apple Commission
Phone: (559) 225-3000
Website: calapple.org

CALIFORNIA APPLE COMMISSION

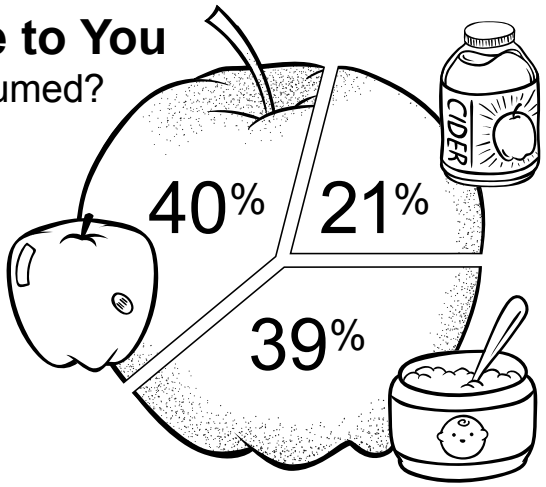
08/22 Learn About Ag

This is one in a series of fact sheets composed by the California Foundation for Agriculture in the Classroom (CFAITC). For additional educational materials: CFAITC, 2600 River Plaza Drive, Suite 220, Sacramento, CA 95833-3377 • (916) 561-5625 • Fax: (916) 561-5697
Email: info@learnaboutag.org • Website: LearnAboutAg.org

Apples Activity Sheet

From Apple Tree to You

How are apples consumed?



Fresh market

Apple juice and cider

Processed into dried fruit, baby food, and other products

Lesson Ideas

- Dissect and examine the anatomical parts of an apple. Observe and identify the function of each structure.
- Research and explain the aphorism “an apple a day keeps the doctor away” using nutritional information.
- Observe and practice various grafting techniques used to grow apples.
- Compare hand and machine harvesting methods. Invent a harvesting machine for apples.
- Perform experiments that show the different methods of preserving apples.
- Research and determine what the top ten apple varieties are and why they are most popular amongst consumers.
- Calculate the percentage of water weight in apples by dehydrating the fruit.
- Sprout an apple plant from a seed.

Fantastic Facts

1. The crabapple is the only apple native to North America.
2. Apples are propagated by two methods: grafting or budding.
3. The apple variety “Red Delicious” is the most commonly grown apple variety worldwide.
4. Apples are a member of the rose family.
5. Twenty-five percent of an apple’s volume is air, which makes it naturally buoyant.
6. It takes the energy from 50 leaves to produce one apple.
7. World’s top apple producers are China, United States, Turkey, Poland, and Italy.
8. Archeologists have found evidence that humans have been enjoying apples since 6500 B.C.
9. Apples account for 50% of the world’s deciduous fruit tree production.
10. Two-thirds of an apple’s fiber and antioxidants are found in the peel.

Lesson Plan: Sugar or Starch

Introduction: Apples naturally contain starch also known as carbohydrates. When an apple begins its ripening process, starches are converted into sugar. This conversion process starts at the core of the apple and moves outward toward the skin. To check the ripeness of the apple an iodine test can be used to identify the amount of starch present.

Objective: Students will investigate the ripening process of apples by conducting an iodine experiment.

Standards: NGSS: 4-LS1-2, 3-5-ETS1-3; CC ELA: L.W.4-5.7

Materials: Variety of apples, iodine tincture, nitrile gloves, safety goggles, paintbrush, knife, paper plates or towels

Procedure:

1. Safety note: Iodine tincture is a hazardous material and should be handled with care. Wash hands after use and avoid contact with the eyes and skin.
2. Place individual, whole apples on labeled plates (1, 2, 3, 4, etc.) and instruct students to observe each apple’s size, color, texture, and firmness. Have students hypothesize, based on their previous knowledge, which apples are at peak ripeness.
3. Cut apples in half, displaying both sides of the apples on each labeled plate. Have students observe each apple’s internal characteristics.
4. With the paintbrush, evenly apply iodine across the cut surface of each top apple half. Let the apple sit for two minutes. Leave the other apple half untouched as a control to compare changes in each apple.
5. Observe the surfaces of the apples. Large amount of purple indicates high starch/low sugar. Little to no purple indicates low starch/high sugar.
6. Place apples on a continuum from least to most ripe. Make concluding observations.
7. Write a conclusion paragraph on your experimental findings.

08/22 Learn About Ag

This Fact and Activity Sheet was developed by California Foundation for Agriculture in the Classroom in conjunction with California educators and meets the required education standards of the California Department of Education.

- FARM FRESH -

Apples

APPLES PROVIDE UNIQUE **health benefits.** THEY ARE FULL OF ESSENTIAL VITAMINS AND A NATURAL SOURCE OF BENEFICIAL ANTIOXIDANTS.

FOOD for FUEL

HERE ARE SOME OF THE HEALTH BENEFITS OF INCLUDING APPLES IN YOUR DIET:

Healthy HEART

Apples are rich in the compound quercetin, which has been shown to reduce inflammation while fighting against heart disease and hypertension.

Clear SKIN & Strong HAIR

The vitamin C found in apples may help strengthen hair, nails, and speed up skin cell production, while the beneficial B vitamins help fight acne and skin irritation.

Healthy GUT

The fiber found in apples helps us feel full and keeps things moving in our digestive tract–just be sure to leave the skin on as it contains half of the total fiber.

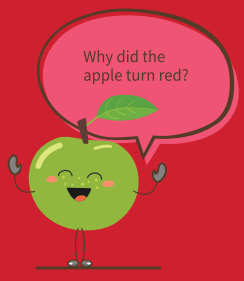
" Learning how to farm—it just takes diving in and doing it. A lot of people don't try what we've tried because they fear failure. It's not a failure if you keep going and learn from it."

– *Kelley Hansen*
Apple Farmer | *Springville, CA*

Did you know?

Americans eat more apples per capita than any other fruit. The average American eats about 16 pounds of fresh apples and 28 pounds of processed apples like juice, cider, or sauce each year.

According to the Guinness Book of World Records, the most apples bobbed in one minute is 37 and was achieved by Cherry Yoshitake, from Japan, in 2015.



"It saw the salad dressing!"

Fresno Unified School District

Learn About Ag® California Foundation for Agriculture in the Classroom

cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

SCAN ME

Scan the code with your smartphone to find out more about apples.

Comparing Apples and... Earth?

Grades 3-5

Explore how much of the Earth's surface is needed for growing food for a world of people.

Activity

1. Hold up an apple to the class and tell the students that it represents Earth.

2. Slice the apple into fourths. Set aside three of the fourths, as they represent water on the Earth's surface.

3. Cut the remaining slice in half. Set aside one of the halves as uninhabited deserts, swamps and Arctic areas.

4. Divide the remaining piece into fourths. Set aside three of the pieces for land that is too rocky, wet, hot, or poor for crop production.

5. The remaining piece is 1/32 of the original apple. Carefully, peel this section. Hold up the peel and explain that it represents the thin layer of soil that is available for producing all of the world's food crops.

Classroom Discussion

- What is the key message underlying the activity?
- What actions can students take to care for their patch of this precious Earth—as individuals, as a class and school, with their families, in their community?
- How are farmers stewards of the land?
- What is sustainability? Introduce the concepts without using the word itself, which can be difficult to define. Produce concept maps based on discussion.
- How do natural resource management, farming techniques, feeding the world, land care, and environmental management play a role in food production in California or your specific region?

Classroom Activities

English Language Arts/History

- Have students journal about this activity, what they learned from the demonstration, and different ways they can take care of the Earth.
- Research different farming practices used in the past and create a chart with the pros and cons of each one. Report your findings to the class.

Visual and Performing Arts

- Create art stamps using different tools (paperclip, toothpick, popsicle stick) to make designs in the apple pieces. Mix paints to produce different colors and dip the stamps in paint to create art.
- Use the activity as a prompt or an example for students to produce a game, puzzle, poster or other means of delivering a similar message.

Materials

Enough for each student:

- Apple (or a paper cutout of an apple)
- Knife
- Chopping board or plates
- Paper towels or wet wipes

Tip

A demonstrator could cut one apple and students eat an approximate amount.

Watch Online!
See a video of this Ag-Bite at LearnAboutAg.org/agbites

California Standards:

Grade 3
Math CC: 3.NF.1
NGSS: 3-LS4-4

Grade 4
Math CC: 4.NF.3a, 3b
NGSS: 4-ESS3-1

Grade 5
Math CC: 5.NF.2
NGSS: 5-ESS3-1

Adapted from materials by the Natural Resources Conservation Service

This is one in a series of Ag-Bites developed by CFAITC. Ag-Bites meet the standards of the California Department of Education.
2600 River Plaza Drive, Suite 220, Sacramento, CA 95833-3292 • (800) 700-AITC • info@LearnAboutAg.org • LearnAboutAg.org

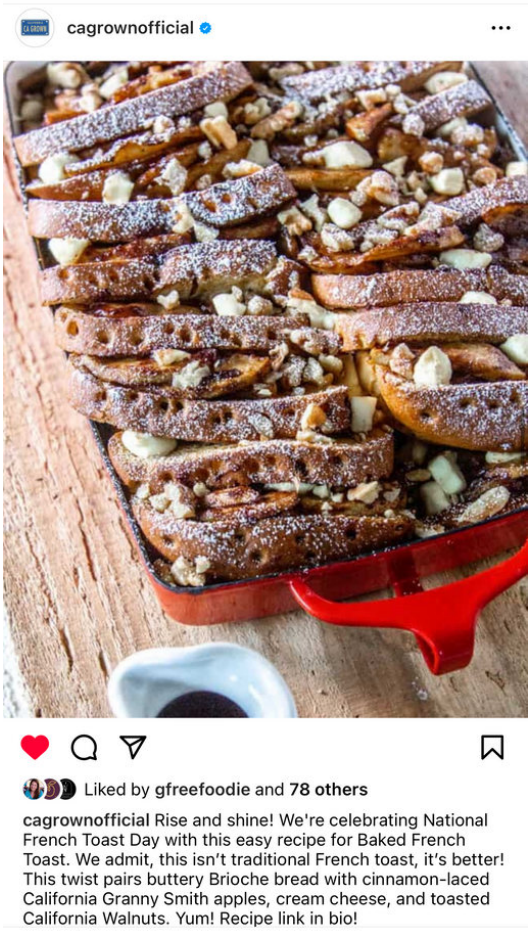
CA GROWN PARTNERSHIP

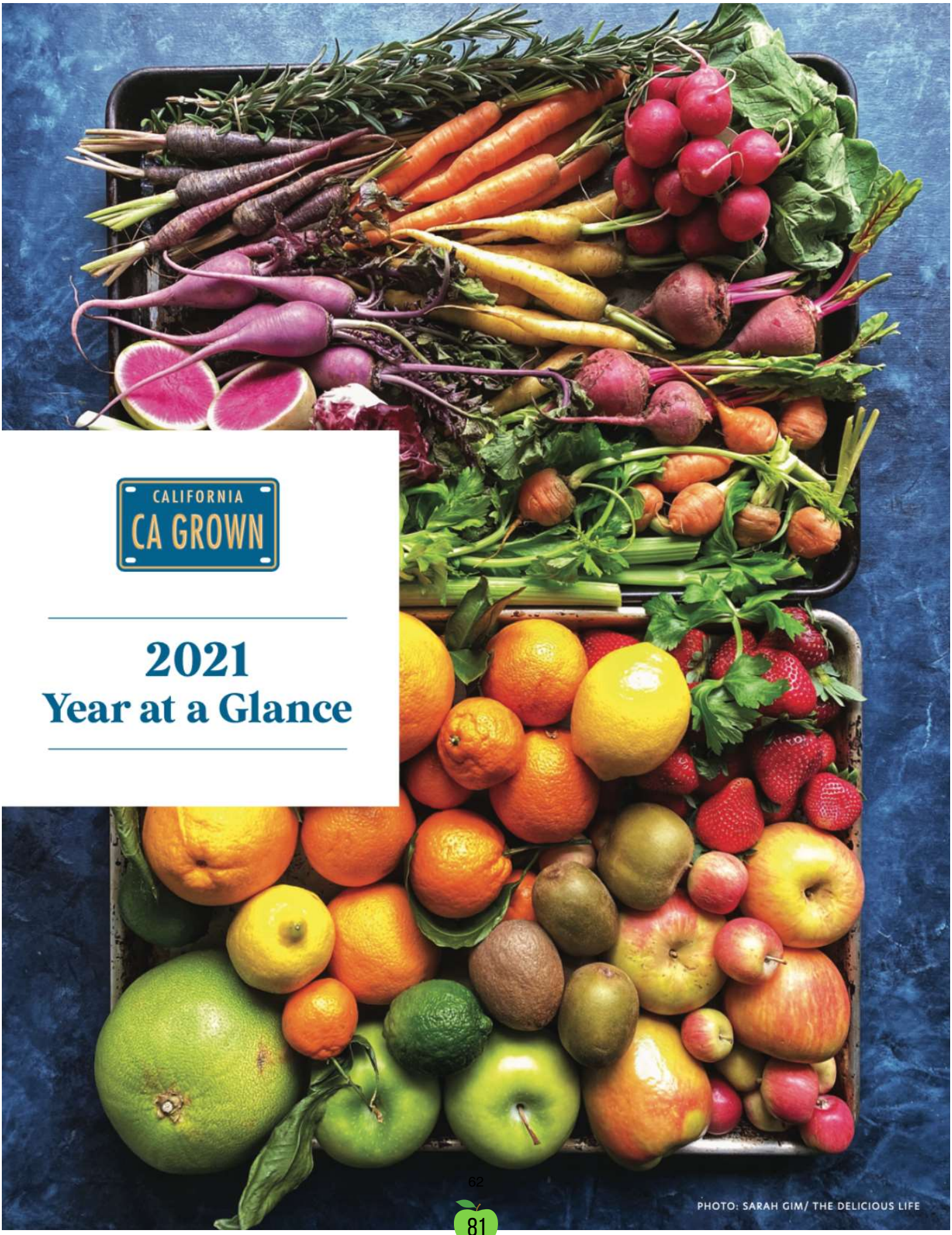
California Grown, also known as the Buy California Marketing Agreement (BCMA), is a joint effort of agricultural industry groups representing the products of California's farms, ranches, forests, and fisheries. Working as an advisory board to the California Department of Food and Agriculture, BCMA brings together industry and government resources to increase the awareness, consumption, and value of California agricultural products, helping the state's consumers enjoy the best of the California lifestyle.

California Grown is funded through public and private contributions by the U.S. Department of Agriculture, the California Department of Food and Agriculture, and California agricultural organizations.

The Commission participates as an active member of the California Grown partnership by attending regular board meetings and joining internal committees. Through this partnership, the Commission is able to feature California apples at various events including, California Agriculture Day at the Capitol, the Produce Marketing Association's Fresh Summit Exposition, and many more.

California Grown also developed original content featuring California apples for their individual social media channels. This content was cross-shared on CAC channels as well to generate a greater audience reach. Additionally, California apples was featured in a number of other California Grown activities including retail promotions, Happy Hour at Home Campaign, Influencer Partnerships, and Grown to be Great Campaign.

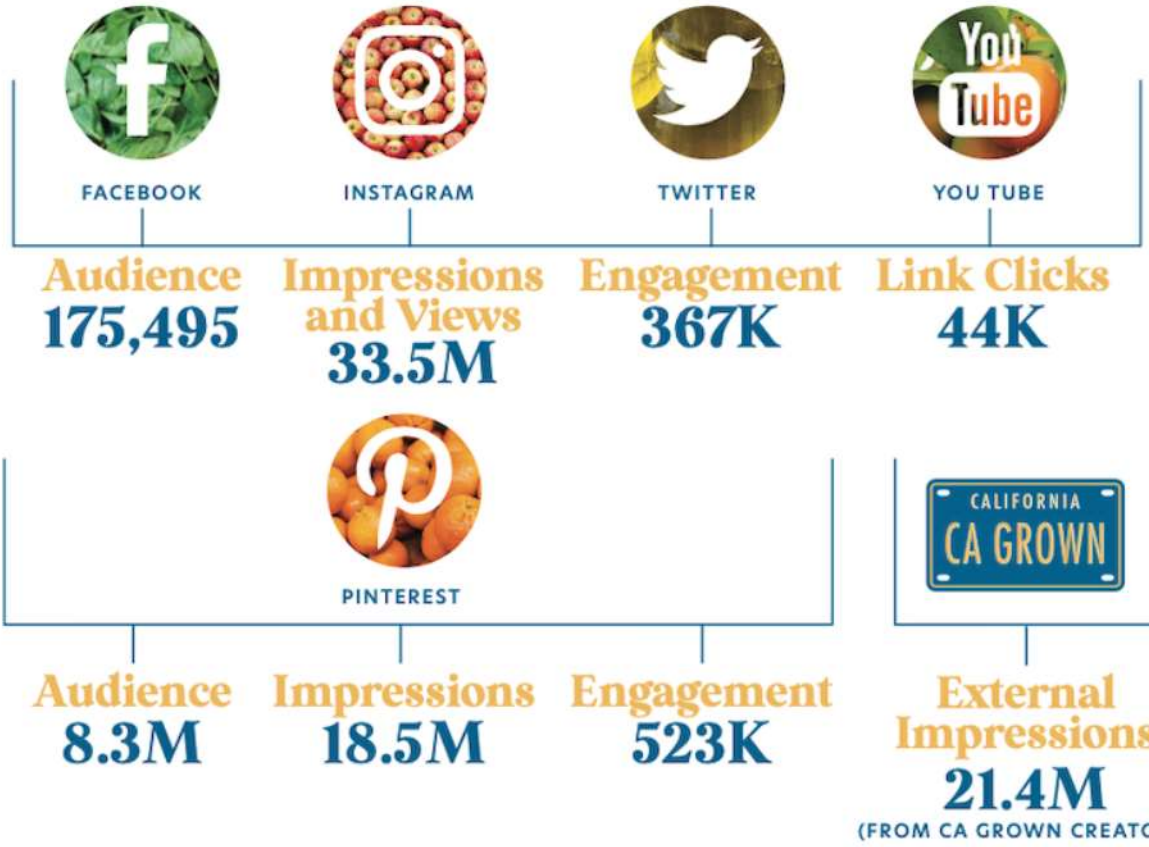




2021
Year at a Glance

PHOTO: SARAH GIM/ THE DELICIOUS LIFE

Performance Metrics: @cagrownofficial



Paid Campaign: "Grown to be Great"

FOCUSED ON WESTERN REGION (CALIFORNIA, ARIZONA, NEVADA, WASHIONGTON, OREGON)

2021 California Grown Sponsored Retail Promotions

EXECUTED

13 Retail Promotions with **9** CA Retail Partners

PROMOTED

60 California Grown commodities over **264** promotion days

Top Influencer Content

Apple Pistachio Crisp from Bakes by Brown Sugar

Apple Pear Fritters by Britney Breaks Bread

Apple Cake with Pistachios from Bakes by Brown Sugar

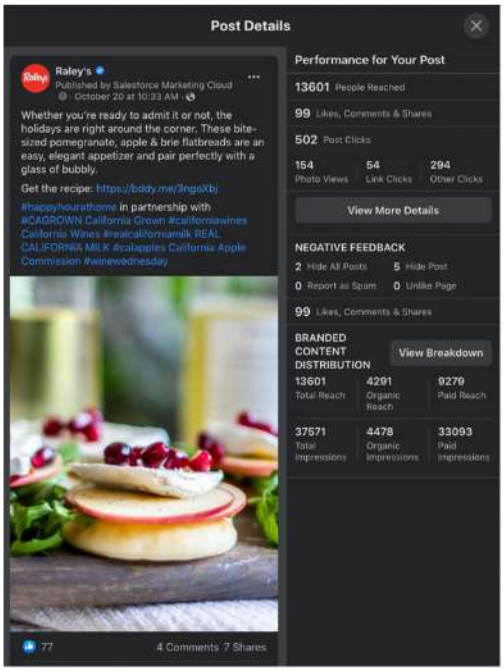
Other Content Featuring Your Crop

Baked French Toast with Apples

Apple, Fig and Walnut Crisp

Apple Cinnamon Cake

Retail Partnerships



California Apples were included in CA GROWN retail promotions executed by Albertsons, Vons, Pavillon, Save Mart, Nugget Markets and Bristol Farms. Apples were also features in the Happy Hour at Home campaign in partnership with Ralphs and California Wines.

Other Notable Activities

California Apples were featured in our Happy Hour at Home Campaign. Recipes were posted on Raley's website and shared on social by CA GROWN, California Wines, Real California Milk and Ralphs. Recipes and wine pairings were promoted at California Grocers' Association. One of our most popular apple recipes, Fried Apple Rings, was refreshed with new information and links in time for apple season.

Looking Forward

California Apples are currently in our Grown to be Great campaign! Rebecca Firth of Displaced Housewife will be your apple influencer! We'll be unveiling your landing page, new recipes and promoted content very soon! Here's an idea of what your Grown to be Great graphics will look like. ***Note- this is a mock up, not a final graphic.

Contact Us!

CALIFORNIA
CA GROWN

CALIFORNIAGROWN.ORG

INFO@CALIFORNIAGROWN.ORG

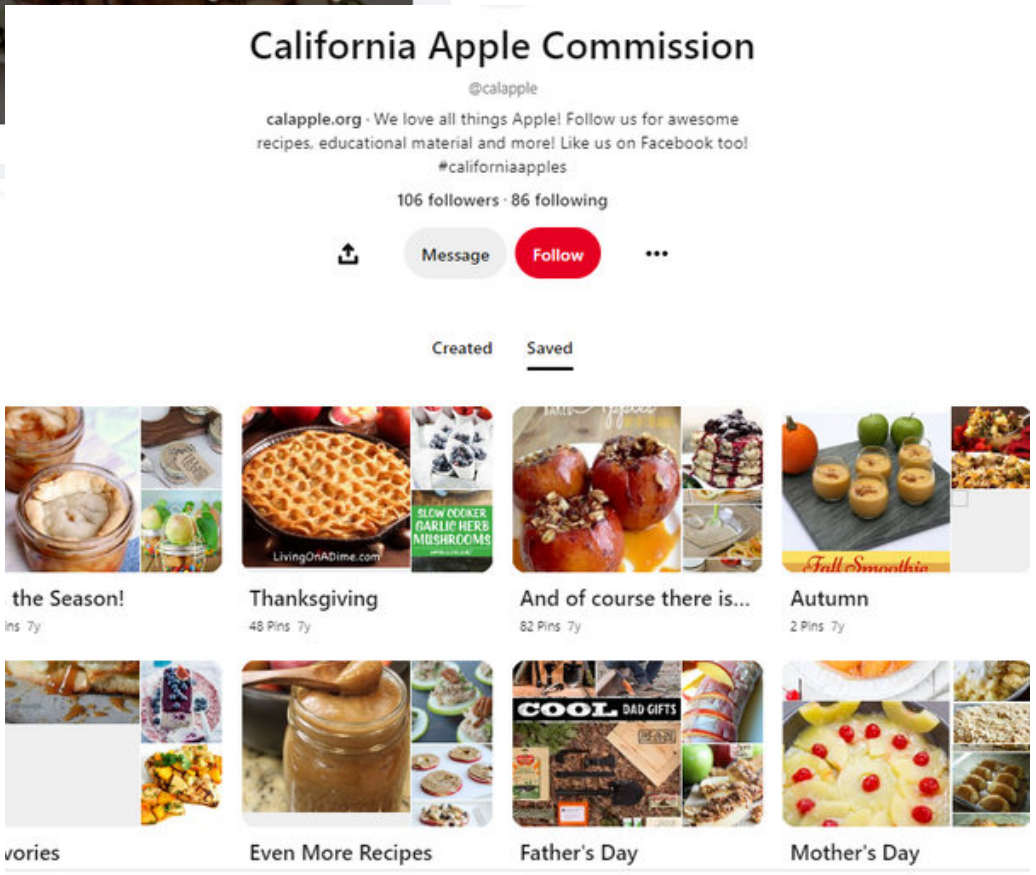
@CAGROWNOFFICIAL

EDUCATION THROUGH SOCIAL MEDIA

In 2021-2022, the California Apple Commission continued to engage with consumers through social media outreach highlighting the seasonality of California apples. The CAC utilized Instagram, Facebook, and Pinterest to feature content on apple usage, California seasonality, varietal characteristics, and California apple grower features. Content was designed to encourage consumers to purchase local, in-season California apples. In an effort to generate a greater audience, the CAC relied on existing partnerships with CA Grown, the California Foundation for Agriculture in the Classroom, and the US Apple Association, among others. Additionally, internal partnerships with the California Wild Rice Advisory Board, California Blueberry Commission, and California Olive Committee have allowed the CAC to engage in additional asset development opportunities, such as recipes, that feature all or a combination of these California commodities.

Instagram was the social media platform with the most engagement in 2021-2022. The CAC grew its average post engagement by a total of 15% during the last Quarter of the program year alone. The CAC utilized standard posts, in addition to stories, on Instagram to maximize audience reach potential and engagement.

CAC-generated Instagram content was cross-shared across other social media profiles, such as Facebook and Pinterest.



SB 982

During the 2021-2022 California State Legislative Session, which concluded on September 30, 2022, the California Apple Commission amended Commission law through Senate Bill 982. SB 982, authored by Senator Laird, authorizes the Commission to establish an organic apple certification program applicable to persons engaged in domestic organic production or processing of apples and to persons engaged in importing apples to determine whether they are in compliance with state and federal laws.

The Commission has the authority to work with the California Department of Food and Agriculture to essentially be the eyes and ears of the fresh apple industry, through the creation of a certification program, to ultimately maintain the integrity of the organic program and protect consumer trust.

SB 982 passed out of the Senate 36-0 and the Assembly 76-0. On August 29, 2022, Governor Newsom signed SB 982 into law to take effect on January 1, 2023.

To read the full bill text, access here!

PEST, DISEASE, & STANDARDIZATION

PEST, DISEASE, & STANDARDIZATION SUMMARY

The California apple industry continuously strives to produce a healthy and safe product. Through its work in pest, disease, and standardization, the Commission continues to partner with other entities to represent the industry on critical issues.

The Food Safety Modernization Act (FSMA) was signed into law on January 4th, 2011 by President Barack Obama. The purpose of the law mandates the U.S. Food and Drug Administration (FDA) to implement a comprehensive, science-based, preventative control across the food supply. The FSMA rules are put in place to ensure specific actions are taken at each of the following points to prevent contamination. FSMA consists of seven different final rules, which can be found by following the link listed below. The Produce Safety rule specifically focuses on production practices and ultimately establishes science-based minimum standards for the safe growing, harvesting, packing, and holding of produce. The rule puts more responsibility on farms to protect their crops from contamination by creating requirements for water quality testing, raw manure application, examining grazing areas, employee health and hygiene training, and more. The rule gives special attention to sprouts due to their frequent association with foodborne illness outbreaks.

For more information, please visit the following link to view the most recent publication of the rules for the Food Safety Modernization Act:
https://www.fda.gov/Food/GuidanceRegulation/FSMA/

Please see the following pages for information regarding CDFA's Produce Safety Program for industry members, in addition to more information on the FSMA Produce Safety Rule itself.

FSMA TRAINING

Under the Produce Safety Rule, every produce farm must have an individual employed who has completed an FDA-approved Produce Safety Rule Grower Training course. This course provides training to ensure a responsible party employed by the farm understands the required food safety practices. The Produce Safety Rule Grower Training need only be taken once; however, the certificate of completion belongs to the individual and not the farm. California Produce Safety Program inspectors will ask to see your designated food safety employee's certificate as part of your on-farm inspection.

About the Training Program
Currently, only courses that have been accredited by the Produce Safety Alliance will satisfy the requirement for training under the Produce Safety Rule.

The 7-hour Produce Safety Rule Grower Training course covers the following topics:

- Introduction to Produce Safety
- Worker Health, Hygiene and Training
- Soil Amendments
- Wildlife, Domesticated Animals and Land Use
- Agriculture Water (Part I: Production Water, Part II: Postharvest Water)
- Developing a Farm Food Safety Plan
- Postharvest Handling and Sanitation

- In-person course is a traditional classroom style course with instructors, typically presented in a single 7-8 hour training day.
- Online delivery course is a three-week course that can be completed at your own pace. The online course is expected to take 15-30 hours for successful completion. The enrollment cost will be $125 during the COVID-19 crisis (until 31 December 2021) by applying discount code GROWER21. The standard enrollment cost is $450.
- Remote delivery course is led in real time by instructors delivered with video conferencing software, such as Zoom or Webex. This is a temporary option being supported during the COVID-19 outbreak.

To sign up please go to https://safefoodalliance.com/events/

cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE
Karen Ross, Secretary

May 30, 2018

Re: Produce Safety Program Website

Dear California Produce Associations:

The California Department of Food and Agriculture is pleased to inform you our new Produce Safety Program (PSP) has launched a website that will serve as a resource to California farmers who must comply with new regulations under the Produce Safety Rule (PSR).

The website, which can be found at www.cdfa.ca.gov/producesafety, includes basic information about the PSP and our efforts to help California produce farmers understand how to comply with the requirements of the PSR under the Food Safety Modernization Act (FSMA).

Our hope is that you will use this website and share it with your grower-members as the official resource for information about PSR implementation in California. Additional information will be added to the site in coming months. Currently, California produce farmers can use the website to learn about mandatory Produce Safety Rule Grower training that is required of at least one employee on every produce farm. Our website provides access to registration information for several courses being offered throughout the state that are subsidized by the U.S. Food and Drug Administration so that farms can complete the required training at a reduced price.

The site provides California produce industry members with some initial information about the upcoming PSP inspections that will be conducted by our staff on behalf of the FDA beginning in spring of 2019. To prepare for inspections, the Department is offering on-farm readiness reviews. Growers can schedule a review directly from the website. A Frequently Asked Questions section has been developed, along with some talking points that can be used to explain the new program to consumers. A regular blog is also part of the website and will be used to provide updates on program activities and resources.

In addition to the website, a Facebook page has been created for the program under @CDFAProduce Safety. Interested industry members can also join a mailing list to receive updates and information.

It is estimated over 20,000 farms in California are covered under the PSR, and we will need your assistance in reaching this audience with important information about the

new regulation. We encourage your organization to share these new resources with your membership. We also welcome any questions you may have.

Sincerely,

Karen Ross, Secretary
California Department of Food and Agriculture

Enclosures

cc: Natalie Krout-Greenberg, Director
Inspection Services Division

Steve Patton, Branch Chief
Inspection Services Division

Shelley Phillips, Supervising Senior Environmental Scientist
Produce Safety Program

FDA U.S. FOOD & DRUG ADMINISTRATION

September 13, 2017

Steve Patton
Branch Chief
1220 N Street
Sacramento, CA 95814

Dear Mr. Patton:

On September 12, 2017, the Food and Drug Administration (FDA) announced a postponement of the implementation of routine inspections of farms subject to the Produce Safety Rule until spring 2019. The announcement also addressed the extension of the compliance date for agricultural water standards and described how FDA will work with stakeholders to modify agricultural water standards in the future.

In light of this announcement, we are modifying the approach outlined in the cooperative agreements so that routine inspections will begin in spring 2019. This will allow states and FDA an opportunity to focus on issuing guidance and training plans, along with conducting On-Farm Advisory (Readiness) Reviews (OFRRs) in 2018. "For-cause" inspections (such as those related to outbreak investigations) will still occur, as needed, and will not change in light of this announcement. The new routine inspection timeline is as follows:

- Large Farms
  - Compliance Date - 1/26/2018; Inspection Start Date – March - June 2019
- Small Farms
  - Compliance Date - 1/28/2019; Inspection Start Date – March - June 2020
- Very Small Farms
  - Compliance Date - 1/27/2020; Inspection Start Date – March - June 2021

We ask that all State Produce Implementation Cooperative Agreement Program (CAP) grantees adjust their inspection implementation timelines according to the above schedule and reassess their strategic plans and budgets to determine the impact of these decisions, if any. We encourage states to consider reprogramming resources planned for inspections in 2018 to conducting OFRRs.

FDA, working closely with our association partners, is scoping out all activities that can be performed in lieu of routine inspections in Year 2. We will also be finalizing CAP-related information and decisions necessary to implement inspections in 2019. We will share this information with you no later than November 1, 2017, so you will have time to revise your strategic plans and budgets, if necessary, and submit them, along with your mid-year progress reports, by December 1, 2017.

U.S. Food & Drug Administration
10903 New Hampshire Avenue
Silver Spring, MD 20903
www.fda.gov

While reassessing your program's strategic plan and budget please be mindful that all other planned activities under your existing cooperative agreement will continue including:

- Developing and continually updating your strategic plan for produce safety (continuation from Year 1)
  - Developing, documenting, and tracking performance measures
- Conducting a jurisdictional self-assessment (continuation from Year 1)
- Establishing and verifying a farm inventory (continuation from Year 1)
- Conducting legislative research and continuing any efforts to obtain regulatory authority (continuation from Year 1)
- Developing program and program infrastructure (continuation from Year 1 and/or new)
  - Developing and implementing a continuing education program to ensure regulatory jurisdiction personnel are trained
  - Establishing ties with FDA's Produce Safety Network and FDA's Technical Assistance Network to ensure that any questions or issues are raised and state/territory regulators receive necessary technical assistance
  - Researching, designing, and implementing a compliance program for applicable produce safety regulations at the jurisdictional level, which includes:
    - Continuing program development work, but adjusting for the new targeted start date; and
    - Delaying implementation of the inspection program and redirecting those resources to OFRRs and other education and outreach programs
  - Continuing communication and collaboration amongst CAP stakeholders
- Performing education and outreach (continuation from Year 1 and/or new)
  - Evaluating educational needs and implementing an educational system to provide for an informed farming community
  - Participating in and providing opportunities for OFRRs

The implementation of the Food Safety Modernization Act (FSMA) and the Produce Safety Rule has been and continues to be a top priority for FDA. As you know, states have a long history of effectively working with and understanding your farming communities. Successful implementation of the Produce Safety Rule cannot happen without the support of our state partners who are helping food producers and growers understand and achieve the new requirements.

FDA is committed to ensuring our regulatory partners and industry have the tools needed to implement the new standards. As we continue to work together with FSMA implementation, we recognize that achieving our shared food safety goals is a continuous effort from all of us.

Thanks for your commitment to integration and food safety. We look forward to our continued partnership.

U.S. Food & Drug Administration
10903 New Hampshire Avenue
Silver Spring, MD 20903
www.fda.gov

- Subpart C of part 507 includes provisions for disclosure statements and written assurances that apply when a manufacturer/processor of food for animals identifies a hazard requiring a preventive control, does not control the identified hazard, and relies on an entity in its distribution chain to control the hazard (§§ 507.36(a)(2), (3), and (4), 507.36(c), 507.36(d), and 507.37). A manufacturer/processor that complies with these provisions of part 507 is not required to implement a preventive control for the identified hazard. The combination of these requirements was intended to provide assurance that the food will be processed to control the identified hazard before it reaches the consumer feeding the food to animals.
- Subpart F of part 507 specifies the elements to be included in the written assurances required by § 507.36(a)(2)(ii), (3)(ii), and (4)(ii). (See § 507.215(b).)

The FSVP regulation includes "customer provisions" that apply when an importer imports a food for which the hazards are controlled after importation (§ 1.507). As with the customer provisions in part 117 and part 507, the requirements in the customer provisions of the FSVP regulation were intended to provide assurance that the food will be processed to control the identified hazard before it reaches the humans or animals that would consume the food.

The produce safety regulation applies to "covered produce" as set forth in §§ 112.1 and 112.2. Produce that would otherwise be covered is eligible for an exemption from most of the requirements of the produce safety regulation if: (1) The produce receives commercial processing that adequately reduces the presence of microorganisms of public health significance (§ 112.2(b)(1)); and (2) certain other conditions are met, including requirements for disclosure statements and written assurances analogous to the requirements for disclosure statements and written assurances in the "customer provisions" required by part 117, part 507, and the FSVP regulation (§ 112.2(b)(2) through (4) and (6)).

FDA has received feedback from industry expressing concern that certain product distribution chains would require vastly more written assurances (and consequently resources to comply with the requirement) than anticipated by FDA during the rulemaking process (Ref. 1). For example, a manufacturing facility may sell food products subject to the customer provisions to a distributor, who may sell numerous items requiring assurances to multiple restaurants, cafeterias, delicatessens, and other distributors. It is estimated that this could result in hundreds or even thousands of written assurances needed by a single distributor (Ref. 1). After considering this feedback from industry, we stated our belief that the requirement for written assurance in the customer provisions of part 117 significantly exceeds the current practices of even the largest facilities; compliance by those facilities by September 19, 2016, may not be feasible; and it is appropriate to extend the compliance dates for 2 years for the written assurance requirements for part 117, part 507, the FSVP regulation, and the produce safety regulation while we considered the best approach to address feasibility concerns (81 FR 57784 at 57786).

FDA intends to initiate a rulemaking that takes into consideration the complex supply chain relationships and resource requirements. To provide sufficient time for us to pursue that rulemaking, we are exercising enforcement discretion with regard to the written assurance requirements of part 117, part 507, part 112, and the FSVP regulation until completion of that rulemaking process. In the meantime, entities with disclosure duties under part 117, part 507,

part 112, or the FSVP regulation are still required to make necessary disclosures. Subsequent entities in the distribution chain will continue to be subject to applicable requirements related to food adulteration in Federal and/or state and local laws and regulations, e.g., part 117, part 507, and the Retail Food Code.

C. Enforcement Policy for Importation of Food Contact Substances Under the FSVP Regulation

The FSVP regulation requires food importers to develop, maintain, and follow an FSVP that provides adequate assurances that the foreign supplier uses processes and procedures that provide the same level of public health protection as those required under the preventive controls or produce safety provisions of FSMA (if applicable) and regulations implementing those provisions, as well as assurances that the imported food is not adulterated and that human food is not misbranded with respect to allergen labeling (21 CFR 1.502(a)). Among other things, the FSVP regulation (21 CFR 1.500-1.514) requires most food importers to do the following:

- Analyze the hazards for the foods they import (21 CFR 1.504);
- Evaluate the performance of their potential foreign suppliers and the risk posed by the foods to be imported (21 CFR 1.505); and
- Determine and conduct appropriate foreign supplier verification activities, such as onsite auditing of foreign suppliers, sampling and testing, and review of supplier food safety records (21 CFR 1.506).

The FSVP regulation applies (with certain exceptions) to the importation of food as defined in section 201(f) of the FD&C Act (see 21 CFR 1.500). Food contact substances are included in the definition of "food" for purposes of the FSVP regulation (21 CFR 1.500). However, for the reasons stated below, we intend to exercise enforcement discretion for importers of food contact substances with respect to the FSVP regulation.

A food contact substance is any substance that is intended for use as a component of materials used in manufacturing, packing, packaging, transporting, or holding food if such use of the substance is not intended to have any technical effect in such food (section 409(h)(6) of the FD&C Act (21 U.S.C. 348(h)(6)); 21 CFR 170.3(e)(3)). The term "food" is defined in section 201(f)(3) of the FD&C Act to include articles used as components of food. In the preamble to the FSVP final rule, we stated that the definition of "food" for purposes of FSVP includes food contact substances that are considered "food" in section 201(f) of the FD&C Act (80 FR 74225 at 74233). Therefore, the FSVP regulation applies to importers of food contact substances that meet the definition of "food" in section 201(f).

In the compliance date final rule, we extended the compliance date for the importation of food contact substances by 2 years so that we could consider how best to address concerns raised about the feasibility of importers of food contact substances meeting the FSVP requirements (81 FR 57784 at 57792-57793). As a result of this extension, the earliest that an importer would be required to comply with FSVP for the importation of food contact substances would be May 28, 2019.

squash, winter; sweet potatoes; and water chestnuts.

(2) Produce that is produced by an individual for personal consumption or produced for consumption on the farm or another farm under the same management; and

(3) Produce that is not a raw agricultural commodity.

(b) Produce is eligible for exemption from the requirements of this part (except as noted in paragraphs (b)(1), (2), and (3) of this section) under the following conditions:

(1) The produce receives commercial processing that adequately reduces the presence of microorganisms of public health significance. Examples of commercial processing that adequately reduces the presence of microorganisms of public health significance are processing in accordance with the requirements of part 113, 114, or 120 of this chapter, treating with a validated process to eliminate spore-forming microorganisms (such as processing to produce tomato paste or shelf-stable tomatoes), and processing such as refining, distilling, or otherwise manufacturing/processing produce into products such as sugar, oil, spirits, wine, beer or similar products; and

(2) You must disclose in documents accompanying the produce, in accordance with the practice of the trade, that the food is "not processed to adequately reduce the presence of microorganisms of public health significance;" and

(3) You must either:

(i) Annually obtain written assurance, subject to the requirements of paragraph (b)(6) of this section, from the customer that performs the commercial processing described in paragraph (b)(1) of this section that the customer has established and is following procedures (identified in the written assurance) that adequately reduce the presence of microorganisms of public health significance; or

(ii) Annually obtain written assurance, subject to the requirements of paragraph (b)(6) of this section, from your customer that an entity in the distribution chain subsequent to the customer will perform commercial processing described in paragraph (b)(1) of this section and that the customer:

(A) Will disclose in documents accompanying the food, in accordance with the practice of the trade, that the food is "not processed to adequately reduce the presence of microorganisms of public health significance"; and

(B) Will only sell to another entity that agrees, in writing, it will either:

(*1*) Follow procedures (identified in a written assurance) that adequately reduce the presence of microorganisms of public health significance; or

(*2*) Obtain a similar written assurance from its customer that the produce will receive commercial processing described in paragraph (b)(1) of this section, and that there will be disclosure in documents accompanying the food, in accordance with the practice of the trade, that the food is "not processed to adequately reduce the presence of microorganisms of public health significance"; and

(4) You must establish and maintain documentation of your compliance with applicable requirements in paragraphs (b)(2) and (3) in accordance with the requirements of subpart O of this part, including:

(i) Documents containing disclosures required under paragraph (b)(2) of this section; and

(ii) Annual written assurances obtained from customers required under paragraph (b)(3) of this section; and

(5) The requirements of this subpart and subpart Q of this part apply to such produce; and

(6) An entity that provides a written assurance under §112.2(b)(3)(i) or (ii) must act consistently with the assurance and document its actions taken to satisfy the written assurance.

§ 112.3 What definitions apply to this part?

(a) The definitions and interpretations of terms in section 201 of the Federal Food, Drug, and Cosmetic Act apply to such terms when used in this part.

(b) For the purpose of this part, the following definitions of very small business and small business also apply:

(1) *Very small business.* For the purpose of this part, your farm is a very small business if it is subject to any of the requirements of this part and, on a

FSMA Produce Safety Rule

cdfa
CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

What Produce Associations Need to Know

- California Department of Food Agriculture (CDFA) is launching the California Produce Safety Program, which will include educational information designed to assist California produce farms in understanding the requirements of the FDA's Produce Safety Rule and how to comply with this new regulation.
- Beginning January 26, 2018, California produce farms designated as "large" (those with annual sales greater than $500,000) are expected to comply with the Produce Safety Rule. Smaller farms will be phased in over the next few years.
- The Produce Safety Rule is mandatory throughout the United States beginning January 26, 2018. Any produce farm found to be out of compliance may be subject to regulatory actions.
- In 2018, the Produce Safety Program will be doing everything possible to inform and educate California produce farmers about the requirements of the Produce Safety Rule.

Who Must Follow the Produce Safety Rule?

- California farms producing fruits, nuts and vegetables must comply with this new rule.
- Multiple rules exist within the federal Food Safety Modernization Act (FSMA). The Produce Safety Program deals specifically with the Produce Safety Rule. Information about other FSMA Rules is available here.
- The exact rule an operation falls under will vary depending upon the type of activities performed. To determine if an operation falls under the Produce Safety Rule, please use this flow chart provided by The National Sustainable Agriculture Coalition.

CDFA Produce Safety Program Website Coming Soon

www.cdfa.ca.gov/producesafety/

CDFA is currently developing a new Produce Safety Program website. This will serve as the go to place for individuals looking for PSR information.

cdfa PRODUCE SAFETY PROGRAM

Who is Exempt from the Produce Safety Rule?

- A list of exemptions from the Produce Safety Rule can be found here. Exemptions generally include the following:
- Thirty commodities have been identified by the FDA as exempt from the Produce Safety Rule because they are rarely consumed raw. Farms exclusively producing these commodities are not covered by the Produce Safety Rule. (Examples of exempt commodities include: dried kidney beans, potatoes and pumpkins.)
- Farms that grow produce only for personal consumption or very limited distribution may also be exempt from the law.
- Some farms may qualify for an exemption from the Produce Safety Rule if their sales are below certain levels or if they grow produce that is processed in a way that would kill pathogens. Farms falling in these categories will be required to verify their exemption status.
- If your organization represents commodities that may be eligible for a qualified exemption because the finished product is processed in a way that kills pathogens, CDFA strongly urges you to seek guidance from FDA regarding documentation requirements to verify this exemption.
- CDFA is also urging associations to work with industry members to ensure procedures for documentation for qualified exemptions required of both farmers and processers are well understood and communicated.

Education and Training

- FDA has determined that official Produce Safety Rule on farm inspections will begin in 2019. The Produce Safety Program will spend 2018 working to make sure California produce farmers understand the requirements of the Produce Safety Rule.
- An informational website providing detailed information on the Produce Safety Program will be available soon and CDFA will be conducting other outreach efforts to educate California produce farms about this new rule and how to comply.
- One of the first steps toward Produce Safety Rule compliance is for every produce farm to have an individual employed who has completed an FDA-recognized Produce Safety Rule Grower Training Course. The training need only be taken once and the certificate of completion belongs to the individual. Available courses are posted on the Produce Safety Alliance website here.
- CDFA has also contracted with outside organizations to provide subsidized Grower Training that meets Produce Safety Rule requirements. These courses are offered at a reduced rate and are being conducted throughout the state in both English and Spanish. A list of dates and locations of these courses is provided with this packet.
- In addition to the required Produce Safety Rule Grower Training, all produce farms must show documentation of ongoing food safety training of farm and contracted employees as part of the required practices under the Produce Safety Rule.
- Any information or assistance your association can provide to ensure farmers are meeting Produce Safety Rule training requirements is greatly appreciated.
- In preparation for official Produce Safety Rule inspections in 2019, CDFA's Produce Safety Program will be offering a series of On-Farm Readiness Reviews (OFRR). These are designed to give produce farmers a better understanding of what they can expect from a Produce Safety Program routine inspection. Information on how to schedule an OFFR will be available very soon.

Information for the Public and Other Stakeholders

- Please note that California Produce Safety Program inspections are a means of verifying compliance and enforcement of the Produce Safety Rule. They are not meant to replace existing quality assurance activities that may be requested of farmers or handlers by their customers.
- Suggested messaging for use in talking about the Produce Safety Program with trade and consumers is included in this packet.
- CDFA urges you to share information contained in this packet with your membership.

Implementation of Required Food Safety Practices

- Produce farms with sales greater than $500,000 per year are expected to implement Produce Safety Rule practices beginning January 26, 2018. The full Produce Safety Rule requirements are available on the FDA website here.
- If your association has commodity specific guidelines that are aligned with the Produce Safety Rule, we encourage you to share these with your membership.
- We also urge you to advise your membership that private audit firms should conduct audits that are aligned with the Produce Safety Rule so that farmers are well prepared for Produce Safety Program inspections when they begin taking place in 2019.

Produce Safety Program Inspections

- CDFA has created a new unit as part of its Inspection Services Division specifically to conduct Produce Safety Rule inspections. This unit is known as the Produce Safety Program.
- Produce Safety Rule inspections will be done on behalf of the U.S. FDA. As such, Produce Safety Program inspectors are credentialed by the FDA and have specific education and training.
- As with all other programs within the CDFA's Inspection Services Division, Produce Safety Program inspectors are part of a public agency mandated to protect the food supply. Inspectors are: accountable to the public, legislature and the industry; financially independent and unbiased; consistent and uniform; and are required to report potential public health threats to the California Department of Public Health.
- CDFA is working with an existing database of California farms acquired from other agencies and organizations to identify California produce farms that are likely subject to this new rule. Farms from this list will be selected for routine inspection by the Produce Safety Program on a random basis following verification of the farm's status.

cdfa PRODUCE SAFETY PROGRAM

Suggested Messaging for Retail and Foodservice Produce Buyers

cdfa PRODUCE SAFETY PROGRAM

About the Produce Safety Rule

- Beginning January 26, 2018, the Produce Safety Rule under the new Food Safety Modernization Act will become law on produce farms throughout the U.S.
- All California farms producing fruits, nuts and vegetables must comply with this new law. Some exceptions apply. Your supplier can provide verification if they are exempt from the Produce Safety Rule.
- The law will be phased in according to farm size over the next few years beginning in 2018 with large farms, defined as those with annual sales of $500,000 or more.
- To implement this new law across the nation, the U.S. FDA is working with State Departments of Agriculture to conduct inspections that will verify produce farms are in compliance with the Produce Safety Rule.
- The U.S. FDA has determined that Produce Safety Rule on-farm inspections will begin in 2019.

Implementation in California

- It is estimated some 20,000 produce farms in California are subject to the Produce Safety Rule.
- The California Department of Food and Agriculture has created a new unit as part of its Inspection Services Division specifically to conduct inspections that will verify compliance with the Produce Safety Rule. This unit is known as the Produce Safety Program.
- The goal of CDFA's Produce Safety Program is to assist and verify that California produce farms are following FDA's Produce Safety Rule.
- This is a big job and it will take time to fully implement. CDFA's goal is for Produce Safety Rule requirements to become ingrained in the culture of California produce farming so that our state is growing the safest produce possible.
- The California Produce Safety Program's role is to first educate California produce farmers on the requirements of the Produce Safety Rule and then regulate farms to ensure they are following this new rule.

About the Produce Safety Program Inspections

- California Produce Safety Program inspections are a means of verifying compliance and enforcement of the Produce Safety Rule. They are not meant to replace existing quality assurance activities provided by farmers or handlers.
- Beginning in 2019, California produce farms will be selected for inspection by the Produce Safety Program on a random basis following verification of the farm's status.
- Unlike audit based certification programs, farms may not request an inspection, but will instead be selected by the Produce Safety Program.

Suggested Messaging for Consumers

cdfa PRODUCE SAFETY PROGRAM

About New Food Safety Regulations for Produce

- Beginning on January 26, 2018 fruit, vegetable and nut farms in California and throughout the U.S. will be required to follow specific food safety practices under a new federal regulation known as the Produce Safety Rule.
- The U.S. Food and Drug Administration (FDA) has been charged with oversight of this new rule and it is being implemented in California by the California Department of Food and Agriculture (CDFA).
- Food safety practices required on farms are similar to what is required of restaurants or to precautions you might take in your own kitchen. The practices are designed to ensure produce is properly handled by workers who are trained to use good hygiene; to make sure farm equipment is sanitary, to ensure soils where produce is grown are safe and, that measures are in place to prevent contamination of produce by wildlife or nearby domesticated animals. Additionally, farmers are required to keep written records to document their farming practices.
- Many produce farms have been implementing these kinds of food safety practices on their farms for years.

What Consumers Can Expect from Produce Grown in California

- Routine on-farm Inspections to verify farmers are following new food safety regulation will be conducted through an inspection unit created by the California Department of Food and Agriculture called the Produce Safety Program.
- It's estimated that 20,000 farms in California are subject to the Produce Safety Rule. It is the goal of CDFA that requirements of this new food safety rule become ingrained in the culture of California produce farming so that our state is growing the safest produce possible.
- Over the next year, the role of the California Department of Food and Agriculture's Produce Safety Program will be to educate California produce farmers about the requirements of the Produce Safety Rule.
- Beginning in 2019, CDFA's Produce Safety Program inspectors will conduct random, routine inspections of produce farms to ensure they are following the new law.
- Inspectors in California are credentialed by the FDA and have specialized education and training. The inspectors are part of a government agency charged with protecting the food supply. They provide independent, unbiased, consistent inspections of California produce farms.
- Most grocery stores and restaurants already require farmers to follow food safety practices on their farms. In addition, many organizations conduct research and provide food safety guidelines that produce farmers have been following for years.
- Requirements for produce safety on farms is now the law. Farmers found to be out of compliance with these new requirements may face economic, regulatory and legal consequences.

LEGISLATIVE & REGULATORY UPDATE

The California apple industry is continuously affected by new regulations resulting from legislation passed in a given legislative session. The 2022 Legislative Session began on January 1st and concluded on September 30th, which was the last day for the Governor to sign or veto bills passed by the Legislature.

The California Apple Commission continued to serve as an advocate for the industry by actively supporting or opposing legislation in the 2022 season. There were several pieces of legislation pertaining to agriculture, but below are some of the most notable that were seen during the session. Please do not hesitate to contact the Commission office with any questions on the below bills. Additionally, if there are any bills that you do not see below, please contact the Commission office for an update.

AB 778-Institutional purchasers: purchase of California grown agricultural food products (E. Garcia)

- AB 778 requires a California state-owned or state-run institution that purchases agricultural food products, as defined, to implement necessary practices to achieve a goal of ensuring that at least 60% of the agricultural food products that it purchases in a calendar year are grown or produced in the state by December 31, 2025. The bill would provide that this goal does not apply to local educational agencies and the segments of public postsecondary education.
- A local educational agency that solicits bids for the purchase of an agricultural food product shall accept a bid or price for that agricultural food product when it is grown in California before accepting a bid or price for a domestic agricultural food product that is grown outside the state, when both of the following are met:

(1) The bid or price of the California-grown agricultural food product does not exceed the lowest bid or price for a domestic agricultural food product produced outside the state.

(2) The quality of the California-grown agricultural food product is comparable to that domestic agricultural food product produced outside the state.

- Outcome: Passed out of the Assembly 80-0. Governor Newsom signed AB 778 on September 27, 2022.
- Bill Text: Access here!

LEGISLATIVE & REGULATORY UPDATE CONTINUED

SB 490-The Buy American Food Act: Public institutions: purchase of nondomestic agricultural food products (Caballero)

- SB 490 enacts the Buy American Food Act to require public institutions, as defined, that receive federal meal reimbursement funding to provide prepared meals and that solicit bids for the purchase of agricultural food products, as defined, to include in their solicitation for bids and contracts that only the purchase of agricultural food products grown, packed, or processed domestically is authorized, unless the bid or price of the nondomestic agricultural food product is more than 25% lower than the bid or price of the domestic agricultural food product, the quality of the domestic agricultural food product is inferior to the quality of the agricultural food product grown, packed, or produced non-domestically, or the agricultural food product is not produced or manufactured domestically in sufficient and reasonably available quantities of a satisfactory quality to meet the needs of the public institution. This bill contains other related laws and provisions.
- Outcome: Passed out of the Assembly 69-0 and amendments concurred in the Senate 39-1. Governor Newsom signed SB 490 on September 27, 2022.
- Bill Text: Access here!

AB 710-Sale of Listed Agricultural Products: Requirements for Sale (E. Garcia)

- AB 710 set out to prohibit the sale of listed agricultural produce that did not meet California's preeminent legal and regulatory standards for health, labor, and environmental protection. AB 710 also sought out to provide discretionary authority to the CDFA to develop a meaningful and workable program and structure to achieve these important consumer protections.
- Outcome: Failed in the Senate Business, Professions and Economic Development Committee on June 13, 2022. Governor Newsom liked the idea of AB 710, so this bill will most likely be brought back in the next session.
- Bill Text: Access here!

LEGISLATIVE & REGULATORY UPDATE CONTINUED

AB 2183–Agricultural labor relations: elections. (Stone)

- The Alatorre-Zenovich-Dunlap-Berman Agricultural Labor Relations Act of 1975 grants agricultural employees the right to form and join labor organizations and engage in collective bargaining with respect to wages, terms of employment, and other employment conditions, and authorizes employees to elect exclusive bargaining representatives for these purposes. Current 42 law creates the Agricultural Labor Relations Board (ALRB) and prescribes its composition, duties, and powers. Current law requires the board to certify the results of an election conducted by secret ballot of employees in a collective bargaining unit to designate a collective bargaining representative, unless the board determines there are sufficient grounds to refuse to do so. Current law further provides that if the board refuses to certify an election because of employer misconduct that would render slight the chances of a new election reflecting the free and fair choice of employees, the labor organization shall be certified as the bargaining representative for the bargaining unit. This bill would refer to the election by secret ballot process as a polling place election. The bill would establish alternative procedures to the polling place election and authorize a labor organization to be certified as the exclusive bargaining representative of a bargaining unit through either a labor peace election or a non-labor peace election, as prescribed, dependent on whether an employer enrolls and agrees to a labor peace election for labor organization representation campaigns. The bill would provide that a labor peace election or a non-labor peace election permits a bargaining unit to summarily select a labor organization as its representative for collective bargaining purposes without using the existing polling place process.

LEGISLATIVE & REGULATORY UPDATE CONTINUED

AB 2183–Agricultural labor relations: elections. (Stone) Continued

- Labor Peace Elections (Mail Balloting):
    - Employers have the opportunity to sign up for Labor Peace during January 2023, and it will automatically be renewed each year if the employer so chooses. Signing up means the employer agrees to:

1) Access onto your property by union organizers.
2) Disparaging statements regarding the union are prohibited during elections.
3) Employers cannot have captive audience meetings with employees when discussing unions.
4) Employees or Unions may request Voting Kits with ballots. Mail ballots are then used to support a petition for a mail ballot election.
5) Employer has to submit names and street addresses for employees who worked during the payroll period before the filing of the petition and the ALRB compares mail ballots with employee list. If more than 50% of listed employees signed mail ballots, then the ALRB will conduct a mail ballot election and mail out voting kits to all employees on the list except for those that already submitted mail ballots.
6) If the union has more than 50% of tallied votes, it becomes certified as the exclusive bargaining representative of the employees.

    - If an employer violates terms of Labor Peace Elections, the union may be certified without conducting a new election.

- Non-Labor Peace Elections (Card Check):
    - For employers who decide not to sign up for Labor Peace Elections, Card Check will be utilized in order to be certified as the bargaining representative of an employer's employees.

1) The union will file a petition with the ALRB along with evidence establishing its majority support (this could include union authorization cards, signature petitions, etc.)
2) Once filed, an employer must turn over the employee list with street addresses and payroll information for the payroll period immediately preceding the filing of a petition.

LEGISLATIVE & REGULATORY UPDATE CONTINUED

AB 2183–Agricultural labor relations: elections. (Stone) Continued

3) The ALRB will compare the evidence of majority support submitted by the union and the employee list within 5 days after the union filing, then the union will be certified.
4) If less than a majority support the union, the ALRB can provide the union with an additional 30 days and the employees list to gather additional proof of support.

- Outcome: Passed out of the Senate 26-10 and amendments concurred in the Assembly 55-18. Governor Newsom signed AB 2183 on September 28, 2022.
- Bill Text: Access here!

AB 2026-Recylcing: Plastic Packaging (Friedman)

- Would require an e-commerce shipper, as defined, that ships purchased products in or into the state to reduce from its 2023 calendar year levels the total weight and number of units of single-use plastic shipping envelopes, cushioning, and void fill, and expanded and 18 extruded polystyrene, it uses to ship or transport the products, by no less than unspecified percentages on or before January 1, 2030. The bill would establish exemptions from these prohibitions.
- Outcome: Failed to pass in the Senate
- Bill Text: Access here!

AB 2146-Neonicotinoid Pesticides: Prohibited Nonagricultural Use.

- Would prohibit, beginning January 1, 2024, the sale, possession, or use of neonicotinoid pesticides, as defined, for application to outdoor ornamental plants, trees, or turf, except for use on, or for the protection of, an agricultural commodity, as defined. The bill would authorize the Director of Pesticide Regulation, in consultation with the Department of Food and Agriculture, to authorize, by written order, the sale, possession, or use of these prohibited pesticides if the director finds that it would address a valid environmental emergency 19 and there are no other, less harmful alternatives, as specified, and would require the director to make reasonable efforts to inform the public of an environmental emergency finding.

LEGISLATIVE & REGULATORY UPDATE CONTINUED

AB 2146-Neonicotinoid Pesticides: Prohibited Nonagricultural Use. Continued

- The bill would also authorize a certified qualified applicator to possess or use a neonicotinoid pesticide and a licensed pest control dealer to sell a neonicotinoid pesticide as provided. The bill would provide that these provisions do not apply to certain actions and applications of these pesticides. Because a violation of these provisions and the regulations adopted pursuant to these provisions would be a misdemeanor, the bill would impose a state-mandated local program.
- Outcome: Passed out of the Senate 30-4 and amendment concurred in the Assembly 53-18. Governor Newsom vetoed AB 2146 on September 28, 2022.
- Bill Text: Access here!

AB 2550-State Air Resources Board: San Joaquin Valley Air Pollution Control District: nonattainment (Arambula)

- Would require the State Air Resources Board, if the San Joaquin Valley Air Pollution Control District does not receive a determination of attainment from the United States Environmental Protection Agency for a national ambient air quality standard established by the agency pursuant to the federal Clean Air Act by the applicable attainment date for that standard, to undertake certain activities, including coordinating with the district and community-based organizations in the district and conducting outreach to under-resourced communities in the district to identify gaps in the state implementation plan and the district's attainment plan, rules, regulations, programs, and enforcement practices that impact the district's ability to attain and maintain that ambient air quality standard.
- Outcome: Passed out of the Senate 27-13 and amendments concurred in the Assembly 48-15. Governor Newsom vetoed AB 2550 on September 22, 2022.
- Bill Text: Access here!

SB 54-Plastic Pollution Prevention and Packaging Product Responsibility Act (Allen)

- As part of its comprehensive statutory scheme, the bill would require the producers of single-use packaging and plastic single-use food service ware to source reduce plastic material, to ensure that covered material offered for sale, distributed, or imported in or into the state on or after January 1, 2032, is recyclable or compostable, and to ensure that plastic covered material offered for sale, distributed, or imported in or into the state meets specified recycling rates. In particular, the bill would require not less than 65% of plastic covered material to be recycled on and after January 1, 2032 and would authorize CalRecycle to increase or decrease specified recycling rates. The bill would require producers to participate in "producer responsibility organizations (PRO) and would require a PRO, commencing in the 2027 calendar year, and until January 1, 2037, to remit a $500 million surcharge each year to be deposited into the California Plastic Pollution Mitigation Fund. The bill would require the PRO to establish and impose on its participant producers an environmental mitigation surcharge in an amount sufficient to raise that sum and to remit those moneys and would authorize a PRO to collect up to $150 million from plastic resin manufacturers who sell plastic covered material to producers who are participants of the PRO. CalRecycle and PROs shall not impose any requirement, including a recycled content requirement, in direct conflict with federal law or regulation, including regulations, rules, or guidelines issued by the U.S. Department of Agriculture or the Food and Drug Administration relevant to packaging agricultural commodities, requirements for microbial contamination, structural integrity, or safety of packaging under the Federal Food, Drug, and Cosmetic Act, the federal FDA Food Safety Modernization Act, and other federal statutes. Neither CalRecycle nor a PRO shall impose a postconsumer recycled content requirement for fresh produce. CalRecycle shall consider relevant information on reduction programs and approaches in other states, localities, and nations, including, but not limited to, the European Union, India, Costa Rica, China, Chile, and Canada, and international standards, including, but not limited to, ISO 18602.

LEGISLATIVE & REGULATORY UPDATE CONTINUED

SB 54-Plastic Pollution Prevention and Packaging Product Responsibility Act (Allen) Continued

- Outcome: Passed out of the Assembly 67-2 and the Senate 29-0. Governor Newsom signed SB 54 on June 30, 2022. Proponents of an initiative to put a single-use plastic packaging ban on the November 2022 ballot agreed to not move forward with their initiative.
- Bill Text: Access here!

SB 982-California Apple Commission: organic apple certification program (Laird)

- Authorizes the California Apple Commission to establish an organic apple certification program applicable to persons engaged in domestic organic production or processing of apples and to persons engaged in importing apples to determine whether they are in compliance with state and federal laws. The bill would require the program's operating procedures to be approved by the secretary. The bill would require the identity of any person determined to be in violation of the program to be provided to the public, the Department of Food and Agriculture, and any other state and federal agency responsible for the administration of laws related to organic products. The bill would require the commission to reimburse the secretary for all expenditures incurred by the secretary in carrying out its duties and responsibilities pursuant to these provisions. Because the provisions of the bill would be in the Food and Agricultural Code, and they do not expressly provide a penalty for violation, the bill would expand the scope of a crime and thereby create a state-mandated local program
- Outcome: Passed out of the Senate 36-0 and the Assembly 76-0. Approved by the Governor on August 29, 2022.
- Bill Text: Access here!

LEGISLATIVE & REGULATORY UPDATE CONTINUED

In addition to participating in the legislative session, the California Apple Commission (CAC) was actively engaged with the California Department of Pesticide Regulation (CDPR) amidst their plan to implement a Statewide Pesticide Application Notification System. CDPR was allocated $10 million as a part of the 2021-2022 state budget to implement a state notification system to provide the public information regarding pesticide usage in their areas. CDPR in partnership with County Agricultural Commissioners, implemented four pilot programs that were launched in 2022 in Riverside, Santa Cruz, Stanislaus, and Ventura counties. For a side by side comparison of the pilot program details, please access CDPR's website below.
https://www.cdpr.ca.gov/docs/pesticide_notification_network/pnn_pilot_projects_details.pdf.

Through the creation of pilot programs, CDPR requested feedback from the public and agriculture industry on the below elements of a notification system:

- Anonymity: Conversations are still taking place on whether or not individuals of the public will need to disclose their address when searching for pesticide applications near them. Currently CDPR has proposed that an individual type in a valid address to receive notifications of pesticide applications within 2 miles of their location. Additionally, conversations are still taking place on whether or not producers will need to provide the exact location of an application.
- Timing: Currently CDPR is proposing that producers notify within 24 hours of applying a pesticide. Members of the public have requested 72 hours' notice so that they can plan accordingly to take alternate routes to school, work, etc.
- Pesticides Included: Currently, only permitted restricted materials necessitate notification. The public has asked that all pesticides including those on the Prop 65 list are included in the plan.
- Accessibility: CDPR is still formulating tools to make the notification system easily accessible to the public which could include a visual map feature. The public has asked that individuals should be able to opt into receiving texts and emails regarding notification. Additionally, several people have expressed that CDPR make all information in English, Spanish and other dialects of Spanish.
- CDPR has hosted feedback workshops in addition to comment periods, in which the CAC has participated in and submitted comments expressing concerns with current proposed plans. A Statewide Notification System Plan is expected to be released by CDPR in Spring of 2023, with implementation beginning in 2024. CAC staff will continue to keep the industry updated as additional information is released.

CALIFORNIA APPLE EXPORT MARKETS

CALIFORNIA APPLE EXPORT AND DOMESTIC OVERVIEW

The California Apple Commission has culminated the final export numbers for the 2021-2022 season. California exported a total of 133,869 boxes. Exports were up significantly from the 2020-2021 season volume of 25,000 boxes. Despite the implications of COVID-19, the increase in apple exports this year is likely attributed to industry's response to alleviate pressure on the domestic market. Due to COVID-19, other apple producing states in the U.S. struggled to export to overseas markets. This was primarily due to transportation and logistical challenges. California apple shippers saw unique opportunities in several key export markets as a result of lower inventory from other apple producing states of specific varieties and logistical challenges preventing other apple producing countries from exporting as much volume overseas. Despite the fact that California has historically relied less on apple exports over the past several years, exports still remain an important option for our industry when the domestic market becomes saturated.

Finally, international trade agreements have created a difficult landscape with the inception of retaliatory tariffs from many countries across the globe. Unfortunately, many of these retaliatory tariff lists contain apples. As mentioned, COVID-19 has caused many challenges for exporters across the globe. Limited and unreliable transportation has made it challenging to physically ship products to export markets. Further, limited retail activities and worldwide government shutdowns have resulted in decreased consumption and altered shopping behaviors across the globe. Despite the industry's challenges, California is still heavily focused on maintaining a presence and supportive role in the international apple arena, with a focus on Canada and Mexico as our key export markets. The Commission believes that with the assistance of the US Apple Export Council, the entire US apple industry can remain competitive in key international markets, thus relieving pressure on the domestic market.

Top Countries
1. Canada (63,563) boxes
2. Mexico (70,306) boxes

FOREIGN AGRICULTURAL SERVICE

The Foreign Agricultural Service (FAS) helps expand and maintain foreign markets for U.S. agricultural products by removing trade barriers and enforcing U.S. rights under existing trade agreements. The FAS works with foreign governments, international organizations, and the Office of the U.S Trade Representative to establish international standards and rules to improve accountability and predictability for agricultural trade. Additionally, FAS partners with the cooperators, such as U.S. Apple Export Council, to help U.S. exporters develop and maintain agricultural export markets. FAS distributes funding to these cooperators via the Farm Bill under programs such as the Market Access Program (MAP), Technical Assistance for Specialty Crops (TASC), Emerging Market Programs (EMP), and the limited-time Agricultural Trade Promotion (ATP) Program. Each of these programs keeps U.S. products more competitive and counter the subsidized foreign competition in the international markets.

California is still one of the largest exporters of apples in the United States and actively receives Market Access Program (MAP) dollars through the USAEC and FAS in order to maintain crucial export markets. Last season, the Commission, in conjunction with the USAEC, received $838,108 for 2021-2022 in MAP funding. Additionally, a new funding program, the Agricultural Trade Promotion (ATP) program, was announced by FAS in late 2018 as part of their efforts to provide support in order to offset recent tariffs on US agricultural products. In 2019, FAS announced a second round of ATP funding as well. The USAEC applied for ATP program funds and received a combined total of $202,000 for 2021-2022. The funds are available for use for up to three program years, and roughly $60,000 of these funds will be rolled into the 2022-2023 program year to conduct further activities.

CANADA

Canada is California's largest export market, and volumes during the 2021-2022 season were up to 63,500 boxes from 17,400 boxes in 2019-2020. This significant increase is likely due to opportunities in the Canadian market resulting from logistical challenges, primarily surrounding the ports, preventing other apple producing countries from exporting as much volume as in prior years. California was able to fulfill this demand in Canada due to the geographical advantage. Several apple varieties are exported to Canada, and the Gala and Granny Smith varieties represent the majority of the volume exported from California.

In 2021-2022, the USAEC decided to continue the strategy it began in 2018 in the Canadian market. The strategy includes coordinating with California shippers and targeting specific retailers at specific times based on the shipments that were going to Canada, otherwise referred to as, "Following the fruit." Suitable national online publications were selected to run banner ads to advertise a California Apples Crunch for Cash Contest where entrants could win one of 10, $100 gift cards, which resulted in the selection of six media outlets that were geo-targeted to reach primary grocery shoppers. This geo-targeted ad campaign resulted in roughly a 20% increase in imports of California apples in October alone. Due to the successes of 2018, the USAEC plans to continue this strategy during the upcoming season with the hopes of partnering with other commodities to pool resources. Additionally, the USAEC will also be focused on wholesalers or smaller regional retailers that are heavily invested in organics and niche markets. The USAEC will also continue to utilize geo-targeted advertising tactics that will focus on individual zip codes to increase location specificity. The USAEC has found that in addition to the major retailers, these smaller, regional outlets have been increasing their requests for California fruit and USAEC assistance. Finally, the USAEC has allocated additional funding to conduct store audits in both the major retailers and small, regional outlets to establish a sense of whether California apples are present throughout the season and to assist in timing the planned advertising tactics.

U.S. APPLE EXPORT COUNCIL FALL 2021 RESULTS REPORT

FINAL REPORT
DECEMBER 3, 2021

Harbinger

USA

CONTENTS

CAMPAIGN OVERVIEW

USA APPLES - GRANNY KNOWS BEST

OUR OBJECTIVE

After a year and a half of lockdowns and gathering restrictions, the USAEC wanted to inspire Canadians to bake with Granny Smith apples as friends and families came together again to celebrate Canadian Thanksgiving on October 11th.

OUR STRATEGY

1. Leverage top voices to inspire Canadian consumers to bake with Granny Smith apples
2. Continue to educate Canadian consumers on U.S.-grown Granny Smith apples
3. Solidify the connection with consistent and engaging “Granny Knows Best” content in the places consumers already look for baking inspiration

OUR TACTICS

1. **Micro-influencer Program:** Partner with five national, high-reaching English influencers to inspire consumers to bake with U.S.-grown Granny Smith apples this Thanksgiving, while driving awareness around why they are the apple of choice for baking.
2. **Landing Page:** Appeal to our target audience and deliver what they’re looking for: delicious apple pie recipes that are “good enough for Granny.”
3. **Google Advertising:** Capture consumers’ attention through a mix of display and search word Google ads directing them to the website landing page.
4. **Pinterest:** Create a USA Apples Pinterest account for the campaign to publish and boost influencer-created recipes and content.
5. **Media Partnership:** Partner with an established media partner that is a trusted, credible source for recipes and baking inspiration to sponsor quality content that highlights U.S.-grown Granny Smith apples.

CAMPAIGN RESULTS

EXECUTIVE SUMMARY

The "Granny Knows Best" campaign was a resounding success, with a collection of tactics that focused on California-grown Granny Smith apples and why they are the best choice for baking.

- **Zero negative consumer sentiment** was expressed in the influencer posts and content, showing incredible receptiveness from Canadian consumers to consider purchasing U.S. apples. Focusing on the Granny Smith variety, which is not as commonly grown in Canada, was a key factor in this success.
- The Fall 2021 campaign included several **new tactics** not executed by the USAEC in Canada previously: Pinterest, influencers, and a campaign landing page.
- Final results from the campaign were over target and show **improved return per dollar invested** compared to last year in several tactics. For a total program cost of $51,000 USD, results included:

1. **Influencers:** Delivered high-quality content that garnered **strong engagement** from consumers.
2. **Landing Page:** Brought in almost 40,000 page views from **24,464 unique users.**
3. **Google Advertising:** Achieved **lower cost-per-click** this year compared to 2020 program.
4. **Pinterest:** Resulted in the **highest click-through-rate** of all tactics at a reasonable cost-per-click.
5. **Media Partnership:** Provided access to a high-value audience in a trusted outlet that provided credibility, with almost 20,000 page views of the sponsored "Ultimate Apple Pie" recipe (3x higher than the guaranteed number of page views).

TACTICS & RESULTS

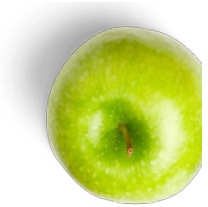
U.S. APPLE EXPORT COUNCIL 2021

MICRO INFLUENCERS

U.S. APPLE EXPORT COUNCIL 2021

PROGRAM TACTICS: MICRO-INFLUENCERS

MICRO-INFLUENCER PROGRAM



USAEC partnered with **five micro-influencers** to develop engaging and relevant content, showcasing U.S.-grown Granny Smith apples as the best choice for baking and emphasizing the joy of baking for friends and family during the holidays. Content was posted via **Instagram static posts, IG stories and Pinterest,** and was also utilized in digital advertising and on the landing page.

1. **GRANNY KNOWS BEST:** Motivate Canadians to embrace U.S.-grown Granny Smith apples as the best choice for baking this year, even for those who aren't regular bakers.

2. **BRAND CONNECTION:** Tap into the nostalgia of baking during Thanksgiving with recipes featuring U.S.-grown Granny Smith apples that are either a tried-and-true classic or a unique twist that stands out from the crowd.

3. **DRIVE TO WEBSITE:** Bring consumers to usaapples.ca via a landing page with campaign-specific content, featuring influencer-created recipes that are "good enough for Granny."

MICRO-INFLUENCER PROGRAM

@wakeupandkale
23.7K Followers

@foodess
48.5K Followers

@abhishekdekate
28.5K Followers

@therivercitysisters
61.7K Followers

@itslivb
102K Followers

791,800
ORGANIC IMPRESSIONS
+
1,135,843
PAID IMPRESSIONS
=
1,927,643
TOTAL IMPRESSIONS

4,629
TOTAL CLICKS

2.87%
ENGAGEMENT RATE

18
TOTAL POSTS

6 INSTAGRAM STORIES

2 INSTAGRAM STATIC POSTS

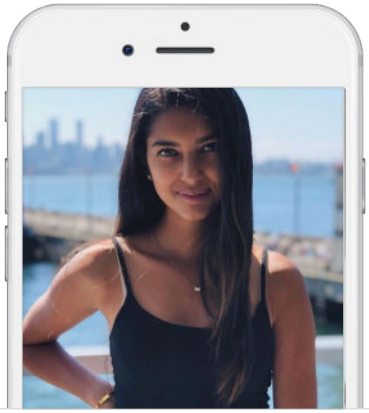
3 INSTAGRAM CAROUSEL

4 LINK IN BIO

3 PINS

PROGRAM TACTICS: MICRO-INFLUENCERS

@WAKEUPANDKALE



@wakeupandkale

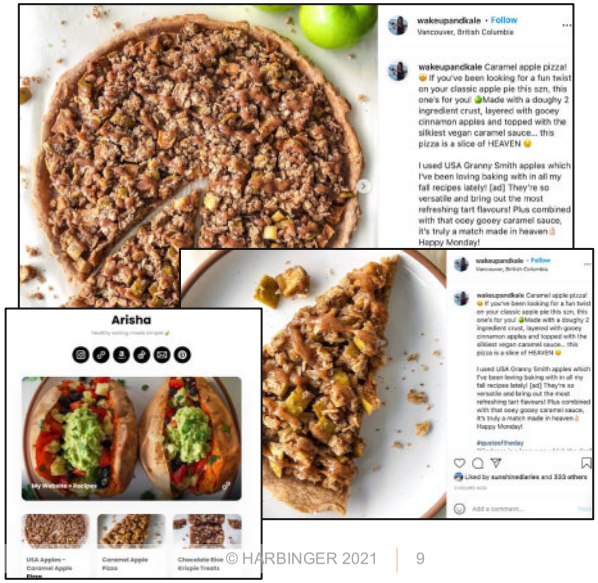
Twist On A Classic

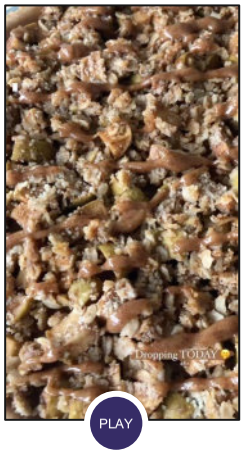
23.7K FOLLOWERS

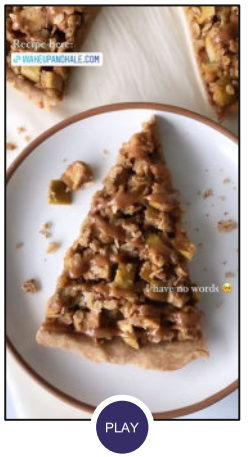
Organic Impressions: 94,900
Paid Impressions: 336,242
Total Impressions: 431,142
Total Clicks: 2,048

Arisha created a vegan Caramel Apple Pizza, focusing on the versatility of U.S.-grown Granny Smith apples for fall baking.

Partnership Included:
- **1x IG Carousel**
- **2x IG Story**
- **1x Link In Bio**
- **1x Pin**
- **1x Video**



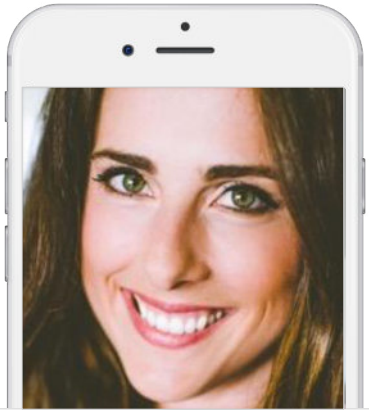




9

PROGRAM TACTICS: MICRO-INFLUENCERS

@FOODESS



@foodess

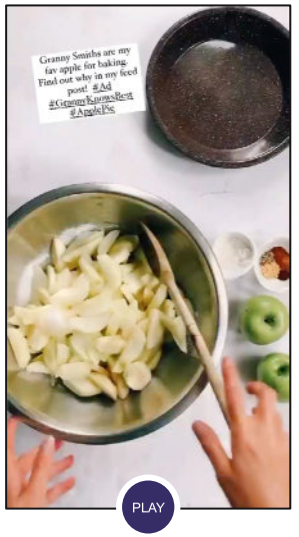
Twist On A Classic

48.5K FOLLOWERS

Organic Impressions: 145,500
Paid Impressions: 188,720
Total Impressions: 334,220
Total Clicks: 539

Jennifer created a Chai Apple Pie layered with fragrant fall spices. Her content highlighted Granny Smith apples as her favourite for baking.

Partnership Included:
- **1x IG Static**
- **2x IG Story**
- **1x Link In Bio**



@ABHISHEKDEKATE

@abhishekdekate

Twist On A Classic

28.5K FOLLOWERS

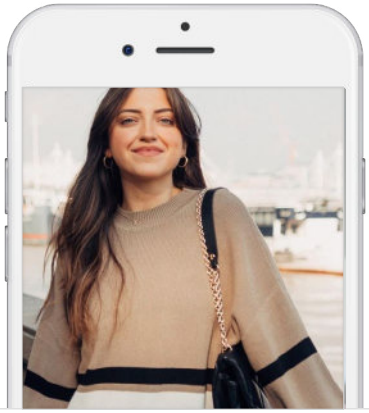
Organic Impressions: 57,000
Paid Impressions: 176,671
Total Impressions: 233,671
Total Clicks: 803

Abhishek created an Irish Cream Caramel Apple Crostata. His content touched on enjoying Thanksgiving with his family, nostalgic memories during the fall, and the benefits of baking with Granny Smith apples.

Partnership Included:
- **1x IG Static**
- **1x Link In Bio**

PROGRAM TACTICS: MICRO-INFLUENCERS

@ITSLIVB



@itslivb

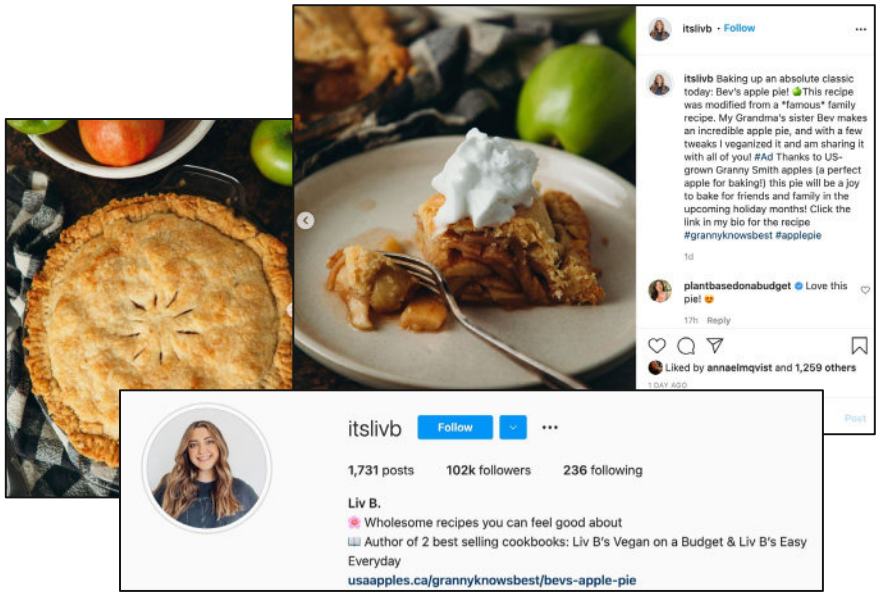
Family Recipe

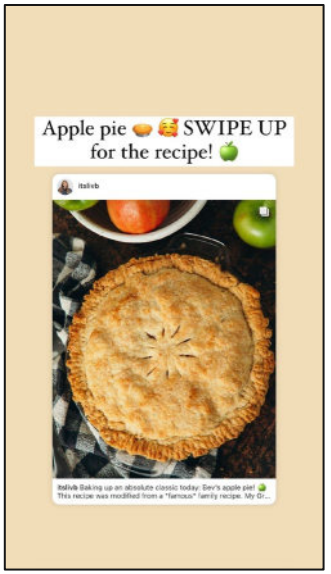
102K FOLLOWERS

Organic Impressions: 306,000
Paid Impressions: 109,380
Total Impressions: 415,380
Total Clicks: 702

Liv created a famous family pie – her grandmother's sister's recipe, a classic apple pie piled high in the middle with apples. She focused on the joys of baking with friends and family during the holidays.

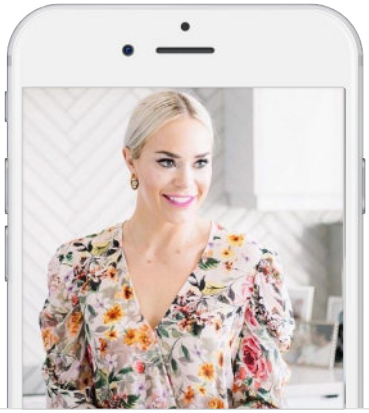
Partnership Included:
- **1x IG Carousel**
- **1x IG Story**
- **1x Link In Bio**
- **1x Video**





PROGRAM TACTICS: MICRO-INFLUENCERS

@THERIVERCITYSISTERS



@therivercitysisters

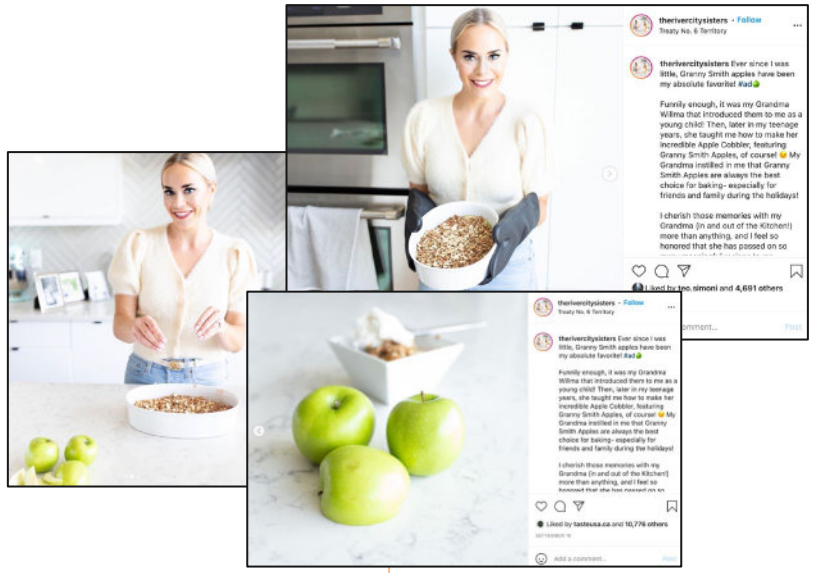
Family Recipe

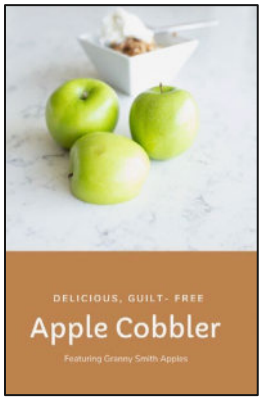
61.7K FOLLOWERS

Organic Impressions: 188,400
Paid Impressions: 324,830
Total Impressions: 513,230
Total Clicks: 537

Richelle shared her grandmother's Apple Cobbler, touching on nostalgic memories and the warm and comforting aspects of her recipe during the Thanksgiving holidays.

Partnership Included:
- **1x IG Carousel**
- **2x IG Story**
- **1x Pin**
- **1x Video**





PROGRAM TACTICS: MICRO-INFLUENCERS

OVERALL SENTIMENT

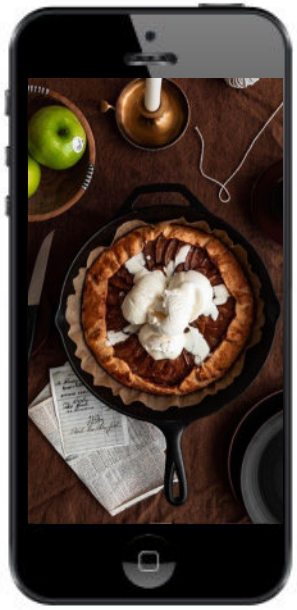
CONSUMER SENTIMENT: Positive*

COMMENTS INCLUDED:

"Yum!! I will ONLY eat Granny Smith apples. I prefer my cobbler with a dollop of cashew butter and date caramel. Divine ❤️❤️❤️❤️"
-@briannekenz

"This looks delicious! Granny Smith apples are the only apples I eat!"
- @bethmmcneil

"Sublime! Granny Smiths are so great for baked desserts. And oh myyyy Irish cream caramel are you kidding me?! 👏"
-@saltnpepperhere



"It doesn't get any better than this!🤎 I love tipsy desserts and this one is gorgeously delicious Abhi! Yes, Granny Smith's are truly the best baking apples! They hold their shape wonderfully too! Happy autumn my darling!🍂🍁!"
-@irene_matys

"I love Granny Smith apples! They're the best 🙌"
-@oksanakatch

"You're absolutely right. Granny Smiths are the best for baking. This pie looks beautiful. Share?! Xo"
-@stemsandforks

**Sentiment is measured positive, neutral or negative. Positive sentiment is a direct and positive comment on the product or brand (e.g. "I love Granny Smith apples" or "Granny Smith apples are our favourite!"). Neutral is a general positive comment on the photo (e.g. "I love that dress!" or "Your kids are adorable!"). Negative is an overtly negative comment about the product, brand and its representation (e.g. "This is processed and bad for your family" or "This recipe uses palm oil").*

"GRANNY KNOWS BEST" LANDING PAGE

U.S. APPLE EXPORT COUNCIL 2021

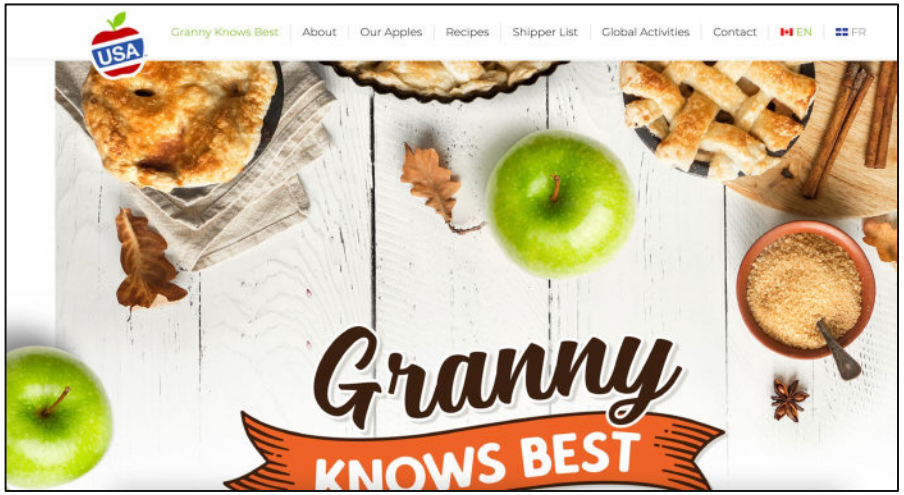
PROGRAM TACTICS: LANDING PAGE

"GRANNY KNOWS BEST" LANDING PAGE

To bring consumers to usaapples.ca, a landing page with campaign-specific content was created that featured influencer-created apple pie recipes.

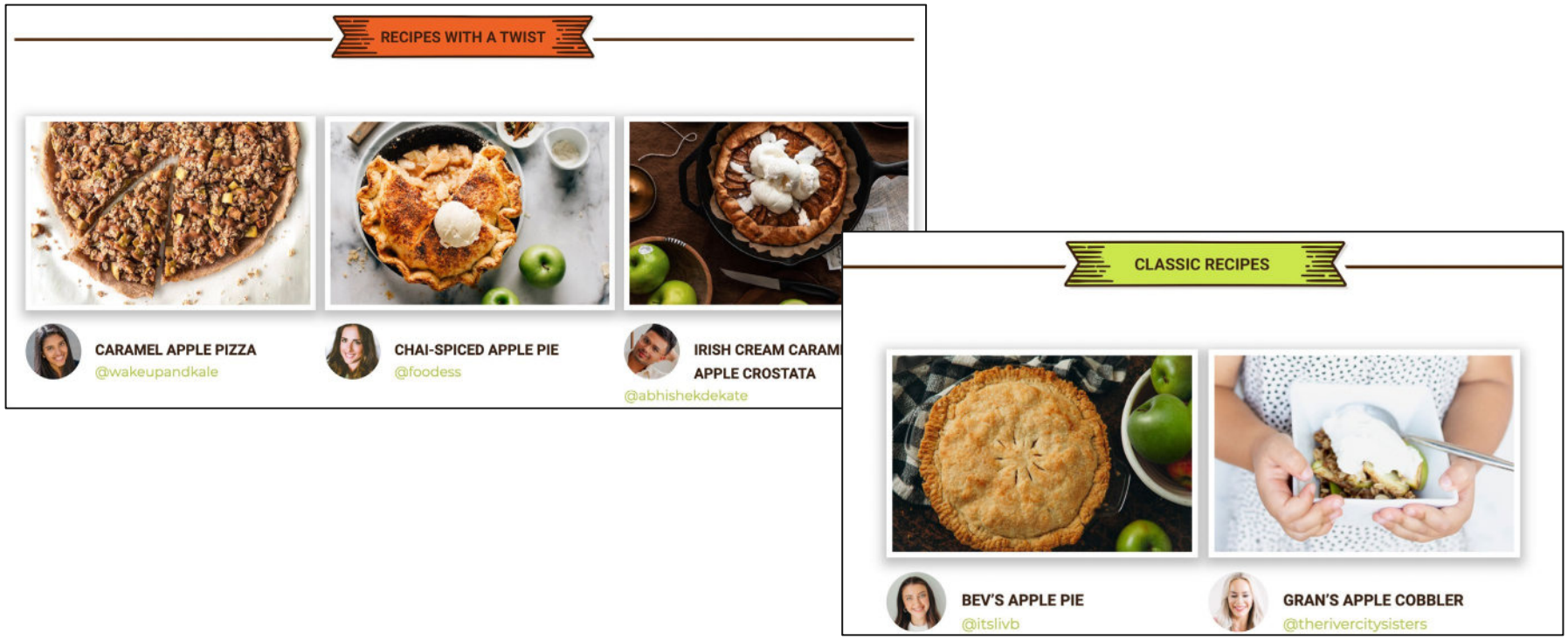
In doing so, we created a hub for Thanksgiving apple pie recipes and inspiration.

Influencer posts, Google ads, Pinterest content and the media partnership directed consumers to the landing page.



"GRANNY KNOWS BEST" LANDING PAGE ASSETS

"GRANNY KNOWS BEST" LANDING PAGE ASSETS



GOOGLE ADVERTISING

U.S. APPLE EXPORT COUNCIL 2021

GOOGLE ADVERTISING

To capture consumers' attention and direct them to usaapples.ca via the campaign landing page, a combination of display and search word Google ads was utilized.

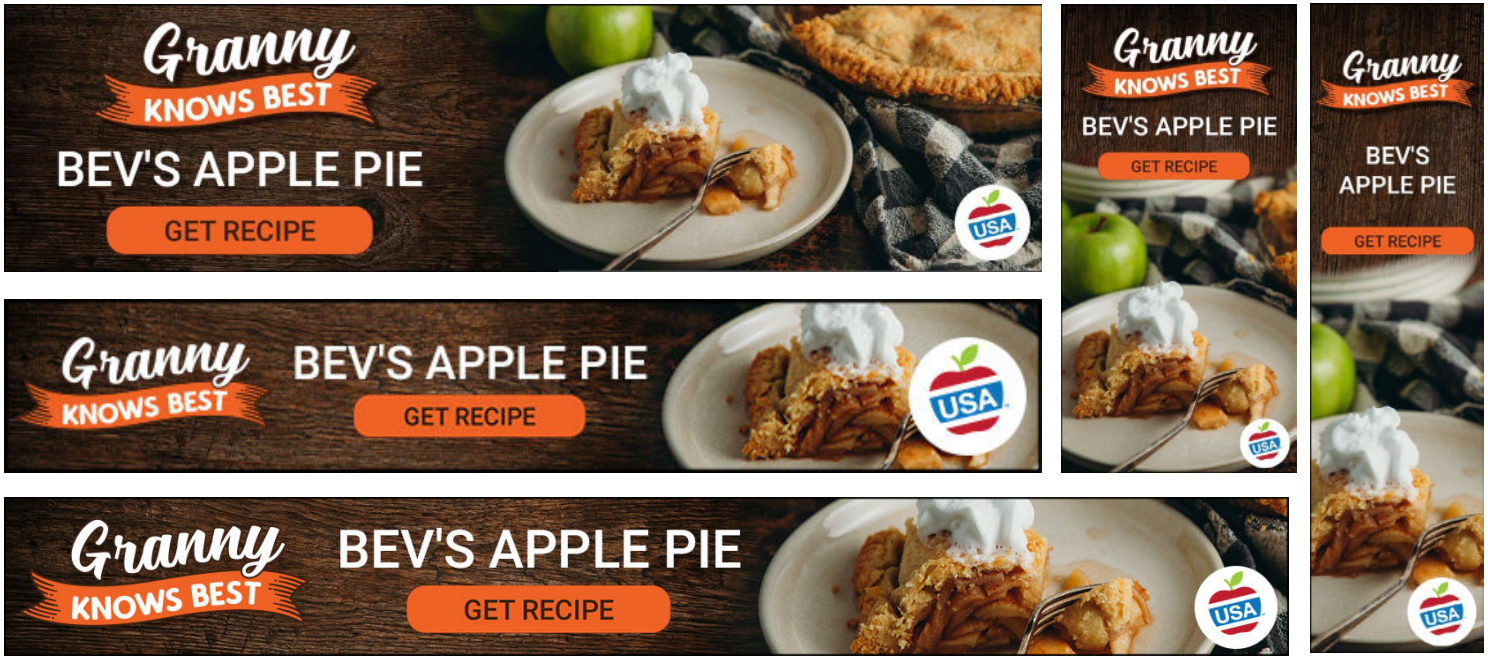
Display ads leveraged images from our micro-influencers, encouraging consumers to discover delicious apple pie recipes in time for Thanksgiving.

Google search ads focused on topics most relevant to the campaign and to Canadian consumers during September and October. Targeted search keywords included: granny smith apples; apple pie recipe; apples for apple pie; apple pie filling recipe; apple crisp recipe; best apple pie; homemade apple pie filling; apple pie directions; best apples for apple pie; easy to make apple crisp; apple cobbler recipe.

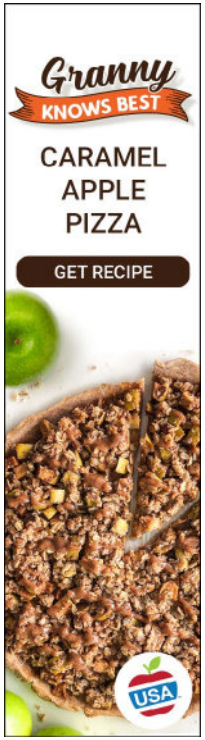
5,179,032
TOTAL IMPRESSIONS

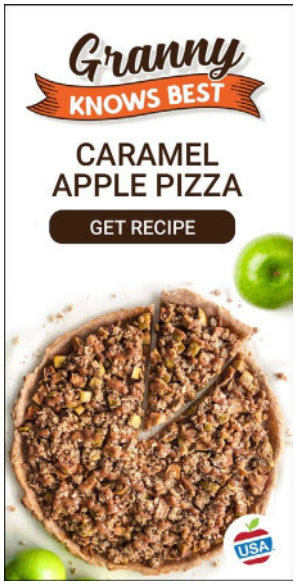
17,624
TOTAL CLICKS

DISPLAY ADS ASSETS



DISPLAY ADS ASSETS





DISPLAY ADS ASSETS

DISPLAY ADS ASSETS

PINTEREST

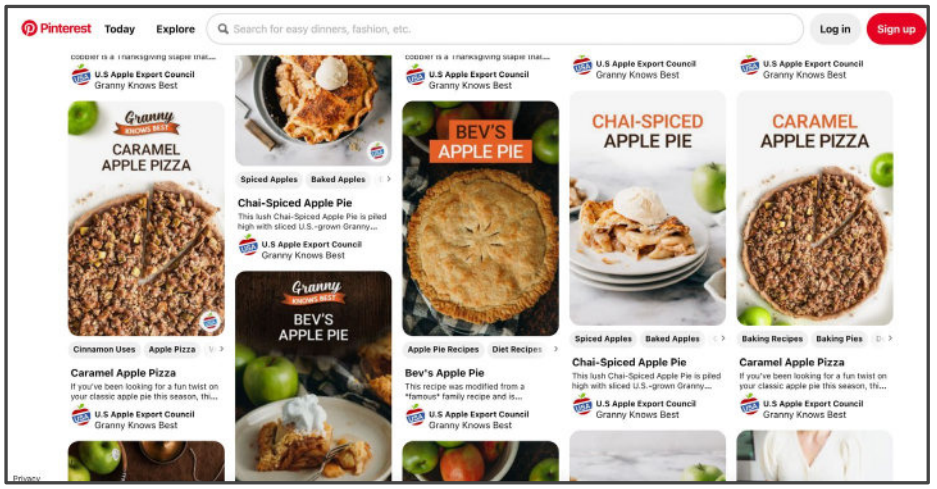
U.S. APPLE EXPORT COUNCIL 2021

PINTEREST

As Pinterest users started looking for Thanksgiving recipes and inspiration earlier this fall, a USA Apples account was created specifically for sharing apple pie and apple pie-inspired recipes for Canadian Thanksgiving.

To help get our “Granny Knows Best” recipes circulating on Pinterest, we published and boosted our own posts, including **videos**, with the recipe titles added to images. We also partnered with micro-influencers who are already on Pinterest to help extend our reach, and micro-influencer-created content was boosted on Pinterest, as well.

In doing so, we promoted recipes made with U.S.-grown Granny Smith apples on Pinterest while **driving traffic** back to the website.

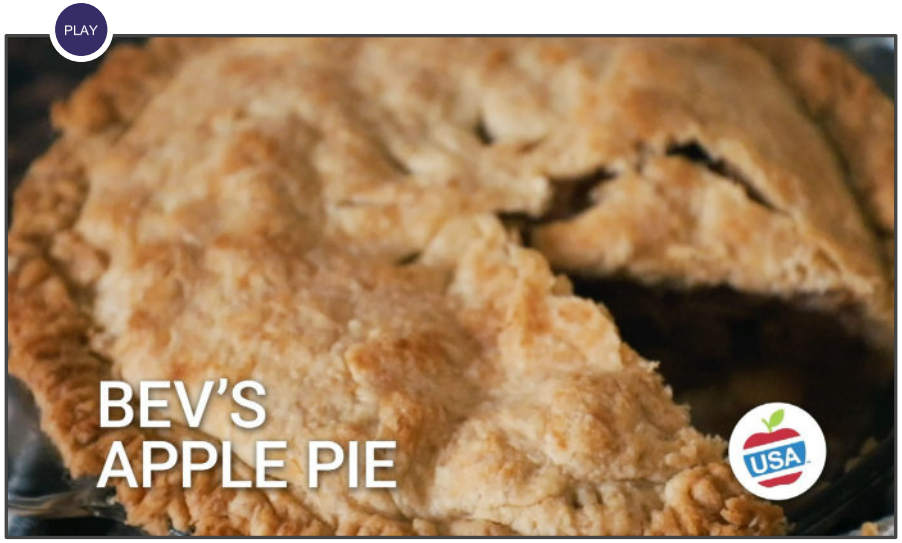


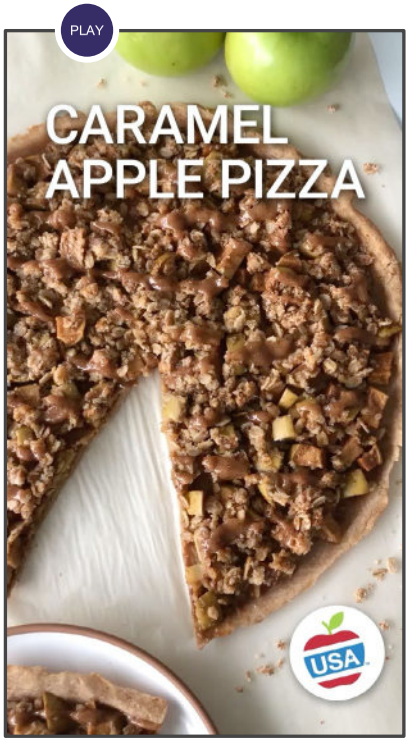
1,387,294
TOTAL IMPRESSIONS

7,822
TOTAL CLICKS

PINTEREST ASSETS

PINTEREST VIDEO ASSETS





MEDIA PARTNERSHIP

U.S. APPLE EXPORT COUNCIL 2021

PROGRAM TACTICS: MEDIA PARTNERSHIP

MEDIA PARTNERSHIP

To drive national awareness and align with a credible and well-known source of **"The Ultimate Apple Pie,"** a media partnership was secured with a top Canadian publication and one of Canada's longest running magazines, ***Canadian Living***.

By sponsoring *Canadian Living's* existing "Ultimate Apple Pie" recipe, we leveraged quality, trusted content that already featured Granny Smith apples. Accompanying advertisements linked to the landing page.

The media partnership gave us premium positioning in an appealing editorial style as consumers searched for apple pie recipes. Aligning with *Canadian Living's* long-running "Tested Till Perfect" recipe collection also provided valuable credibility for the message that U.S.-grown Granny Smith apples are best for baking.

The sponsored recipe page received three times the number of guaranteed **page views** on their website.

https://www.canadianliving.com/food/baking-and-desserts/recipe/the-ultimate-apple-pie

264,402
TOTAL IMPRESSIONS

18,079
PAGE VIEWS

PROGRAM TACTICS: MEDIA PARTNERSHIP

MEDIA PARTNERSHIP ASSETS

RESULTS SUMMARY

U.S. APPLE EXPORT COUNCIL 2021

PROGRAM RESULTS SUMMARY

8,758,371 TOTAL IMPRESSIONS + **30,473** TOTAL CLICKS

TARGET FOR THE PROGRAM: 6,050,000 to 7,950,000 impressions + 20,000 to 25,000 clicks

1,927,643
TOTAL INFLUENCER IMPRESSIONS*
4,629
TOTAL CLICKS
0.2%
CLICK-THROUGH RATE
$1.36
COST-PER-CLICK

+

5,179,032
TOTAL GOOGLE AD IMPRESSIONS
17,624
TOTAL CLICKS
0.3%
CLICK-THROUGH RATE
$0.27
COST-PER-CLICK

+

1,387,294
TOTAL PINTEREST IMPRESSIONS
7,822
TOTAL CLICKS
0.6%
CLICK-THROUGH RATE
$0.41
COST-PER-CLICK

+

264,402
TOTAL MEDIA PARTNERSHIP IMPRESSIONS
398
TOTAL CLICKS
0.2%
CLICK-THROUGH RATE
$11.77
COST-PER-CLICK

*Total micro-influencer impressions includes organic & paid amplification

RESULTS SUMMARY

WEB TRAFFIC SUMMARY: SEPT-OCT

31,426
TOTAL SESSIONS

+

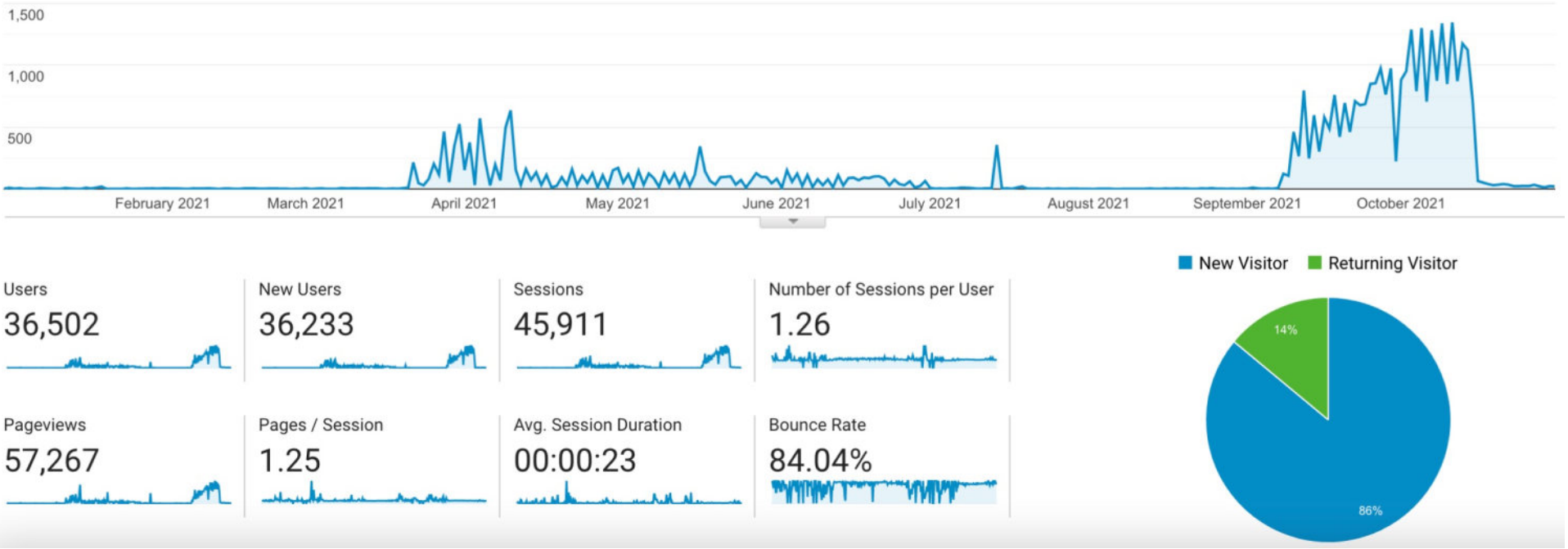
38,325
PAGE VIEWS

151

In a short period of time, this program directly drove more than 30,000 clicks to the website, with 24,464 unique users!

RESULTS SUMMARY

2021 TOTAL WEB TRAFFIC



RESULTS SUMMARY

2020 & 2021 TACTICS COMPARISON

Programs in 2020 and 2021 had different tactics and budgets. The consistent tactics were Google advertising and the media partnership.

We saw strong improvements in our Google search word ad campaign this year, as well as some improvements in our Google display ad campaign. For both, we achieved lower cost per click this year, as well as a lower cost-per-1000 impressions. **If we had spent the same budget on advertising this year as we did last, we would have far exceeded last year's results.**

GOOGLE SEARCH	Cost	Impressions	Clicks	CTR	Cost Per Click
Google Search 2021	$2,496	125,717	3,272	2.60%	$0.76
Google Search 2020	$7,173	95,123	2,310	2.43%	$3.11
Percentage Change 2021	Down -65.2%	Up +32.2%	Up +41.6%	Up +7%	Down -75.6%
GOOGLE DISPLAY	**Cost**	**Impressions**	**Clicks**	**CTR**	**Cost Per Click**
Google Display 2021	$5,969	8,295,871	25,390	0.31%	$0.24
Google Display 2020	$9,493	10,622,647	36,516	0.34%	$0.26
Percentage Change 2021	Down -37.1%	Down -21.9%	Down -30.5%	Down -8.8%	Down -7.7%

RESULTS SUMMARY

2020 & 2021 TACTICS COMPARISON

The media partnership did not produce a large amount of clicks to website, but we achieved higher-than-expected page views on *Canadian Living,* and we know the audience we did reach with the partnership was comprised of **value, specially focused consumers** who were likely to purchase Granny Smith apples.

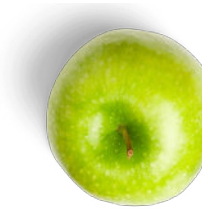
MEDIA PARTNERSHIP	Impressions	Clicks	Pageviews
Canadian Living 2021	**264,402**	**398**	**18,079**
Canadian Living & Best Health 2020	**1,034,562**	**3,742**	**4,212**

KEY LEARNINGS

U.S. APPLE EXPORT COUNCIL 2021

KEY LEARNINGS

MICRO-INFLUENCERS & PINTEREST



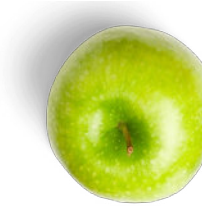
Basing all campaign tactics on high-quality, themed content from **five influencers** provided clear direction and a smooth transition across all tactics. This built a consistent and recognizable "Granny Knows Best" theme across **multiple touchpoints**. Utilizing **Pinterest** around the holiday season performed well on both impressions and website traffic, as more consumers were looking for Thanksgiving recipes.

Investing in quality, themed content mattered: Influencers' assets delivered the "wow" factor and all content worked in synchronicity across tactics to drive traffic to the landing page.

Engagement = website traffic: Influencers with higher numbers of followers did not directly correlate with the number of respective clicks to the website – those with higher engagement levels overall resulted in more clicks.

KEY LEARNINGS

LANDING PAGE & GOOGLE ADS



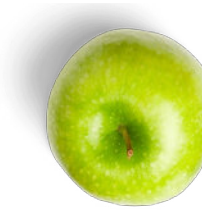
A campaign-themed **landing page** was essential to provide a gateway into the usaapples.ca website. All content drove to the landing page, and influencers directed their audiences to access their recipes on the landing page, as well. **Google display ads** featured mouth-watering visuals and a direct call to "Get Recipes," and **Google search word ads** helped us reach consumers already interested in apple pie recipes, reaching those most likely to click through to the website.

Consistent CTA: All ads had a specific and direct CTA, "Get Recipes," that enticed consumers to click through to the landing page.

Recipes front and centre: Consumers were driven to the website by the promise of great apple pie recipes for Thanksgiving and the landing page put the recipes front and centre, welcoming over 30,000 visitors to usaapples.ca and linking to additional information on the website.

KEY LEARNINGS

MEDIA PARTNERSHIP



The sponsored recipe page received three times the number of guaranteed **page views** on the *Canadian Living* website, which means even more visitors were exposed to the expanded ”Granny Knows Best” messaging. Though impressions and clicks to website were lower than other tactics, partnering with ***Canadian Living*** provided important credibility to our message that U.S.-grown Granny Smith apples are the best for baking.

Expanded messaging: Sponsoring the recipe page provided an opportunity to include advertisements with expanded messaging to entice consumers to the website.

The perfect audience: This partnership gave us prime access to those interested in baking and entertaining, while establishing Granny Smith apples as the perfect “dessert commodity” as families come together again over the holiday.

158

KEY LEARNINGS

CONSIDERATIONS FOR 2022

WEBSITE: We have seen the benefits of adding new materials and recipes to the website and making it more consumer friendly. It will be important to continue adding new recipes and utilizing campaign-specific landing pages in the future.

INFLUENCERS: Partnering with high-reaching influencers to create inspiring recipes and mouthwatering visuals provided us with targeted, expanded audiences. Working with influencers on TikTok should be considered in the future as the platform rapidly grows and becomes more influential.

PINTEREST: Pinterest is very effective at reaching consumers looking for recipes, tips and inspirations. With the new USAEC Pinterest board now established, it will be a valuable addition to future campaigns.

LOGO: The USA Apples logo includes “USA” very prominently. When marketing in Canada, where apples are produced domestically, refining the logo could make it more appealing or accessible to Canadian consumers.

GOOGLE ADVERTISING: Google display and search word ads are an important element of any campaign, as they reach the highest volume of consumers efficiently. Even greater efficiencies have been achieved in this tactic as the cost-per-click was reduced in the 2021 campaign compared to 2020.

MEDIA PARTNERSHIPS: Media partnerships provide credibility and expanded audiences, plus they allow for controlled messaging and timing during short campaigns. In the future, potential partnerships should be explored with outlets like *Daily Hive’s* “Dished,” which can offer a diverse audience refined by region.

THANK YOU!

Harbinger

USA

MEXICO

Similar to Canada, export volume for California apples to Mexico was up from 2,600 boxes in 2020-2021 to over 70,000 boxes in 2021-2022. This significant increase is likely due to opportunities in the Mexican market resulting from logistical challenges, primarily surrounding the ports, preventing other apple producing countries from exporting as much volume as in prior years. In 2021-2022, the Mexico inspection program operated under the first year of the phase-out process for the newly negotiated work plan. In the new work plan, the inspector was not required to conduct inspections prior to the season. Rather, the inspections were conducted by local USDA-APHIS officials. The Mexico inspector does, however, have the option to return every three years to conduct follow-up inspections, but is not required to.

Additionally, the Commission, in conjunction with USDA-APHIS and Chapman University, was successful in adding irradiation as an additional treatment protocol to the Mexico export program. California apples are now allowed to be irradiated in the U.S. or Mexico (if tarped) as a treatment protocol. California apples are being used as a trial run for other commodities. With the help of Chapman University, research on irradiation and apples will continue throughout the 2022 season. Additionally, Chapman University received federal funding through the most recent USDA Farm Bill to continue their work on irradiation as an alternative treatment method to methyl bromide for apples and also received a Technical Assistance for Specialty Crops (TASC) grant for the 2021-2022 season as well.

SOUTHEAST ASIA- INCLUDING TAIWAN

South East Asia (SEA), a region which includes Malaysia, Thailand, Indonesia, Singapore, Vietnam, Taiwan, and the Philippines, was once one of California's largest export markets. While California has not exported significant volume of apples to the region in recent years, SEA continues to be a valuable market to the USAEC. The USAEC continues to promote and educate buyers on all U.S. apples, which, in turn, benefits the entire US apple production, including California and Washington State. In 2021, the ongoing effects of COVID-19 unfortunately limited the number of activities the USAEC was able to conduct in the SEA market. In-person activities, such as in-store sampling, were only allowed on a limited basis, and therefore caused the USAEC to shift the majority of promotional activities to a digital format.

Over the last several years, California has relied less on the SEA market for a number of reasons. First, California has not needed to export to SEA in recent years due to the strong domestic market and a smaller Granny Smith variety crop. Further, competition from China and Washington State have strained the window for California apples in the SEA market. Nearly 80% of China's apple exports are specifically focused on SEA and California is simply not able to compete at this level. Unfortunately, the SEA market opportunity becomes less available to the U.S. as China increases their total apple production and other countries such as New Zealand, Australia, and Chile increase their ability to store apples long term. It is simply too difficult to compete with the lower prices and close proximity of these other apple producing countries.

Despite these challenges, the USAEC's objective has been to compete in terms of quality and therefore extend California's marketing window by several weeks. While the future of the SEA market is uncertain, the current population of 600 million people has been growing significantly over time, and the opportunity for increased apple exports certainly exists.

INDIA

The US apple industry has been attempting to expand apple exports to India for a number of years. The sheer population within the country boasts significant opportunities, and the growing middle class demonstrates further potential for demand of U.S. apples to grow. In early 2019, the USAEC contracted the services of a new in-country representative in India to facilitate all market activities. In 2021, however, the USAEC made the decision to scale down its program in India temporarily due to the current 75% tariff on all US apples going to India. The USAEC retained enough funds to keep the in-country representative with the hopes that market conditions will improve and the market will become more enticing for US apple shipments in the future.

Initial difficulties within the Indian market included lack of infrastructure to transport and store apples. As retail giants such as Costco and Walmart gained access, they began investing in improved infrastructure and transportation methods and, therefore, were supported by additional outside investments and commitments by the Indian government to open the market to US investments. This made India a very attractive market and helped expand the US apple market share from 100k metric tons in 2009 to over 300k metric tons in 2016. Unfortunately, this growth was stymied by the implementation of the aforementioned 75% tariff on all US apples being imported into India in 2019.

For California specifically, India is not a market of priority. The varieties grown in California and the availability of California apples are not conducive to California's marketing/shipping window to India. Despite this, the CAC supports the US Apple Export Council's push to gain a larger market segment for other U.S. apple producing states knowing the potential to greatly decrease the pressure domestically and within localized export markets such as Mexico and Canada.

LATIN AMERICA

For the purposes of this report, the Latin American region refers to countries within both South and Central America. This region is not a major market for California apples specifically, however other states in the U.S. have been relying on these markets more since the implementation of tariffs on other key U.S. apple export markets. Increasing exports to Latin America will potentially eliminate pressure on markets that California does ship to, such as Mexico.

The USAEC's strategy in the Latin American market last season was to conduct broad-scale retail promotions during the U.S. apple shipping season without limiting working relationships to specific retailers or importers. This approach was designed to address the fluctuations typically seen in volumes from year to year between importers. With this, the USAEC conducted in-store promotions with at least 2 supermarket chains last season and implemented a number of cooking workshops and recipe sampling programs targeting consumers directly. Further, technical trainings have been one of the most important activities conducted in Central America for the trade. The purpose of this is to educate supermarkets and importers and retailers' personnel in order to assure greater quality product, proper handling procedures, and lesser product damage, all factors that can negatively impact sales.

CHINA

China continues to be the world's largest producer of both fresh and processed apples. In 2021-2022, they produced a record-breaking total of 46 million tons. Until recently, China's domestic production has historically been consumed by the Chinese population. However, with rising unemployment and an economy that remains sluggish, China is expected to increase its focus on exports. Despite disruptions due to COVID-19, exports are estimated to exceed 1 million tons, making China the lead exporter of apples in the world. As China's apple production rises, China will continue to rely more on exports to neighboring countries, particularly South East Asia. Additionally, China was recently granted access to export apples to the United States. Apple exports to the United States from China are currently minimal, however, there is potential for dramatic increases due to China's large population and overall demand for apples. However, due to recent trade conflicts between the United States and China, there is a 40% retaliatory tariff being applied to all apples exported from the US to China. This radically decreases the competitiveness of US apples in China and could significantly affect exports from Washington. Since California does not currently export apples to China, California is more concerned with the ripple effect this disruption will have on other international markets and domestic markets.

ISRAEL

The process of establishing access into the Israeli market for US apples has been difficult and burdensome. Shipments to Israel have been limited to only a few shippers, all of which are located on the East Coast, due to the country's strict phytosanitary issues and pest control measures. Since California does not have a proximity or varietal advantage, the state does not currently view Israel as a market of potential. However, the USAEC sees Israel as a potential niche market for apples from the East Coast. Packers from the East Coast have been reluctant to export to Israel in any significant volume due to the high risks involved with shipment rejection concerns. The USAEC continued its partnership with their current in-market representative throughout 2021-2022. The USAEC evaluates the potential of each market on an annual basis, and the level of commitment to Israel was discussed in terms of the level of involvement the USAEC wants to commit to for 2022-2023. It was agreed that the USAEC should remain in Israel for the foreseeable future due to the potential shipping window for the East Coast. Additionally, as other markets reduce apple trade opportunities with the U.S., alternative markets will be needed to offset these losses. The Foreign Agricultural Service committed $176,400 on behalf of the USAEC to maintain and establish a market in Israel, primarily for the East Coast.

MIDDLE EAST

During the 2021-2022 season, the U.S. faced sharp competition from competing apple producing countries when importing to the Middle East. Exports to the Middle East were down this year once again when compared to previous seasons due to increased prices that resulted from overall lower production levels. The US is finding it difficult to compete with the lower priced apples being imported from countries including Russia, Italy, Poland, Turkey, and the Ukraine. Additionally, the ongoing war in Yemen, coupled with increased taxes in Dubai and Saudi Arabia to cover the cost of the war, are resulting in a 20 percent reduction in the region's overall economy. This is thought to also have an impact on apple imports as Saudi Arabia and Dubai are the two largest markets for US Apples in the Middle East.

The Middle East is a new market for the USAEC, however, due to recent decreases in export volume to the region, coupled with increased competition from other apple producing countries, the USAEC has adjusted its priorities within this market. As a result, the USAEC decided not to allocate funding to conduct activities in this market for 2021-2022, however, there is potential to revisit this market in the future.

RUSSIA AND THE EU

Unfortunately, the ban on western products to Russia is still in effect. This not only has an effect on the U.S., but has also resulted in a ripple throughout the global apple industry. Additionally, the ongoing conflicts within Ukraine have cause further challenges within the market.

Specifically, apple exports from China to Russia decreased over the past year, thus resulting in greater pressure on the overall international market. China has instead continued to remain heavily focused on exporting to SEA. Additionally, while Poland has used other avenues to export apples to Russia in the past, conflicts within Ukraine have cause them to focus heavily on the EU and South America, thus generating additional competition globally. Additionally, Poland has been aggressively pursuing market access into the US by claiming that they should fall under the parameters of the existing EU work plan. This is extremely problematic and would result in additional pressure on an already overcrowded domestic market. As of now, access has not been granted and the current political climate in regards to trade agreements could work in favor of the US.

The EU has been notorious for implementing strict pesticide regulations in the past, and continues to disrupt trade opportunities for US apples. Specifically, EU action on pesticides, particularly diphenylamine (DPA) and morpholine wax, have eroded the US's access for apples to the EU market. While California does not ship to the EU, these regulations heavily affect the East Coast apple producing states. The East Coast must now find new markets for these apples, thus increasing competition for California in both the domestic and alternative international markets. Additionally, the EU has historically purchased significant volumes of specific varieties, such as Empire and Macintosh. However, with trade volumes to the EU in decline, the US must now find alternative outlets for these varieties, thus placing undue pressure on other varieties that California does produce, such as Gala.
Due to the consistent decline in US apples shipments to the EU, the USAEC decided not to allocate funding for this market in 2021-2022. However, the USAEC will continue to fund and plan to participate with a booth at the Fruit Logistica trade show held annually in Berlin. While this trade show was not held in 2021, the first post-pandemic trade show was held in April of 2022 and is expected to occur again in February of 2023.

CALIFORNIA APPLE DOMESTIC AND EXPORT STATISTICS

CALIFORNIA APPLE COMMISSION- UNITED STATES
DOMESTIC SHIPMENTS 2021-2022
(MEASURED IN 40 lb. BOXES)

STATE	GALA	GRANNY SMITH	FUJI	CRIPPS PINK	OTHER	TOTAL
ARIZONA	12,825	98	147			13,070
CALIFORNIA	239,370	70,698	71,736	45,083	4,536	431,423
COLORADO	2,438					2,438
FLORIDA	3,215	3,732	1,073			8,020
GEORGIA	17,406	1,190	291	126		19,013
ILLINOIS	1,767	98	375			2,240
INDIANA	10,560	1,839	461			12,860
KANSAS	1,430					1,430
KENTUCKY	6,930					6,930
LOUISIANA	720	441	411			1,572
MAINE	1,155	825				1,980
MASSACHUSETTS	49	1,960				2,009
MICHIGAN	9,591	1,514	3,882			14,987
MINNESOTA	976	245	1,200			2,421
MISSOURI	1,172	537				1,709
NEVADA	54,894	11,464	21,651	8,799		96,808
NEW HAMPSHIRE	49					49
NEW JERSEY	7,336	714		1,305		9,355
NEW YORK	1,242	6,050	359			7,651
NORTH CAROLINA	780					780
OHIO	20,172	1,312	2,484			23,968
OKLAHOMA	1,323	1,304	801			3,428
OREGON	98	245				343
PENNSYLVANIA	1,373	7,313	170			8,856
SOUTH CAROLINA	1,142	990				2,132
TENNESSEE	5,032	2,090				7,122
TEXAS	35,167	38,184	21,295	17,873		112,519
UTAH	6,255					6,255
VIRGINIA	5,315					5,315
WASHINGTON	3	3,162	1			3,166
WISCONSIN	4,144		742	53		4,939
WYOMING	1,020		200			1,220
TOTAL	**454,949**	**156,005**	**127,279**	**73,239**	**4,536**	**816,008**

CALIFORNIA APPLE COMMISSION- UNITED STATES
DOMESTIC SHIPMENTS 2020-2021
(MEASURED IN 40 lb. BOXES)

STATE	GALA	GRANNY SMITH	FUJI	CRIPPS PINK	OTHER	TOTAL
ALABAMA	31,755	343	3,722			35,820
ARIZONA	37,730	22,682	11,702			72,114
ARKANSAS	1,430					1,430
CALIFORNIA	197,566	131,502	45,590	20,838	7,632	403,128
COLORADO	1,374	5				1,379
CONNECTICUT	4,312					4,312
FLORIDA	34,597	5,690	4,323	98		44,708
GEORGIA	2,113	3,224				5,337
ILLINOIS	27,458	8,095	2,981			38,534
INDIANA	26,076	1,175	4,227			31,478
KENTUCKY	16,275	3,038	1,705			21,018
LOUISIANA	2,150	3,646				5,796
MARYLAND	4,753	1,677				6,430
MASSACHUSETTS	343	4,221				4,564
MICHIGAN	20,709	1,568	196			22,473
MINNESOTA	392	510	1,667			2,569
MISSOURI	9,456	4,910	4,070			18,436
NEVADA	46,879	29,381	11,996	834		89,090
NEW HAMPSHIRE	98					98
NEW JERSEY	5,039	3,423				8,462
NEW MEXICO		980				980
NEW YORK	3,203	7,284	28	113		10,628
NORTH CAROLINA	720	1,600	715			3,035
OHIO	12,932	1,428	663			15,023
OKLAHOMA	12,006	6,425	2,540			20,971
OREGON		28				28
PENNSYLVANIA	21,337	6,135	1,705			29,177
SOUTH CAROLINA	13,863	420	1,485			15,768
TENNESSEE			2,430			2,430
TEXAS	15,591	37,413	390	2,548		55,942
UTAH	807	2,700	1,793			5,300
VIRGINIA	11,220		1,291			12,511
WASHINGTON	394					394
WISCONSIN	5,097	391	196			5,684
WYOMING	1,744	1,633	1,577			4,954
TOTAL	**569,419**	**291,527**	**106,992**	**24,431**	**7,632**	**1,000,001**

CALIFORNIA APPLE COMMISSION- UNITED STATES
DOMESTIC SHIPMENTS 2019-2020
(MEASURED IN 40 lb. BOXES)

STATE	GALA	GRANNY SMITH	FUJI	CRIPPS PINK	BRAEBURN	OTHER	TOTAL
ALABAMA	47,685	10,615	8,470	385			67,155
ARIZONA	54,674	30,538	12,458	1,320			98,990
ARKANSAS			715	385			1,100
CALIFORNIA	226,839	120,442	93,078	41,777	689	4,266	487,091
COLORADO	196		49	1,648	49		1,942
CONNECTICUT	196						196
FLORIDA	5,684	27,599	14,877	1,496	49		49,705
GEORGIA	3,976	6,788	6,113	1,047			17,924
ILLINOIS	4,998	4,523	1,624	495			11,640
INDIANA	40,765	442	3,279		84		44,570
IOWA	294	179					473
KANSAS	28		1,389	49			1,466
KENTUCKY	9,711	746	1,632	98			12,187
LOUISIANA	2,852	980	713				4,545
MAINE	9,575						9,575
MARYLAND	329	1,748	42				2,119
MASSACHUSETTS	490	231					721
MICHIGAN	10,046	392	490				10,928
MINNESOTA	5,220	8,129	533	1,418	98		15,398
MISSISSIPPI	6,445	2,255	2,475				11,175
MISSOURI	1,259	49	1,589	770			3,667
NEBRASKA	1,045	220	605	1,045			2,915
NEVADA	54,708	34,988	14,374	12,491			116,561
NEW JERSEY	395	1,740					2,135
NEW MEXICO	13,151	5,538	2,090	1,373			22,152
NEW YORK	14,509	3,443	280	165			18,397
NORTH CAROLINA	1,223	70	407	56	59		1,815
OHIO	6,531	182	832				7,545
OKLAHOMA	1,030		1,250	275			2,555
OREGON	49		1,274				1,323
PENNSYLVANIA	8,366	5,560	911	576	142		15,555
SOUTH CAROLINA	9,145	91	3,740				12,976
TENNESSEE			2,920				2,920
TEXAS	39,134	19,823	6,855	4,103			69,915
UTAH	246	140	2,504	1,320			4,210
VIRGINIA	4,900		1,029	98			6,027
WASHINGTON	917	98	2,441				3,456
WISCONSIN	21,621	110	1,100	1,834	49		24,714
WYOMING	1,370	220	770	2,815			5,175
TOTAL	**609,602**	**287,879**	**192,908**	**77,039**	**1,219**	**4,266**	**1,172,913**

CALIFORNIA APPLE COMMISSION- UNITED STATES
DOMESTIC SHIPMENTS 2018-2019
(MEASURED IN 40 lb. BOXES)

STATE	GALA	GRANNY SMITH	FUJI	CRIPPS PINK	BRAEBURN	OTHER	TOTAL
ALABAMA	17,490						17,490
ARIZONA	14,316	1,112					15,428
ARKANSAS	11,601		440				12,041
CALIFORNIA	257,288	354,123	93,051	47,975	2,448	15,237	770,122
COLORADO	609		49	245	294	196	1,393
CONNECTICUT	245					637	882
FLORIDA	10,777	2,138	2,233		49	349	15,546
GEORGIA	21,045	8,198	1,395	805	7	121	31,571
HAWAII	98						98
ILLINOIS	22,383	1,877	2,095	294		84	26,733
INDIANA	9,769	5,821	3,486	126	168	280	19,650
IOWA	966						966
KENTUCKY	8,939	3,279	1,066	1,791	36	146	15,257
LOUISIANA	5,935		605				6,540
MAINE			550				550
MARYLAND	2,481		4	449		196	3,130
MASSACHUSETTS	539						539
MICHIGAN	10,417	10,249	2,574	2,847			26,087
MINNESOTA	13,683	3,801	1,192	931	306	133	20,046
MISSISSIPPI	6,215		55				6,270
MISSOURI	15,800	7,593	984	147	70	429	25,023
NEBRASKA	6,215		220	110			6,545
NEVADA	43,006	19,279	18,486	6,768			87,539
NEW HAMPSHIRE						21	21
NEW JERSEY	539	844	98	49	98	322	1,950
NEW MEXICO	3,905	882					4,787
NEW YORK	13,004	2,924	858	98			16,884
NORTH CAROLINA	16,655	196	2,234	98	49	195	19,427
OHIO	7,091	16,288	4,727	196			28,302
OKLAHOMA	15,567		2,445				18,012
OREGON	415						415
PENNSYLVANIA	5,559	2,254	2,274	660		343	11,090
SOUTH CAROLINA	960	2,730	825				4,515
TENNESSEE	9,392	6,668	1,540	660			18,260
TEXAS	77,571.00	31,267.00	19,126	14,167			142,131
UTAH	7,532			3,513			11,045
VIRGINIA	11,204	2,540					13,744
WASHINGTON		440	330	110		25	905
WISCONSIN	15,915	1,021	879	676			18,491
WYOMING	8,930		440				9,370
TOTAL	**674,056**	**485,524**	**164,261**	**82,715**	**3,525**	**18,714**	**1,428,795**

CALIFORNIA APPLE COMMISSION- UNITED STATES
DOMESTIC SHIPMENTS 2017-2018
(MEASURED IN 40 lb. BOXES)

STATE	GALA	GRANNY SMITH	FUJI	CRIPPS PINK	BRAEBURN	OTHER	TOTAL
ALABAMA	833	196					1,029
ARIZONA	15,402	12,684	2,952	1,876	44		32,958
ARKANSAS	16,638	3,338	3,420				23,396
CALIFORNIA	353,753	163,117	85,418	58,329	2,259	16,220	679,097
COLORADO	13,291	9,120	207		383	786	23,787
CONNECTICUT	1,127	308				1,960	3,395
FLORIDA	14,461	3,956	1,156		98	973	20,644
GEORGIA	58,261	52,056	8,825		7	497	119,646
HAWAII	280	515					795
ILLINOIS	10,380	7,154	1,586	784		321	20,225
INDIANA	12,528	7,679	1,813		68	651	22,739
IOWA	7,104	4,981					12,085
KANSAS	5,697	2,778	635				9,110
KENTUCKY	12,139	8,658	1,770	559	147	684	23,957
LOUISIANA	12,011	3,233	1,020				16,264
MAINE	8,880	3,000	1,380	1,003			14,263
MARYLAND	4,326	4,036	114	75		534	9,085
MASSACHUSETTS	2,177	4,141	294				6,612
MICHIGAN	22,080	4,465	3,786	1,875			32,206
MINNESOTA	14,802	17,265	2,176	98	410	420	35,171
MISSISSIPPI	1,320						1,320
MISSOURI	9,896	2,882	5,880				18,658
NEBRASKA	1,334		2,580				3,914
NEVADA	3,332	1,257					4,589
NEW JERSEY	87,023	36,474	2,296	490	343	344	126,970
NEW MEXICO		980					980
NEW YORK	8,808	16,276	7,668	477			33,229
NORTH CAROLINA	5,490	817	77		227	271	6,882
OHIO	33,762	18,563	3,971			98	56,394
OKLAHOMA	8,280	5,094	5,739			357	19,470
OREGON	1,470	389	98		229	469	2,655
PENNSYLVANIA	6,511	3,302	2,041	2,311	126	530	14,821
SOUTH CAROLINA	1,421						1,421
TENNESSEE	9,151	5,599	1,591	3,548			19,889
TEXAS	114,599	35,204	17,319	5,379		1,263	173,764
UTAH	8,649	2,891					11,540
VIRGINIA	9,282	5,593	1,568				16,443
WASHINGTON	52,905	7,332	147		294	501	61,179
WISCONSIN	6,743	335	3,436		28	155	10,697
WYOMING	4,392		2,620				7,012
TOTAL	**960,538**	**455,668**	**173,583**	**76,804**	**4,663**	**27,034**	**1,698,290**

CALIFORNIA'S TOP 5 STATES

(MEASURED IN BOXES)

2012-2013		
1	CALIFORNIA	678,730
2	TEXAS	197,916
3	MICHIGAN	60,972
4	ILLINOIS	54,998
5	FLORIDA	54,230

2013-2014		
1	CALIFORNIA	969,932
2	TEXAS	248,105
3	WASHINGTON	59,851
4	ILLINOIS	53,648
5	FLORIDA	42,993

2014-2015		
1	CALIFORNIA	661,422
2	TEXAS	195,680
3	FLORIDA	70,100
4	PENNSYLVANIA	64,343
5	NEW YORK	57,448

2015-2016		
1	CALIFORNIA	612,547
2	TEXAS	164,500
3	FLORIDA	73,892
4	ILLINOIS	73,031
5	PENNSYLVANIA	51,881

2016-2017		
1	CALIFORNIA	622,088
2	TEXAS	132,264
3	FLORIDA	80,270
4	ARIZONA	77,312
5	MINNESOTA	76,823

2017-2018		
1	CALIFORNIA	679,097
2	TEXAS	173,764
3	NEW JERSEY	126,970
4	GEORGIA	119,646
5	WASHINGTON	61,179

2018-2019		
1	CALIFORNIA	770,122
2	TEXAS	142,131
3	NEVADA	87,539
4	GEORGIA	31,571
5	OHIO	28,302

2019-2020		
1	CALIFORNIA	487,091
2	NEVADA	116,561
3	ARIZONA	98,990
4	TEXAS	69,915
5	ALABAMA	67,155

2020-2021		
1	CALIFORNIA	403,128
2	NEVADA	89,090
3	ARIZONA	72,114
4	TEXAS	55,942
5	FLORIDA	44,708

2021-2022		
1	CALIFORNIA	431,423
2	TEXAS	112,519
3	NEVADA	96,808
4	OHIO	23,968
5	GEORGIA	19,013

EXPORT TOTALS
2021-2022
(MEASURED IN BOXES)

COUNTRY	GALA	GRANNY SMITH	FUJI	CRIPPS PINK	BRAEBURN	OTHER	TOTAL
CANADA	48,890	14,428	245				63,563
MEXICO	13,942	56,364					
TOTAL	**62,832**	**70,792**	**245**	**0**	**0**	**0**	**133,869**

EXPORT TOTALS
2020-2021
(MEASURED IN BOXES)

COUNTRY	GALA	GRANNY SMITH	FUJI	CRIPPS PINK	BRAEBURN	OTHER	TOTAL
CANADA	9,841	7,605					17,446
MALAYSIA		49					49
MEXICO		2,641					2,641
TAIWAN	14		4,851				4,865
TOTAL	**9,855**	**10,295**	**4,851**	**0**	**0**	**0**	**25,001**

EXPORT TOTALS
2019-2020
(MEASURED IN BOXES)

COUNTRY	GALA	GRANNY SMITH	FUJI	CRIPPS PINK	BRAEBURN	OTHER	TOTAL
CANADA	17,708	8,715	448	88	147		27,106
MALAYSIA		49					49
MEXICO	7,056	8,232					15,288
PANAMA	294						294
TAIWAN	3,360		12,018				15,378
TOTAL	**28,418**	**16,996**	**12,466**	**88**	**147**	**0**	**58,115**

EXPORT TOTALS
2018-2019
(MEASURED IN BOXES)

COUNTRY	GALA	GRANNY SMITH	FUJI	CRIPPS PINK	OTHER	TOTAL
CANADA	25,997	24,830	13,959	196	3,584	68,566
COLUMBIA		2,009				2,009
EL SALVADOR	1,840					1,840
MEXICO	18,542	11,229				29,771
TAIWAN			5,468			5,468
TOTAL	**46,379**	**38,068**	**19,427**	**196**	**3,584**	**107,654**

EXPORT TOTALS
2017-2018
(MEASURED IN BOXES)

COUNTRY	GALA	GRANNY SMITH	FUJI	CRIPPS PINK	OTHER	TOTAL
CANADA	35,203	17,737	1,368	4,671	196	59,175
MALAYSIA	49		49			98
MEXICO	427	7,593				8,020
PUERTO RICO	294	245				539
THAILAND	290					290
TOTAL	**36,263**	**25,575**	**1,417**	**4,671**	**196**	**68,122**

CALIFORNIA'S TOP 5 COUNTRIES

(MEASURED IN BOXES)

2012-2013		
1	CANADA	216,027
2	MEXICO	39,703
3	TAIWAN	36,536
4	MALAYSIA	31,713
5	THAILAND	9,775

2013-2014		
1	CANADA	132,105
2	MALAYSIA	46,509
3	MEXICO	31,184
4	SRI LANKA	11,680
5	TAIWAN	10,309

2014-2015		
1	CANADA	94,599
2	TAIWAN	28,852
3	MALAYSUA	17,933
4	MEXICO	11,151
5	THAILAND	9,690

2015-2016		
1	CANADA	44,984
2	MEXICO	19,908
3	TAIWAN	13,682
4	PANAMA	661
5	PUERTO RICO	49

2016-2017		
1	CANADA	70,196
2	MEXICO	10,716
3	TAIWAN	5,552

2017-2018		
1	CANADA	59,175
2	MEXICO	8,020
3	PUERTO RICO	539
4	THAILAND	290
5	MALAYSIA	98

2018-2019		
1	CANADA	68,566
2	MEXICO	29,681
3	TAIWAN	5,468
4	COLUMBIA	2,009
5	EL SALVADOR	1,840

2019-2020		
1	CANADA	27,106
2	TAIWAN	15,378
3	MEXICO	15,288
4	PANAMA	294
5	MALAYSIA	49

2020-2021		
1	CANADA	17,446
2	TAIWAN	4,865
3	MEXICO	2,641
4	MALAYSIA	49

2021-2022		
1	CANADA	63,563
2	MEXICO	70,306

HISTORICAL PACK OUT REPORT
(MEASURED IN BOXES)

VARIETY	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022
FUJI	213,223.0	245,745.0	262,849.8	232,140.0	306,231.0	175,000.0	183,688.0	205,374.0	111,843.0	128,061.0
GALA	801,831.0	761,904.0	758,736.9	977,006.4	951,408.4	996,801.2	720,435.0	638,020.0	579,274.0	517,771.0
GRANNY SMITH	905,965.0	969,320.0	763,849.3	443,648.0	429,506.2	481,242.9	523,591.6	304,875.0	301,822.0	226,260.0
CRIPPS PINK	95,446.0	142,530.0	63,208.6	75,355.3	100,066.0	81,475.0	82,911.0	77,127.0	24,431.0	73,239.0
BRAEBURN	10,675.0	18,460.0	6,694.1	13,519.6	7,189.4	4,663.0	3,525.0	1,366.0		
GOLDEN DELICIOUS				5.0						
HONEYCRISP		8,998.0	6,192.0							
RED DELICIOUS	671.0	2,015.0	2,778.0	1,366.0	2,547.0	182.0				
SUNDOWNER						155.0		42.0		
SWEETIE			2,766.0							
OTHER	30,146.0	37,499.0	57,679.0	30,277.0	40,372.0	26,893.0	22,298.0	4,224.0	7,632.0	4,536.0
Total Packed	2,057,957.0	2,186,471.0	1,924,753.7	1,773,317.3	1,837,320.0	1,766,412.1	1,536,448.6	1,231,028.0	1,025,002.0	949,867.0
Total Shipped	2,057,957.0	2,186,471.0	1,924,753.7	1,773,317.3	1,837,320.0	1,766,412.1	1,536,448.6	1,231,028.0	1,025,002.0	949,867.0

INDUSTRY COMMUNICATIONS

APPLE COMMUNICATIONS

The California Apple Commission takes pride in ensuring that our audience is kept up to date with issues concerning the apple industry. The CAC is on social media. Please follow us on the following social media outlets and let us know what you think. We would love to know what you want to hear more about.

Facebook.com/CaliforniaAppleCommission

Pinterest.com/calapple

Instagram.com/calapples

The Commission has published a series of newsletters throughout the season and they are included in the following pages. The Commission encourages you to sign up for our online newsletters. To sign up for the California Apple Commission's newsletter, visit calapple.org under the "About Us" tab. You can subscribe in the "Newsletter" section. The Commission sends out newsletters on a bi-monthly basis.

CALIFORNIA APPLE COMMISSION

Newsletter

Issue No. 153 November/December 2022

AB 2183 SEMINAR

The CAC and other local agriculture associations invite you to join them for an important labor seminar regarding AB 2183, the agricultural employee unionization card check legislation that goes into effect on January 1, 2023. The next seminars are located in Coachella and Orland.

Coachella: Thursday, January 5th from 10 a.m.-12 p.m. Deadline to RSVP is January 3rd.
Orland: Tuesday, January 10th from 10 a.m.-12 p.m. Deadline to RSVP is January 6th.

For additional details on how to RSVP, please access the Coachella flyer here and the Orland flyer here.
If this location is not convenient for you, we will be hosting additional seminars that will take place in other locations in the state. Additionally, we will be hosting additional seminars over zoom.

For updated procedural forms from the Agricultural Labor Relations Board, please access their website here. Please do not hesitate to contact the CAC office with any questions.

CAC ATTENDS USAEDC ANNUAL WORKSHOP IN BALTIMORE

The U.S. Agricultural Export Development Council held its annual workshop from November 16-18 in Baltimore, MD. This annual event features in-depth presentations on a wide range of topics, including: election analysis, marketing trends, successes with export development programs, sustainability, effects of current events on world markets, updates to compliance with FAS funding programs, and issues facing specific sectors of the agricultural industry. If you would like additional information on this event, please do not hesitate to contact the CAC office.

USDA-RMA SPRING 2023 LISTENING SESSIONS

The Risk Management Agency (RMA) is inviting interested parties to participate in a listening session to discuss proposed changes to the apple crop insurance program. Proposed changes were published in a Proposed Rule with request for comments on December 16, 2021. RMA invited the public to comment on this rule through April 15, 2022. RMA would like to engage with interested parties to clarify the intent of the Proposed Rule before finalizing changes. Please access the listening session flyer here to learn how to participate.

2023 SPECIALTY CROP BLOCK GRANT PROGRAM PHASE 2

On August 18th, the California Department of Food and Agriculture (CDFA) announced the opening of the 2023 Specialty Crop Block Grant Program! The CAC submitted two concept proposals to CDFA by the September 16th deadline. The first project is titled, *Back to Fresh: Improving Consumer Education on the Importance of Buying Fresh, Local Apples*, with a total funding request of $427,912. The second project is titled, *Analysis of the Effects of 1-MCP use on the Quality of Gala, Fuji, and Granny Smith Apples in Long Term Storage*, with a total funding request of $140,000. Both projects have made it to the Phase 2 process, at which time staff will be submitting full proposals by the January 19th deadline. Please do not hesitate to reach out to the CAC office with any questions.

ACCEDE PLANT GROWTH REGULATOR

Accede, which is used to thin pome and stone fruit to reduce crop load, is available for use on apples in California. Accede Plant Growth Regulator contains ACC, a natural compound responsible for the biosynthesis of ethylene production in tree fruits. This product is manufactured by Valent. For the EPA Federal label, please access here.

CAL OSHA COVID-19 NON-EMERGENCY REGULATIONS

On December 15, 2022, the Occupational Safety and Health Standards Board voted to adopt non-emergency COVID-19 Prevention regulations. These regulations will take effect in the month of January 2023 and will remain in effect for two years after the effective date. Some requirements implemented in the COVID-19 Prevention Emergency Temporary Standards (ETS), will remain in the Non-Emergency Regulations. For instance, employers must provide face coverings and ensure they are worn by employees when CDPH require their use, employers must make COVID-19 testing available at no cost during paid time to employees following a close contact, etc. For additional information, please access Cal-Osha information here.

STERILE INSECT TECHNIQUE FIELD DAY

Join USDA-ARS and M3 Agriculture Technologies in Parlier, CA for a field day that will emphasize the benefits and adaptation of sterile insect technique as a biological pest control method, along with state of the art technology advancements. There will be presentations and speeches on history, challenges, commercialization, success and opportunities of Codling Moth SIT here in California. The event will conclude with a live field demonstration of American made drones releasing moths. For additional details on the field day agenda and how to register, please access the registration website here.

CALENDAR OF EVENTS

- **JANUARY 10TH- POMOLOGY ACTION CONFERENCE**
  - DAVIS, CA
- **JANUARY 16TH- OFFICE CLOSED**
- **JANUARY 20TH- SIT FIELD DAY EVENT**
  - PARLIER, CA
- **JANUARY 23-27- CAC STAFF IN D.C.**

California Apple Commission
2565 Alluvial Ave., #152
Clovis, CA 93611
PH: (559) 225-3000
FAX: (559) 456-9099
www.calapple.org

BOARD OF DIRECTORS FORM 700 STATEMENT OF ECONOMIC INTERESTS

As outlined by CDFA and the Fair Political Practices Commission (FPPC), all Board of Directors filers must complete the necessary Form 700. Board members are now eligible to submit your Form 700 electronically through eDisclosure , please log on to https://form700.fppc.ca.gov/, once you have completed your Form, the system will prompt you to electronically submit your completed Form 700. You may also download the Form 700 at https://www.fppc.ca.gov/Form700.html. As a reminder, Form 700 is due April 3, 2023. If you have any problems accessing or completing your eDisclosure Form 700, please contact your assigned filing officer, Andrea Carey, via email at Form700@fppc.ca.gov. As always, the CAC is available to assist you as well. Please do not hesitate contact the CAC office for support.

DR. GENNARO FAZIO VISITS CALIFORNIA APPLE GROWERS

In early November, Dr. Gennaro Fazio from USDA-ARS visited California to visit apple rootstock trial test sites throughout the State. Dr. Fazio has been working with the CAC and California apple industry over the past several years to conduct trials in California on various apple rootstocks to determine performance. This project has been co-funded by USDA-ARS and CDFA Specialty Crop Block Grant program funds. For more information on the trials or grant program, please do not hesitate to contact the CAC office.

Find us on social media!

#calapple **@calapples** **@calapple**

CALIFORNIA APPLE COMMISSION

Newsletter

Issue No. 152 September/October 2022

CAC ATTENDS INTERNATIONAL FRESH PRODUCE ASSOCIATION CONFERENCE

In late September, the CAC traveled to Washington, DC to participate in the annual International Fresh Produce Association Conference. The purpose of this event is to unite fresh produce industry members in order to address some of the most pressing public policy matters impacting specialty crops. The CAC was able to meet with many Members of Congress to discuss issues impacting the California apple industry including reformed disaster relief specific to California and the upcoming reauthorization of the 2023 Farm Bill. If you have any questions regarding this event, please do not hesitate to contact the CAC office.

2023 STERILE CODLING MOTH RELEASES

If you are interested in releasing Sterile Codling Moths on your apple acreage during the 2023 season, M3 Ag Tech is coordinating releases for the 2023 season now! M3 specializes in sterile insect release (SIR), of Codling Moths as an organic control strategy. M3 provides an end-to-end service, ensuring the viability of moths from the time they leave the facility until they're released into orchards.800 sterile moths per acre are released on a weekly basis via drone deployment. Cost to release is **$450/acre.** In 2021, the CAC funded trials with M3 Ag Tech. If you would like a copy of the final report and trial data, please reach out to Elise Oliver eoliver@calapple.org. If you would like to secure releases for the 2023 season, please reach out directly to Nathan Moses of M3 Ag Tech at nmosesgo@m3cg.us

CDPR COMMENT PERIOD FOR PROTONE

California Department of Pesticide Regulation (CDPR) has posted the conditional registration of ProTone, for use as an organic apple thinner, to a 30-day comment period. Letters are due to CDPR by November 20th. CAC staff will keep the industry updated once the registration is complete. For more information on ProTone, please reach out to Elise Oliver eoliver@calapple.org.

AB 2183 SIGNED BY GOVERNOR NEWSOM

On September 28, 2022, Governor Newsom signed into law AB 2183-Agricultural Label Relations: Elections, authored by Assemblymember Stone. Previously, union elections were conducted via secret ballot. AB 2183 instead provides agricultural workers the right to vote for or against union representation by mail balloting or through card check. Beginning January 1st, employers will have the opportunity to opt-in to labor-peace compacts, which triggers mail balloting. For employers who do not opt-in to labor-peace compacts, non-labor peace elections, or card check, will be utilized in order certify unions as bargaining representatives of an employer's employees. For a detailed explanation of the various differences between labor peace elections and non-labor peace elections or how this law may affect your operation, please do not hesitate to contact Elise Oliver eoliver@calapple.org.

FSMA FINAL RULE: REQUIREMENTS FOR ADDTIONAL TRACEABILITY RECORDS FOR CERTAIN FOODS

The FDA issued a final rule on November 15th, that establish traceability and recordkeeping requirements for person who manufacture, process, pack, or hold foods included on the Food Traceability List. Companies will need to maintain records containing Key Data Elements (KDEs) associated with specific Critical Tracking Events (CTEs) and provide information to the FDA within 24 hours or within a reasonable time to which the FDA has agreed. Compliance date for all persons involved is January 20, 2026. To view a Stakeholder webinar regarding this recent rule, please click here. Please do not hesitate to contact the CAC office with any questions.

CAC ATTEND IFPA GLOBAL PRODUCE & FLORAL SHOW

The California Apple Commission recently attended the inaugural International Fresh Produce Association (IFPA) Global Produce & Floral Show held in Orlando, FL from October 27-29, 2022. This tradeshow replaced the Produce Marketing Association (PMA)'s Fresh Summit, and is a result of the recent merger between PMA and the United Fresh Produce Association. At the tradeshow, the CAC participated in a promotional activity, in conjunction with the U.S. Apple Export Council, to encourage attendees to visit USAEC member booths and engage with representatives from each apple producing state. The activity included distributing a USAEC "Passport" to importers and distributors at the show that they could then collect stickers for their passport book from state representatives. Trade members who collected the greatest amount of stickers were entered into a raffle for a Visa card or gift certificate. For more information on the tradeshow and promotional activity, please do not hesitate to contact the Commission office.

CALENDAR OF EVENTS

- **United States Agricultural Export Development Council Annual Workshop- Baltimore, Maryland**
  - Date: November 16-18
- **CAC Board of Directors Meeting**
  - Date: November 29
- **Office Closed for Thanksgiving**
  - Date: November 24-25

California Apple Commission
2565 Alluvial Ave., #152
Clovis, CA 93611
PH: (559) 225-3000
FAX: (559) 456-9099
www.calapple.org

APPLE BUTTER

InstantPot California Apple Butter

Ingredients

- 12 cups (about 14 medium) California apples
- 1/ 3 cup coconut sugar
- 2 teaspoons ground cinnamon
- 2 teaspoons pure vanilla extract
- 1 teaspoon fresh lemon juice
- 1/ 2 teaspoon ground nutmeg
- 1/ 2 teaspoon ground allspice
- 1/ 4 teaspoon salt

Directions

- Wash and slice your apples and place them into your Instant Pot.
- Add all of the other ingredients to the Instant Pot and pressure cook/use manual mode for 20 minutes.
- When it's done cooking, pressure release and carefully remove the lid.
- Stir the apple butter to combine all the ingredients.
- Transfer the apple butter to a blender and blend until smooth.

Find us on social media!

#calapple @calapples @calapple

CALIFORNIA APPLE COMMISSION

Newsletter

Issue No. 151 July/August 2022

U.S. APPLE OUTLOOK CONFERENCE

In August, the CAC staff traveled to Chicago, IL to attend the annual U.S. Apple Outlook Conference meeting. The conference was attended by leaders from every facet of the apple industry, including production, packaging, processing, sales, marketing, and new product development. In addition, the conference was attended by a diverse range of speakers who covered topics ranging from inflation, retail market trends, transportation and logistics challenges, etc. During the US Apple Outlook Conference, CAC Staff was able to meet with Hazel Technologies (pictured below), based out of Chicago, Illinois. Please do not hesitate to reach out to the CAC office with any questions regarding this event.

2023 SPECIALTY CROP BLOCK PROGRAM

On August 18th, the California Department of Food and Agriculture (CDFA) announced the opening of the 2023 Specialty Crop Block Grant Program! CDFA anticipates that up to $22 million will be awarded to projects enhancing the competitiveness of California specialty crops. Grant amounts range from $100,000 to $500,000. CAC submitted two concept proposals to CDFA by the September 16th deadline. The first project is titled, *Back to Fresh: Improving Consumer Education on the Importance of Buying Fresh, Local Apples*, with a total funding request of $427,912. The second project is titled, *Analysis of the Effects of 1-MCP use on the Quality of Gala, Fuji, and Granny Smith Apples in Long Term Storage*, with a total funding request of $140,000. Please do not hesitate to reach out to the CAC office with any questions.

USAEC CANADA PROGRAM UPDATE

To drive sales of California Gala and Granny Smith apples in Canada this season, the U.S. Apple Export Council (USAEC), in conjunction with the California Apple Commission (CAC), has a robust slate of ongoing and upcoming activities. This includes Google banner ad placements, Pinterest advertising, influencer partnerships, sponsored content on Daily Hive, Grocery Business Eblasts, and updating the USAEC Canada website. To ensure that the content is fresh and engaging, USAEC, in conjunction with CAC, developed eight new apple recipes this season, which will be featured in all of the digital advertising. The first phase of the campaign, which targets California Gala apples, launched on August 3. The second phase will launch in mid-September and emphasize California Granny Smith apple availability. If you would like to view the newly developed recipes, please feel free to visit the USAEC Canadian website: https://usaapples.ca/applesplus/

JULY LEGISLATIVE VISITS

In July, CAC staff traveled to Washington D.C., to advocate on behalf of the California apple industry in preparation for the reauthorization of the 2023 Farm Bill. CAC staff met with over twenty different Congressional offices in both the House and Senate. If you have any questions or any topics of interest for the 2023 Farm Bill, please do not hesitate to contact the CAC office.

California Apple Commission meeting with Congressman LaMalfa

CALENDAR OF EVENTS

- **United Fresh Washington Conference D.C.**
  - Date: September 26-30
- **Produce Marketing Association Fresh Summit**
  - Date: October 27-29

California Apple Commission
2565 Alluvial Ave., #152
Clovis, CA 93611
PH: (559) 225-3000
FAX: (559) 456-9099
www.calapple.org

APPLE BUTTER

InstantPot California Apple Butter

Ingredients

- 12 cups (about 14 medium) California apples
- 1/ 3 cup coconut sugar
- 2 teaspoons ground cinnamon
- 2 teaspoons pure vanilla extract
- 1 teaspoon fresh lemon juice
- 1/ 2 teaspoon ground nutmeg
- 1/ 2 teaspoon ground allspice
- 1/ 4 teaspoon salt

Directions

- Wash and slice your apples and place them into your Instant Pot.
- Add all of the other ingredients to the Instant Pot and pressure cook/use manual mode for 20 minutes.
- When it's done cooking, pressure release and carefully remove the lid.
- Stir the apple butter to combine all the ingredients.
- Transfer the apple butter to a blender and blend until smooth.

Find us on social media!

#calapple @calapples @calapple

CALIFORNIA APPLE COMMISSION

Newsletter

Issue No. 150 May/ June 2022

BEEHERO SEEKS CALIFORNIA APPLE INDUSTRY PARTICIPATION

At the annual Board of Directors meeting, representatives from BeeHero, a data-driven tech company who is working to redefine pollination in commercial agriculture, provided an update on their planned work in the CA apple industry during the 2023 pollination cycle. BeeHero use advanced data analytics, artificial intelligence, and low-cost IoT sensors to bring transparency and efficiency to the complex logistics of commercial crop pollination. Much of their precision pollination efforts to date have been focused on almonds. In 2023, they will launch a research project to properly assess the pollination requirements of apples. By tradition, Apple growers tend to have their own "rule of thumb" for the number of hives per acre.

They want to assess apple pollination to see if they can determine how many bees are really needed to optimize yield. They are looking for a few apple growers to provide orchard acreage for gratis installation of our hive monitoring technology-sensors to provide data on the foraging activity of the beehives.

If you are interested in learning more about BeeHero, please contact Elise Oliver at eoliver@calapple.org

CALIFORNIA APPLE PACKET

To all California Apple handlers, Apple Packets for the 2022-2023 Fiscal Year will be mailed out July 8, 2022. Included in the Apple Packet are the following, Assessment Invoice Forms, reflecting the new assessment amount of $0.004375 mils per pound or $0.175 cents per 40-lb. standard box of fresh apples, Destinations Report Form, and Growers List. Forms are due with each monthly assessment report and payment. Should you have any questions, please contact the Commission office.

CAC ASSESSMENT RATE ESTABLISHED

At the annual California Apple Commission meeting held on June 15, 2022, the Board of Directors voted to reduce the assessment rate of the Commission. After discussing the upcoming season and budgetary requirements, the Board concluded that reducing the assessment rate was in the best interest of the California Apple industry and that the Commission could accomplish the same goals and objectives at a lower rate. The reduced income will be offset by using some of the Commission reserve and the utilization of income from current management contracts. Beginning July 1, 2022, the assessment rate for the 2022-2023 fiscal year for the California Apple Commission will now be 17.5 cents per 40lb box. If you have any questions or comments, please feel free to contact the Commission office.

2022-2023 RESEARCH UPDATE

At the annual CAC Board of Directors Meeting held on June 15, 2022, the Board approved the following research projects for the 2022-2023 Fiscal Year:

Researcher	Project	Amount
Dr. Jim Adaskaveg	Evaluation of New Bactericides for Controls of Fire Blight of Apples Caused by Erwinia Amylovora and Evaluation of New Postharvest Fungicides for Pome Fruits	**$21,200**
Dr. Anu	Postharvest Quality and Physiology of 'Gala', 'Granny Smith', and 'Fuji' Apples Subjected to Phytosanitary Irradiation	**$1,500**
	Total	**$22,700**

These two research projects are all a continuation of prior research from the previous fiscal year. If you would like a copy of the 2021-2022 Final Report for these projects, please email Program Supervisor Elise Oliver at eoliver@calapple.org

OCEAN SHIPPING REFORM ACT

On Thursday, June 16, President Biden signed the Ocean Shipping Reform Act into law. This bill was introduced by Senator Amy Klobuchar from Minnesota in February 2022 and passed through the senate in March with strong bipartisan support. The Ocean Shipping Reform Act increases the authority of the Federal Maritime Commission to investigate complaints about detentions and Demurrage charges (i.e. late fees) charged by ocean carriers, determine whether these charges are reasonable, and order refunds for unreasonable charges. The Ocean Shipping Reform Act also prohibits ocean carriers, marine terminal operators, ocean transportation intermediaries from unreasonably refusing cargo space when available or resorting to discriminatory methods. The commission has been a supporter of this effort and will continue to monitor its progress. If you have any questions, please contact our office.

FARM BILL

The 2023 Farm Bill is currently being drafted. If you have any concerns or topics of interest about the drafting of the Farm Bill, please contact the office for more information. Please do not hesitate to reach out to our office.

DROUGHT UPDATE

Governor Newsom's California Blueprint proposed to invest $2 billion for drought response, including $100 million along with the prior investment of $16 million during the current fiscal year. During the public meeting of the State Water Board, regulations were adopted that will require implementation of local water supplier's level 2 of their Water Shortage Contingency Plans. For those without a plan they are required limit outdoor water use by banning ornamental grass irrigation on commercial properties and businesses. It also restricts watering during the hottest time of the day and limited to two days per week.

California Apple Commission
2565 Alluvial Ave., #152
Clovis, CA 93611
PH: (559) 225-3000
FAX: (559) 456-9099
www.calapple.org

AB 710 AND AB 778 UPDATES

The CAC Board of Directors voted to support AB 710 and AB 778 which are moving through the California legislature. AB 710 prohibits the sale of listed agricultural products that does not meet California's pesticide and labor regulations, and AB 778 requires state institutions to purchase California grown produce when available. As both bills have been moving through various Committees, CAC staff has provided Letters of Support along the way. AB 778 is set to be heard in the Senate Agriculture Committee shortly. AB 710 fell one vote short of passing through the Senate Business, Professions, and Economic Development Committee, but bill author, Assemblyman Garcia is currently pushing for a reconsideration.

APPLE REFRESHER

Ingredients

- 1 California apple, sliced
- 1 California pomegranate, arils removed
- 1/4 cup fresh basil leaves, about 10-12 large
- 48 oz. apple juice
- 12 oz. pomegranate juice
- 12 o. lemon-lime soda
- ice

Instructions

- Place the apples, pomegranate arils and basil leaves in the bottom of the pitcher. Fill the pitcher with ice up to a little over half way.
- Pour in the apple juice, pomegranate juice and soda. Stir to mix well.
- Serve and enjoy!

CALENDAR OF EVENTS

- **CAC in D.C.**
  - July 11-15, 2022
- **USAEDC 2022 Attaché Seminar**
  - July 13-14, 2022
- **U.S. Apple Export Council Meeting**
  - August 17, 2022
- **U.S. Apple Outlook 2022**
  - August 18-19, 2022

Find us on social media!

#calapple @calapples @calapple

CALIFORNIA APPLE COMMISSION

Newsletter

Issue No. 149 March/ April 2022

COVID-19 SUPPLEMENTAL PAID SICK LEAVE LAW

On February 19, 2022 the new 2022 COVID-19 Supplemental Paid Sick Leave law went into effect. This law provides covered employees up to 80 hours of COVID-19 related paid leave, with up to 40 of those hours for isolation and quarantine, receiving vaccines, and caring for a child whose school or place of care is closed and up to an additional 40 of those hours available only when an employee, or family member for whom the employee provides care, tests positive for COVID-19.

UPDATED RESEARCH PAGE ON CAC WEBSITE

The California Apple Commission recently updated the Research tab on the California Apple Commission website. We have added a significant amount of research, some which dates back to the 1980s. This page is password protected and only available to California apple growers. If you are interested in viewing the page, please email Riley at intern@calapple.org to receive the password.

DROUGHT UPDATE

Following the driest first three months of a year in the state's recorded history, Governor Newsom released an executive order on March 28, 2022 that calls on local water suppliers to activate drought contingency plans. This order also calls the Water Board to consider a ban on watering decorative grass around commercial, industrial and institutional buildings. To further conserve water and strengthen drought resiliency in this critically dry year, the Governor is encouraging suppliers, where appropriate, to consider going above and beyond the Level 2 of their water shortage contingency plans, activating more ambitious measures. To view the executive order, click here.

CAC BOARD ELECTIONS

Due to changes in the industry, which has caused a shift in the concentration of apple acreage in the original three (3) Districts, the California Apple Commission Board of Directors voted unanimously to restructure the Board to rectify this issue. The elimination of Districts will allow for a Statewide Board of Directors. A Statewide Board, will allow producers who are eligible and interested to serve to now participate on the Board regardless of their location. The California Apple Commission is announcing the following Statewide positions for the Board of Directors for the 2022 – 2023 fiscal year. In accordance to Commission bylaws, all apple producers must be notified of these positions. The California Apple Commission will host a Zoom/Conference call to nominate candidates for the 2022-2023 Board of Directors. Elections will take place on Thursday, APRIL 28, 2022 at 9:00 a.m. The following is a list of the seats up for (re)election and whose positions expire on June 30, 2022. If you would like additional information regarding these positions, or the zoom information, please contact the Commission office.

STATEWIDE PRODUCERS	STATEWIDE HANDLERS
Chris Britton Virginia Hemly Chhabra	Bill Denevan Doug Hemly - Alternate Tim Sambado Vacant - Alternate

HEAT ILLNESS TRAINING

On April 29, 2022, the Department of Industrial Relations, Cal/OSHA Consultation & Agricultural Organizations will be having a scheduled Heat Illness Prevention and Wildfire Smoke Training Session. The no-cost training will be held at the C.P.D.E.S. Portuguese Hall in Fresno. The program is intended for Supervisory Positions and certificates will be given upon completion of the two-hour session. Please click here to view the flyer for more information.

CAC ATTENDS U.S. CAPITOL HILL DAY

In March, representatives of the California Apple Commission, including Chairman, Jeff Colombini, traveled to Washington, DC to participate in the US Apple Capitol Hill Day. During this annual event, CAC representatives met with numerous Members of Congress to discuss the US Apple industry's official position on important topics including: immigration, food safety, trade, transportation/logistics, labor, and pesticide policies, among others. Event host and organizer, US Apple, serves the interests of the nation's apple growers on a wide range of issues including agricultural labor, export promotion, specialty crop farm bill programs, and federal nutrition programs. For more information regarding US Apple or this meeting, please contact the Commission office.

SB-982 CALIFORNIA APPLE COMMISSION: ORGANIC APPLE CERTIFICATION PROGRAM UPDATE

SB-982 has passed the Senate Agriculture Committee and is set to be heard on April 25, 2022. If passed, this bill would authorize the California Apple Commission to enforce an organic apple certification program that would prevent the use of prohibited substances in organic apple production. This bill protects the integrity of the California organic apple industry. The organic apple certification program would ensure the apples are in compliance with already existing state and federal laws. The CAC Board of Directors voted unanimously to pursue this effort in December of 2021. CAC staff will continue to keep the California apple industry up-to-date with any news relating to SB-982. Please feel free to contact the office at (559) 225-3000 with any questions

COMMISSION ATTENDS FRUIT LOGISTICA TRADESHOW

The California Apple Commission participated in the annual Fruit Logistica Tradeshow, held in Berlin, Germany, from April 5-7, 2022. The Commission represented the California apple industry, and its members, at the U.S. Apple Export Council booth. Exhibitors from 86 countries and trade visitors attend Fruit Logistica every year. Fruit Logistica covers every sector of the fresh produce business and provides a complete picture of the latest innovations, products and services at every link in the international supply chain. For more information on this event, please do not hesitate to contact the CAC office.

CALENDAR OF EVENTS

- **2022 MRL Harmonization Workshop, San Francisco**
  - May 25-26, 2022
- **OFFICE CLOSED - Memorial Day**
  - May 30, 2022
- **Annual June Board of Directors Meeting**
  - Date TBD

Some events are being held virtually. Please contact the CAC office for more information.

Find us on social media!

#calapple **@calapples** **@calapple**

California Apple Commission
2565 Alluvial Ave., #152
Clovis, CA 93611
PH: (559) 225-3000
FAX: (559) 456-9099
www.calapple.org

CALIFORNIA APPLE COMMISSION

Newsletter

Issue No. 148 November/December 2021

TAIWAN ENHANCES BORDER INSPECTIONS FOR FRESH APPLES FROM THE U.S.

On December 16th, the Taiwan Food and Drug Administration (TFDA) announced its 2022 enhanced border inspection list for agricultural products. Of the total 23 products listed from specific countries, 3 U.S. products are on the list, one of which was fresh apples (HS code: 0808.10.00.00.2).

Other products included "fresh avocado" (HS code: 0804.40.00.00.0-A) and "other paper plate" (H.S. code: 4823.69.00.00.5-E). These products from the United States will have enhanced border inspection rates from 20 to 50 percent. This announcement will be effective from January 1, 2022 to December 31, 2022.

if you have any questions or concerns, please do not hesitate to contact the Commission office. Thank you.

U.S. HOUSE REPRESETATIVES PASS THE OCEAN SHIPPING REFORM ACT OF 2021

On December 8, 2021, the U.S. House of Representatives passed the Ocean Shipping Reform Act (OSRA) of 2021 with a 364-40 vote. OSRA aims to crack down on unreasonable practices by container shipping lines, bolster U.S. enforcement against uncompetitive carrier practices, and improve transparency for exporters. The CAC has actively supported the OSRA and has been urging Congressional leadership to work to develop a solution to the ongoing supply chain issues. The CAC is pleased with the passage of this bill in the House, and will continue to voice support as it makes its way through the Senate. If you have any questions on the passage of OSRA, please do not hesitate to contact the Commission office.

CDPH REQUIRES MASKING FOR ALL PUBLIC INDOOR SETTINGS

California Department of Public Health (CDPH) continues to monitor COVID-19 data in order to protect the health and well-being of all Californians. Since Thanksgiving, the statewide seven-day average case rate has increased by almost half (47%) and hospitalizations have increased by 14%. In response to the increase in cases and hospitalizations, and to slow the spread of both Delta and the highly transmissible Omicron variant, CDPH has issued updated guidance to curb the spread of COVID-19 and its variants.

Beginning December 15, CDPH will require masks to be worn in all indoor public settings irrespective of vaccine status through January 15, 2022, at which point California will make further recommendations as needed in response to the pandemic.

On January 5, 2022 the CDPH announced that the mask requirement have been extended and are now required to be worn indoors until February 15, 2022.

Additionally, CDPH updated requirements for attending mega events, like concerts and sporting events. Prior to attending an event, attendees will now require either proof of vaccination, a negative antigen COVID-19 test within one day of the event, or a negative PCR test within two days of the event.

CDPH also issued a new travel advisory effective immediately to recommend that all travelers arriving in California test for COVID-19 within three to five days after arrival, regardless of their vaccination status.

APHIS REMOVES FEDERAL DOMESTIC QUARANTINE REQUIREMENTS FOR LIGHT BROWN APPLE MOTH

Effective December 17, 2021, the Animal and Plant Health Inspection Service (APHIS) is removing the light brown apple moth (LBAM) quarantine in California and Hawaii. APHIS is reclassifying LBAM as a non-quarantine pest, removing all areas under quarantine, and removing movement restrictions on LBAM host material as they have determined that LBAM is no longer a pest of regulatory significance. If you have any questions, please do not hesitate to contact the Commission office.

CALENDAR OF EVENTS

- **OFFICE CLOSED - MLK Day**
  - January 17, 2022
- **USApple Capitol Hill Day - Washington, DC**
  - March 9, 2022

Some events are being held virtually. Please contact the CAC office for more information.

Find us on social media!

#calapple **@calapples** **@calapple**

APPLE BITES

Mini Apple And Gouda Frittatas

Ingredients:

- 2 cups baby spinach
- 1 tsp. coconut oil
- 1 medium onion, diced
- 1 medium California apple, diced
- 6 large eggs
- 1/3 cup 2% milk
- 1/2 cup Gouda cheese, shredded
- 1/2 tsp. salt
- 1/4 tsp. ground pepper

Directions:

- Preheat oven to 350F and spray a muffin pan with nonstick spray. Set aside.
- Place spinach in a steamer set over boiling water, cover, and steam until just wilted, about 1 minute. Remove and pat dry with a paper towel to remove some of the excess moisture.
- Melt coconut oil in a small saucepan set over medium heat. When pan and oil are hot, add the diced onion and cook until soft and translucent, about 5 minutes. Transfer to a separate bowl and add the wilted spinach and diced apple. Stir well and set aside.
- In a medium-sized mixing bowl, whisk together eggs, milk, Gouda, salt, and pepper. Divide the spinach, onion, and apple mixture evenly among the muffin tins, and use a ladle to spoon the egg mixture over top, filling about 3/4 of the way full.
- Bake for 15-20 minutes until eggs have set and edges begin to turn golden brown. Remove from oven and allow to cool for 5 minutes before removing from tins and serving.

Recipe courtesy of www.thefeedfeed.com and @Runwithspoons

California Apple Commission
2565 Alluvial Ave., #152
Clovis, CA 93611
PH: (559) 225-3000
FAX: (559) 456-9099
www.calapple.org

CALIFORNIA APPLE COMMISSION

Newsletter

Issue No. 147 September/October 2021

CA APPLE COMMISSION APPLIES FOR 2022 CDFA SPECIALTY CROP BLOCK GRANT

Each year, the California Department of Food and Agriculture (CDFA) conducts the Specialty Crop Block Grant Program (SCBGP). The notice of funding for the 2022 SCBGP was distributed in early October, with proposals due at the end of the month. Grant awards range from $100,000 to $500,000 per project and projects may last for up to two and a half years. The CAC applied for two proposals in the 2022 program: *The Exclusively Fresh Campaign: Promoting California Apple Growers and the High Quality, Fresh Apples They Produce* and *Evaluating Effectiveness of Various Calcium Fertilizers to Prevent Bitter Pit in Apples*. The CAC should be notified whether the applications made it through to Phase 2 later this year. If you have any questions regarding the grant program, please do not hesitate to contact the CAC office.

GOVERNOR NEWSOM EXPANDS DROUGHT EMERGENCY STATEWIDE AND URGES CALIFORNIANS TO REDOUBLE WATER CONSERVATION EFFORSTS

As California faces potentially a third year of drought, Governor Newsom issued a proclamation extending drought emergency statewide. The record low storage in California's largest reservoirs and record high temperatures experienced in August 2021 are forcing difficult decisions to be made. The proclamation requires local water suppliers to implement water shortage contingency plans and prepare for a third dry year. The proclamation also authorizes the Governor's Office of Emergency Services to provide assistance and funding under the California Disaster Assistance Act to support the emergency response and delivery of drinking water and water for public health and safety. Lastly, the Governor's California Comeback Plan invests $5.2 billion over three years to support immediate drought response and long-term water resilience. To view the full proclamation click here.

CA APPLE COMMISSION ATTENDS UNITED FRESH PRODUCE ASSOCIATION CONFERENCE

In late September, the CAC traveled to Washington, DC to participate in the annual United Fresh Produce Association Conference. The purpose of this event is to unite fresh produce industry members in order to address some of the most pressing public policy matters impacting these industries. The CAC was able to meet with many Members of Congress to discuss issues impacting the California apple industry. If you have any questions regarding this event, please do not hesitate to contact the CAC office.

Below the CAC staff is picture with Congressman Costa, one of the Members CAC met with during their visit to Washington D.C.

NOSB DENIES KASUGAMYCIN PETITION

On October 20, 2021, the National Organic Standards Board (NOSB) voted unanimously to not add kasugamycin to the National List of approved products. The final recommendations and official transcripts will be posted to the NOSB website in the coming weeks. Given that the NOSB has voted to remove other antibiotics in the same family, such as streptomycin, from the National List, the Crops Subcommittee found that kasugamycin, is not compatible with a system of sustainable agriculture under OPFA criteria. CAC staff is currently looking into a possible appeals process and other research opportunities to support a new petition. Please reach out to CAC staff with questions regarding the NOSB's decision.

CALENDAR OF EVENTS

- **Produce Marketing Association (PMA) Fresh Summit, New Orleans, LA**
  - October 28-30, 2021- CANCELLED
- **OFFICE CLOSED- Veterans Day**
  - November 11, 2021
- **OFFICE CLOSED- Thanksgiving**
  - November 25-26, 2021
- **Fruit Logistica, Berlin, Germany**
  - February 9-11, 2022

Some events are being held virtually. Please contact the CAC office for more information.

Find us on social media!

#calapple **@calapples** **@calapple**

APPLE BITES

Caramelized Onion, Cheddar, Apple, And Blueberry Grilled Cheese

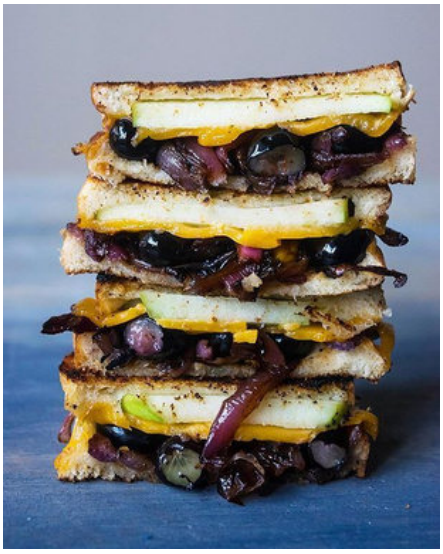
Ingredients:

- 2 slices of crusty French bread
- cheddar cheese
- caramelized balsamic onions
- California blueberries
- California apples, sliced

Directions:

- Over medium heat preheat your indoor griddle/skillet. Place a slice of cheese over the bread. Top with the caramelized onions, California blueberries, and California apple slices. Top with another slice of cheese if desired.
- Top with the remainder bread slices and grill sandwiches until cheese is melted, flipping once. Enjoy!

Recipe courtesy of www.thefeedfeed.com and @Lastcookie_ca



California Apple Commission
2565 Alluvial Ave., #152
Clovis, CA 93611
PH: (559) 225-3000
FAX: (559) 456-9099
www.calapple.org