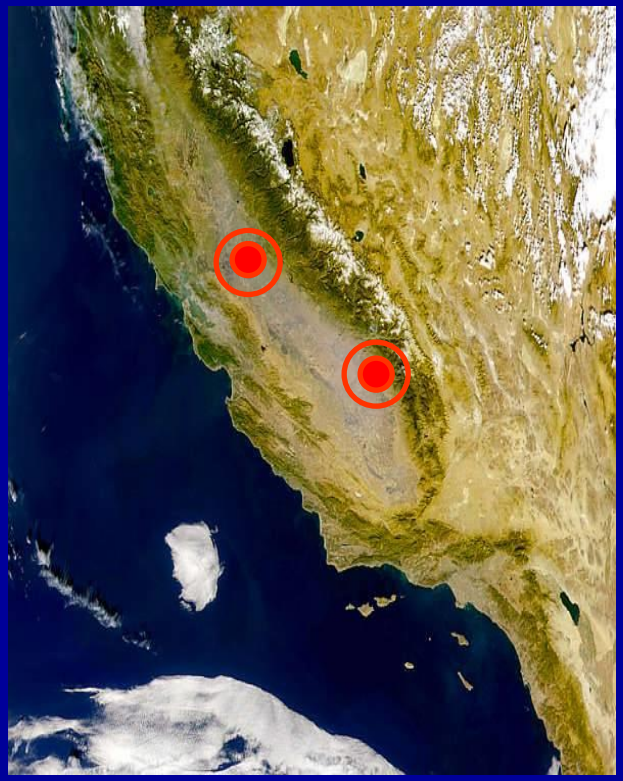
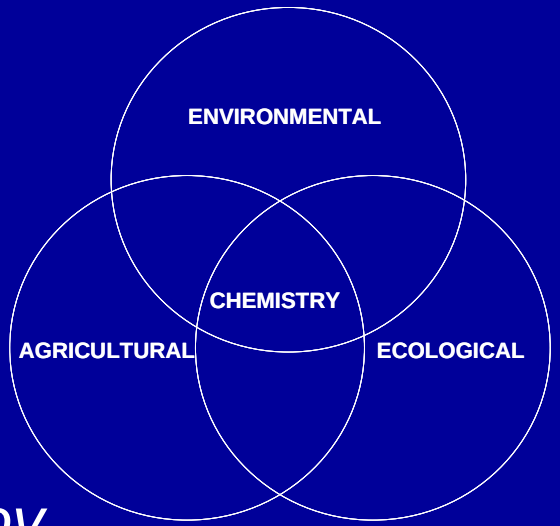
“2022 Research update”

Crop Protection & Quality Unit

Spencer S. Walse

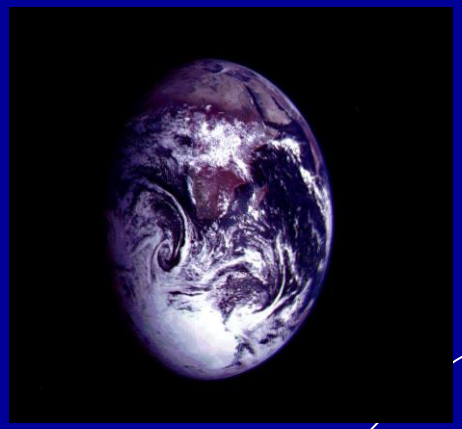


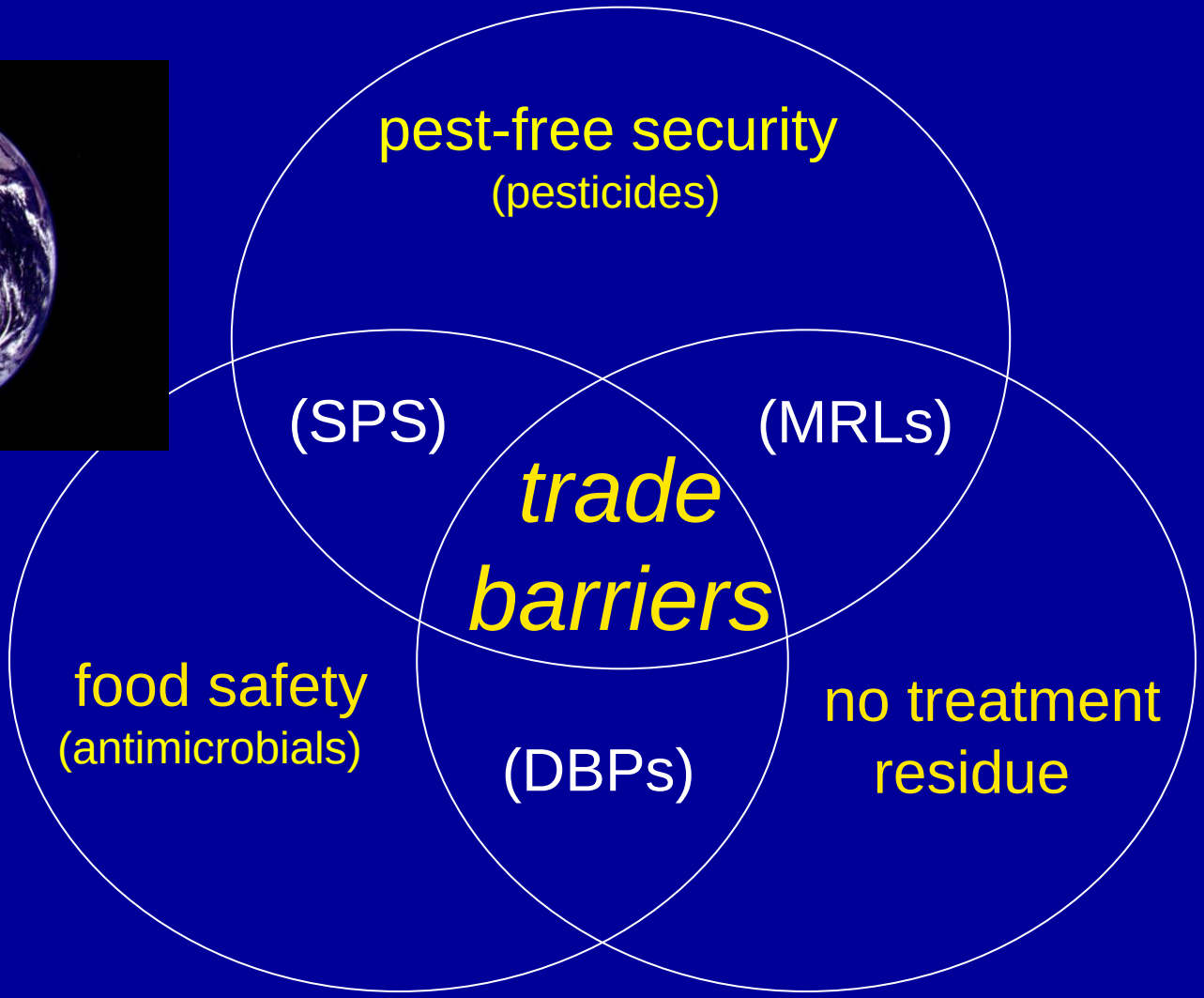


http//fresno.ars.usda.gov

http://agchem.ucdavis.edu/

Regulatory Research Demands





Agricultural Conundrum –

must use chemicals, but can't????

(biologicals??)

Ag. systems "end" at the consumer

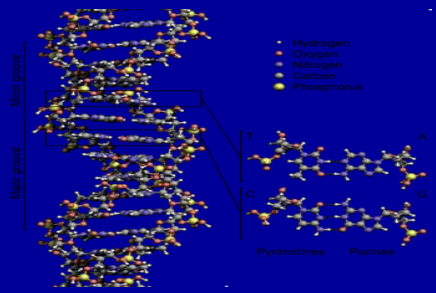
quantitative

RETROspective systems approach

uncertainty

certainty

"Pest control based retrospectively through the point of marketing/consumption"



PREPLANT ▼ PRODUCTION ▼ POSTHARVEST

start

"SYSTEM"

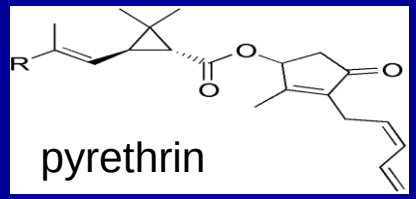
finish

- Insectophobia – insects
- Iophobia- poison
- Radiophobia – radiation
- Microbiophobia - microbes (germs)
- Genophobia- (GMO)
- Chemophobia - chemicals
- Chrometophobia - $$ money
- Georgophobia – farms
- Gnosiophobia- knowledge

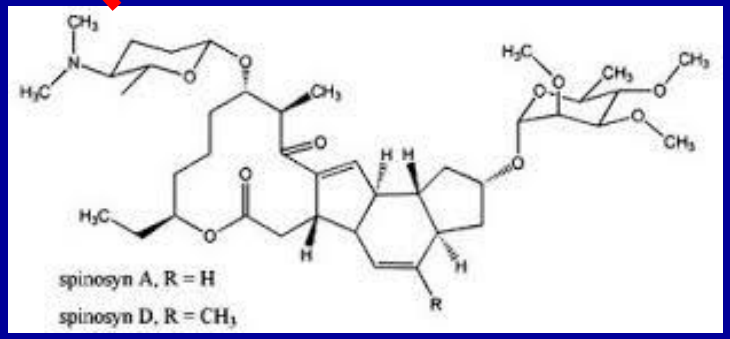
natural inspiration!

consumer drive

conventional option

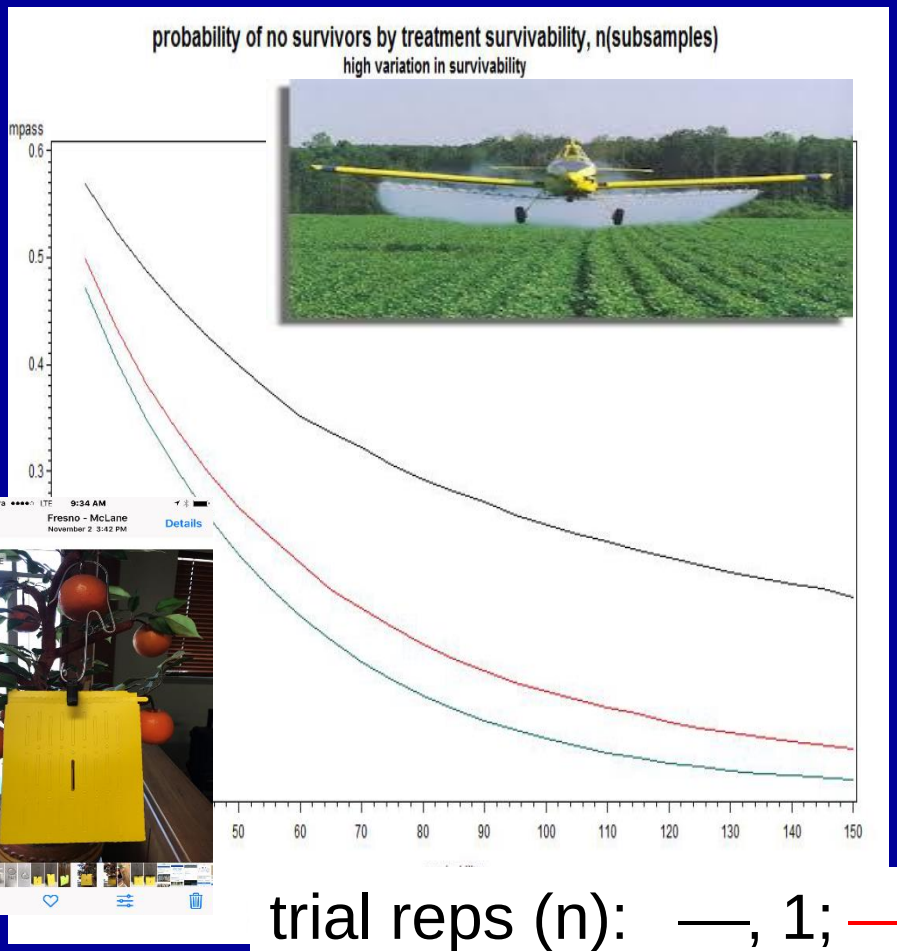


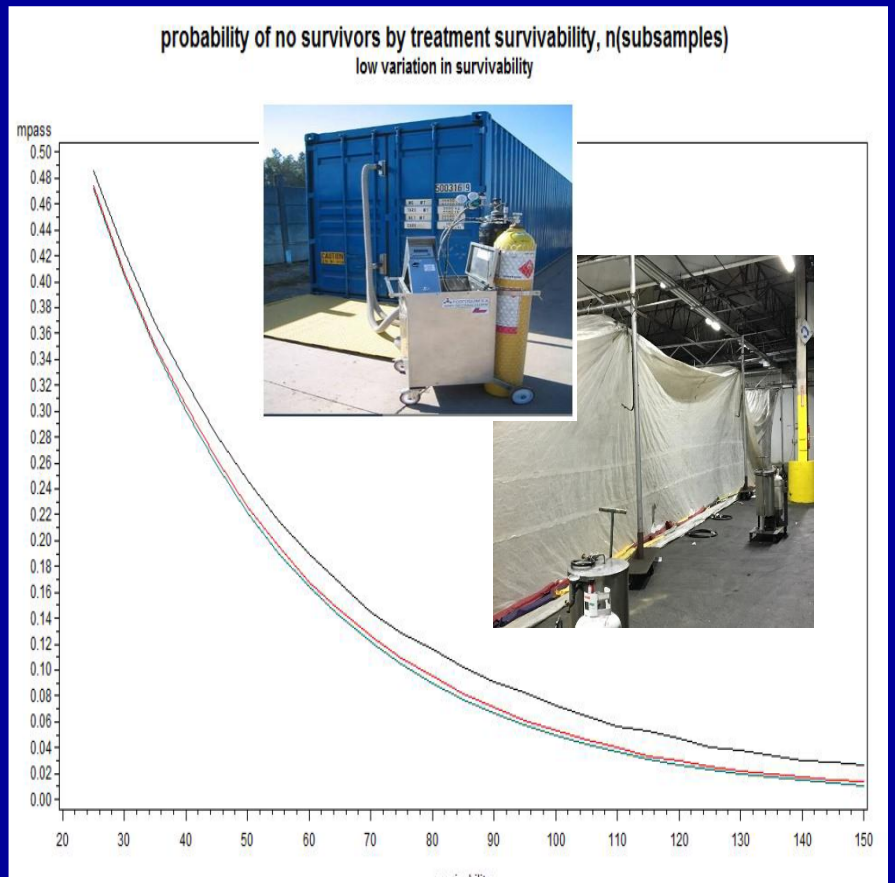
organic/ biopesticide options



semiochemicals

“SPS solutions” are critically linked to postharvest, even “systems-approaches”





trial reps (n): —, 1; —, 5; —, 95,000

Low dispersion - *variance* (fumigation) >>>> high dispersion - *variance* (field treatment)

Postharvest Fumigation:
SPS & residues

or

1-slide take home.....

EU #1: increasing QPS "capacity"

(but reduced PPPs, "mirror", global health)

SCIENTIFIC OPINION

EFSA Journal

ADOPTED: 19 May 2021

doi: 10.2903/j.efsa.2021.6666

Pest categorisation of *Amyelois transitella*

EFSA Panel on Plant Health (PLH),
Claude Bragard, Katharina Dehnen-Schmutz, Francesco Di Serio, Paolo Gonthier, Marie-Agnès Jacques, Josep Anton Jaques Miret, Annemarie Fejer Justesen, Christer Sven Magnusson, Panagiotis Milonas, Juan A Navas-Cortes, Stephen Parnell, Roel Potting, Philippe Lucien Reignault, Hans-Hermann Thulke, Wopke Van der Werf, Antonio Vicent Civera, Jonathan Yuen, Lucia Zappalà, Chris Malumphy, Ewelina Czwienczek, Virag Kertesz, Andrea Maiorano and Alan MacLeod

Abstract

The EFSA Panel on Plant Health performed a pest categorisation of the navel orangeworm, *Amyelois transitella* (Lepidoptera: Pyralidae), for the EU. This polyphagous species feeds on citrus, almonds, pistachios, grapes and other crops cultivated in the EU. *A. transitella* occurs in North, Central and South America in a range of climates some of which also occur in the EU. Adult females lay up to 200 eggs on overripe, damaged, cracked or mummified fruits or nuts. In citrus, eggs are laid at the navel end of damaged fruit. On occasions, they may be found on adjacent leaves or stems. This species is not included in EU Commission Implementing Regulation 2019/2072. Potential entry pathways for *A. transitella*, such as plants for planting, and fruit, exist. The pest is not known to be present in the EU territory although it has been intercepted in Italy and Austria. Should *A. transitella* arrive in the EU the availability of hosts and occurrence of potentially suitable climates would be conducive for establishment. Should this species establish in the EU, yield and quality losses in citrus, nuts, stone and pome fruit production is anticipated. *A. transitella* satisfies the criteria that are within the remit of EFSA to assess for this species to be regarded as a potential Union quarantine pest.

EU #2: DBPs
(trigger MRLs)

TECHNICAL ASSISTANCE FOR SPECIALTY CROPS PROGRAM
CFDA PROGRAM NUMBER: 10.604

FEDERAL AWARD IDENTIFICATION NUMBER: TASC–2020–10

Activity Information
Activity Code: T20GXCLOP1
Activity Title: Chlorate MRL barrier to EU export of California dried fruits and tree nuts

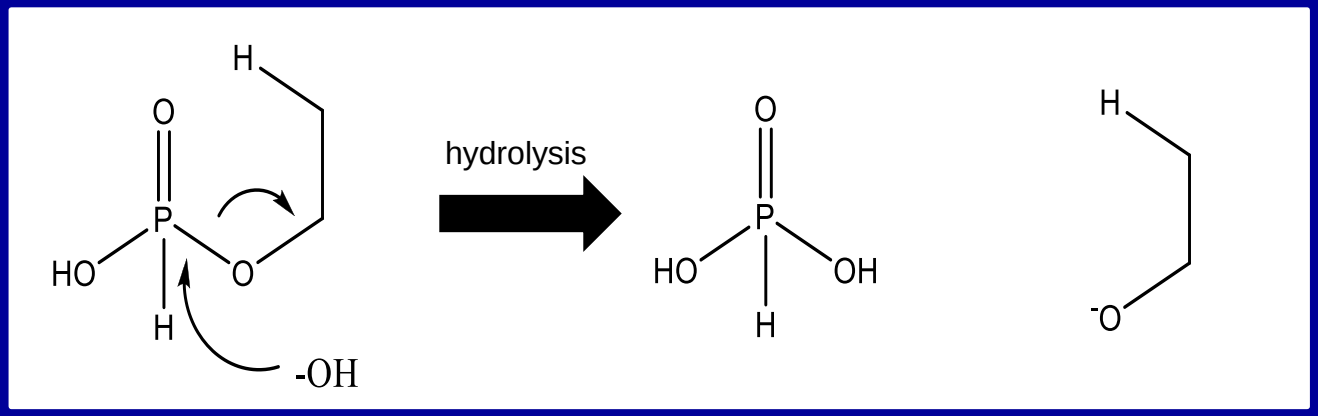
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32020R0749

Tree nuts: 0.1ppm vs. apples 0.05ppm

factors limiting chlorate:

- $Ca(ClO)_2$ versus NaOCl
- minimizing organic “fouling”
- chloramination

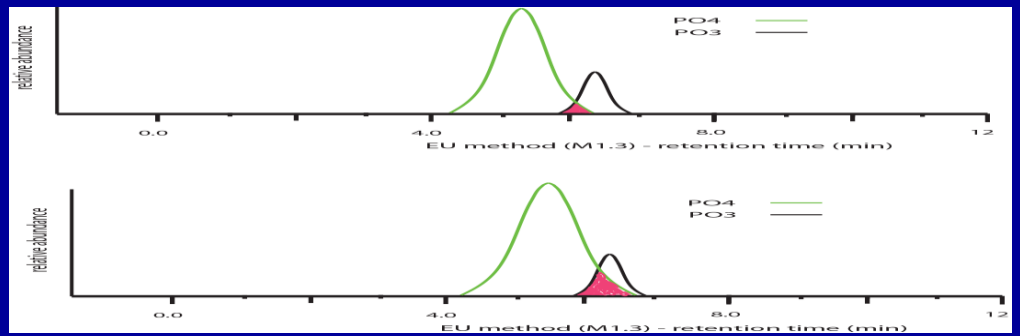
EU #3: degradants/metabolites
("false" MRL exceedances)



fosetyl (MW 110)

PO3 (MW 82) phosphite, phosphonate, phosphorous acid

PO4 (MW 98) phosphate, phosphoric acid



EU #3: degradants/metabolites
(false MRL exceedances)

"Hypothetical" scenario

pesticide – isolated from a microbe via "natural inspiration"

- Conventional – applied synthetic
- Organic – applied microbial "broth"
- Biologic – applied microbe

What if a "shared" trigger?

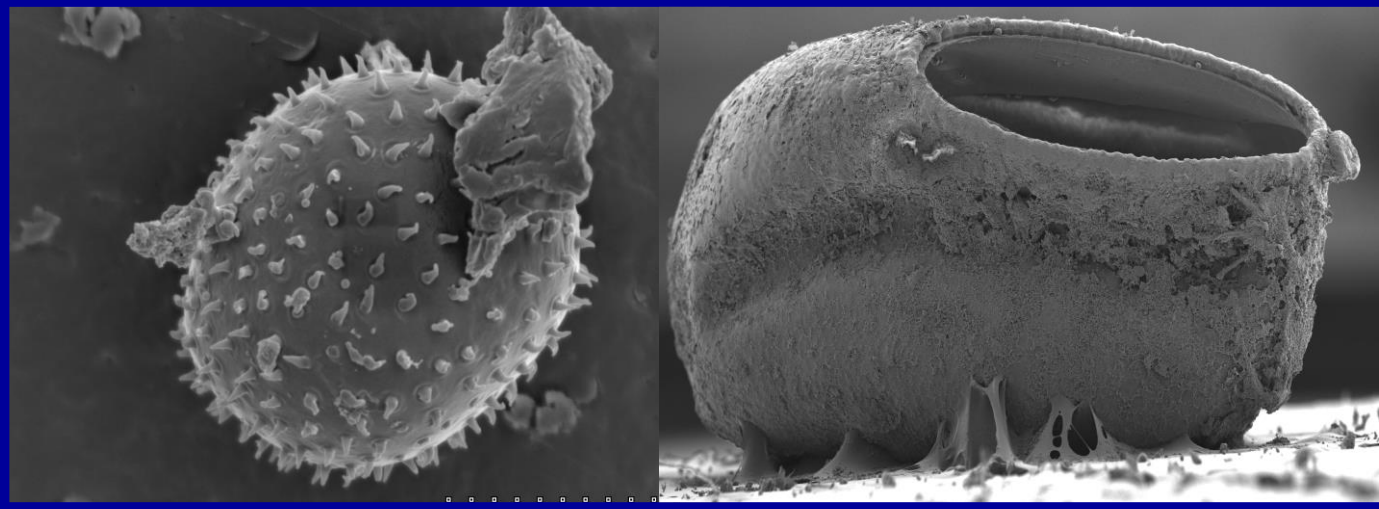
How do we guide “enforcement”?

- chemical ? MRL (EU is likely to take this approach)
- molecular ? SPS adopt. has been slow

Molecular Advances in Larval Fruit Moth Identification to Facilitate Fruit Export From Western United States Under Systems Approaches

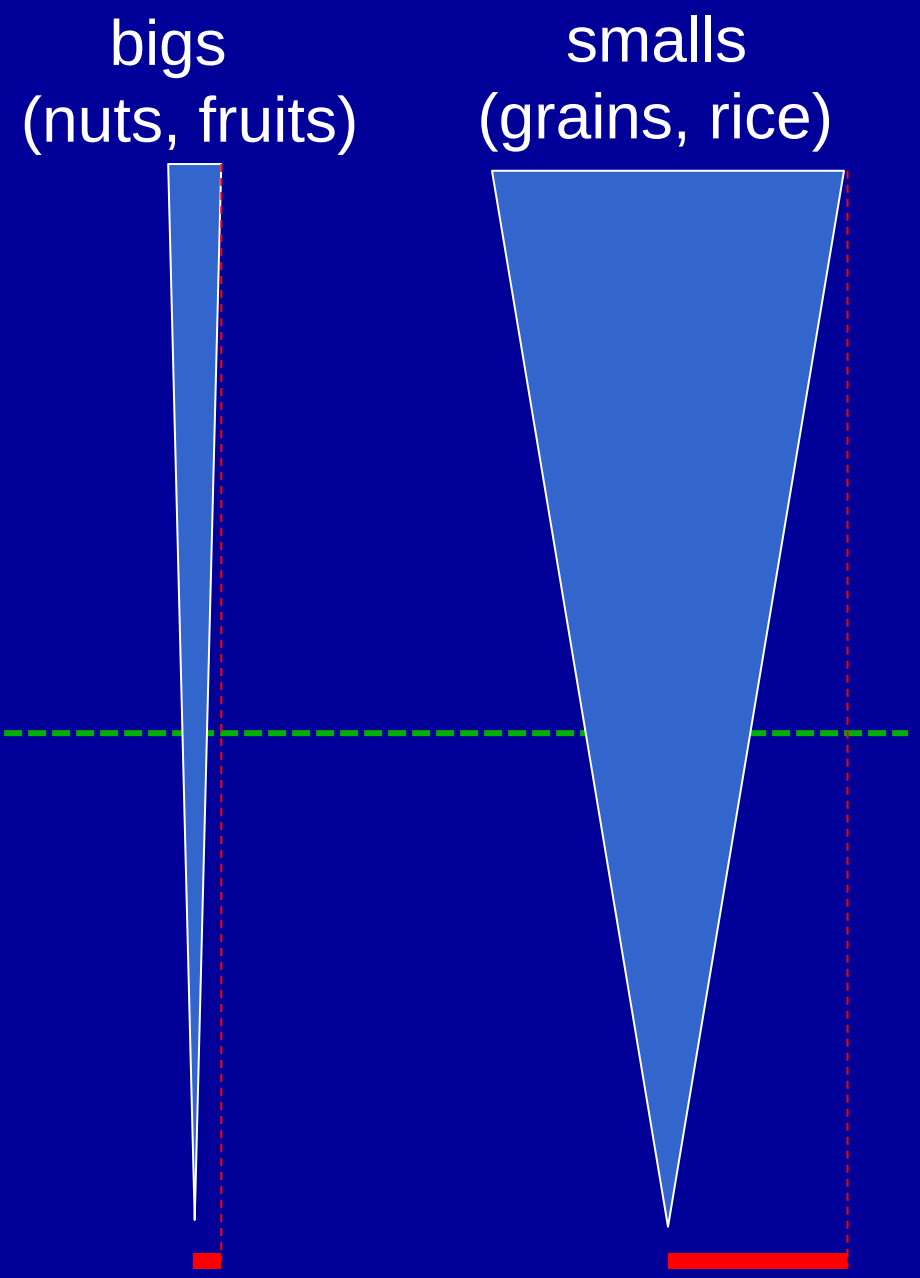
Raymond Yokomi,[1,4,*] Jennifer K. Delgado,[2,*,†] Thomas R. Unruh,[3] Nina M. Barcenas,[2] Stephen F. Garczynski,[3] Spencer Walse,[1] Adalberto A. Pérez de León,[1] and William Rodney Cooper[3]

- biological?



Postharvest fumigants work!

	bp °C
• ozone	-112
• phosphine	-87
• carbon dioxide	-79
• sulfuryl fluoride	-55
• sulfur dioxide	-10
• methyl bromide	4
• hydrogen cyanide	26
• propylene oxide	34
• ethyl formate	54
• Vapona (non-food)	148
• pyrethrin	170



phosphine

- QPS uses fresh & durables (USAID)
- USEPA re-registration Q3 2022 (buffers looking good)
- Concentration monitoring required on FIFRA label (finally)
- CODEX re-registration
  - Non-food use, no-tolerance
    (think pre-plant fumigant)

TOWARD THE GLOBAL FUTURE

ISPM No. 28

PHYTOSANITARY TREATMENTS FOR REGULATED PESTS

procedures for postharvest fumigants

FAO
PLANT
PRODUCTION
AND PROTECTION
PAPER
225

Submission and evaluation of pesticide residues data for the estimation of maximum residue levels in food and feed

OECD – test guideline opportunity

sulfuryl fluoride

- QPS uses
- only durables
- emission control

Wirkung wie der innerdeutsche Flugverkehr

S+ Deutschlands unbekannter Klimakiller

Sein Name ist unaussprechlich, die Klimawirkung tausendfach stärker als die von CO_2: Sulfurylfluorid, in großen Mengen eingesetzt, entweicht direkt in die Atmosphäre – ohne in der Klimabilanz aufzutauchen. Der Schaden ist enorm.

Von **Susanne Götze**
31.03.2021, 10.38 Uhr

Containerschiffe im Hamburger Hafen: Sulfurylflourid-Einsatz vor dem Holzexport nach China Foto: Ingeborg Knol / imagebroker / imago images

FAS & ARS & Others

- Technical Assistance for Specialty Crops (TASC)-USDA
  Agreement: # 2018-02

- Project Title: "Preserving sulfuryl fluoride for dried fruit exports to the European Union"
  - AMOUNT: $2,500,000

- Project Goal:
  – Marketing: Long-term retention of USA-grown dried fruit and tree nuts treated with sulfuryl fluoride (SF)

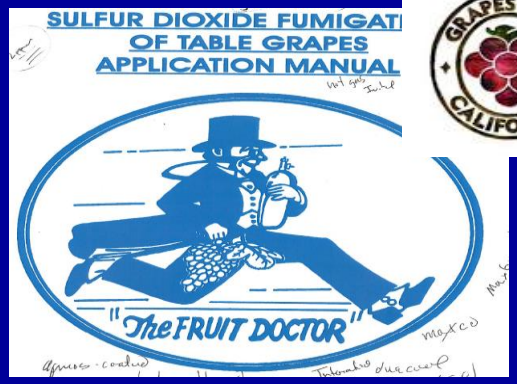
20ft container- “Single pass”

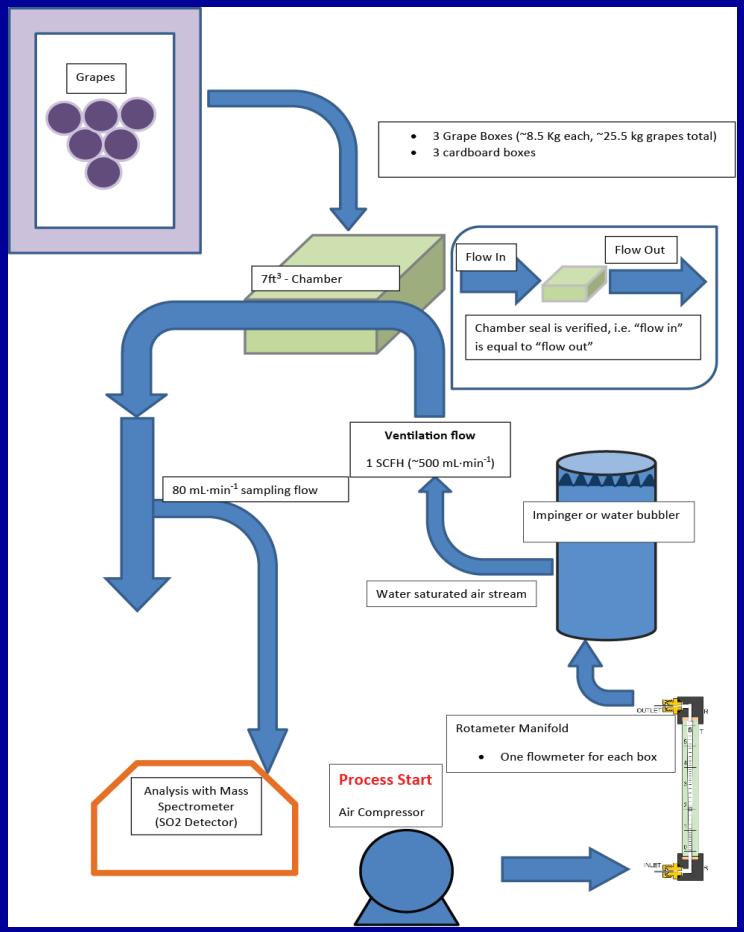
125 g m^{-3} dosage

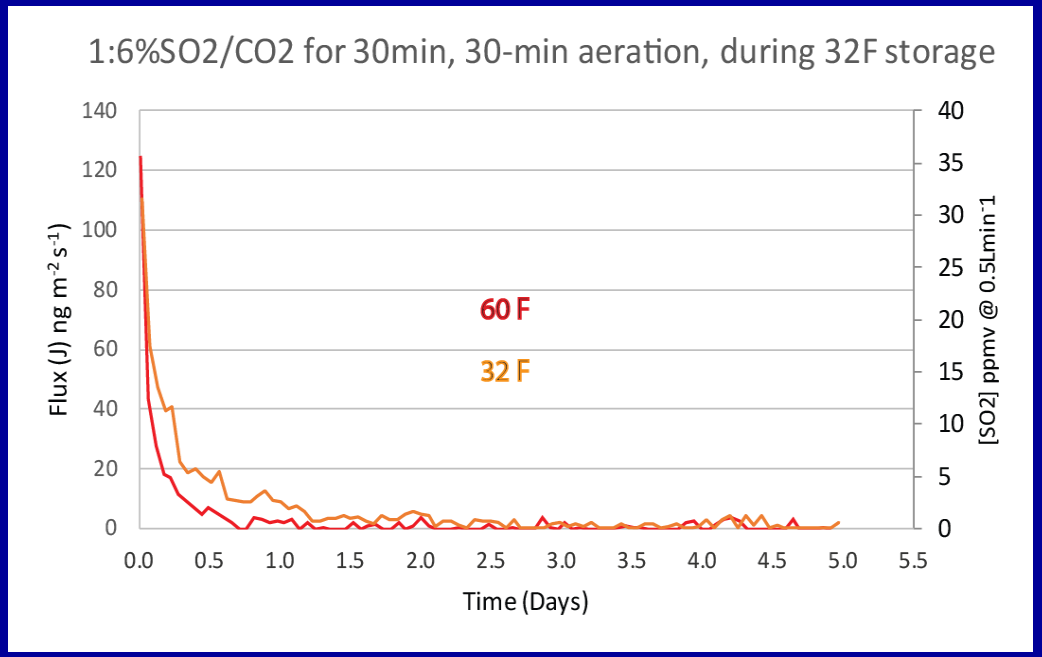
							[SF]20	[SF]35	Half-loss (min)
							-	1.12%	
							-	9.97%	8.466800118
							33.24%	-	
							67.22%	-	5.49073462
Test 3	First Column	^{FC}[SF]	19.95%	21.52%	21.27%	-	13.79%	-	
OH	Exhuast	^{E}[SF]	40.01%	38.48%	42.75%	-	34.09%	-	5.38323775
Test 5	First Column	^{FC}[SF]	81.98%	87.60%	90.06%	-	100.00%	-	
H2O2	Exhuast	^{E}[SF]	98.11%	100.00%	100.00%	-	100.00%	-	6.165682022

sulfur dioxide

- USEPA reregistration
- grapes & blueberries







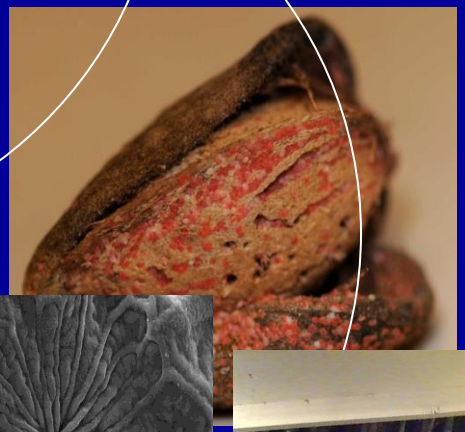
methyl bromide: the issue

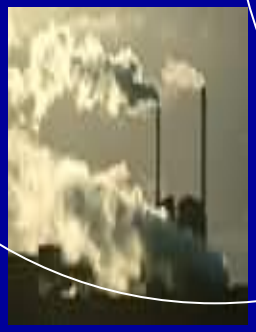
politics

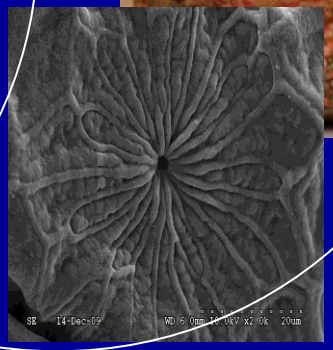
economics

science

$







port “large” Scenarios

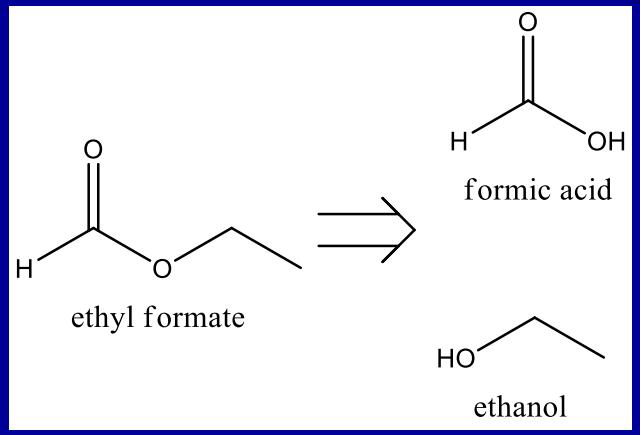
FreshFruitPortal.com (https://www.freshfruitportal.com)

The future of methyl bromide

May 24 , 2022

ethyl formate

- USEPA registration
- Fruits
- GRAS
- QPS uses (ACP)



eFUME™

GRAS per § 186.1316

PART 185—TOLERANCES FOR PESTICIDES IN FOOD

Subpart A [Reserved]

Subpart B—Food Additives Permitted in Food for Human Consumption

§ 185.2900 Ethyl formate.

The food additive ethyl formate may be safely used in or on specified dried fruits in accordance with the following prescribed conditions:

(a) It is used or intended for use in or on raisins and dried Zante currants as a bulk and package fumigant.

(b) It is used in accordance with directions registered with the U.S. Environmental Protection Agency, and so used that the total formic acid present free and combined, in the finished product shall not exceed 250 parts per million.

GRAS per § 184.1293

Section 180.910 - Inert ingredients used pre- and post-harvest; exemptions from the requirement of a tolerance.

U.S. Environmental Protection Agency
Office of Pesticide Programs
List of Inert Pesticide Ingredients
List 4B - Other ingredients for which EPA has sufficient information to reasonably conclude that the current use pattern in pesticide products will not adversely affect public health or the environment. - By Chemical Name
Updated August 2004

GRAS per § 184.1295

eFUME® "Special Citrus Use"

Spencer Walse USDA - ARS

ozone

- GRAS
- structurally selective
  - can work (grey mold)
  - cant work (certain pesticides)
- poor penetrator
  - into commodity
  - pore, bulk
- coffee, table grapes

Environmental Science & Technology
ARTICLE
pubs.acs.org/est

Remediation of Fungicide Residues on Fresh Produce by Use of Gaseous Ozone

Spencer S. Walse*[†] and Hakan Karaca[‡]

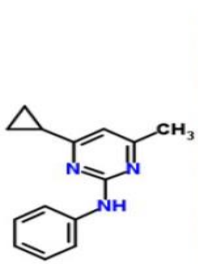
[†]Agricultural Research Service, United States Department of Agriculture, 9611 South Riverbend Avenue, 93648, Parlier, California, United States

[‡]Department of Food Engineering, Faculty of Engineering, Pamukkale University, 20070 Camlik, Denizli, Turkey

During ocean transportation

Ozone brings MRLs of fungicides and pesticides down within limits

Restrictions on the use of pesticides and fungicides are becoming increasingly stringent. In some cases, changes to Maximum Residue Levels (MRLs) are made by governments overnight, putting a lot of pressure on growers and exporters. "Most of the pressure is coming from the European Union," says Christian DeBlasio, CEO of Purfresh. "They are one of the most stringent government groups when it comes to acceptable MRLs on produce."



ian DeBlasio, CEO of Purfresh.

Contents lists available at ScienceDirect

Postharvest Biology and Technology

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

ELSEVIER

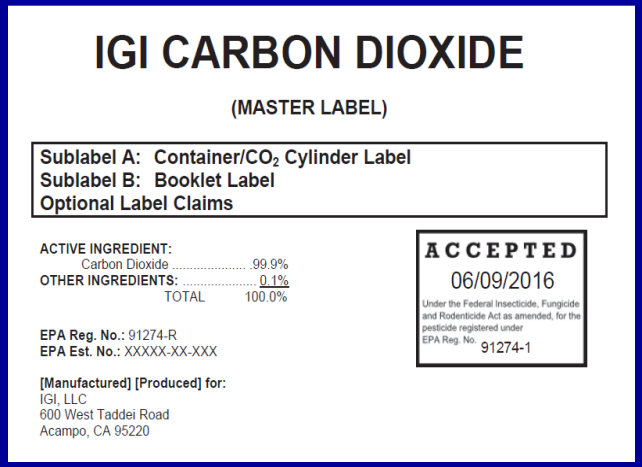
Postharvest fumigation of California table grapes with ozone to control Western black widow spider (Araneae: Theridiidae)

Spencer S. Walse*, J. Steven Tebbets, James G. Leesch

USDA, Agricultural Research Service, San Joaquin Valley Agricultural Sciences Center, 9611 South Riverbend Avenue, Parlier, CA 93648-9757, United States

carbon dioxide (low O_2)

- QPS uses
- no residues
- lacking efficacy data



IGI CARBON DIOXIDE

(MASTER LABEL)

Sublabel A: Container/CO_2 Cylinder Label
Sublabel B: Booklet Label
Optional Label Claims

ACTIVE INGREDIENT:
Carbon Dioxide 99.9%
OTHER INGREDIENTS: 0.1%
TOTAL 100.0%

EPA Reg. No.: 91274-R
EPA Est. No.: XXXXX-XX-XXX

[Manufactured] [Produced] for:
IGI, LLC
600 West Taddei Road
Acampo, CA 95220

ACCEPTED
06/09/2016
Under the Federal Insecticide, Fungicide and Rodenticide Act as amended, for the pesticide registered under
EPA Reg. No. 91274-1

Low O2

CO2

-

+

Cig. beetle

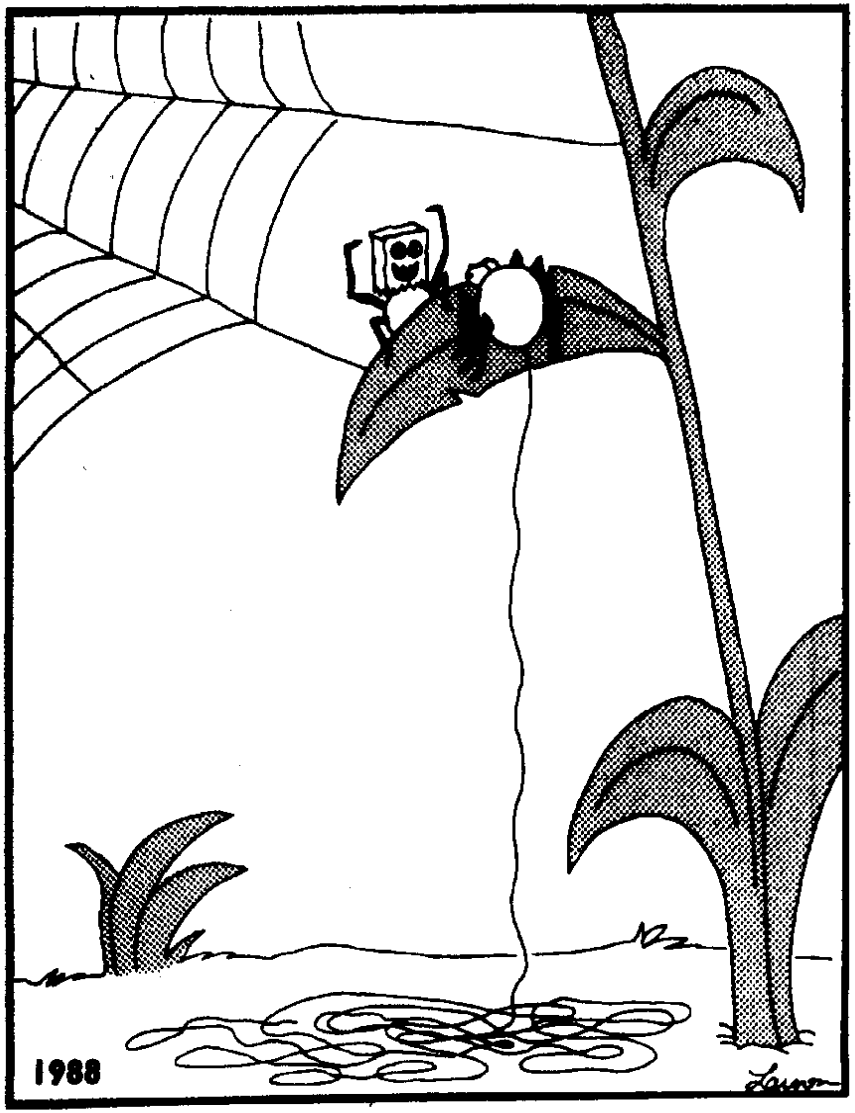
NOW

tab. moth

	Treatment time (d)	*L. serricone* E	*L. serricone* P	*L. serricone* ML	*L. serricone* LL	*A. transitella* E	*A. transitella* P	*A. transitella* ML	*A. transitella* LL	*E. elutella* LL
A) 0% CO_2	*0*	7.4	10.7	3.1	1.8	45.9	10.2	0	2	10.5
	3	98.5	94.5	98	52.2	100	98.5	30.9	33.4	46.3
	6	100	100	100	93.9	100	100	98.9	95.9	99.4
	8	100	100	100	93.9	100	100	100	100	100
	10	100	100	100	99.4	100	100	100	100	100
	12	100	100	100	100	100	100	100	100	100
B) 15%	*0*	12.4	1	1	2.2	55.6	19.4		1.9	5.9
	3	97	91.9	100	71.4	100	100		20.1	50.7
	6	100	100	100	100	100	100		85.5	98.5
	8	100	100	100	100	100	100		95.5	100
	10	100	100	100	100	100	100		100	100
C) 50%	*0*				2.1				0.4	9
	2				82.8				18.9	54.3
	4				98.3				90.8	100
	6				100				100	100
D) 99%	*0*				2.2				7.5	8.8
	2				79.6				31.3	58.2
	4				98.9				98.9	100
	6				100				100	100

Table 1. Results from CA treatments at 28°C. Stored product pests were treated with the following controlled atmosphere (CA) gas mixtures of oxygen, carbon dioxide and nitrogen [O_2 : CO_2 : N_2] as follows: A) 1% : 0% : 99% , B) 1% : 15% : 84% , C) 1% : 50% : 49% and D) 1% : 99% : 0 %. Egg, pupae and larval life stages of navel orangeworm (NOW) and cigarette beetle were treated with atmospheres A and B, at which point most the most CA treatment-tolerant life stage was determined to be the late-stage larvae for both species. Only the late larval stage of CB and NOW were treated with atmospheres C and D. Tobacco larvae were treated with all four mixtures, with tests ongoing for other life stages for mixtures A and B.

To be low O2, or not?



"Hey, Bob … did I scare you or what?"

THANK YOU