Evaluation of variety tolerance and chemical control of Fusarium vine decline

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Fusarium wilt

Fusarium falciforme
vine decline

Fusarium wilt

Fusarium crown and root rot

Fusarium falciforme stem rot and vine decline

Cassandra Swett


N 6428
Cassandra Swett

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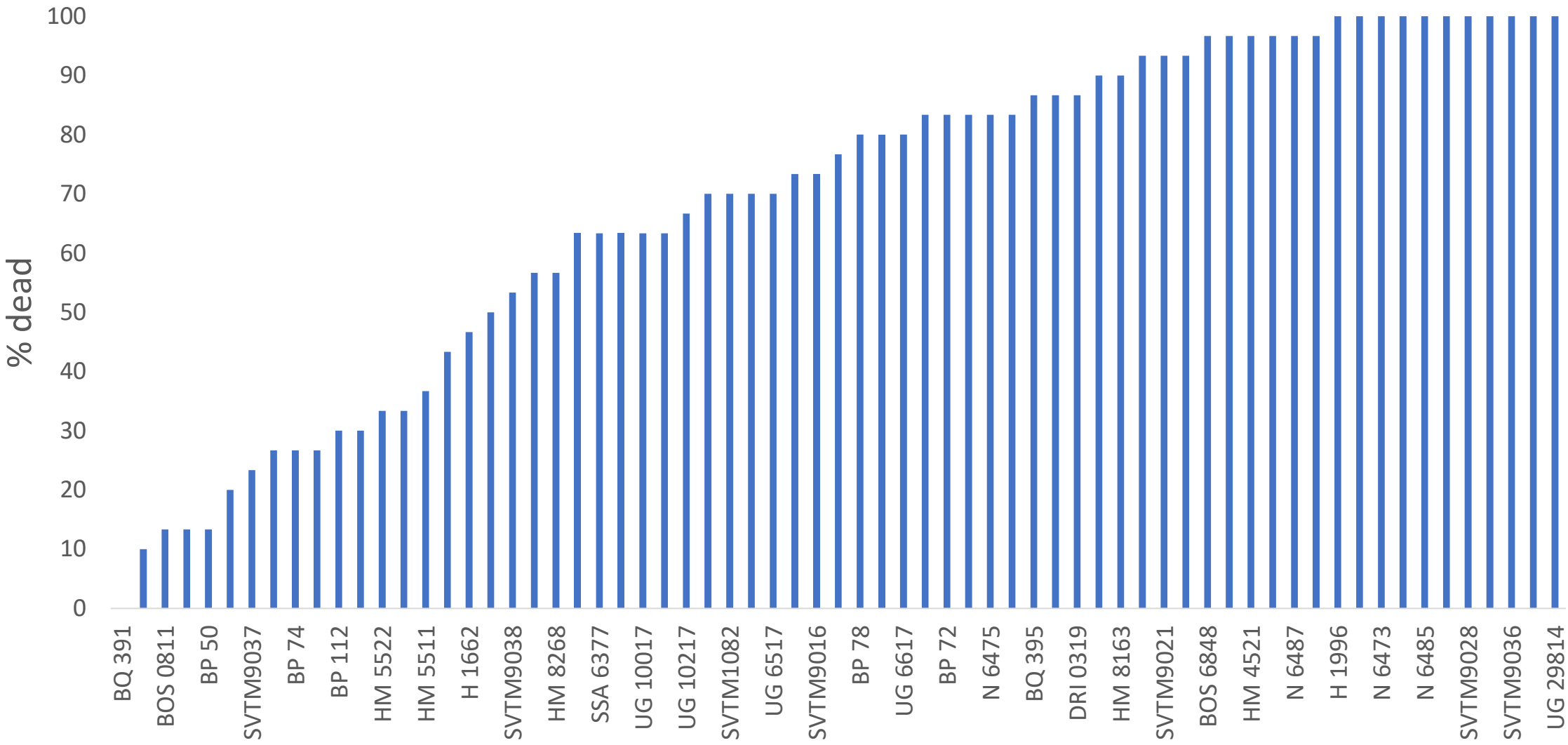
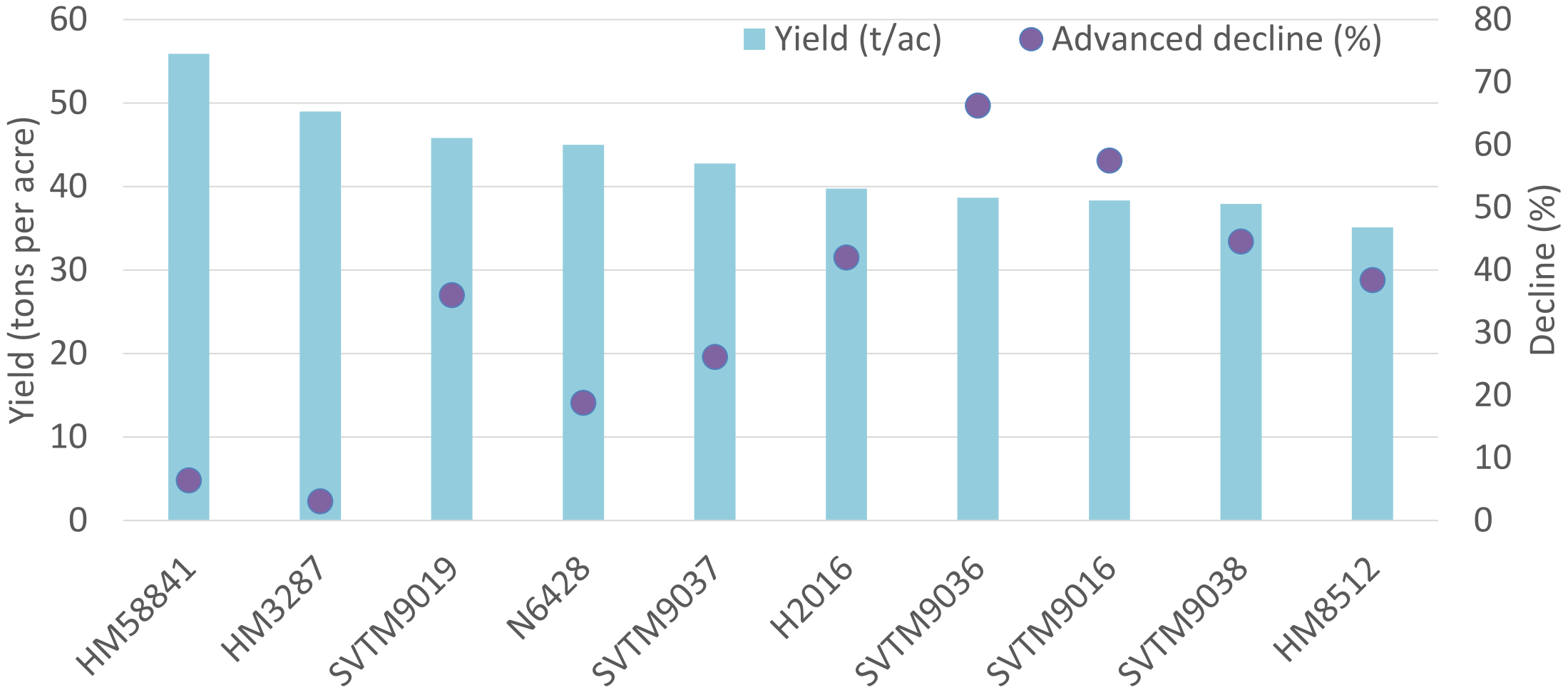
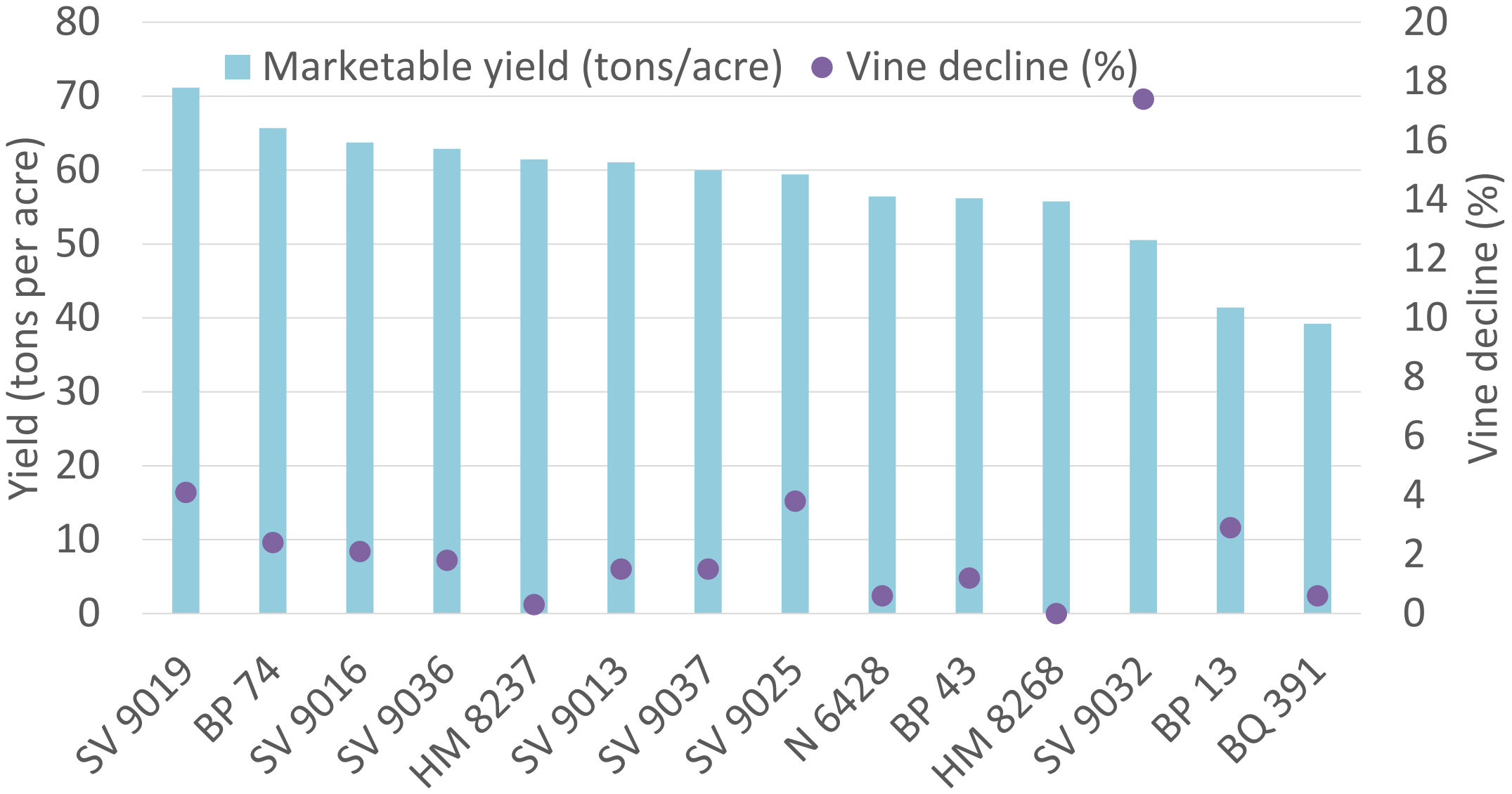


TS&L variety trial in a commercial field, Yolo County 2022



2022 Sutter County Ag Seeds trial



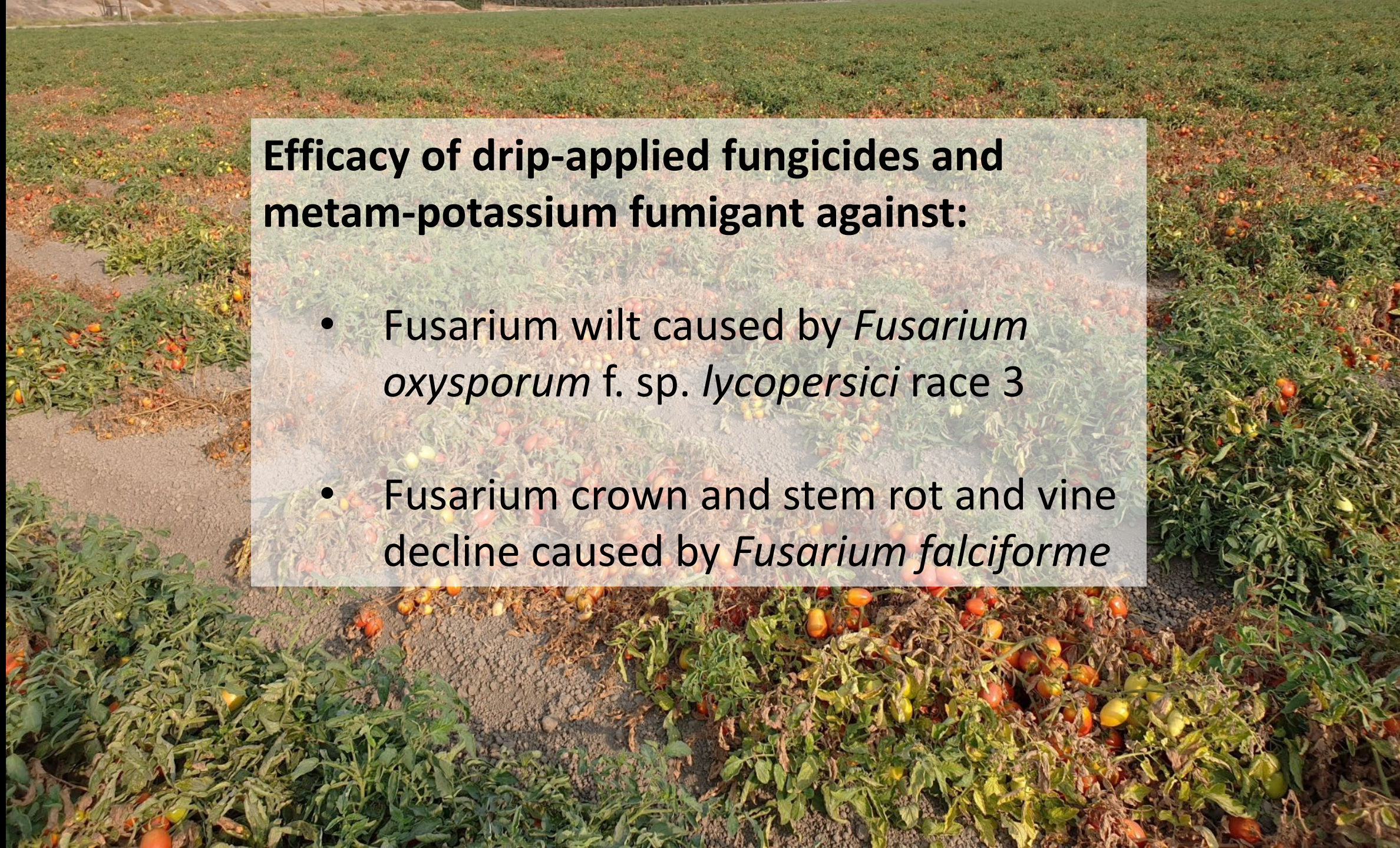
2022 San Joaquin County trial

Cultivar	# of field trials	Normalized yield[x]	Normalized fruit damage levels[y]	Fruit damage average to very low	Normalized vine decline at harvest[z]	Tendency towards vine decline
HIGH PERFORMING						
H1776	3	1.26	0.54	very low fruit damage	0.96	average tendency towards vine decline
SV9016	3	1.16	0.52	very low fruit damage	0.82	more data needed
SV9019	2	1.15	0.61	very low fruit damage	0.54	more data needed
N6428	7	1.13	0.65	low fruit damage	0.87	less likely to decline prematurely
SV9025	3	1.13	0.39	very low fruit damage	0.95	more data needed
H5608	4	1.10	0.77	low fruit damage	0.44	more data needed
H8504	5	1.10	0.67	low fruit damage	0.80	less likely to decline prematurely
DRI0319	3	1.06	0.96	average damage	0.41	less likely to decline prematurely
N6434	3	1.05	0.73	low fruit damage	0.38	more data needed
HM58841	5	1.05	0.86	low fruit damage	1.04	average tendency towards vine decline
MEDIUM PERFORMING						
BQ273	2	1.04	1.65		0.24	more data needed
H1428	3	1.00	0.81	low fruit damage	0.89	more data needed
HM5235	4	1.00	1.39		0.90	less likely to decline prematurely
HM58801	5	0.97	1.16		0.96	average tendency towards vine decline
H1996	2	0.96	0.57	very low fruit damage	1.50	more data needed
BQ403	2	0.95	1.30		1.06	more data needed
HM4909	5	0.92	0.97	average damage	1.13	more likely to decline prematurely
SV9011	2	0.90	1.30		0.69	more data needed
H4707	2	0.90	0.56	very low fruit damage	0.95	more data needed
H1310	4	0.89	1.07		1.08	average tendency towards vine decline
H1662	2	0.88	0.43	very low fruit damage	0.98	more data needed
LOW PERFORMING						
HM5522	2	1.04	1.63		1.23	more data needed
BP13	2	1.02	1.65		1.32	more data needed
HM3887	7	0.88	1.35		1.33	more likely to decline prematurely
SV8011	3	0.86	1.07		1.37	more data needed
H9663	2	0.86	1.70		1.36	more likely to decline prematurely
AB0311	3	0.82	1.07	variable fruit damage	1.28	more data needed
N6416	2	0.77	1.30		1.30	more likely to decline prematurely

Top performers under *F. falciforme* pressure

- N 6428, N6434
- H 5608, H 1776
- SVTM 9016, SVTM 9019, SVTM 9025
- HM 58841, HM5235

- Trials on-going



Efficacy of drip-applied fungicides and metam-potassium fumigant against:

- Fusarium wilt caused by *Fusarium oxysporum* f. sp. *lycopersici* race 3
- Fusarium crown and stem rot and vine decline caused by *Fusarium falciforme*

Study sites

2019

- UC Davis field infested with Fusarium wilt
- UC Davis field infested with Fusarium falciforme
- Yolo Co. commercial field with Fusarium falciforme
- San Joaquin Co. commercial field with both diseases

2020 & 2021

- San Joaquin Co. commercial field with both diseases

Materials evaluated:

Fungicides (applied at planting and early season):

- **Miravis** (Syngenta) – pydiflumetofen (FRAC group 7)
- **Velum** (Bayer) – fluopyram (7)
- **Rhyme** (FMC) – flutriafol (3)

Fumigant (applied at least two weeks prior to planting):

- **K-Pam (AMVAC)** – metam potassium

Application timings

application timing(s) relative to transplant date	>2 weeks pre-plant	At transplanting	3 wk	5 wk
Product (active ingredient)				
Velum One (fluopyram)		drench	drip	drip
Rhyme (flutriafol)		drench	drip	drip
Miravis (pydiflumetofen)		drench	drip	drip
K-Pam (metam potassium)	drip			

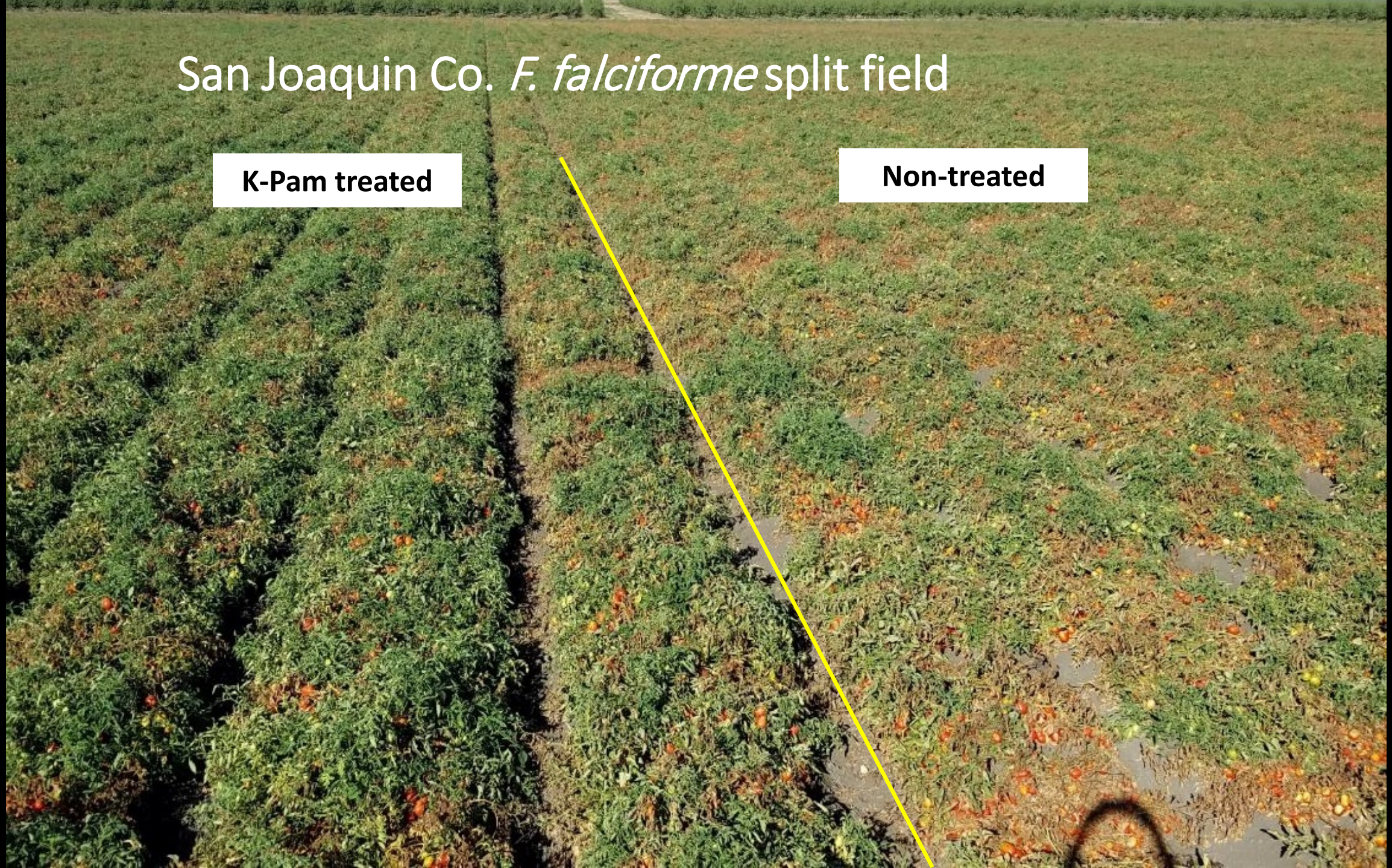
	Fusarium incidence (%)			Marketable yield		Fruit biomass	
Treatment	6-Jul	13-Aug		(tons/acre)		(tons/acre)	
K-Pam 31 gal	1.8	15.8	e	53.5	a	58.7	a
K-Pam 31 gal + AMV6125 at planting	3.0	18.8	de	48.6	ab	56.8	a
K-Pam 15.5 gal	3.0	23.0	cd	41.2	abc	49.9	ab
Rhyme 7 oz at 0, 4 & 6 wks	6.0	23.8	bcd	41.1	abc	47.8	ab
K-Pam 15.5 gal + AMV6125 at planting	3.3	21.5	cde	40.5	bc	48.2	ab
AMV6125 at planting	5.8	34.0	a	36.8	bcd	43.2	bc
Miravis 13.7 oz at 0, 2 & 4 weeks	3.5	27.5	abc	36.8	bcd	44.6	bc
Rhyme 7 oz at 0, 2 & 4 weeks	6.5	28.5	abc	34.0	cd	40.0	bc
Non-treated control	4.3	30.3	ab	27.6	d	34.1	c
Mean	4.1	24.8		40.0		47.0	
LSD	NS	7.03		12.69		12.09	
P-value	*NS*	*0.0004*		*0.015*		*0.008*	
CV %	*54.9*	*19.4*		*21.7*		*17.6*	

Means in the same column with the same letter are not significantly different.

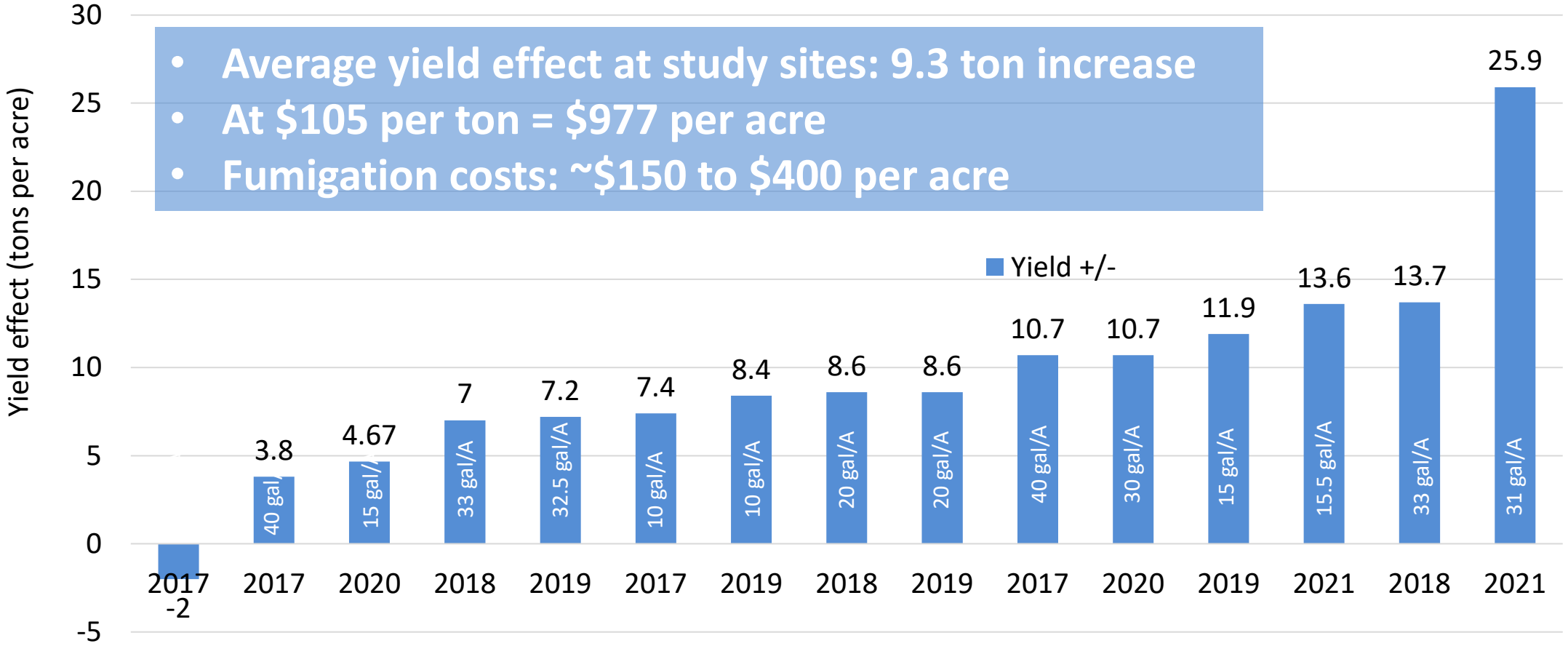
San Joaquin County trial, 2021

Summary of seven field trials including fungicides and/or fumigants

year	2019	2019	2019	2019	2019	2020	2021
location	UC Davis	UC Davis	Yolo Co	San Joaquin Co	San Joaquin Co	San Joaquin Co	San Joaquin Co
disease(s)	Fol	Ff	Ff	Fol	Ff	Fol & Ff	Fol & Ff
Product							
K-Pam ~30 gal	++	NT	NT	++	+ 7.2 t/a	+	+ 26 t/a
K-Pam ~15 gal	-	NT	+ 11.9 t/a	NT	NT	+	+ 13.6 t/a
Miravis	++	+	NT	++	NT	+	+ 9.2 t/a
Rhyme	-	NT	NT	-	NT	+	+ 10 t/a
Velum	-	+	NT	-	NT	-	NT
Disease level in non-treated control	68% vine decline	47% rot	73% rot	37% vine decline	20% vine decline	31% vine decline	30% vine decline
Disease *P value*	P < 0.05	NS	NS	0.01	not tested	0.06	0.0004
Yield *P value*	NS	NS	0.01	NS	0.016	NS	0.015


San Joaquin Co. *F. falciforme* split field
K-Pam treated
Non-treated

Effect of metam drip fumigation on processing tomato yield in trials 2017 to 2021



2017 -2018 data from
Marja Koivunen, AMVAC

Rates are expressed as broadcast equivalents,
Yield difference is expressed in comparison to non-treated control in Tons/A

FIFRA

Section 2(ee) Recommendation

Date: June 24, 2020

Product: Miravis® Prime
EPA Reg. No. 100-1603

Use: Suppression of Fusarium wilt in Fruiting Vegetables

State: California

Directions for Use

- **It is a violation of Federal law to use this product in a manner inconsistent with its labeling.**
- **The user must refer to the federally approved labels for the above noted product and read and follow all directions for use, restrictions, and precautions.**
- **The user should have this recommendation in its possession at the time of use.**
- **This recommendation for use of this product is permitted under Section 2(ee) of FIFRA and has not been submitted to or been approved by EPA.**

Apply 11.4 fl oz/A immediately after transplanting or within 7-14 days later. Make a second application of 11.4 fl oz/A, 14-21 days after the first application. Apply no closer than a 7-day interval. Apply using one of the following application methods:

- foliar spray in a 7- to 10-inch band spray over the top,
- direct nozzles on both sides of transplants as a soil-directed spray in a minimum of 20 GPA or,
- using overhead chemigation in 0.25 inches water per acre.

RHYME™
FUNGICIDE

FIFRA 2(ee) Recommendation

EPA Reg. No. 279-3588

FOR DISTRIBUTION AND USE IN ARKANSAS, CONNECTICUT, DELAWARE, FLORIDA, GEORGIA, KENTUCKY, ILLINOIS, INDIANA, MAINE, OHIO, MARYLAND, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, SOUTH CAROLINA, MASSACHUSETTS, MICHIGAN, NORTH CAROLINA, PENNSYLVANIA, RHODE ISLAND, TENNESSEE, VERMONT, VIRGINIA, WEST VIRGINIA

THIS RECOMMENDATION, WHICH CONTAINS ADDITIONAL DIRECTIONS FOR USE, IS MADE AS PERMITTED UNDER FIFRA SECTION 2(ee) AND HAS NOT BEEN SUBMITTED TO OR APPROVED BY THE US EPA.

This recommendation for Rhyme™ fungicide is valid until March 31, 2025, or until withdrawn, canceled or suspended.

Use of this product according to this bulletin has not been reviewed or endorsed by the Office of the Indiana State Chemist

IT IS A VIOLATION OF FEDERAL LAW TO USE THIS PRODUCT IN A MANNER INCONSISTENT WITH ITS LABELING. ALL APPLICABLE DIRECTIONS, RESTRICTIONS AND PRECAUTIONS ON THE EPA REGISTERED LABEL MUST BE FOLLOWED.

THESE USE DIRECTIONS MUST BE IN THE POSSESSION OF THE USER AT THE TIME OF PESTICIDE APPLICATION.

FOR SUPPRESSION OF FUSARIUM SP. VIA CHEMIGATION IN TOMATOES

Directions for Use

Rhyme fungicide will provide suppression of listed diseases.

Apply preventatively or when conditions are favorable for disease development. Repeat as necessary if conditions are favorable for disease development. Best results for soilborne pathogens has been obtained when Rhyme fungicide is applied preventively, shortly after transplanting, followed by subsequent applications at 14 day intervals to provide protection of the roots from soilborne pathogens.

Crop	Pest	Rate (fl oz/A)	PHI	Retreatment Interval (Days)	Restrictions
Tomatoes (see label for listed crops)	Fusarium sp.(Suppression) (*Fusarium oxysporum*)	7	0	14	• Do not apply more than 7.0 fl. oz. (0.114 lb ai) product/A/ application. • Do not apply more than 28 fl. oz. of product/A/year. • Do not make more than 4 applications/ year. • Do not apply more than 0.455 lb. ai of flutriafol or flutriafol containing products/A/year.

Variety selection and chemical control

We don’t have resistance to the new Fusarium vine decline, but there are varieties that are more tolerant

Chemical control is not highly effective, but combined with other measures it can often be useful

Acknowledgements

California Tomato Research Institute

Ag Seeds and TS & L

Cassandra Swett & Kelley Paugh, UC Davis Plant Pathology

Amber Vinchesi-Vahl, UCCE Colusa & Sutter/Yuba counties

Tom Turini, UCCE Fresno County

Del Carlo Farms, R & J Sanguinetti Ranch, Coit Farms, Dresick Farms

Bill Vignolo, Simplot Stockton

AMVAC, Syngenta, Bayer and FMC

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