Variety evaluation and chemical control for Fusarium diseases

Brenna Aegerter and
Patricia Lazicki, UCCE

in collaboration with

Tom Turini, Zheng Wang, and Amber Vinchesi-Vahl, UCCE

Cassandra Swett, UC Davis

AgSeeds and TS&L

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Host resistance or tolerance to Fusarium diseases in processing tomatoes

- Many varieties have resistance to Fusarium wilt race 3 (resistance designated by ‘FFF’ or F3)
- A few varieties have resistance to Fusarium crown and root rot (resistance designated by ‘Fr’)
- No resistance yet identified to Fusarium stem rot and vine decline (FRD)


N 6428
Cassandra Swett

Cassandra Swett

Varietal tolerance

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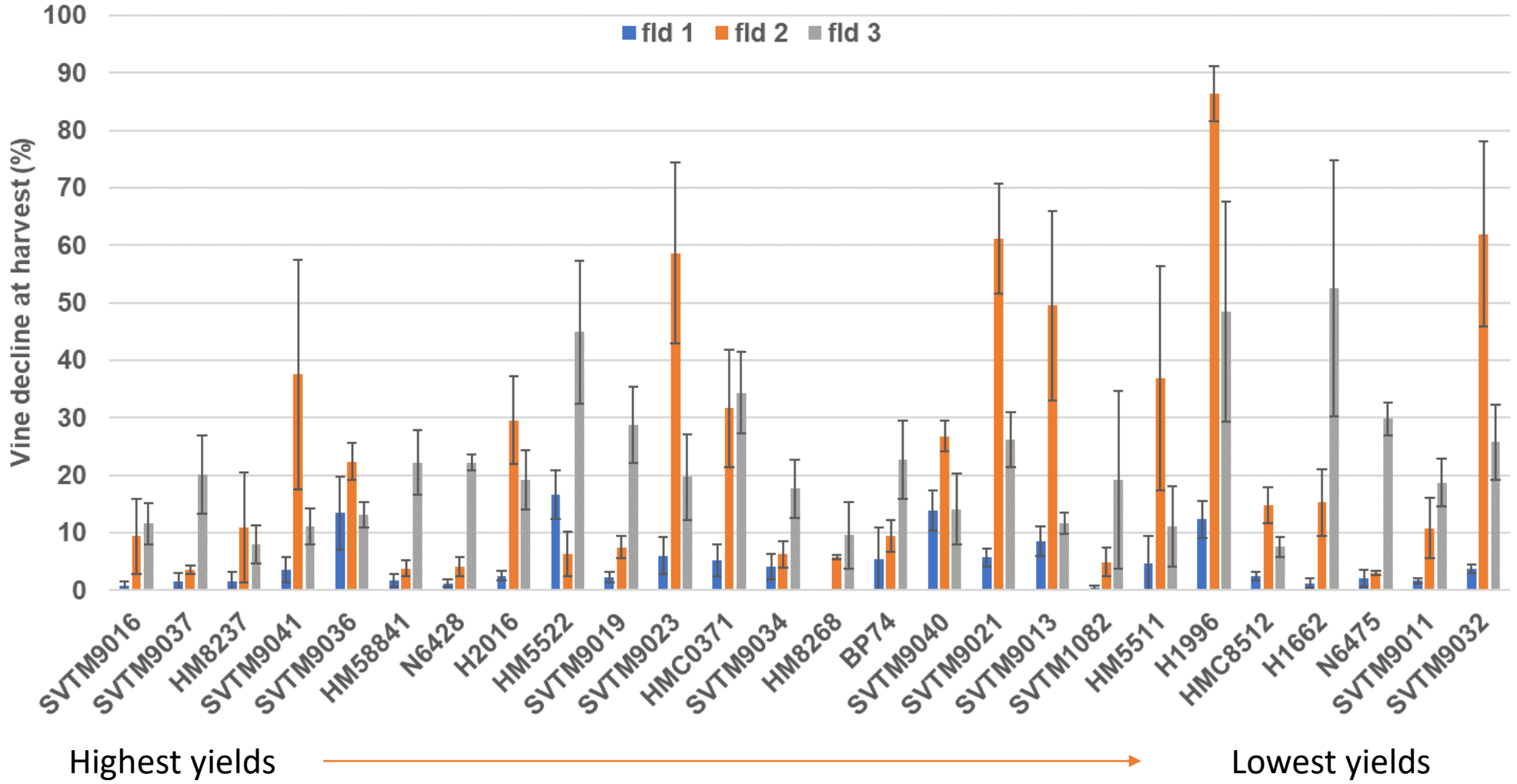
Sources of variety performance data

- Trials conducted on the UC Davis campus farm in infested soil
- Trials established by UCCE farm advisers in commercial fields with confirmed laboratory diagnosis of FRD pathogens
- Replicated yield trials established by AgSeeds in fields with vine decline
- Other variety trials we come across (some not replicated, many without yield)

Challenges of variety evaluation

- Variation from site to site and year to year → need lots of data
- Foliar symptoms and rot not that indicative?
- We have focused on advanced vine decline and yield
- Yield performance is complex
- Current turnover in varieties is fast!

Varietal trials: 2023 collaborations with AgSeeds (Sutter & San Joaquin Counties)

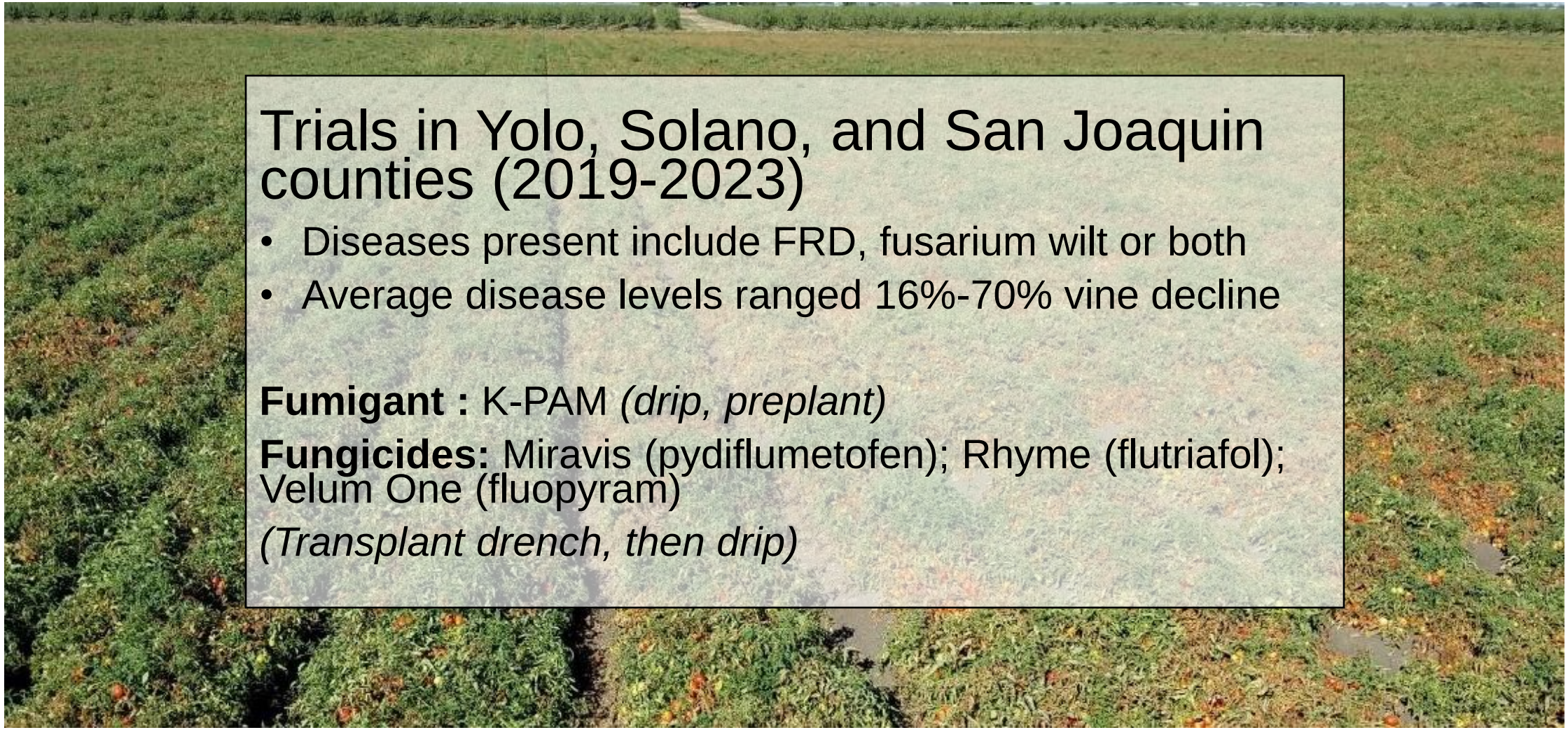


	Planting date	1-May		17-Apr		20-Apr		31-May		8-Jun	3-May	8-Jun	19-May	
	Location (county)	Yolo		Sutter		Sutter		San Joaquin		San Joaquin	San Joaquin	Fresno	Stanislaus	
	replicates	3		3		3		3		1	3	4	4	
	FRD pathogens			*F. noneumartii*		*F. noneumartii* *F. martii*		*F. martii*		*F. noneumartii*	*F. noneumartii* *F. martii*	*F. noneumartii*	not sampled	
	other soil pests			SB, tent. Forl		SB, tent. Forl		tent. Forl		tent. Forl		tent. Forl, RKN	tent. Forl	
	trial means	**36%**	**73.8 tons**	**5%**	**68.9 tons**	**24%**	**47.7 tons**	**22%**	**47.6 tons**	**27%**	**47%**	**19%**	**21%**	**42.6 tons**
	Variety	**disease**	**yield**	**disease**	**yield**	**disease**	**yield**	**disease**	**yield**	**disease**	**disease**	**disease**	**disease**	**yield**
	BOS0811	0.83	1.07									1.73	0.6	0.97
	BP74	1.69	0.54	1.16	0.96	0.398	1.02	1.04	0.98	0.88		0.37	0.48	0.90
	BP88										0.42			
	BP101												1.86	0.81
	BQ391	0.12	1.46											
	H1662	1.35	0.89	0.27	0.93	0.64	0.91	2.39	0.97	3.54		1.04	2.58	0.90
	H1996			2.63	1.01	3.63	0.76	2.21	1.06	3.65				
	H2016			0.54	1.02	1.24	0.90	0.87	1.15	0.44				
	HM5511	1.69	0.47	1.02	0.99	1.55	0.99	0.51	0.85	0.29		0.69	1.44	0.97
	HM5522	0.86	1.10	3.53	1.02	0.27	1.03	2.05	1.02	1.59		1.59	2.16	0.92
	HM58841			0.36	1.04	0.16	1.12	1.01	1.02	1.22			0.18	1.29
	HM8237			0.34	1.05	0.46	1.02	0.37	1.23	0.06	0.5			
	HM8268	0.37	1.21	0	1.04	0.24	1.00	0.44	0.92	0.38	0.3	1.43	0.48	1.1
	HMC0371			1.12	0.97	1.33	1.08	1.57	0.97	0.36				
	HMC8512			0.53	0.97	0.62	0.92	0.35	0.94	0.24				
	N6428	0.22	1.61	0.27	1.03	0.17	1.08	1.01	1.01	0.24		0.6	0.54	0.83
	N6475			0.44	0.96	0.13	1.05	1.36	0.76	0.35				
	N6494										1.44			
	N6495										1.89			
	N6485										1.98			
	SVTM1082			0.09	0.92	0.21	1.04	0.87	0.92	0.29				
	SVTM9011	0.83	1.06	0.36	0.89	0.46	0.98	0.85	0.89	2.26		1.52	0.54	0.89
	SVTM9013			1.81	0.94	2.08	0.86	0.53	1.08	0.24				
	SVTM9016	0.52	1.36	0.17	1.01	0.40	1.23	0.53	1.23	0.11	0.43	1.11	1.86	0.76
	SVTM9019			0.49	1.04	0.31	1.18	1.31	0.84	0.23				
	SVTM9021			1.21	0.99	2.57	0.89	1.20	1.01	0.24				
	SVTM9023			1.28	1.09	2.47	0.89	0.90	1.04	3.17				
	SVTM9032			0.80	0.95	2.61	0.8	1.18	0.86	1.21				
	SVTM9034			0.89	0.99	0.26	1.13	0.81	0.88	0.61				
	SVTM9036	2.03	0.51	2.86	1.09	0.94	0.99	0.60	1.09	1.82		0.71	0.6	0.96
	SVTM9037	0.92	0.98	0.32	1.04	0.15	1.19	0.92	1.09	0.57		0.76	0.48	1.07
	SVTM9040	1.57	0.74	2.97	0.95	1.13	0.91	0.64	1.10	1.88	1.83	0.45	0.9	1.08
	SVTM9041			0.76	1.10	1.58	1.03	0.51	1.11	0.12	0.75			
	SVTM9042										1.23			
	SVTM9043										0.24			

Variety selection for fields with known FRD

- Newer varieties that exhibit tolerance in many/most FRD sites:
  HM8237, HM8268
  SVTM9016, SVTM9019, SVTM9037
- Older varieties with good tolerance:
  N6428
  HM58841
- Consult with seed retailers or UC advisors about your particular situation
- Study continuing in 2024

Chemical approaches to FRD management



Trials in Yolo, Solano, and San Joaquin counties (2019-2023)

- Diseases present include FRD, fusarium wilt or both
- Average disease levels ranged 16%-70% vine decline

Fumigant : K-PAM *(drip, preplant)*

Fungicides: Miravis (pydiflumetofen); Rhyme (flutriafol); Velum One (fluopyram)

(Transplant drench, then drip)

Photo by Brenna Aegerter

Chemical effectiveness in product trials, 2019-2023

- 9 trials
- Location, pathogen and disease pressure didn't have a clear relation to effectiveness

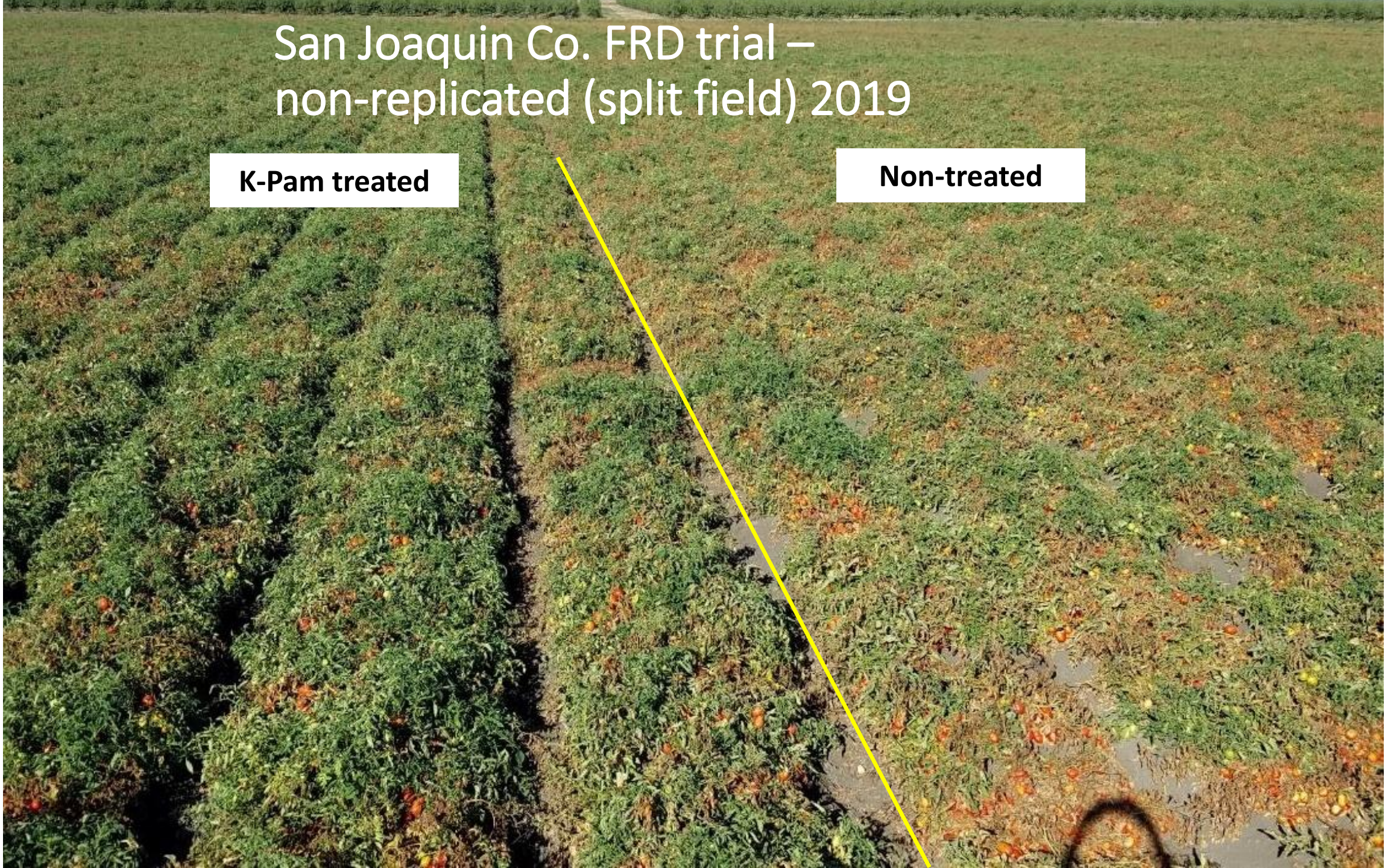
Product (active ingredient)	Sig. disease effect?	Sig. yield effect?	Range in average yield boost (where sig.)
K-PAM (metam potassium) ~30 gal/acre	4 (of 6 trials)	4 (of 7 trials)	3.5 – 26 t/a
K-PAM (metam potassium) ~15 gal/acre	2 (of 4)	2 (of 4)	11.9 – 13.6 t/a
Miravis (pydiflumetofen)	2 (of 4)	1 (of 4)	9.2 t/a
Rhyme (flutriafol)	1 (of 4)	1 (of 4)	10 t/a
Velum One (fluopyram)	1* (of 3)	0 (of 3)	

K-PAM @ ~30 gal/acre

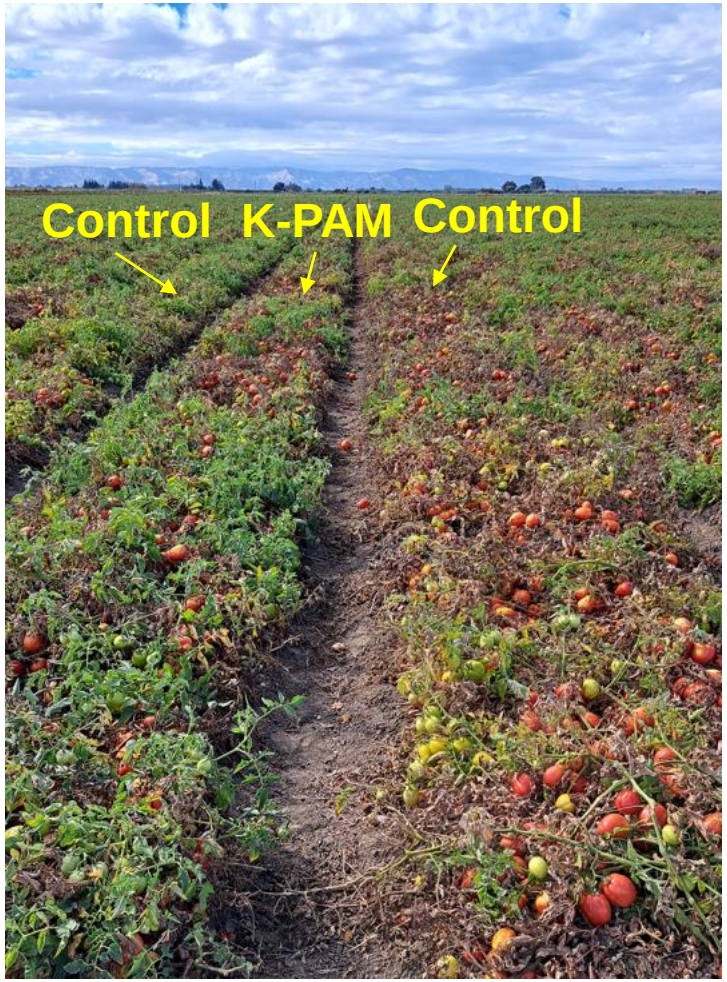
Site	UC Davis	San Joaquin co.	San Joaquin co.	San Joaquin co.	San Joaquin co.	Yolo co.	Solano co.
Year	2019	2019	2019	2020	2021	2023	2023
Disease	Fol	Fol	Ff	Fol & Ff	Fol & Ff	Fol, Ff, southern blight	Ff
Vine decline	68%	37%	20%	31%	30%	55%	16%
Decline?	++	++		+	++	NS	++
Yield increase?	NS	NS	7.2 t/a (++)	NS	26 t/a (++)	~4.7 t/a (+)	3.5 t/a (++)

+=statistically weak positive effects ++=statistically strong positive effect; NS=not significant

- @ $138/ton, 2-3 t/acre yield boost needed to offset 30-40 gal/acre K-PAM
- To break even for 3.5 t/acre yield difference, price needs to be ~$85-$114/ton


San Joaquin Co. FRD trial –
non-replicated (split field) 2019
K-Pam treated
Non-treated

Fumigation



Managing FRD: Conclusions

Variety selection

- A handful of varieties show FRD tolerance

Chemical approaches

- Sometimes useful
- Efficacy varies widely
- **Safest to combine with other approaches**

Acknowledgements

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