

# Chemical and varietal approaches to FRD management

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# Materials evaluated:

Please note that Propulse is not registered for use on California tomatoes.

## Fungicides (applied at planting and early season):

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

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

- **K-Pam (AMVAC)** – metam potassium



# Chemical effectiveness in product trials, 2019-2024

- Results of 10 trials in Yolo, Solano, and San Joaquin counties
- Diseases present include FRD, fusarium wilt and other soilborne diseases
- Average disease levels ranged 16% to 70% vine decline

Product (active ingredient)	Sig. disease effect?	Sig. yield effect?	Range in average yield boost (where sig.)
K-Pam (metam potassium) ~30 gal/acre	3 (of 6 trials)	5 (of 7 trials)	3.5 – 26 t/a
K-Pam (metam potassium) ~15 gal/acre	2 (of 3)	2 (of 3)	11.9 – 13.6 t/a
Miravis (pydiflumetofen)	3 (of 3)	1 (of 3)	9.2 t/a
Rhyme (flutriafol)	2 (of 3)	1 (of 3)	10 t/a
Velum One (fluopyram)	1* (of 3)	0 (of 3)	

\*Effect was statistically weak

<b>Site</b>	UC Davis	Yolo Co.	San Joaquin Co.	San Joaquin Co.	San Joaquin Co.	Yolo Co.	Solano Co.	San Joaquin Co.	Yolo Co.	Yolo Co.	
<b>Year</b>	2019	2019	2019	2020	2021	2023	2023	2024	2024	2024	
<b>Disease</b>	FRD	FRD	FRD	Fol & FRD	Fol & FRD	Fol, FRD, Forl, s. blight	FRD, Forl	RKN & FRD	FRD, vert	FRD	
<b>Product</b>	<b>Vine decline in non-treated control</b>	47%	73%	20%	31%	30%	55%	16%	19%	18%	21%
<b>K-Pam ~30 gal</b>	<i>Disease</i>				+	++	NS	++		NS	-
	<i>Yield</i>			7.2 t/a	NS	26 t/a	4.7 t/a	3.5 t/a		NS	7.5 t/a
<b>K-Pam ~15 gal</b>	<i>Disease</i>		NS		+	++					
	<i>Yield</i>		11.9 t/a		NS	13.6 t/a					
<b>Miravis</b>	<i>Disease</i>	+			+	++					
	<i>Yield</i>	NS			NS	9.2 t/a					
<b>Rhyme</b>	<i>Disease</i>				+	++			NS		
	<i>Yield</i>				NS	10 t/a			NS		
<b>Velum</b>	<i>Disease</i>	+			-				NS		
	<i>Yield</i>	NS			NS				NS		
	<b>Disease P-value</b>	NS	NS	Not tested	P=0.06	P=0.0004	NS	P=0.008	NS	NS	P=0.04
	<b>Yield P-value</b>	NS	P=0.01	P=0.016	NS	P=0.015	P=0.05	P=0.01	NS	NS	P=0.0006

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







# Varietal tolerance





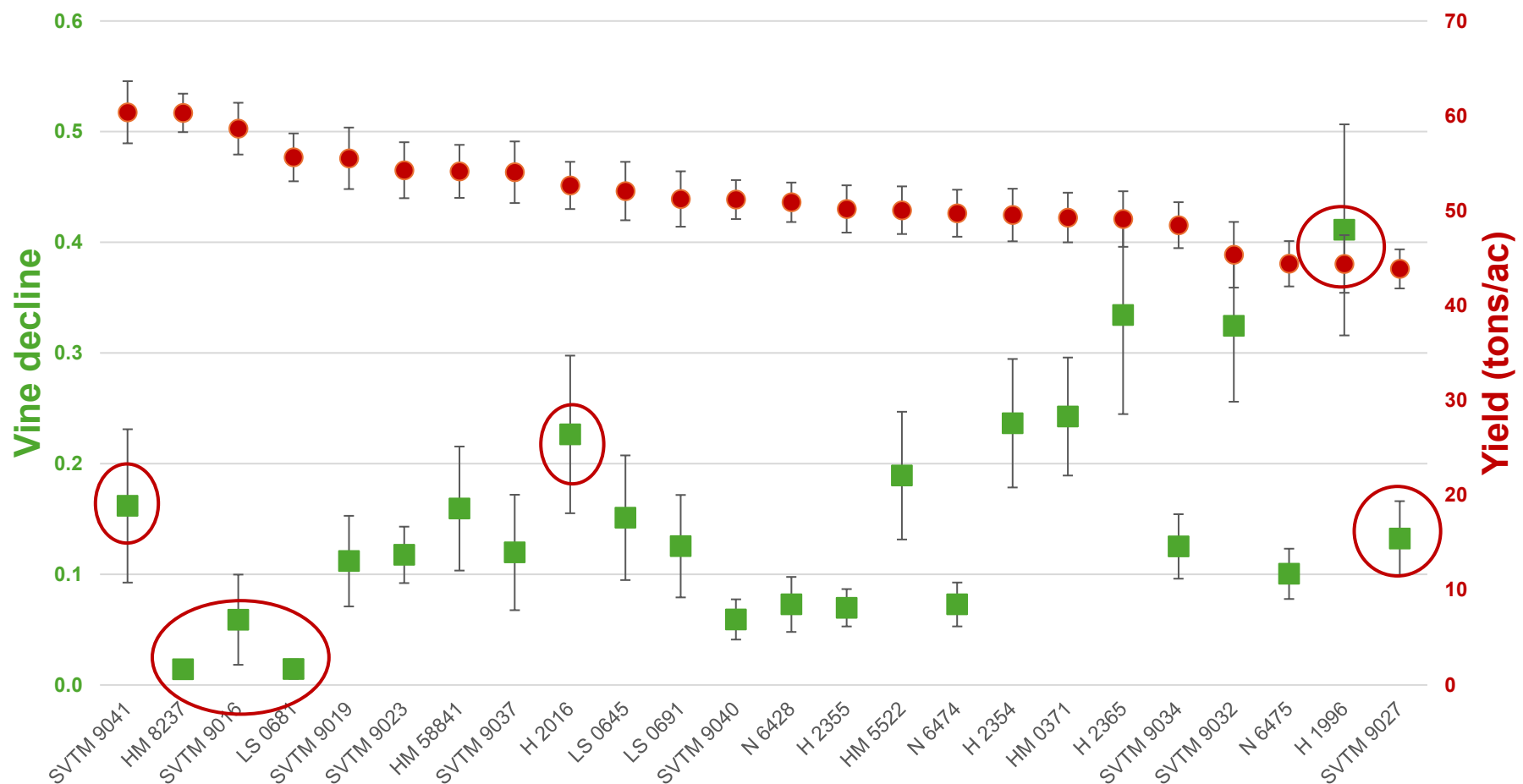
# No resistance gene for FRD, but wide range of tolerance among varieties

**Goal: Identify varieties which consistently perform well in infested fields**

- Grower fields, UCD inoculated trials
- ~25 replicated trials 2019-2024
- Other non-replicated trials we find
- Variety choice:
  - Widely grown
  - New material
  - Unusually susceptible or tolerant (control)
- Challenges:
  - Variable disease pressure across the field
  - Many pests/pathogens/abiotic issues in a field
  - Other factors affect yields



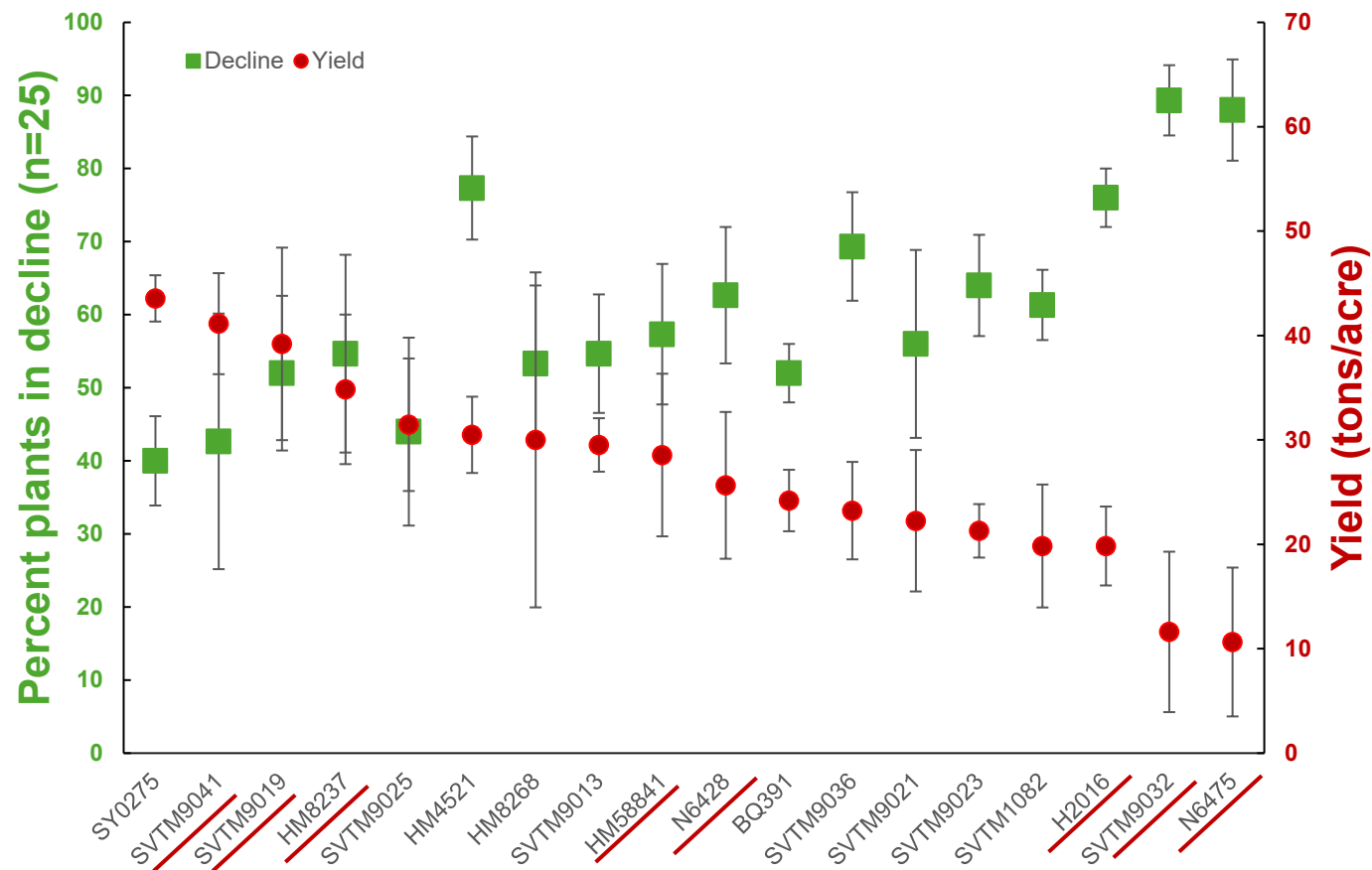
# 2024 results: AgSeeds Bioassay Trials



6 commercial fields: Yolo, Sutter, Colusa, San Joaquin counties. 3 replicates at each site



# 2024 results: Inoculated UCD trial





# 2024 trial summary

Normalized to trial mean (Values>1= higher than trial average yield or vine decline)

Statewide rank	Variety	Sutter 1 (1-70% VD) <i>FRD, RKN</i>		Colusa (0-9% VD) <i>FRD, s. blight</i>		Yolo 1 (1-25% VD) <i>FRD, Fol, RKN</i>		Sutter 2 (1-69% VD) <i>FRD, Fol, Ff</i>		Yolo 2 (0-55% VD) <i>FRD, Fol, Bc</i>		San Joaquin (2-87% VD) <i>FRD, s. blight, Bc, anthracnose</i>		UCD inoculated (40-89% VD) <i>FRD</i>		Mean	
		VD	Yield	VD	Yield	VD	Yield	VD	Yield	VD	Yield	VD	Yield	VD	Yield	VD	Yield
2	HM8237	0.1	1.1	0.1	1.1	0.4	1.2	0.0	1.3	0.0	1.2	0.1	1.3	0.9	1.3	0.13	1.19
44	SVTM9041	0.6	1.2	0.5	1.2	0.3	1.2	1.4	1.2	0.1	1.2	1.4	1.0	0.7	1.5	0.72	1.17
1	SVTM9016	0.1	1.1	0.9	1.1	0.3	1.1	0.1	1.2	0.2	1.2	0.8	1.1			0.39	1.15
	LS0681	0.1	1.1		1.0	0.1	1.1	0.0	1.1	0.0	1.1	0.2	1.2			0.08	1.08
11	SVTM9019	0.9	1.1	1.5	1.0	0.8	1.1	0.6	1.1	0.0	1.1	0.8	1.1	0.9	1.4	0.76	1.07
15	SVTM9023	1.0	1.1	0.3	1.0	1.1	1.0	0.6	1.1	0.4	1.0	0.8	1.0	1.1	0.8	0.69	1.05
4	HM58841	0.5	1.0	1.1	1.1	0.9	1.1	0.9	1.0	0.2	1.1	1.7	1.0	0.9	1.1	0.90	1.05
22	SVTM9037	0.3	1.1	0.1	1.1	0.3	1.0	1.4	0.8	0.0	1.1	1.0	1.0			0.53	1.04
5	H2016	1.9	1.0	2.0	1.0	0.8	1.0	2.1	1.0	0.3	1.0	1.2	1.2	1.2	0.7	1.37	1.03
	SVTM9040	0.2	0.9	0.4	1.0	0.7	0.9	0.3	1.1	0.2	0.9	0.6	1.1			0.39	1.00
	LS0645	0.6	1.0	0.4	1.1	0.3	1.0	1.5	0.9	0.3	1.0	1.3	1.0			0.73	1.00
9	N6428	0.5	1.0	0.5	1.0	0.6	0.9	0.2	1.1	0.3	1.1	0.7	1.0	1.0	0.9	0.44	1.00
	LS0691	1.3	1.0	1.1	1.0	0.5	1.0	0.4	1.1	0.0	1.0	1.0	0.8			0.72	0.99
6	HM5522	0.7	0.9	0.7	1.1	4.4	0.9	0.5	1.2	1.2	0.9	1.5	0.9			1.50	0.98
	H2355	0.7	0.9	1.6	1.0	0.2	1.0	0.1	1.0	1.0	0.9	0.3	0.9			0.66	0.98
25	N6474	0.7	1.0	1.5	0.9	0.2	1.0	0.6	1.1	0.1	0.9	0.3	1.0			0.56	0.97
	H2354	1.3	1.0	1.3	1.0	1.5	1.0	1.5	1.0	8.8	0.8	0.5	1.0			2.48	0.96
	HM0371	1.5	1.0	2.2	1.0	2.3	1.0	1.6	0.9	2.9	0.9	1.3	1.0			1.95	0.95
	H2365	3.3	1.0	0.3	0.9	1.7	1.0	3.1	0.7	1.1	1.1	1.2	1.1			1.79	0.95
32	SVTM9034	0.7	0.9	0.4	1.0	1.0	0.9	0.6	0.9	1.1	0.9	1.1	1.0			0.81	0.94
18	SVTM9032	2.5	1.0	1.1	0.9	2.7	1.0	1.3	0.9	3.2	0.8	2.4	0.7	1.5	0.4	2.19	0.88
21	N6475	0.5	0.9	1.5	0.9	0.3	0.9	1.0	0.8	0.1	1.0	0.6	0.8	1.4	0.4	0.67	0.86
8	SVTM9027	0.5	0.8	1.7	0.8	0.3	0.9	1.2	0.8	2.3	1.0	0.6	0.8			1.10	0.86
3	H1996	3.5	1.0	1.6	0.8	2.5	0.9	3.2	0.7	0.2	0.8	2.7	0.9			2.27	0.85

Highest mean yield



Lowest mean yield

FRD = Fusarium vine rot and decline; RKN = root knot nematode; s. blight= southern blight; Fol= fusarium wilt; Ff=Fusarium foot rot; Bc= Bacterial canker

**Green highlight:** Yields >5% more than average, decline >5% lower than average (mean across all sites)



# 2024 State top ten varieties: FRD risk

2024 Rank	Variety	# trials	Performance	Risk in FRD-infested fields
1	SVTM 9016	17	Generally has good yield, low vine decline at high-pressure sites	Green
2	HM 8237	15	Normally but not always high yields, usually low vine decline. Performs well in high pressure fields	Green
6	H 1996	12	Consistently high vine decline, generally low yields under disease pressure	Red
4	HM 58841	19	High to medium yields, usually but not always low vine decline. Tends to perform well in high pressure fields where F3 not present. F2 variety	Light Green
5	H 2016	12	Often has high vine decline under high disease pressure. May have reasonably good yields even when vine decline is high	Yellow
6	HM 5522	15	Susceptible to both FRD and F3. Yields decently despite decline. FORL resistant.	Yellow
7	HM 8268	9	More data needed. Tends to have low vine decline, medium yields.	Yellow
8	SVTM 9027	6	More data needed. In 2024: relatively low vine decline, not high yielding	Yellow
9	N 6428	17	Normally low vine decline, medium yields	Green
10	HM 7103		No data	

Questions about another variety? [palazicki@ucanr.edu](mailto:palazicki@ucanr.edu); (530-219-5198)



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