Host resistance for managing soilborne diseases in strawberry production

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Strawberry Center

NEXT GENERATION DISEASE RESISTANCE BREEDING

Disease Common Name	FL	SD-CA	DN-CA	NP	*R*-Gene	QTL	Complex
Charcoal rot	1	1	1	1		?	+
Fusarium wilt	N	1	1	1	*FaFo2A*		
Verticillium wilt	N	2	2	1		?	+
Anthracnose	1	3	3	2	*FaRca2*	?	
Phytophthora crown rot	2	3	3	2		*FaRPc2*	
Powdery mildew	2	3	3	2		+	+
Angular leaf spot	2	3	3	2	*FaRXf1*		
Colletotrichum crown rot	3	N	N	3		*FaCg1*, *FaCg2*	

1 = highest priority; 2 = medium priority; 3 = lowest priority; N = non-priority.

SD = short-day, DN = day-neutral, and NP = nursery production.

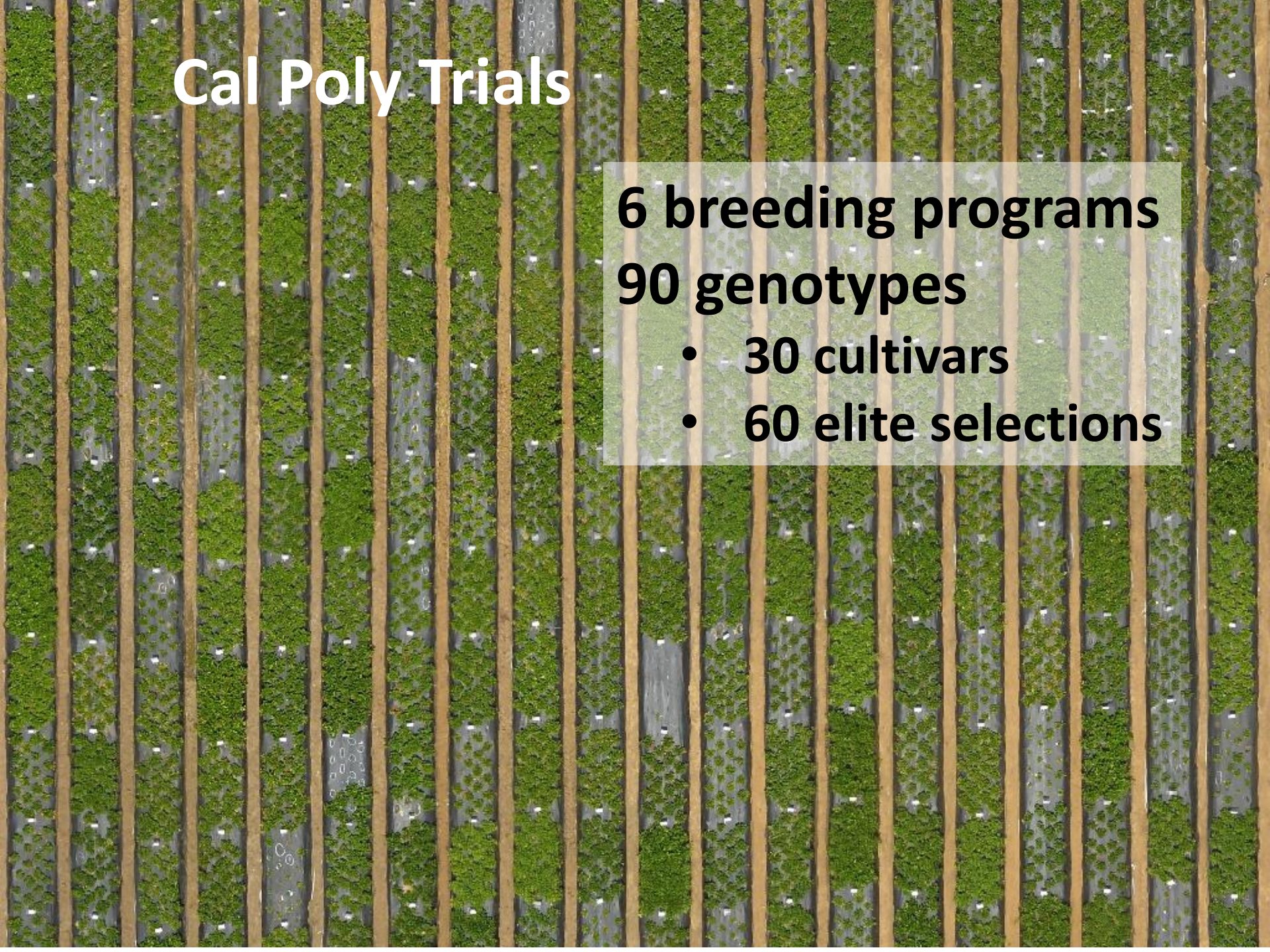
R-gene = resistance gene, QTL = large-effect quantitative trait locus, complex = polygenic, complex genetics, and ? = unknown or hypothesized.

Fields infested on the campus of Cal Poly:

Macrophomina phaseolina

Verticillium dahliae

Field infested at the Monterey Bay Academy:


Cal Poly Trials
6 breeding programs
90 genotypes
• 30 cultivars
• 60 elite selections

Fields infested on the campus of Cal Poly:

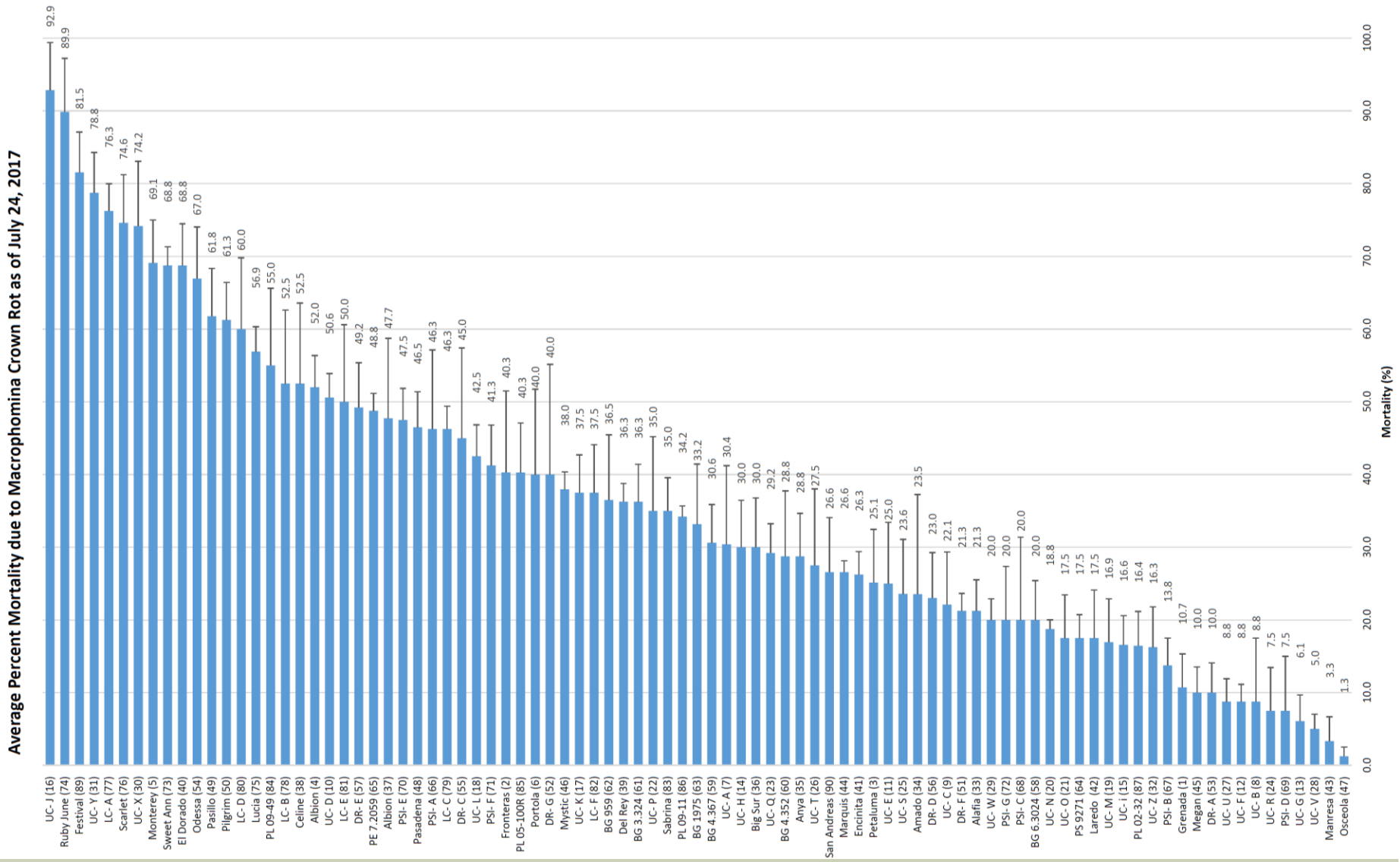
Macrophomina phaseolina

MACROPHOMINA TRIAL

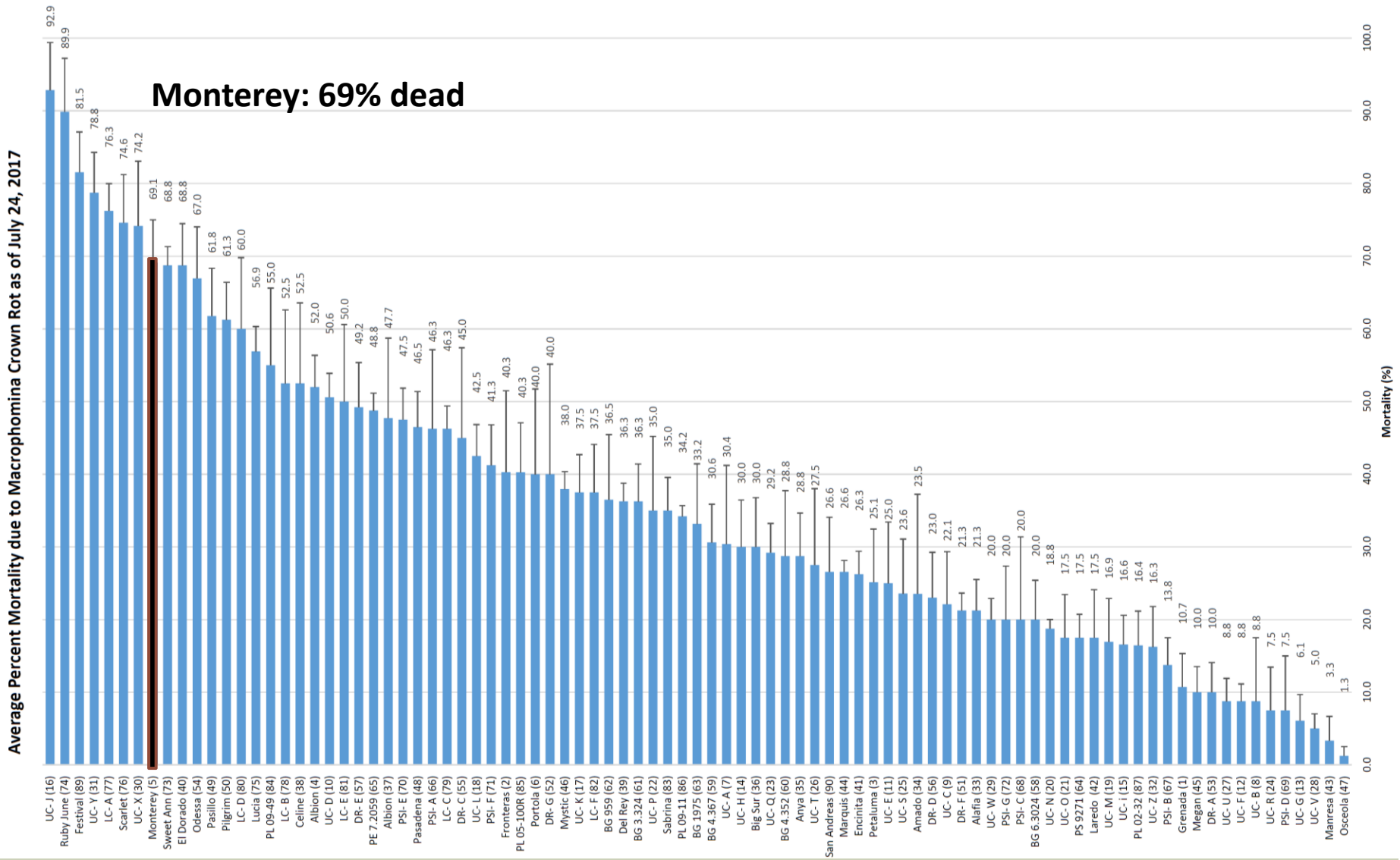
MACROPHOMINA TRIAL

August 1, 2017

MACROPHOMINA CROWN ROT SUSCEPTIBILITY



MACROPHOMINA CROWN ROT SUSCEPTIBILITY



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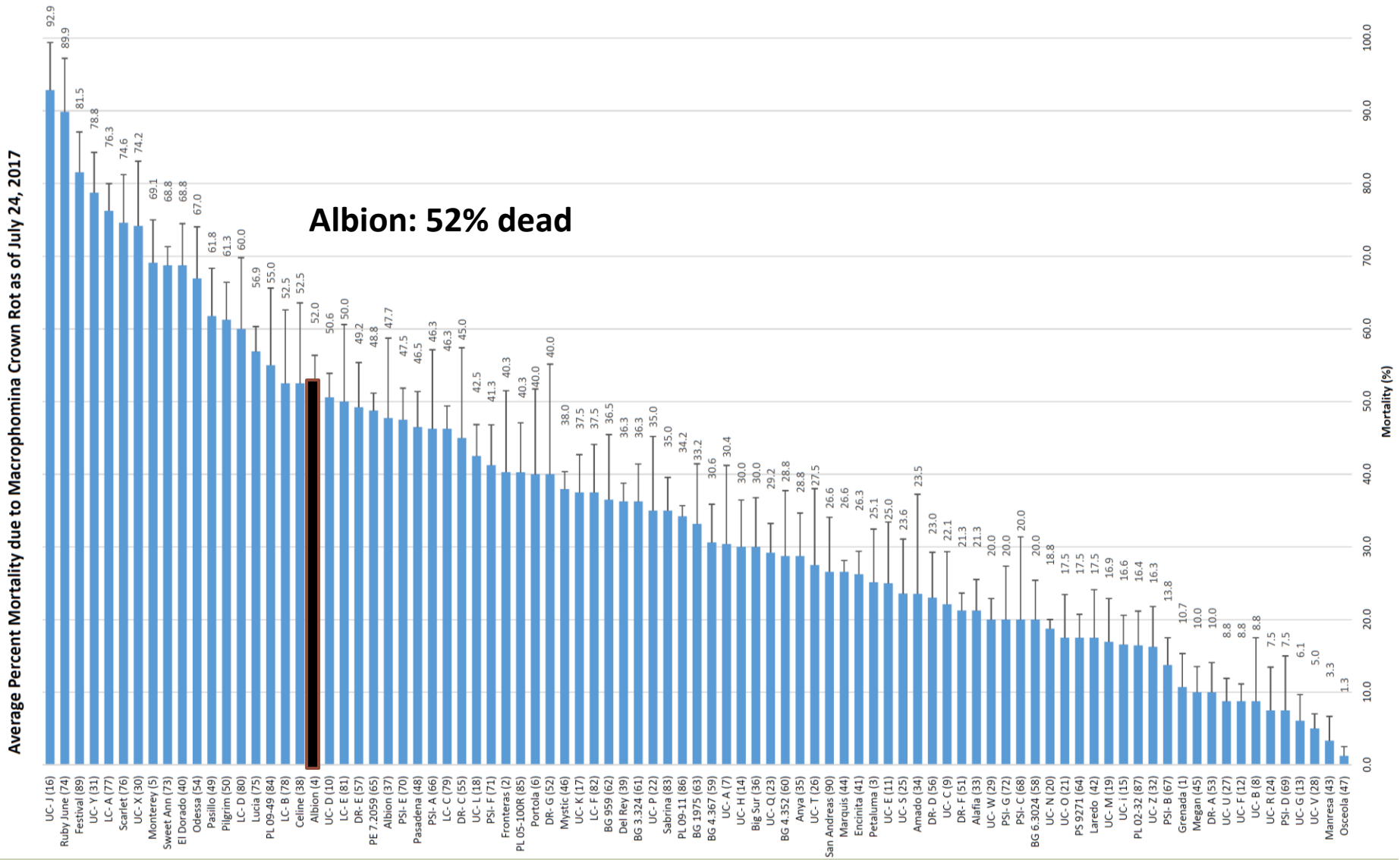

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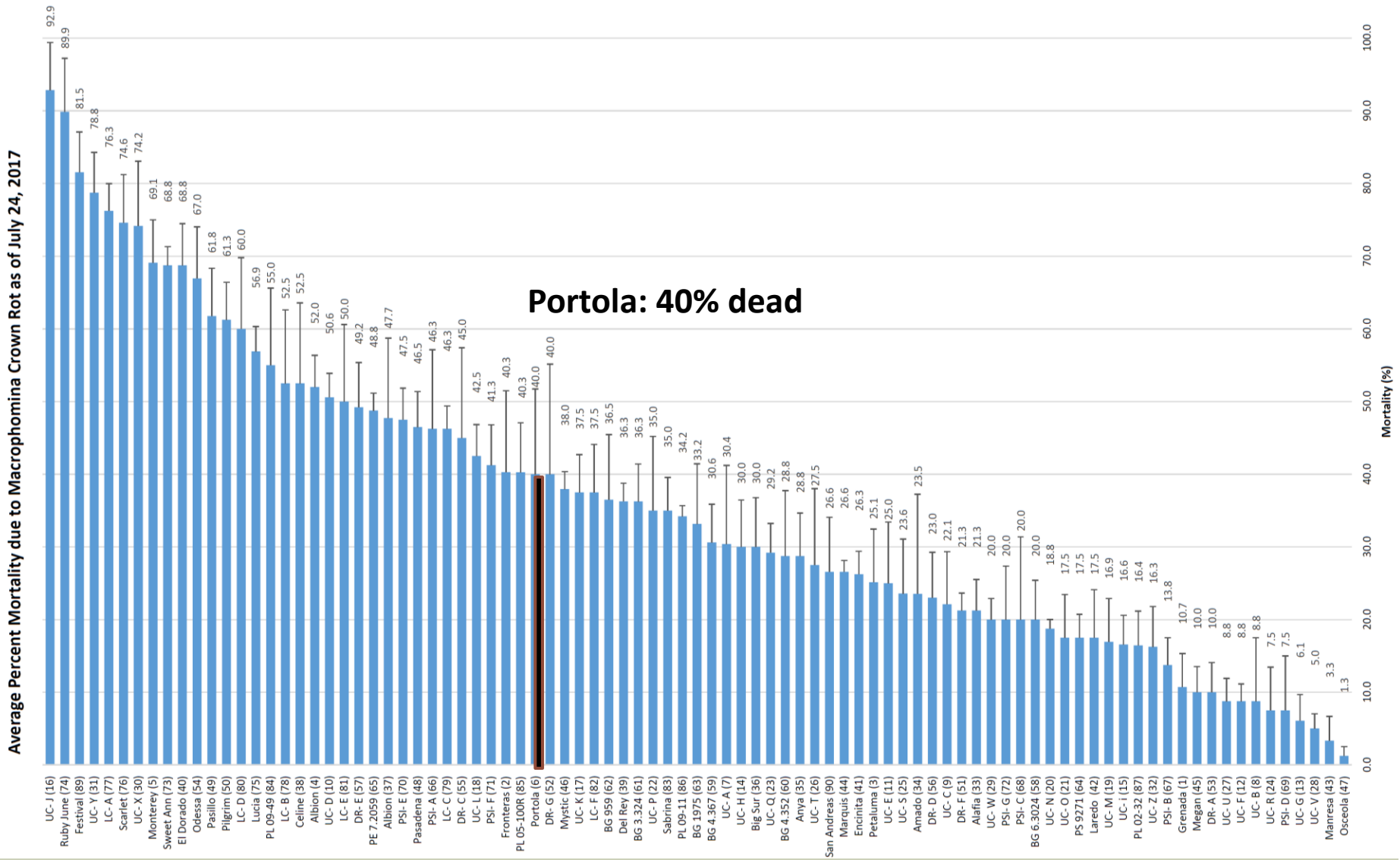

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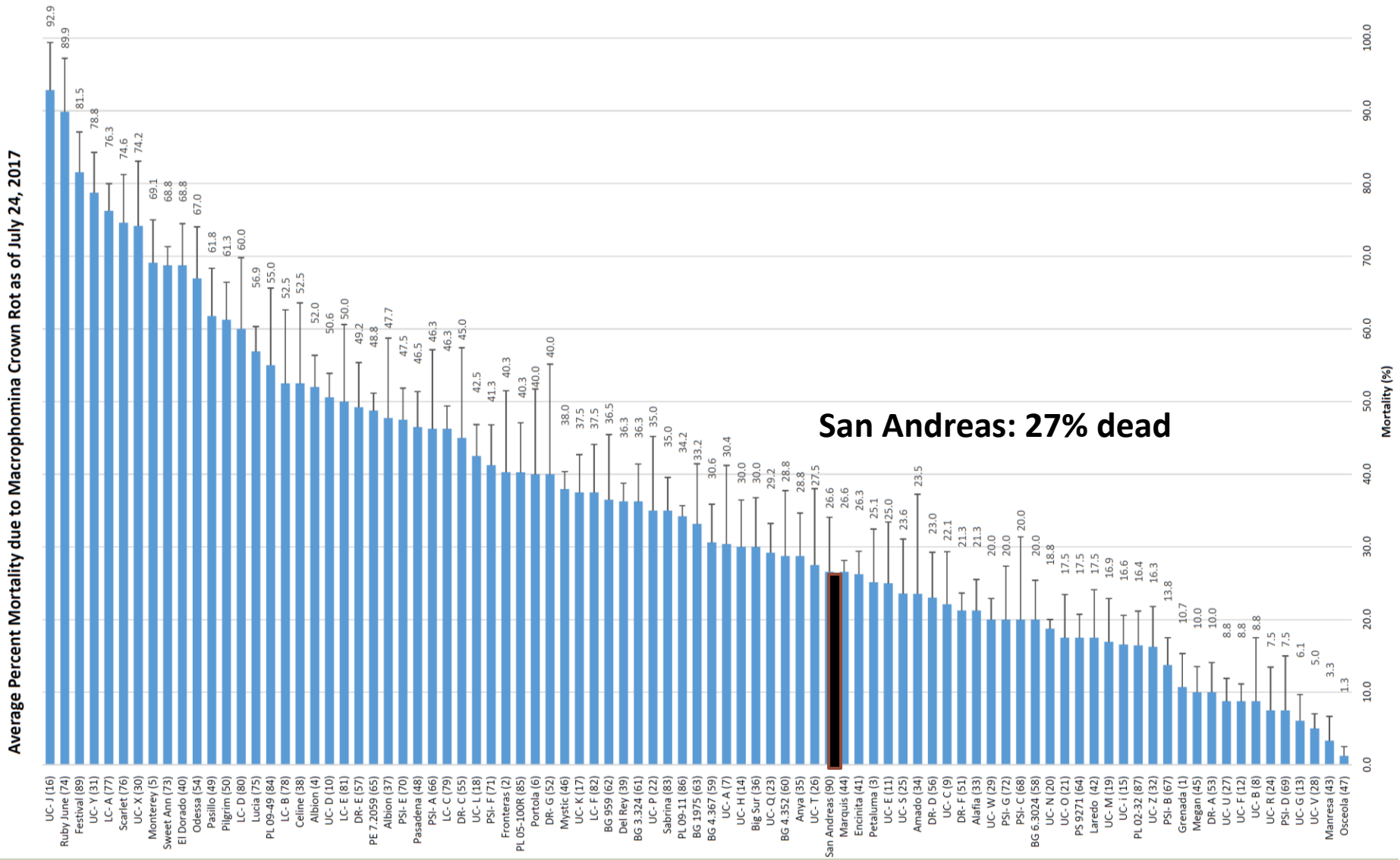

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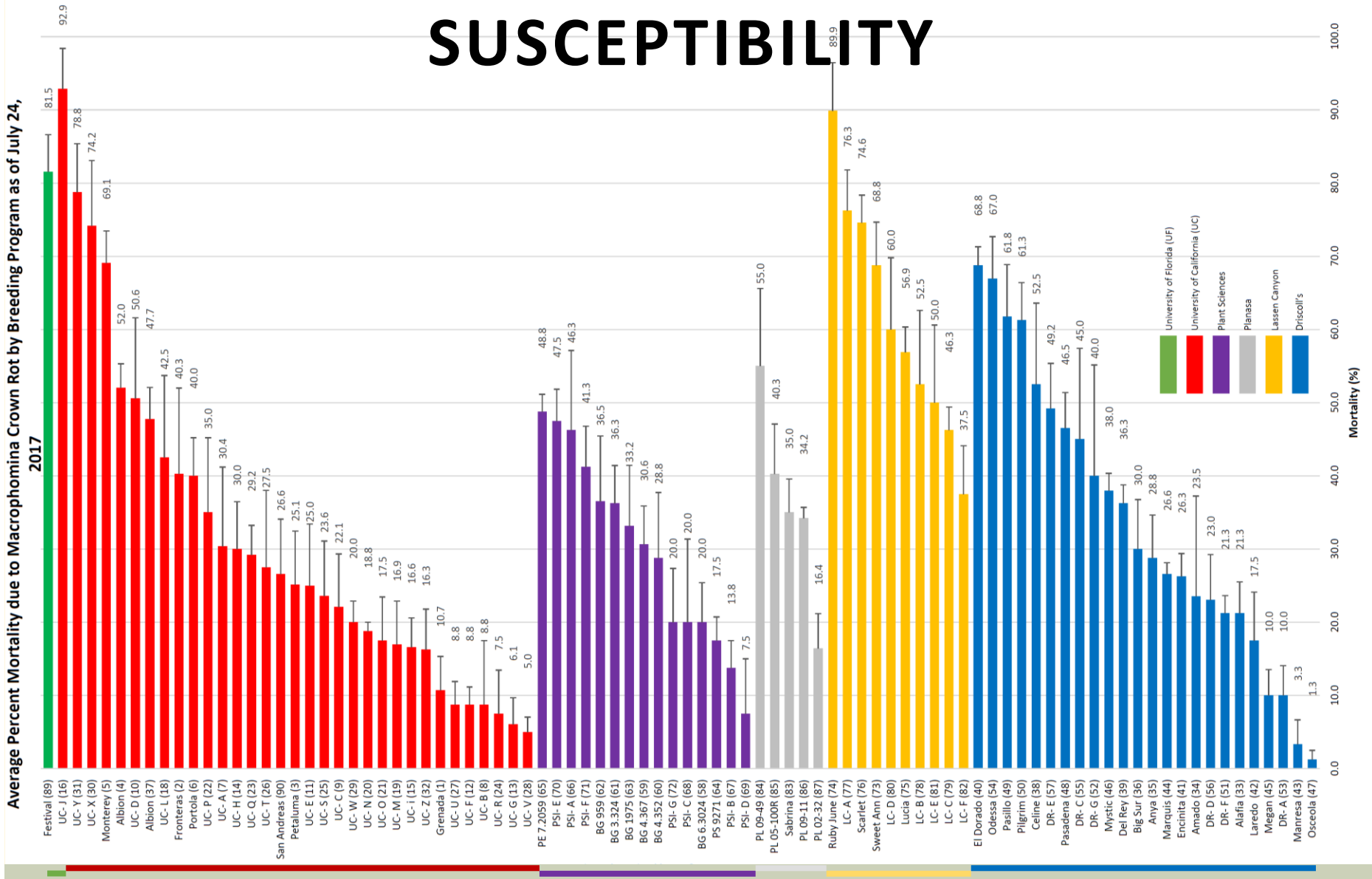


Fields infested on the campus of Cal Poly:

Macrophomina phaseolina

Verticillium dahliae

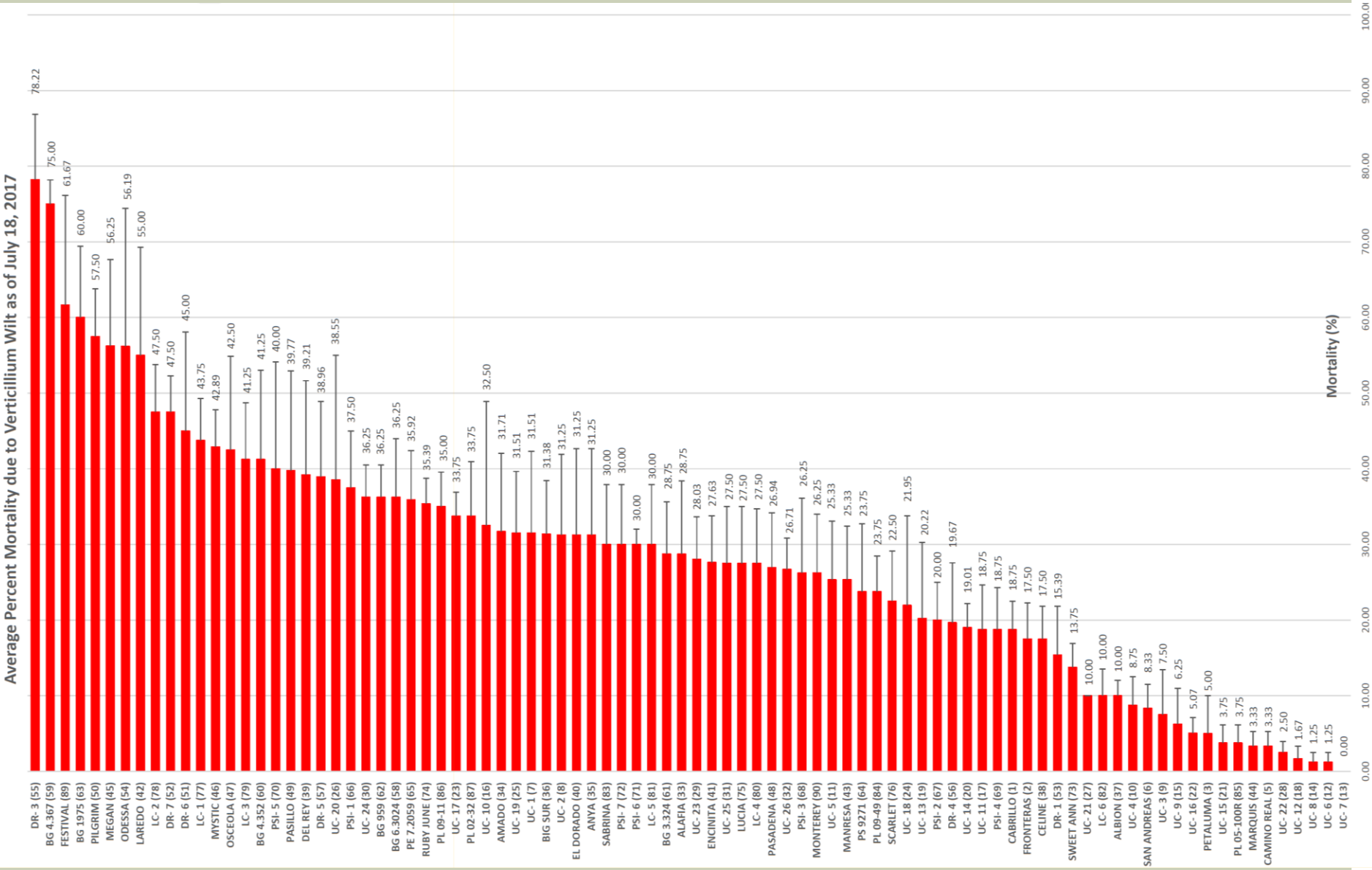
VERTICILLIUM TRIAL

March 21, 2017

VERTICILLIUM TRIAL

July 15, 2017

VERTICILLIUM WILT SUSCEPTIBILITY



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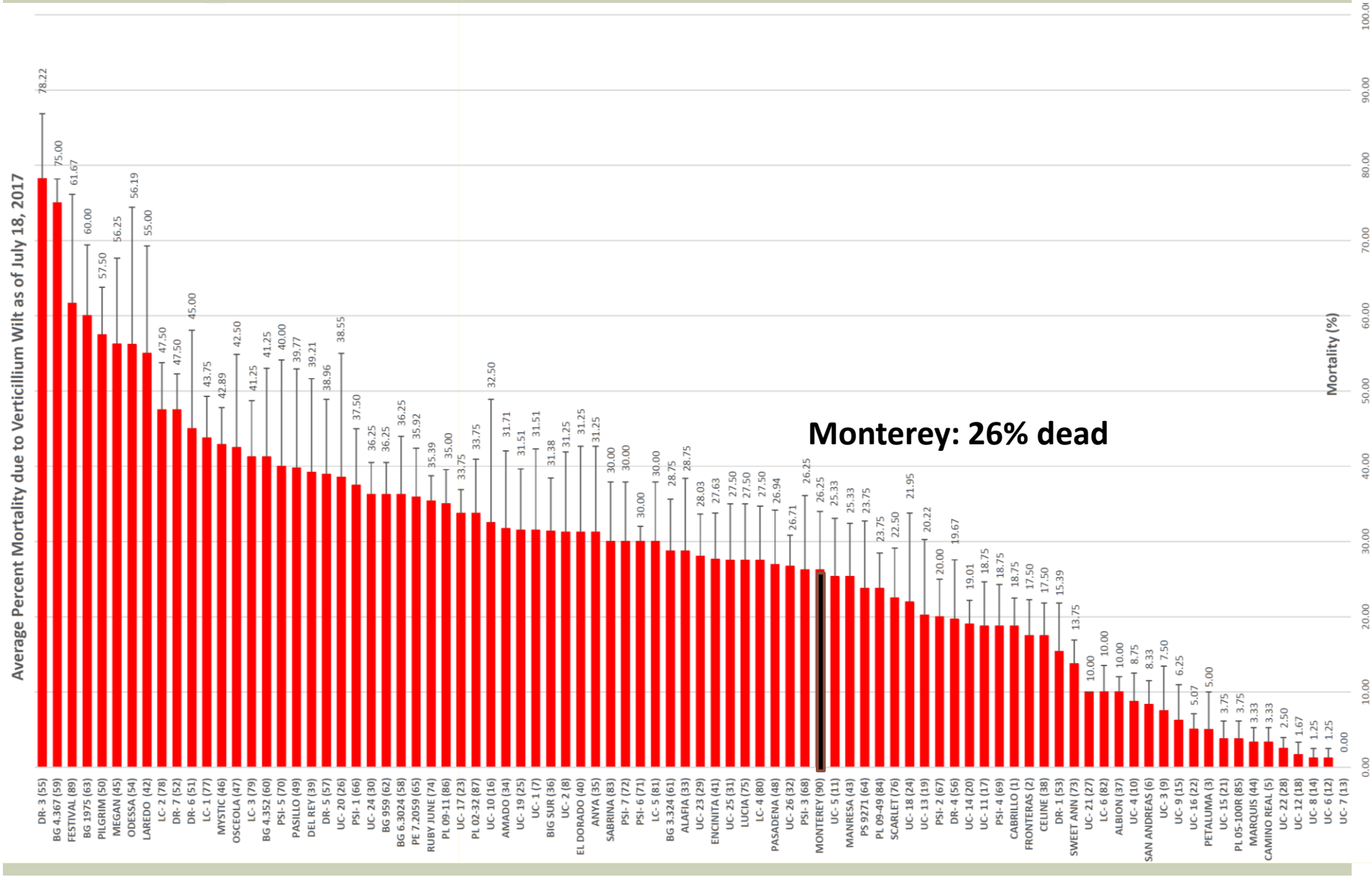

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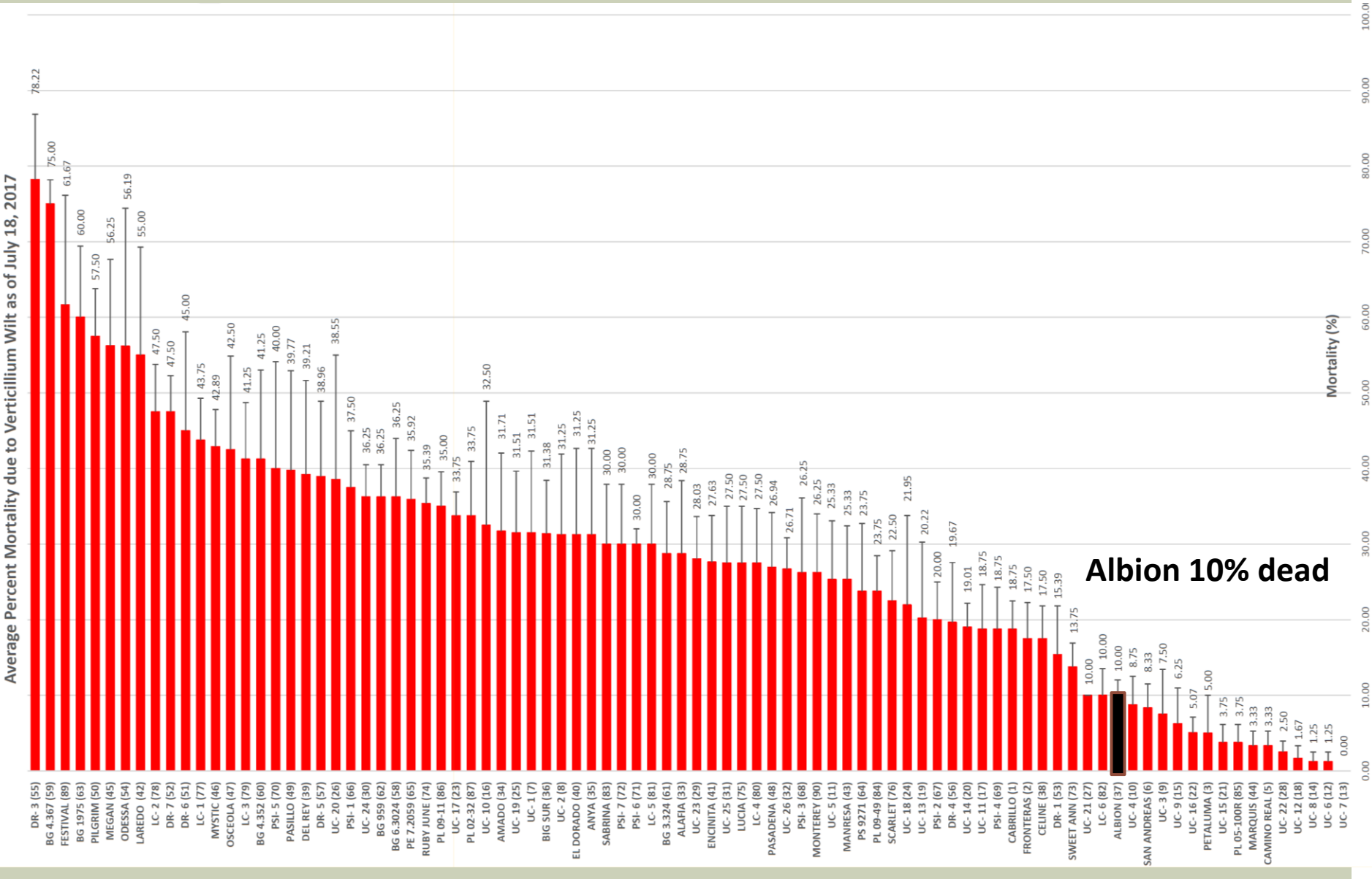

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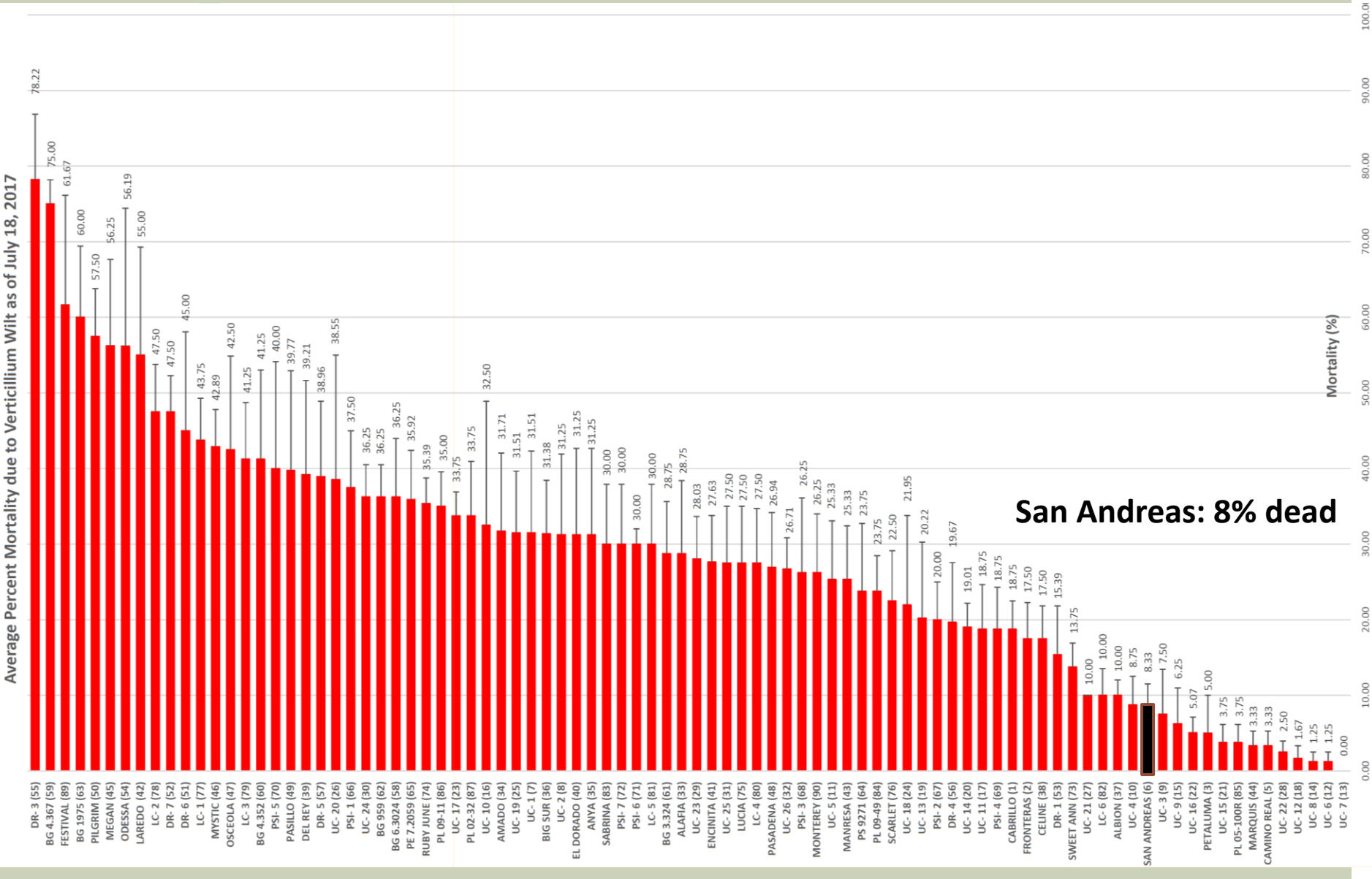

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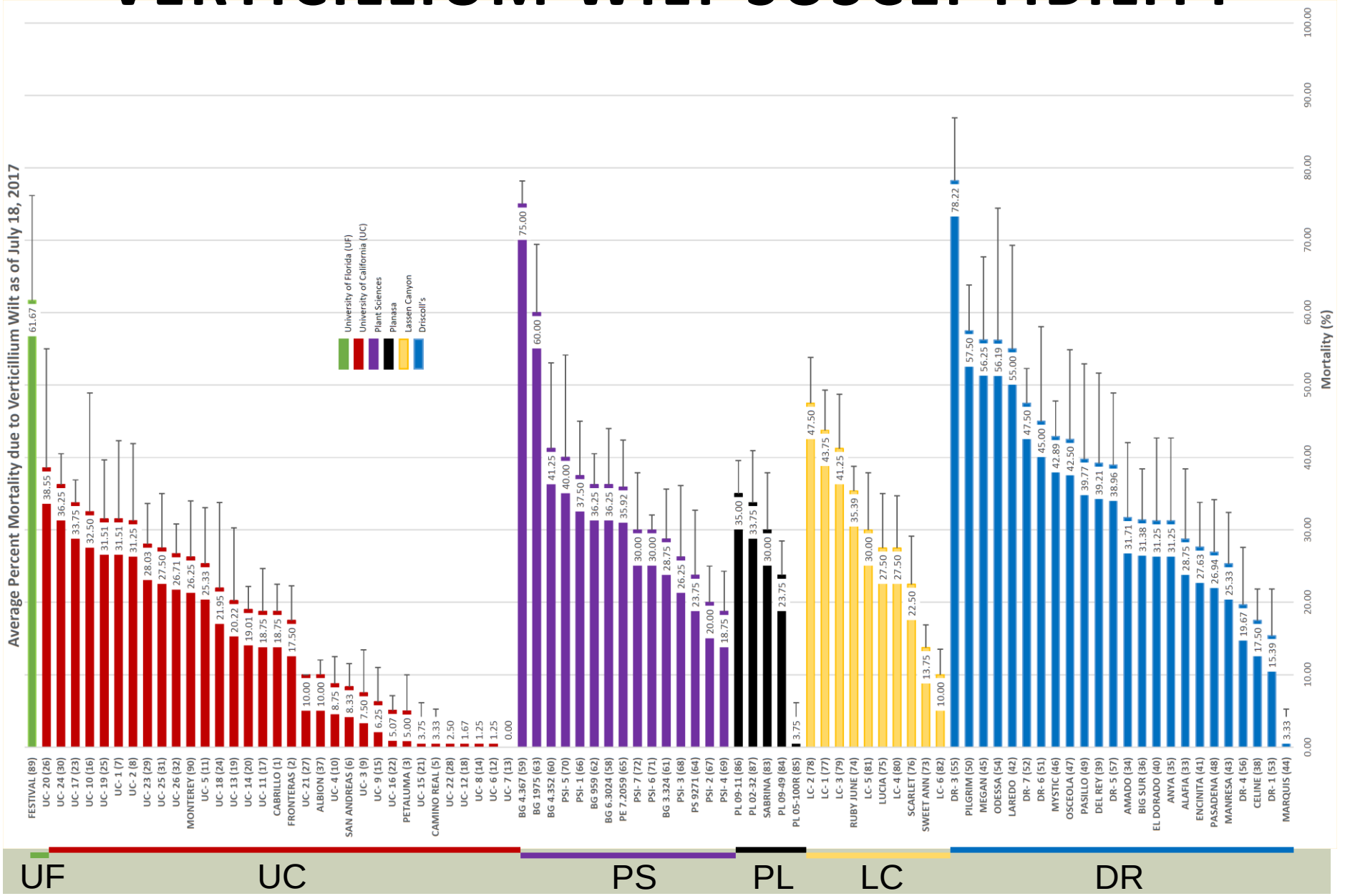


VERTICILLIUM TRIAL 2015

Cultivar	Disease incidence (% plant mortality)[z]		AUDPC[y]	Yield (g/plant)[z]		
	12 Jun	11 Sep		Early season[xz]	Late season[vz]	Total[uz]
Portola……..	44.4 a	98.4 a	8536.3 a	652.6 c	21.9 b	674.5 c
Monterey……..	27.8 ab	89.9 a	6572.5 b	759.3 b	69.6 b	828.9 b
Albion……..	4.8 c	46.0 b	2409.6 c	709.2 bc	136.5 a	845.7 b
San Andreas…….	10.1 bc	34.7 b	2623.4 c	923.5 a	170.9 a	1094.4 a
P Values	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

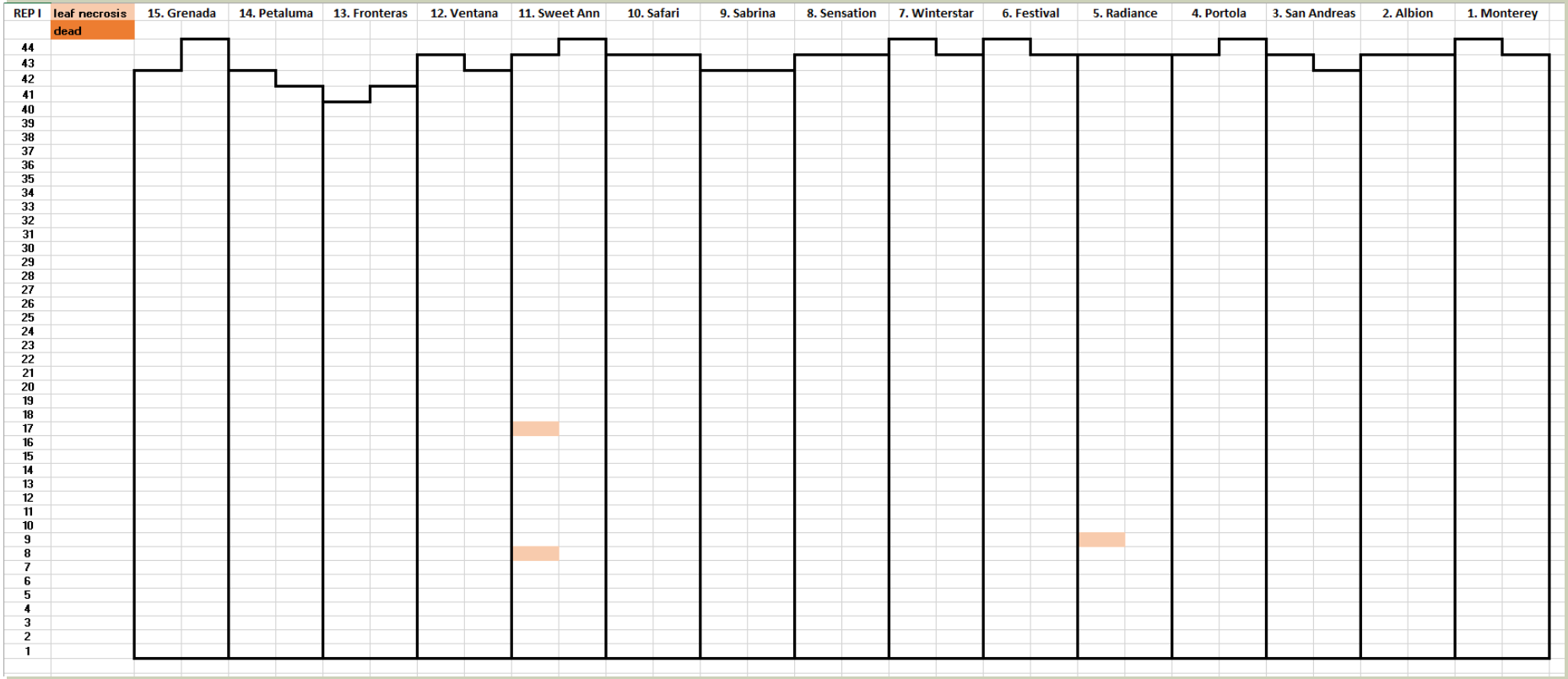
Field infested at the Monterey Bay Academy:

FUSARIUM TRIAL 2015

FUSARIUM TRIAL 2015

FUSARIUM TRIAL 2015

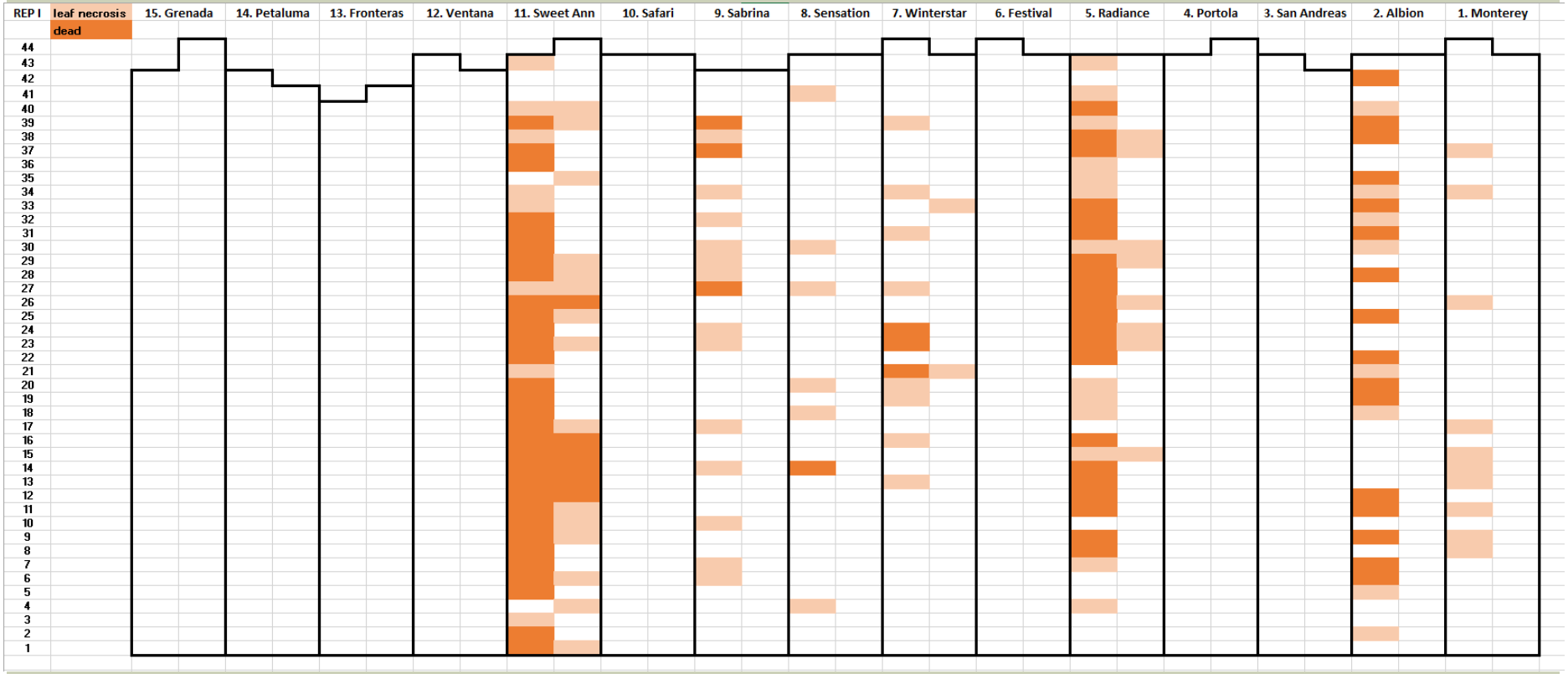
March 20, 2015



This is a map of Rep I in the MBA variety trial, where the soilborne fungus *Fusarium oxysporum* f. sp. *fragariae* is established. Each area surrounded by black lines represents one bed of a different strawberry cultivar (cultivar name listed at the top of each bed). Light orange color = leaf necrosis; burnt orange color = dead strawberry plant.

FUSARIUM TRIAL 2015

May 15, 2015



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FUSARIUM TRIAL 2015

July 23, 2015

This is a map of Rep I in the MBA variety trial, where the soilborne fungus *Fusarium oxysporum* f. sp. *fragariae* is established. Each area surrounded by black lines represents one bed of a different strawberry cultivar (cultivar name listed at the top of each bed). Light orange color = leaf necrosis; burnt orange color = dead strawberry plant.

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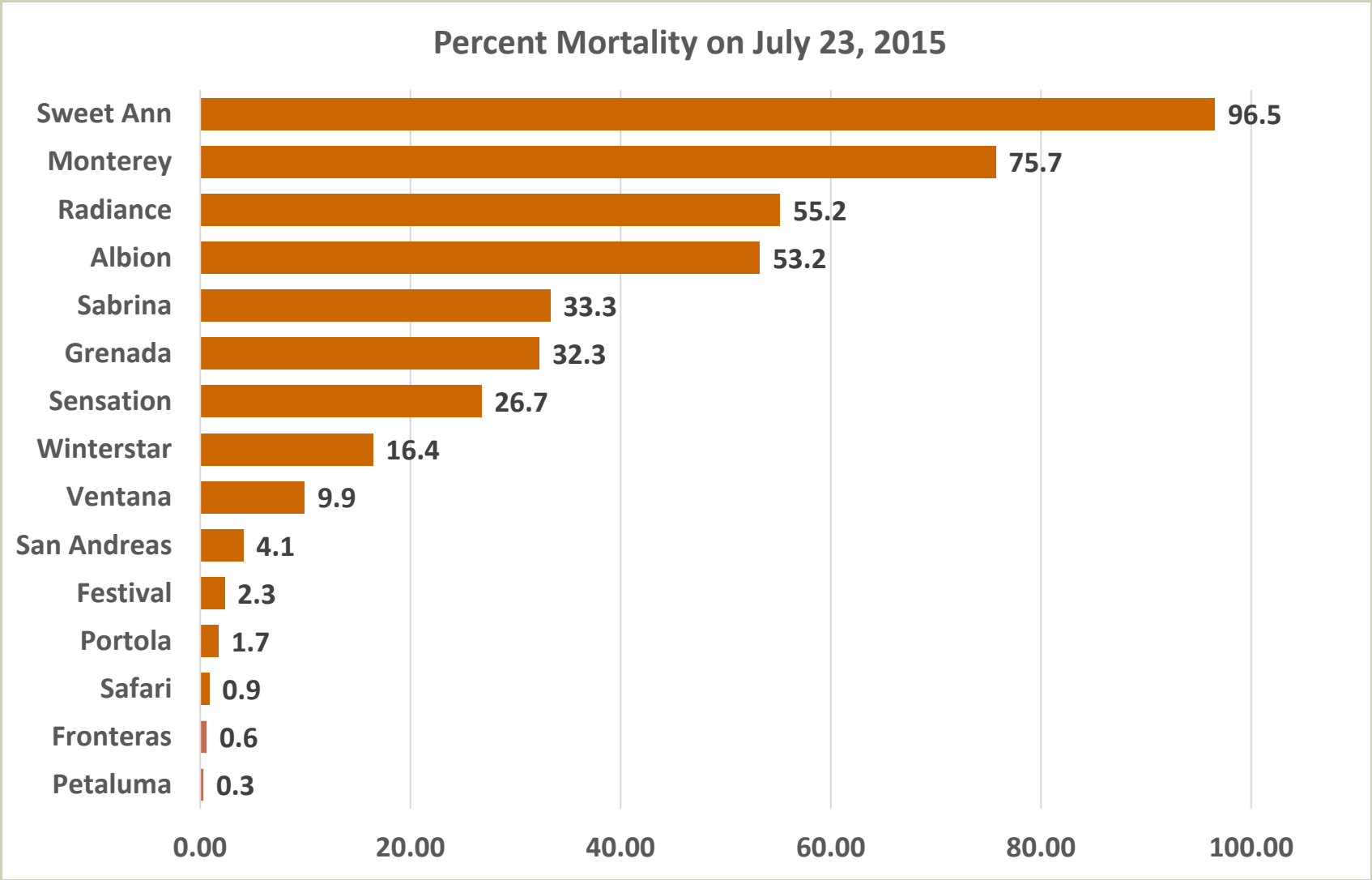

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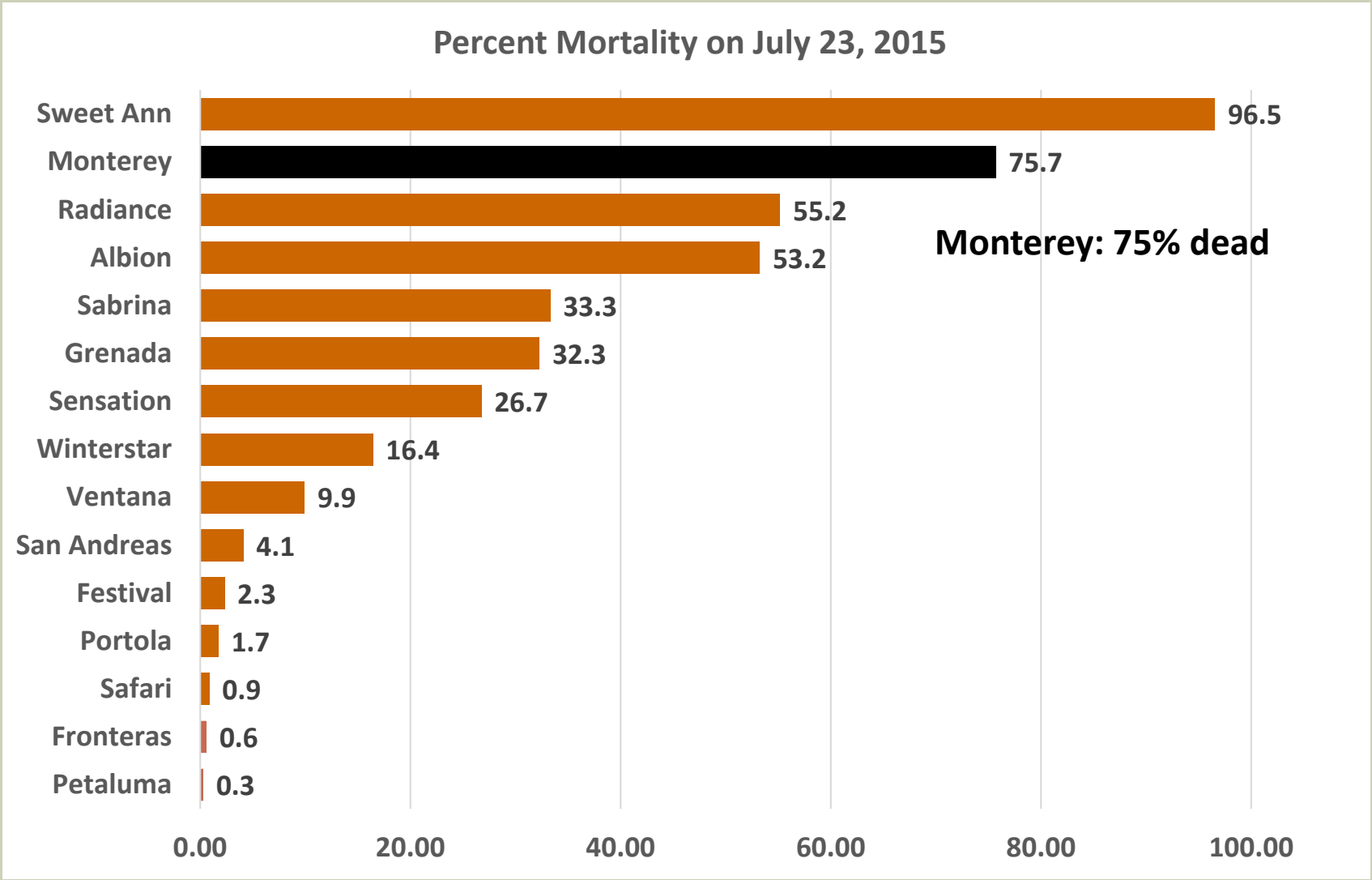

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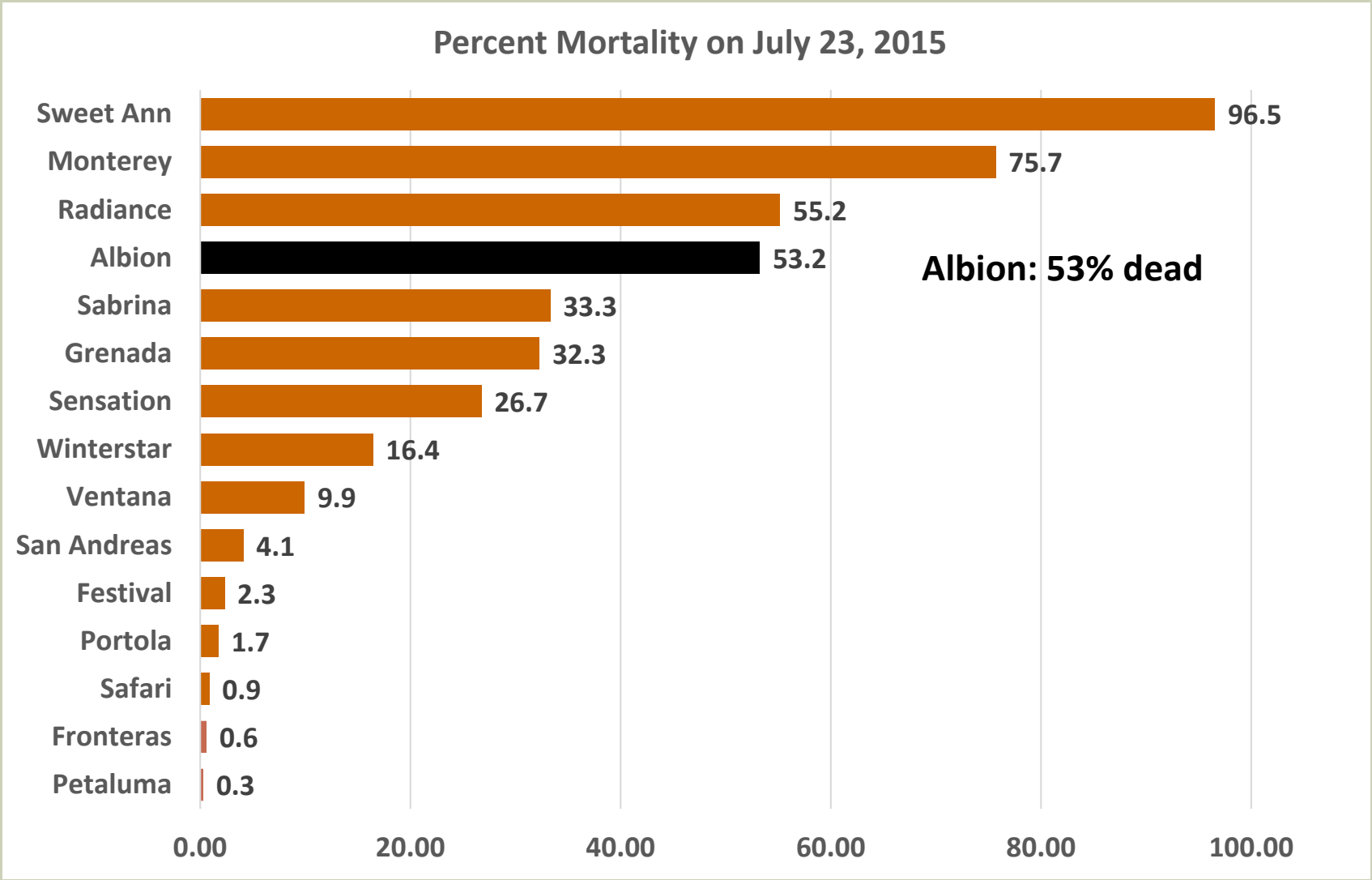

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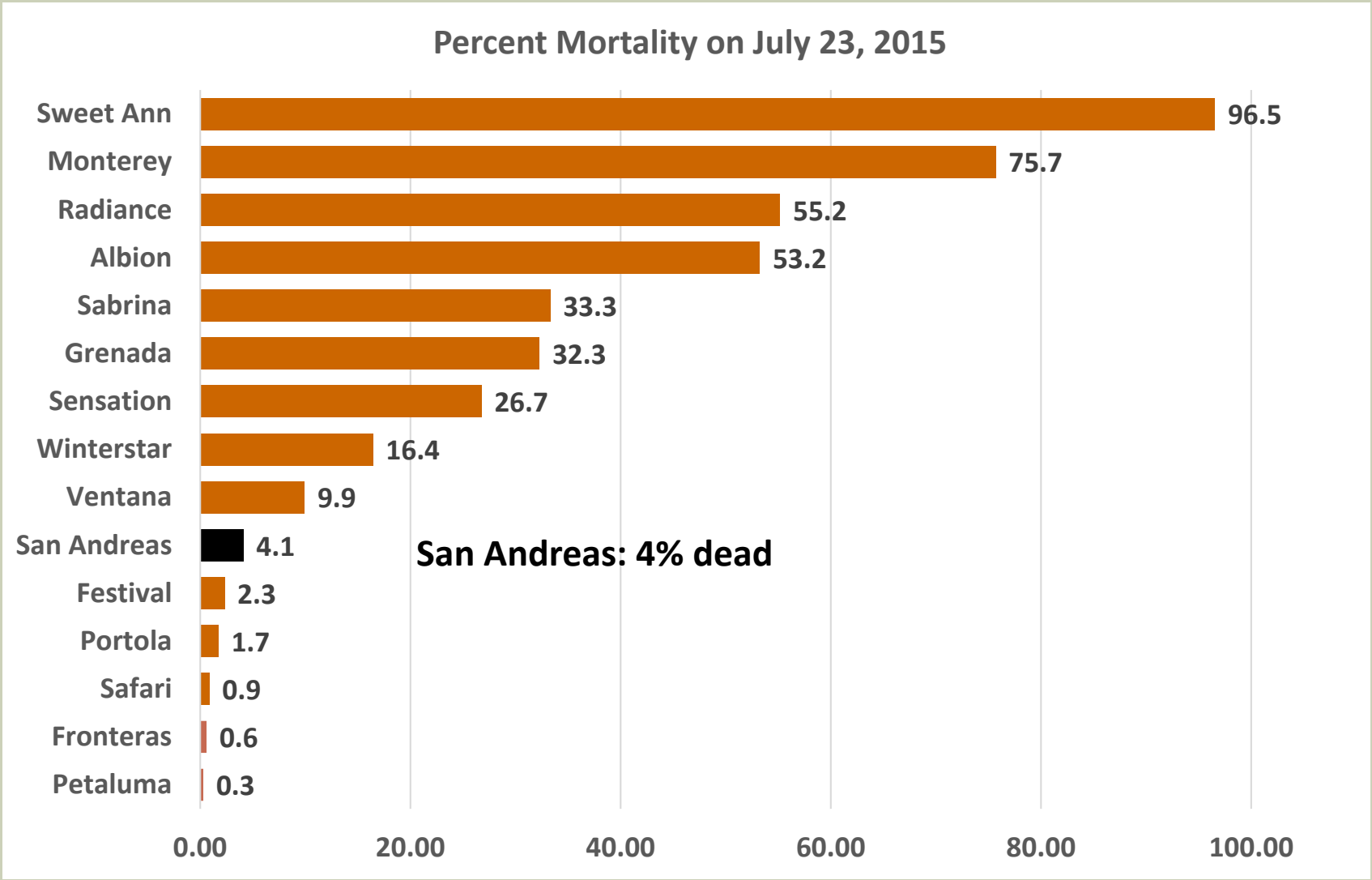

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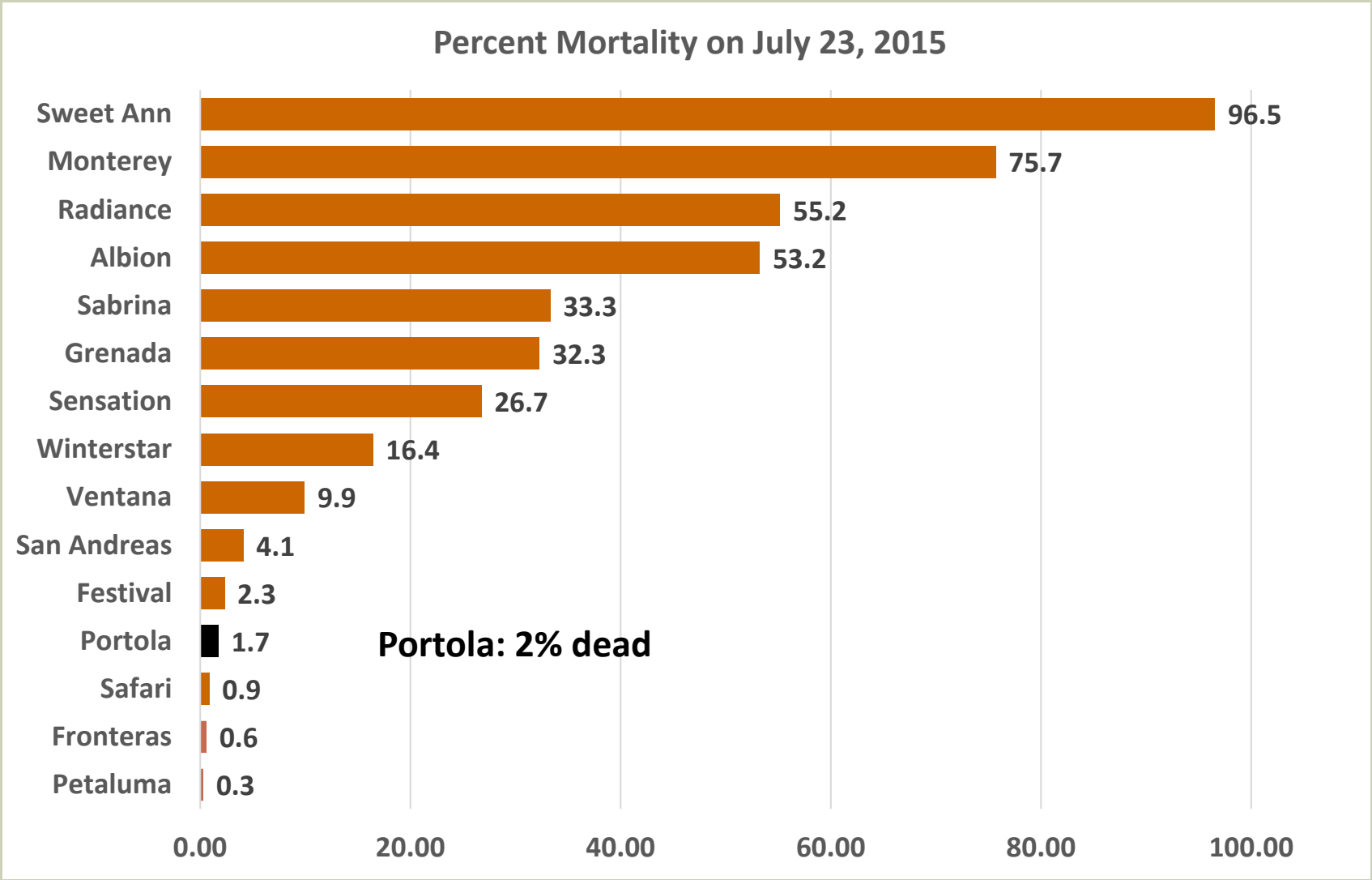

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Strawberry Center

CULTIVAR EVALUATION TABLE

		Soilborne diseases					Fruit diseases			Arthropods	
	CULTIVAR	Fusarium wilt	Verticillium wilt	Macrophomina crown rot	Phytophthora	Anthracnose	Gray mold	Powdery mildew	Anthracnose	Mites	Lygus
3	Alafia		28.8	21.3							
4	Albion	53.2	10	49.85							
5	Amado		31.7	23.5							
6	Anya		31.3	28.8							
7	Big Sur		31.4	30							
8	Cabrillo		18.8	--							
9	Camino Real		3.3	--							
10	Celine		17.5	52.5							
11	Del Rey		39.2	36.3							
12	El Dorado		31.3	68.8							
13	Encinita		27.6	26.3							
14	Festival	2.3	61.7	81.5							
15	Fronteras	0.6	17.5	40.3							
16	Grenada	32.3	--	10.7							
17	Laredo		55	17.5							
18	Lucia		27.5	56.9							
19	Manresa		25.3	3.3							
20	Marquis		3.3	26.6							
21	Megan		56.3	10							
22	Monterey	75.7	26.25	69.1							
23	Mystic		42.9	38							
24	Odessa		56.2	67							
25	Osceola		42.5	1.3							
26	Pasadena		26.9	46.5							
27	Pasillo		39.8	61.8							
28	Petaluma	0.3	5	25.1							
29	Pilgrim		57.5	61.3							
30	Portola	1.7	--	40							
31	Radiance	55.2	--	--							
32	Ruby June		35.4	89.9							
33	Sabrina	33.3	30	35							
34	Safari	0.9	--	--							
35	San Andreas	4.1	8.3	26.6							
36	Scarlet		22.5	74.6							
37	Sensation	26.7	--	--							
38	Sweet Ann	96.5	13.75	68.8							

CONCLUSIONS

High levels of resistance

Wide range of susceptibility in germplasm

Strawberry Center to continue host resistance screening for additional diseases…

THANKS TO...


CALIFORNIA
STRAWBERRY
COMMISSION
UCDAVIS
UNIVERSITY OF CALIFORNIA
UF | UNIVERSITY of FLORIDA
Plant Sciences Inc.
PSI
Advancing Agriculture through Science
PLANASA
INNOVATION IN PLANT VARIETIES
Driscoll's
Only the Finest Berries™
"Growers of Quality Strawberry Plants"
Lassen Canyon Nursery, Inc.
TriCal
INC.