Anthracnose susceptibility in 76 strawberry cultivars and elite breeding lines

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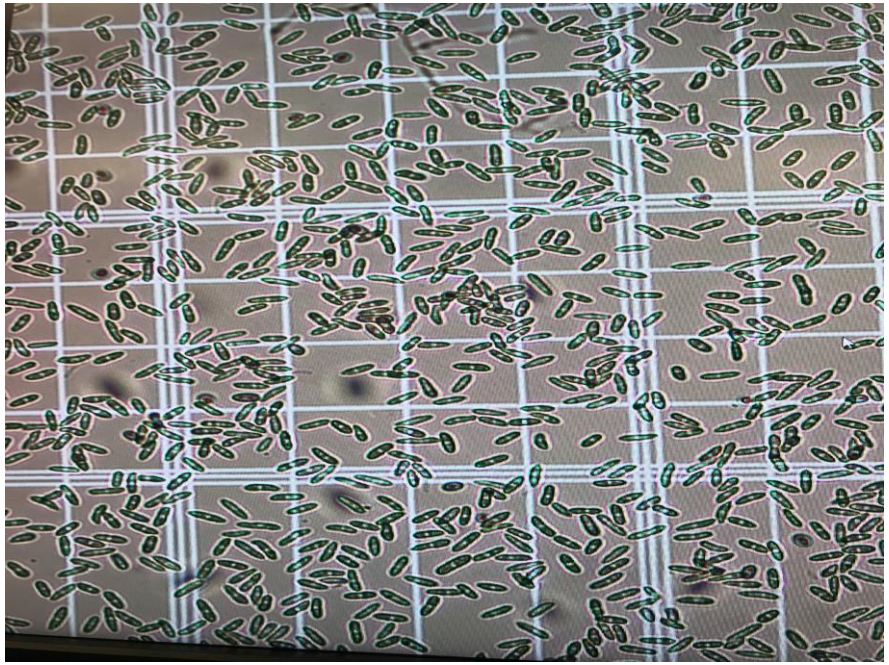
Overview

- Introduction
  - Anthracnose
  - Objective
- Materials and Methods
  - Inoculum
  - Ratings
- Results
- Conclusion

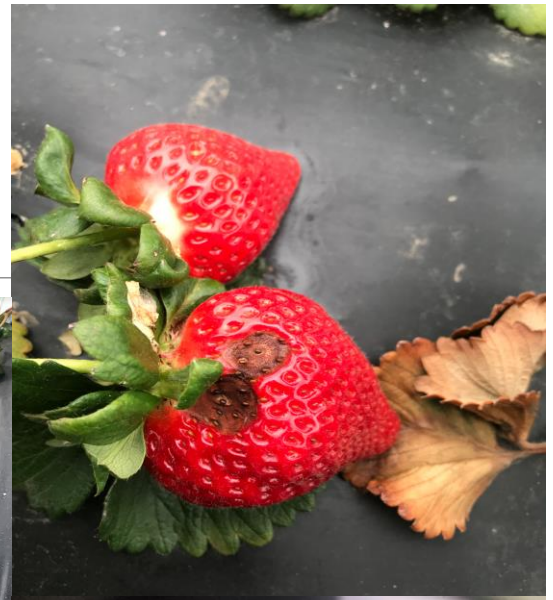
Anthracnose

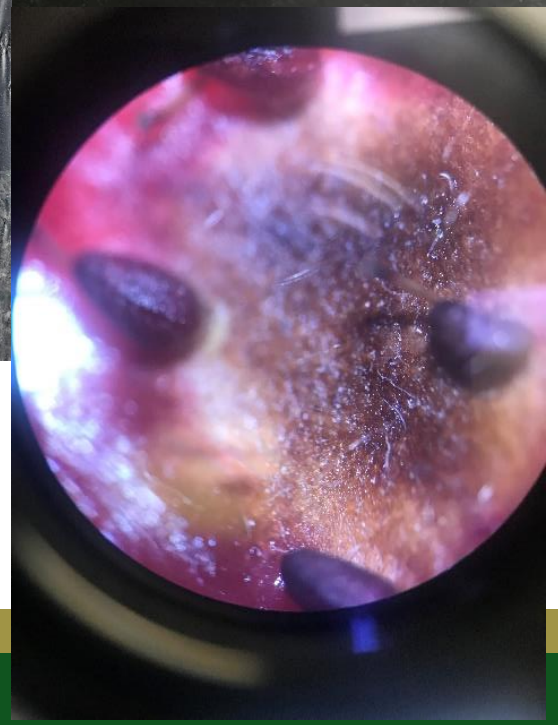
- Caused by:
  - *Colletotrichum acutatum*
- Economically important disease
- Broad range of host: Strawberry, Almond, Apple, Pines and several weeds



Anthracnose

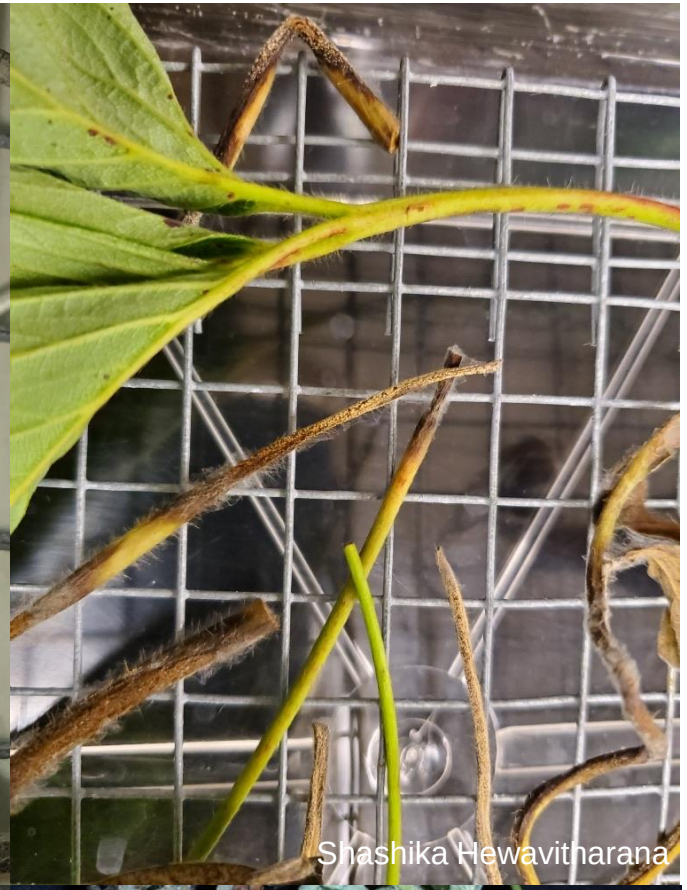
- Symptoms: necrotic and blight symptoms on plant leaves petioles, flower or even roots (Peres et al., 2015)
- It also causes fruit lesions on ripe fruit (Peres et al., 2015, Garrido et al., 2016)





Symptoms

- Dark brown and black sunken lesion on petioles and runners
- Anthracnose crown: Cinnamon to red color
- Phytophthora crown: Chocolate brown

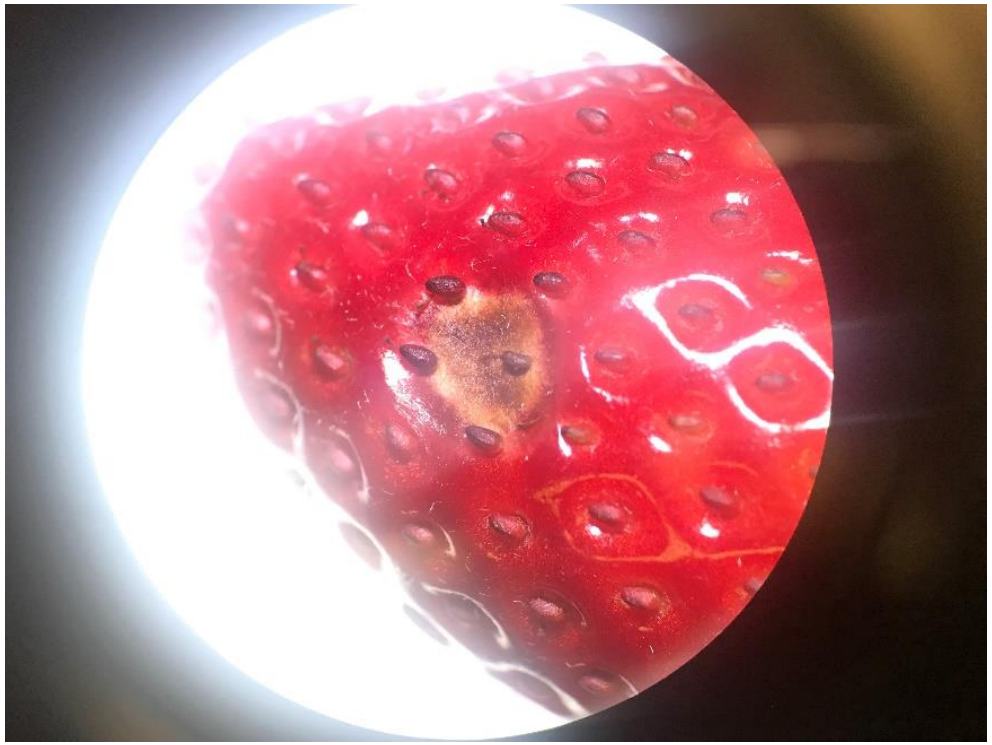


Outbreak

- During the 2015-16 strawberry season:
  - High levels of anthracnose
- Santa Maria and Oxnard

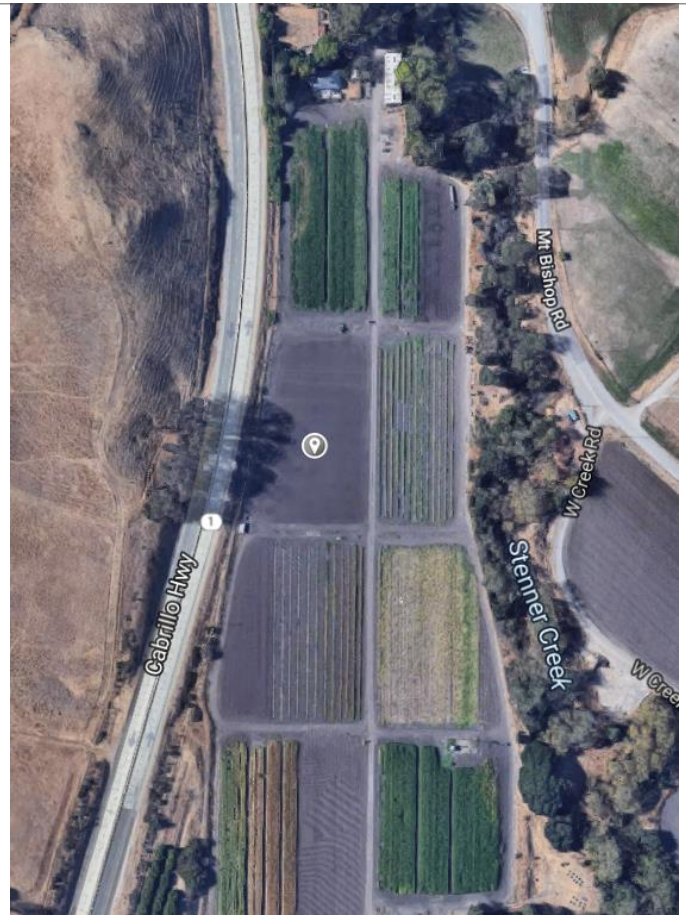
Focus to Breeding Programs

- Objective: Test resistance to anthracnose of 76 cultivars and elite breeding lines



Materials and Methods

- California Polytechnic State University, San Luis Obispo
- Field 25, Block 3
- Trial initiated 23 October 2018



Complete Randomized Block Design

- 76 total Cultivars
- 4 inoculated reps
- 1 non-inoculated rep
- 10 plants per rep

Rep I			Rep II		
1128 (76)	1156 (26)		1228 (45)	1256 (48)	
1127 (25)	1155 (57)	1183 (56)	1227 (25)	1255 (17)	1283 (26)
1126 (59)	1154 (2)	1182 (39)	1226 (18)	1254 (35)	1282 (3)
1125 (34)	1153 (24)	1181 (11)	1225 (7)	1253 (56)	1281 (11)
1124 (64)	1152 (43)	1180 (44)	1224 (72)	1252 (58)	1280 (52)
1123 (32)	1151 (46)	1179 (61)	1223 (38)	1251 (78)	1279 (2)
1122 (22)	1150 (8)	1178 (50)	1222 (46)	1250 (73)	1278 (20)
1121 (13)	1149 (80)	1177 (49)	1221 (64)	1249 (47)	1277 (60)
1120 (29)	1148 (17)	1176 (41)	1220 (13)	1248 (34)	1276 (40)
1119 (73)	1147 (81)	1175 (65)	1219 (39)	1247 (42)	1275 (65)
1118 (15)	1146 (5)	1174 (82)	1218 (28)	1246 (69)	1274 (16)
1117 (28)	1145 (38)	1173 (36)	1217 (12)	1245 (22)	1273 (32)
1116 (3)	1144 (20)	1172 (14)	1216 (23)	1244 (29)	1272 (68)
1115 (69)	1143 (83)	1171 (33)	1215 (30)	1243 (57)	1271 (49)
1114 (72)	1142 (7)	1170 (45)	1214 (44)	1242 (75)	1270 (63)
1113 (47)	1141 (67)	1169 (18)	1213 (77)	1241 (6)	1269 (83)
1112 (70)	1140 (60)	1168 (55)	1212 (31)	1240 (33)	1268 (59)
1111 (51)	1139 (35)	1167 (66)	1211 (54)	1239 (27)	1267 (80)
1110 (1)	1138 (63)	1166 (30)	1210 (21)	1238 (1)	1266 (4)
1109 (53)	1137 (42)	1165 (68)	1209 (66)	1237 (15)	1265 (70)
1108 (6)	1136 (4)	1164 (37)	1208 (24)	1236 (81)	1264 (8)
1107 (74)	1135 (9)	1163 (12)	1207 (76)	1235 (10)	1263 (36)
1106 (79)	1134 (77)	1162 (19)	1206 (37)	1234 (51)	1262 (50)
1105 (54)	1133 (31)	1161 (62)	1205 (71)	1233 (41)	1261 (55)
1104 (23)	1132 (10)	1160 (78)	1204 (67)	1232 (43)	1260 (5)
1103 (48)	1131 (27)	1159 (40)	1203 (74)	1231 (53)	1259 (82)
1102 (71)	1130 (75)	1158 (58)	1202 (14)	1230 (79)	1258 (9)
1101 (21)	1129 (52)	1157 (16)	1201 (62)	1229 (61)	1257 (19)
Bed 22	**Bed 21**	**Bed 20**	**Bed 19**	**Bed 18**	**Bed 17**

Inoculum

- Three local isolates of anthracnose used
  - CA 1, CA 15 and CA 140
- 74 total isolates, 10 tested

Natamycin, a New Biofungicide for Managing Crown Rot of Strawberry Caused by Qol-Resistant *Colletotrichum acutatum*

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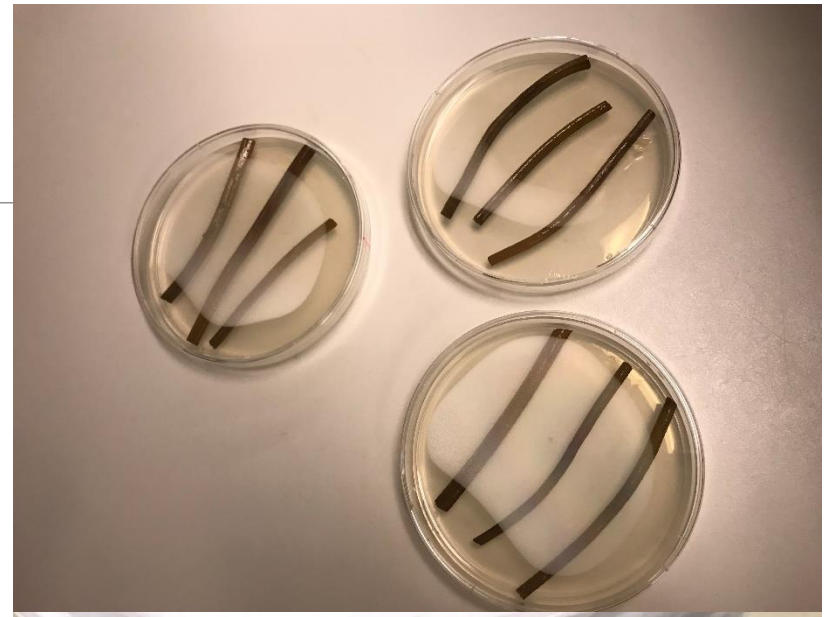
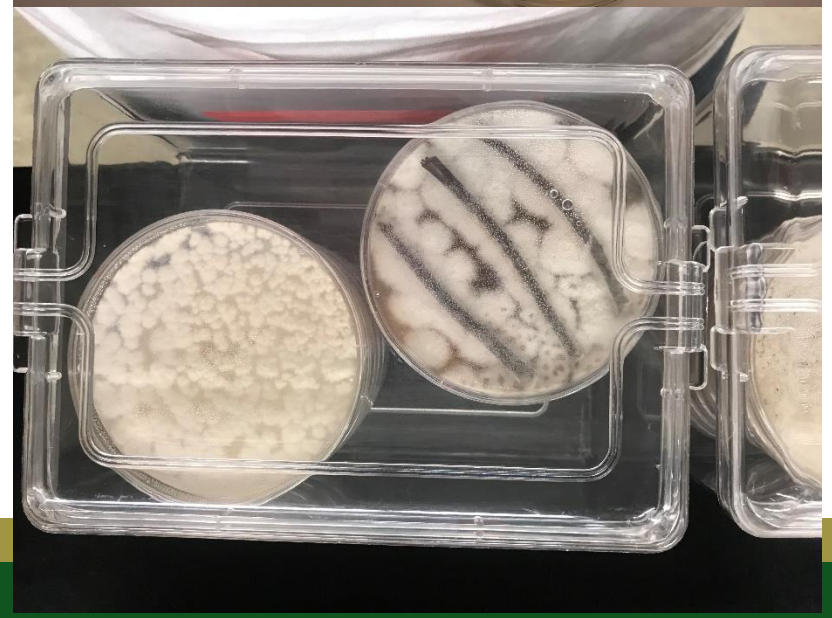
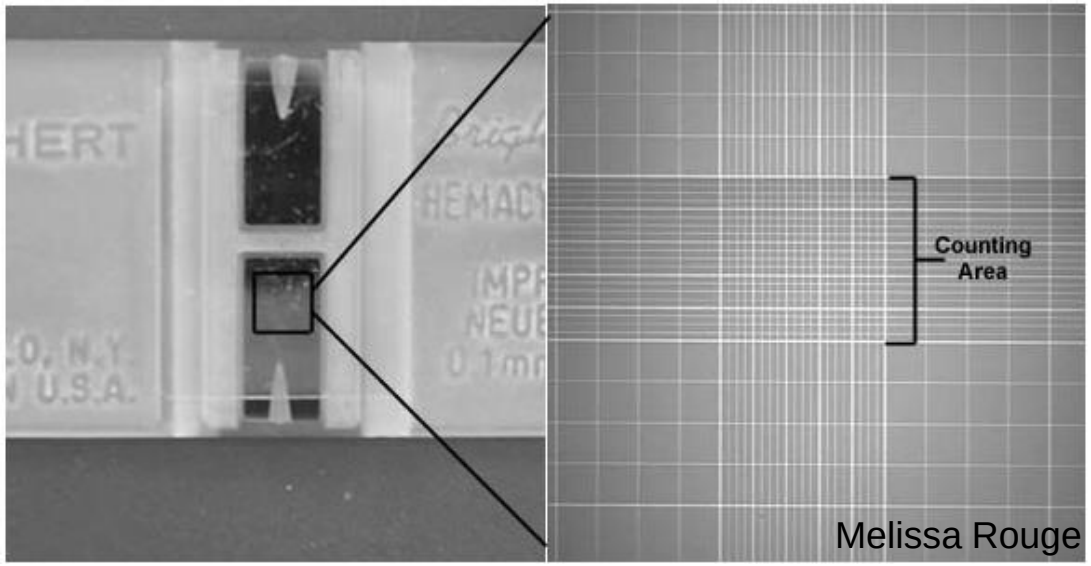
•Anthracnose biology

- Efficacy test of spore growth on each isolate
- Three tests:
  1. Petioles, 7 days after inoculation
  2. Petioles, 12 days after inoculation
  3. No petioles, 7 days after inoculation







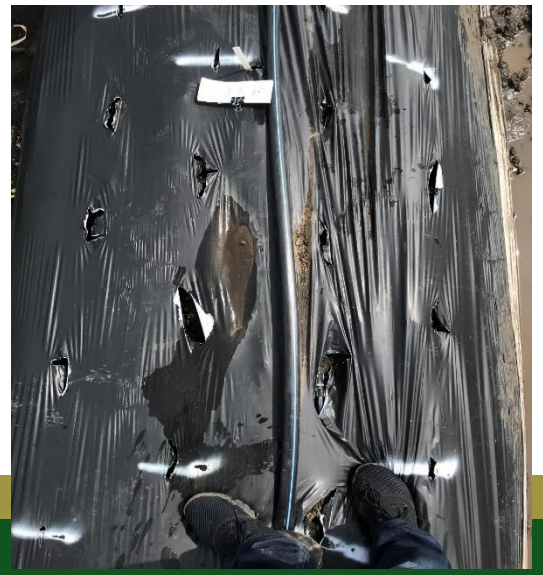
Melissa Rouge

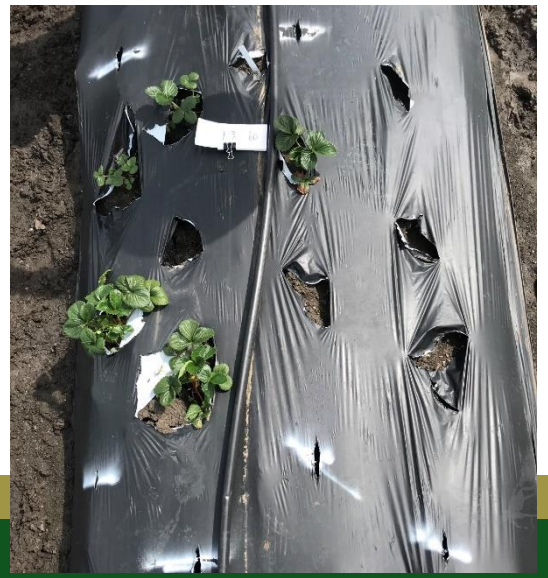
Inoculation method

- Bare-roots transplants soaked for 1 min in 100 ml of anthracnose inoculum (1×10^6 spores/ml)

Ratings

- Plant mortality assessments were taken every week
- Number of dead plants
- % Mortality

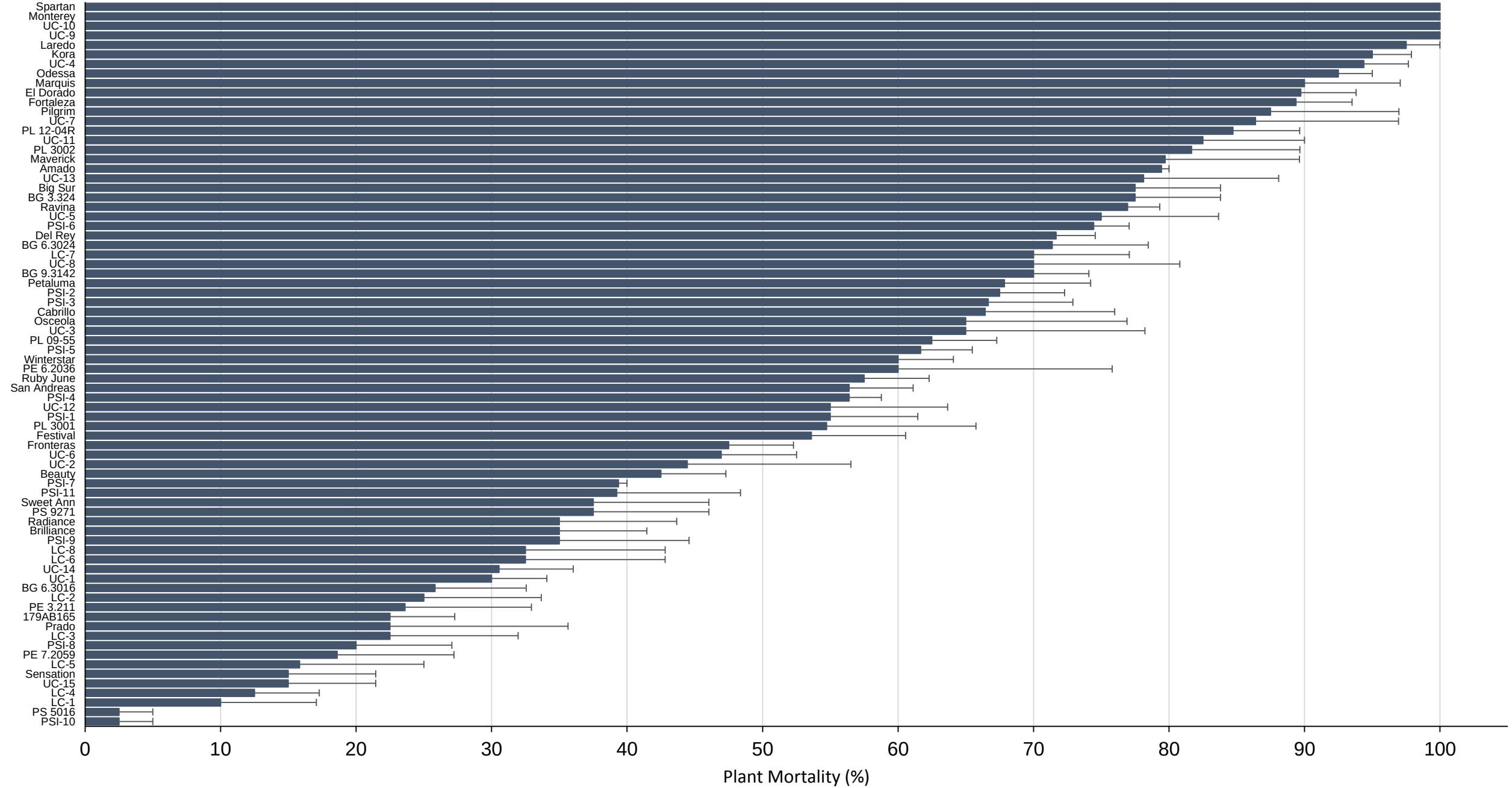


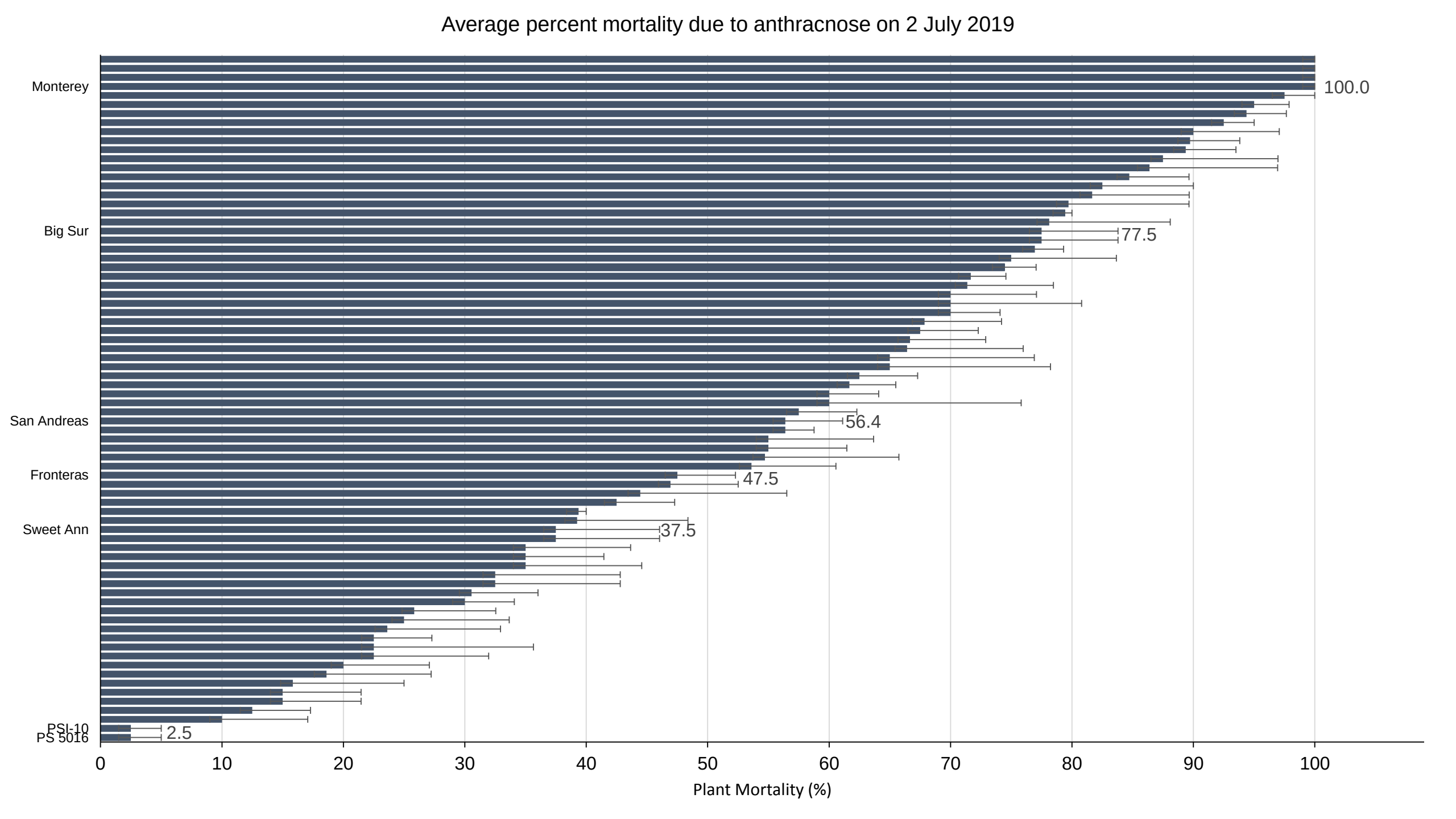


Results

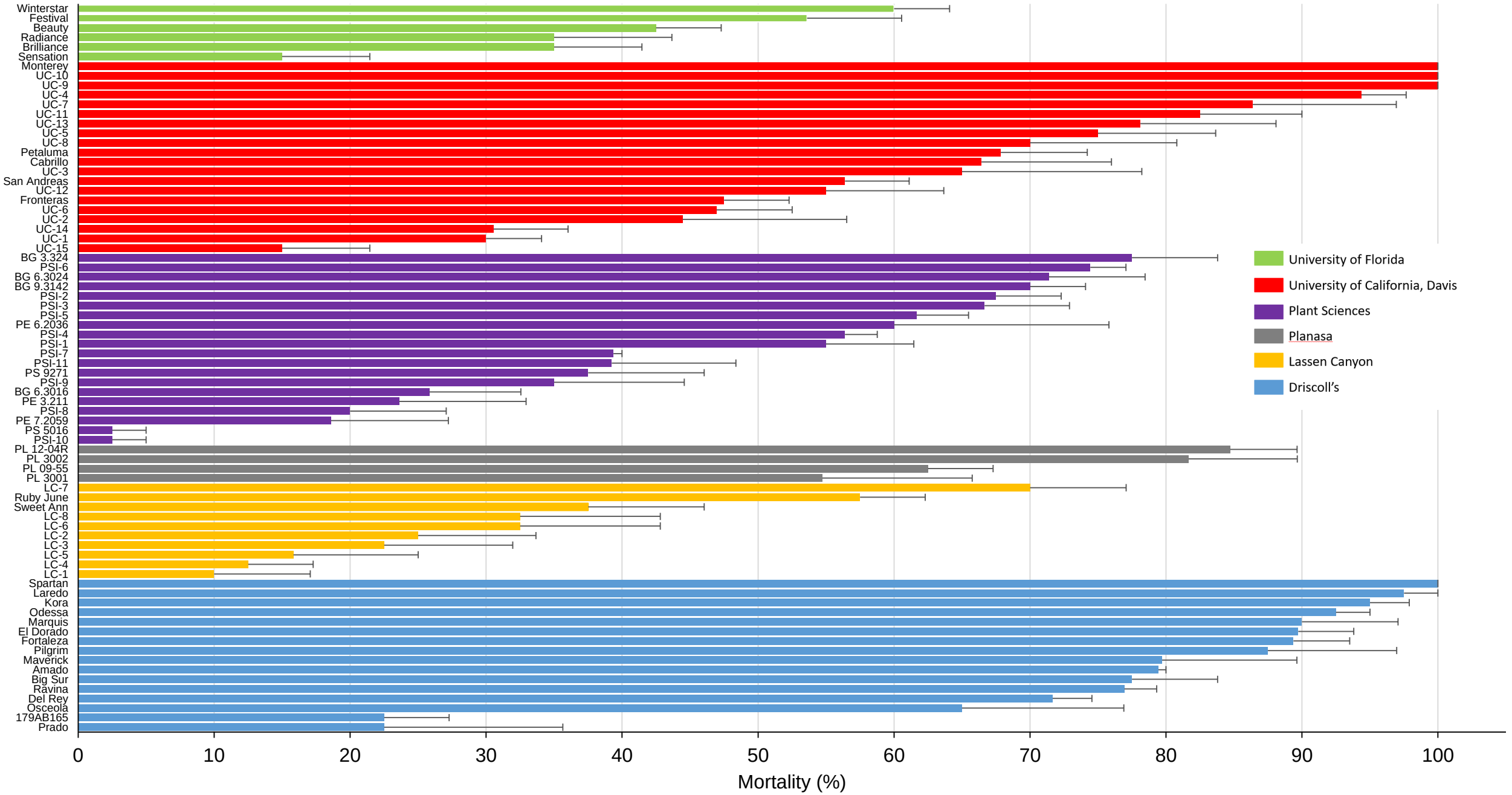
- First symptoms of anthracnose:
  - Three weeks after planting
- Majority of death in December (71.5% of total deaths in trial)

Average percent mortality due to anthracnose on 2 July 2019




Average percent mortality due to anthracnose on 2 July 2019
Monterey
Big Sur
San Andreas
Fronteras
Sweet Ann
PSI-10
PS 5016
100.0
77.5
56.4
47.5
37.5
2.5
0
10
20
30
40
50
60
70
80
90
100
Plant Mortality (%)

Average percent mortality due to anthracnose (sorted by breeding program) on 2 July 2019



Plant Sciences

Entry Name	Avg % Mortality
PSI-10	2.5
PS 5016	2.5
PE 7.2059	18.6
PSI-8	20.0
PE 3.211	23.6
BG 6.3016	25.8
PSI-9	35.0
PS 9271	37.5
PSI-11	39.2
PSI-7	39.4
PSI-1	55.0
PSI-4	56.4
PE 6.2036	60.0
PSI-5	61.7
PSI-3	66.7
PSI-2	67.5
BG 9.3142	70.0
BG 6.3024	71.4
PSI-6	74.4
BG 3.324	77.5

UC, Davis

Entry #	Avg % Mortality
UC-15	15.0
UC-1	30.0
UC-14	30.6
UC-2	44.4
UC-6	46.9
Fronteras	47.5
UC-12	55.0
San Andreas	56.4
UC-3	65.0
Cabrillo	66.4
Petaluma	67.9
UC-8	70.0
UC-5	75.0
UC-13	78.1
UC-11	82.5
UC-7	86.4
UC-4	94.4
UC-9	100.0
UC-10	100.0
Monterey	100.0

Lassen Canyon

Entry #	Avg % Mortality
LC-1	10.0
LC-4	12.5
LC-5	15.8
LC-3	22.5
LC-2	25.0
LC-6	32.5
LC-8	32.5
Sweet Ann	37.5
Ruby June	57.5
LC-7	70.0

U of Florida

Entry #	Avg % Mortality
Sensation	15.0
Brilliance	35.0
Radiance	35.0
Beauty	42.5
Festival	53.6
Winterstar	60.0

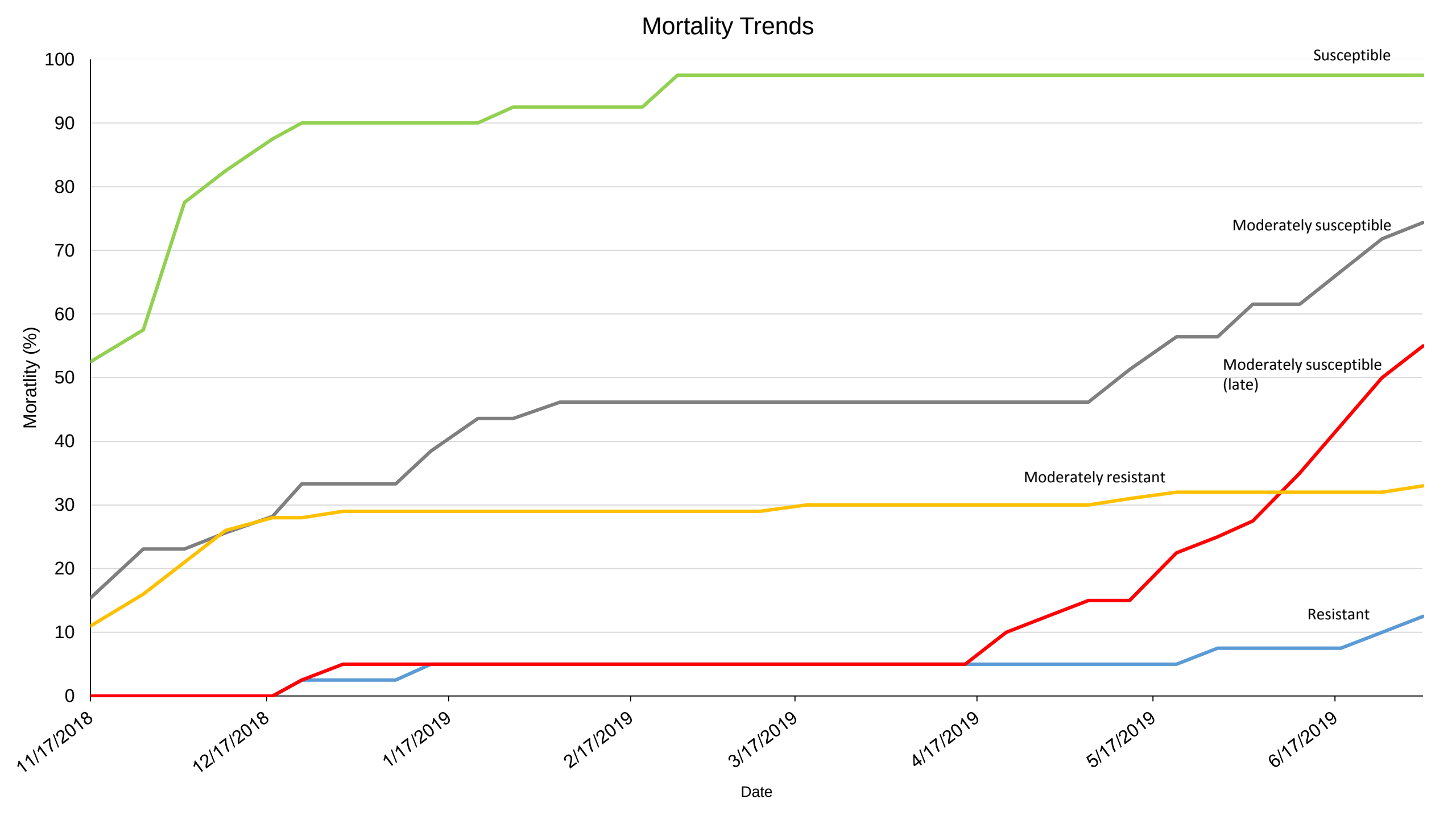
Driscoll's

Entry #	Avg % Mortality
Prado	22.5
179AB165	22.5
Osceola	65.0
Del Rey	71.7
Ravina	76.9
Big Sur	77.5
Amado	79.4
Maverick	79.7
Pilgrim	87.5
Fortaleza	89.4
El Dorado	89.7
Marquis	90.0
Odessa	92.5
Kora	95.0
Laredo	97.5
Spartan	100.0

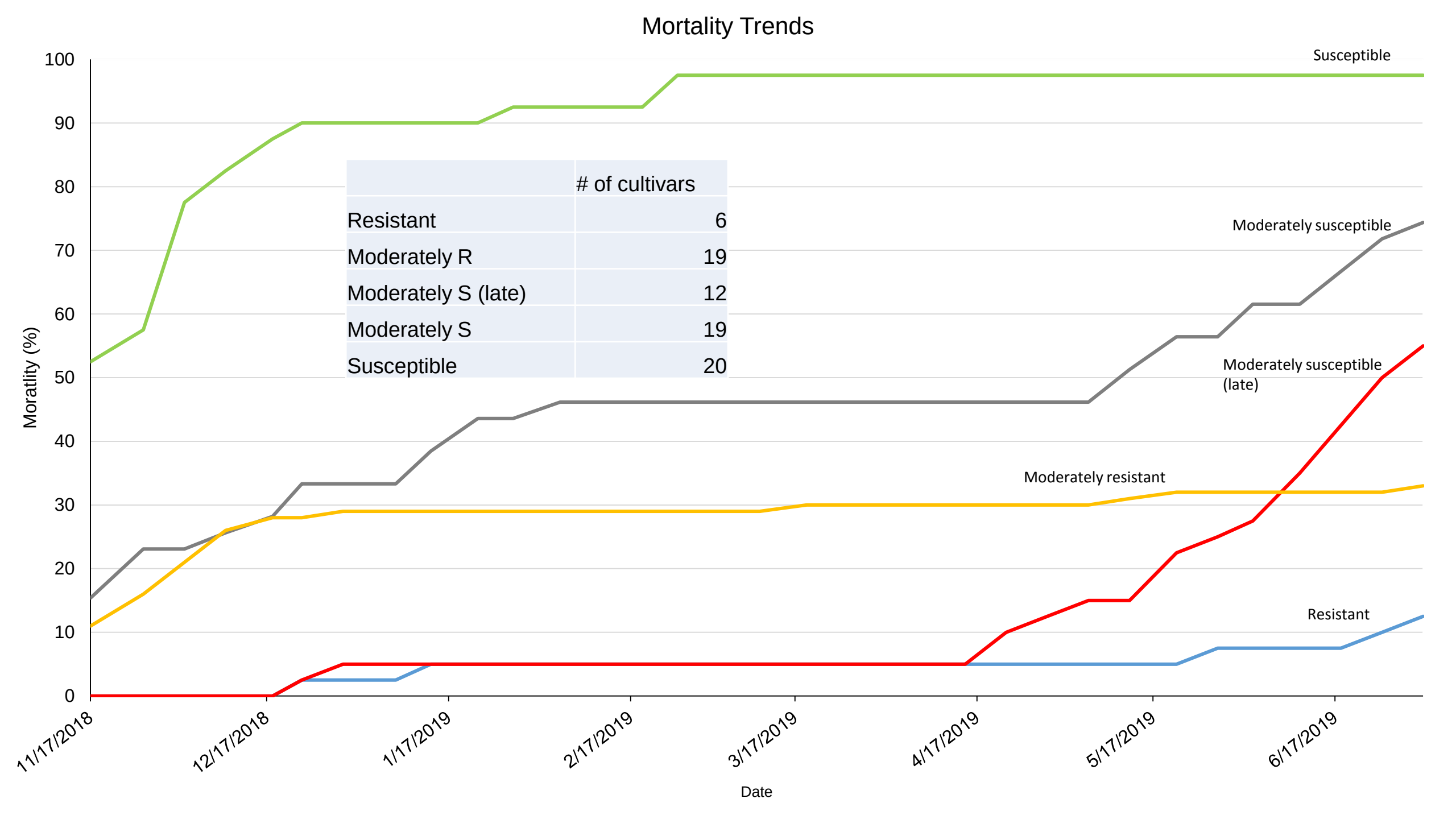
Plant Sciences

Entry #	Avg % Mortality
PL 3001	54.7
PL 09-55	62.5
PL 3002	81.7
PL 12-04R	84.7

- University of Florida
- University of California, Davis
- Plant Sciences
- Planasa
- Lassen Canyon
- Driscoll's


Mortality Trends
Susceptible
Moderately susceptible
Moderately susceptible (late)
Moderately resistant
Resistant
Moratlity (%)
Date
100
90
80
70
60
50
40
30
20
10
0
11/17/2018
12/17/2018
1/17/2019
2/17/2019
3/17/2019
4/17/2019
5/17/2019
6/17/2019

Mortality Trends



	# of cultivars
Resistant	6
Moderately R	19
Moderately S (late)	12
Moderately S	19
Susceptible	20

Management Practices: Pre-Plant

- Good sanitation practices in nurseries
- Disease-free plants
- Wash transplants prior to planting
- Host plant resistance
- Transplant dips (Switch, Abound, Zivion)

Management Practices: Post Plant

- Avoid using overhead irrigation
- Practice good field sanitation practices
- IPM: Scout fields
- Foliar application of fungicides (Switch, Captan and Abound)

Surendra Dara

Questions?

- Funding for this project was provided by the California Strawberry Commission.
- Thank you to the strawberry center team for your help in getting this project established.

CALIFORNIA STRAWBERRY™ COMMISSION

References

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