

HOST PLANT RESISTANCE FOR MANAGEMENT OF VERTICILLIUM WILT, FUSARIUM WILT AND MACROPHOMINA CROWN ROT IN CALIFORNIA STRAWBERRIES

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Host plant resistance is the most widely used and effective method of managing plant diseases worldwide. However, this method was not sufficiently utilized for control of soilborne diseases over the past 50 years because of the high efficacy of methyl bromide (MB) fumigation. Since the phase-out of MB, host plant resistance to soilborne diseases has become a primary objective in strawberry breeding programs worldwide.

In California strawberry production, the three most important soilborne diseases are Verticillium wilt, caused by *Verticillium dahliae*, Fusarium wilt caused by *Fusarium oxysporum* f. sp. *fragariae* and Macrophomina crown rot caused by *Macrophomina phaseolina*. In order to utilize host plant resistance in disease management programs, it is important to know the susceptibility to each disease for existing cultivars and elite breeding lines. We have identified field locations for each disease where high levels of each pathogen exist and are screening strawberry genotypes for susceptibility to each disease. The sites are Monterey Bay Academy for Fusarium wilt and the Cal Poly Strawberry Center fields for Verticillium wilt and Macrophomina crown rot. The Fusarium and Verticillium wilt fields are naturally infested with the pathogens while the Macrophomina crown rot site was artificially infested following fumigation with Tri-Con 50/50 (MB/chloropicrin).

At the Cal Poly sites, during the 2016-17 season we screened 89 cultivars and elite breeding lines from six major strawberry breeding programs: University of California Davis, Driscoll's, Plant Sciences, Lassen Canyon, Planasa and University of Florida. Fifteen cultivars were screened at the Fusarium wilt site. We found that for each disease there are relatively high levels of resistance and susceptibility in the genotypes tested (Tables 1 and 2). There is potential to incorporate higher levels of resistance in new cultivars and for host plant resistance to be used to a much greater extent in managing soilborne diseases in strawberry production worldwide.

Table 1. Categorization of strawberry genotypes tested into four resistance/susceptibility categories.

Disease	Resistance*		Susceptibility**		Total genotypes
	High	Medium	Medium	High	
Verticillium wilt	18	33	32	6	89
Macrophomina crown rot	11	31	27	20	89
Fusarium wilt	7	2	2	4	15

* highly resistant = 0-10% final plant mortality; moderate resistance = 11-30% final plant mortality.

** moderately susceptible = 31-50% final plant mortality; highly susceptible = 51-100% final plant mortality.

Table 2. Listing of cultivars tested according to their resistance / susceptibility category for each soilborne disease.*

Disease	resistance / suscep.**	Cultivars (final % mortality)
Verticillium wilt		
	highly resistant	Camino Real (3), Marquis (3), Petaluma (4), San Andreas (6), Albion (10)
	moderately resistant	Sweet Ann (14), Celine (18), Fronteras (18), Cabrillo (19), Scarlet (24), Manresa (25), Monterey (26), Pasadena (26), Amado (28), Encinita (28), Alafia (29), Sabrina (30)
	moderately susceptible	Anya (31), Big Sur (31), El Dorado (31), Ruby June (35), Pasillo (38), Del Rey (39), Odessa (40), Mystic (43), Oseola (43), Festival (46)
	highly susceptible	Laredo (56), Megan (56), Pilgrim (58), Benicia (69)
Macrophomina crown rot		
	highly resistant	Osceola (1), Manresa (3), Megan (10)
	moderately resistant	Grenada (11), Laredo (18), Alafia (21), Amado (24), Petaluma (25), Encinita (26), Marquis (27), San Andreas (27), Anya (29), Big Sur (30)
	moderately susceptible	Sabrina (35), Del Rey (36), Mystic (38), Portola (40), Fronteras (40), Pasadena (47)
	highly susceptible	Albion (52), Celine (52), Lucia (57), Pilgrim (61), Pasillo (62), Odessa (67), El Dorado (69), Sweet Ann (69), Monterey (69), Scarlet (75), Festival (82), Ruby June (90)
Fusarium wilt		
	highly resistant	Petaluma (0), Fronteras (1), Safari (1), Portola (2), Festival (2), San Andreas (4), Ventana (10)
	moderately resistant	Winterstar (16), Florida Sensation (27)
	moderately susceptible	Grenada (32), Sabrina (33)
	highly susceptible	Albion (53), Radiance (55), Monterey (76), Sweet Ann (97)

* elite breeding lines make up ~67% of the genotypes tested and are not listed.

** highly resistant = 0-10% final plant mortality; moderate resistance = 11-30% final plant mortality; moderately susceptible = 31-50% final plant mortality; highly susceptible = 51-100% final plant mortality.