

Powdery Mildew in California Strawberries

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Powdery mildew on leaves first occurs as irregular, white, fluffy patches.



Photo Steven Koike, UCCE

Not all “mildew” is mildew!



Greenhouse whitefly eggs and waxy deposits outside.



As the mildew continues to develop, leaves will start to curl up.



Photo Steven Koike, UCCE

Powdery mildew can cause underlying leaf tissue to turn red to purple.



Photo Steven Koike, UCCE

Immature fruit colonized by powdery mildew can ripen unevenly and support extensive mycelial growth.



Photo Steven Koike, UCCE

More powdery mildew infects immature fruit, which later ripen and can be covered with fungal growth.



Causal organism

- *Podosphaera aphanis* (previously named *Sphaerotheca macularis* f. sp. *fragariae*).
- *Podosphaera aphanis* has a narrow host range and ONLY infects cultivated and wild strawberry species.

Spores of *P. aphanis* are barrel shaped, whitish to clear, and form distinctive chains



Photo Steven Koike, UCCE

Powdery mildew

- Like most mildews, fungus grows outside of the host.
- Asexual spores called conidia are mostly formed, but *P. aphanis* also forms sexual ascospores which form inside of tiny brown spherical structures called chasmothecia.

Chasmothecia of powdery mildew.

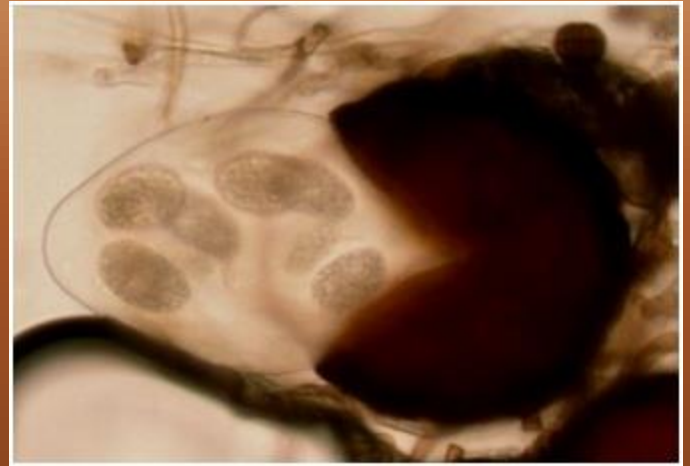
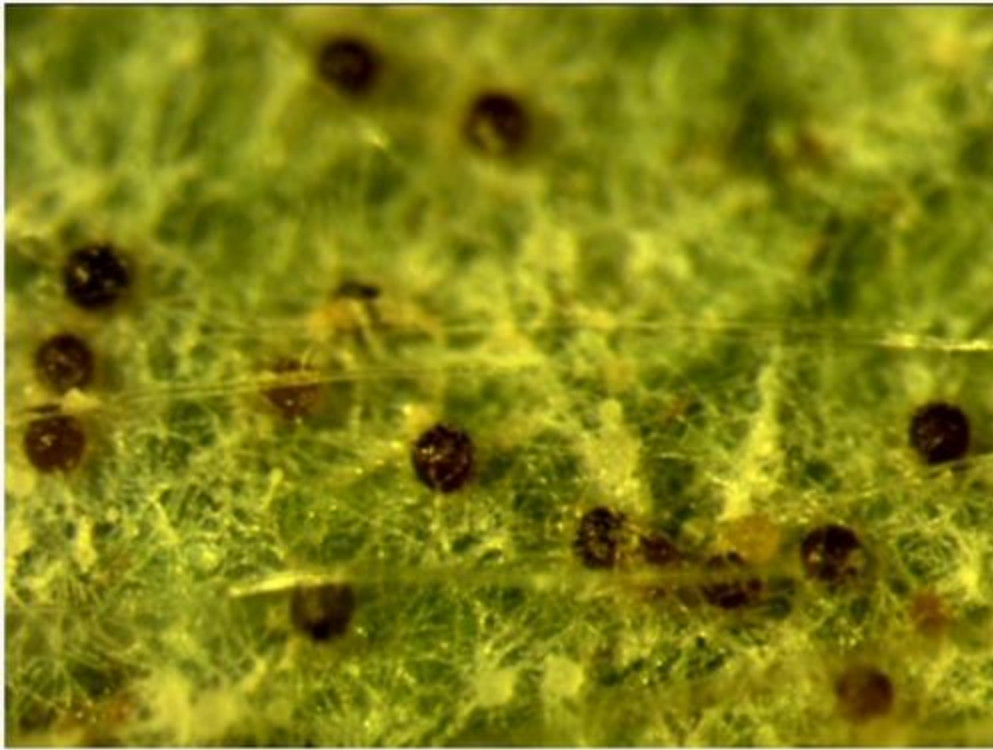


Photo credit: David Gadoury, Cornell University

Role of ascospores in California strawberries

- Very rare.
- Have not yet seen a chasmothecium in California.

Source of powdery mildew in California strawberries.

- Established plants such as volunteer strawberry and second year strawberry.
- Nursery plants.
- Possibility of ascospores serving a role.

Conditions amenable to powdery mildew development.

- 50°- 70° F and 75% relative humidity.
- Free moisture (rain and accumulated fog) as inhibiting growth of mildew.
- Even worse in strawberries under structures:
Absence of free moisture, lowered UV and elevated humidity.

2015 Mildew Trial

- Pristine-Switch-Pristine- Switch-Pristine-Switch
- Pristine-Switch-Pristine- Fracture 24 fl oz-
Pristine-Fracture 24 fl oz
- Pristine-Fracture 24 fl oz-Pristine-Fracture-
Pristine – Switch
- Pristine-Fracture 24 fl oz-Pristine-Switch-
Pristine-Fracture 24 fl oz

2015 Powdery mildew trial (cont'd)

- Vivando 10.3 fl oz
- Vivando 15.4 fl oz
- Procure-Quintec-Pristine-Procure-Quintec-Pristine
- Procure-Quintec-Fracture-Procure-Quintec-Fracture
- Procure-Quintec-Fracture 18.3 fl oz Procure-Quintec-Fracture 18.3 fl oz

2015 Powdery mildew trial (cont'd)

- Ph-D
- Ph-D + 3 lb Captan
- Pristine-Switch-Pristine-Fracture 18.3 fl oz-Pristine-Fracture 18.3 fl oz
- Procure-Fracture 18.3 fl oz- Pristine-Fracture 18.3 fl oz- Quintec-Pristine
- Pristine-Fracture 18.3 fl oz-Pristine-Fracture 18.3 fl oz- Pristine-Switch
- Pristine-Fracture 18.3 fl oz-Pristine-Switch-Pristine-Fracture 18.3 fl oz
- Procure-Fracture 24 -Pristine-Fracture 24-Quintec-Pristine

2015 Powdery mildew trial (cont'd)

- Quadris Top
- Elevate 1.5 lb
- Pyriofenone 4 & 5 fl oz
- Switch
- OSO 5%
- OSO 5% alt w Pristine
- Merivon

2015 Powdery mildew trial (cont'd)

- Fontelis 16 fl oz
- Fontelis 24 fl oz
- Untreated check

		July 13		August 14	
1	Treatment Name	Mean		Mean	
2	Pristine-Switch-Pristine- Switch-Pristine-Switch	4.85	a	4.88	a-f
3	Pristine-Switch-Pristine- Fracture 24-Pristine-Fracture 24	3.42	ab	2.35	d-h
4	Pristine-Switch-Pristine-Fracture 18.3-Pristine-Fracture 18.3	0.61	c	3.27	c-g
5	Pristine-Fracture 18.3 -Pristine-Fracture 18.3-Pristine-Switch	2.58	abc	3.34	c-g
6	Pristine-Fracture 24-Pristine-Fracture-Pristine - Switch	0.61	c	2.33	e-h
7	Pristine-Fracture 24-Pristine-Switch-Pristine-Fracture 24	3.10	abc	3.74	b-g
8	Vivando 10.3 fl oz	0.63	c	0.20	hi
9	Vivando 15.4 fl oz	2.49	abc	2.41	d-h
10	Procure-Quintec-Pristine-Procure-Quintec-Pristine	3.63	ab	6.11	a-d
11	Procure-Quintec-Fracture-Procure-Quintec-Fracture	3.94	ab	3.42	c-g
12	Procure-Quintec-Fracture 18.3 Procure-Quintec-Fracture 18.3	4.67	a	8.06	ab
13	Procure-Fracture 24 -Pristine-Fracture 24-Quintec-Pristine	2.96	abc	7.46	abc
14	Ph-D	4.27	a	4.88	a-f
15	Ph-D + 3 lb Captan	2.48	abc	4.32	a-g
16	Procure-Fracture 18.3- Pristine-Fracture 18.3- Quintec-Pristine	2.14	abc	6.00	a-e
17	Procure-Fracture 18.3-Pristine-Switch-Pristine-Fracture 18.3	2.30	abc	4.13	a-g
18	Quadris Top	1.24	bc	1.42	ghi
19	Elevate 1.5 lb	3.26	ab	6.45	abc
20	Pyriofenone 5 fl	1.95	abc	3.41	c-g
21	Switch	2.70	abc	1.90	f-i
22	OSO 5%	3.37	ab	5.48	a-e
23	OSO 5% alt w Pristine	3.45	ab	6.23	abc
24	Untreated control	4.60	a	8.51	a
25	Merivon	0.61	c	0.00	i
26	Fontelis 16 fl oz	2.33	abc	4.79	a-f
27	Fontelis 24 fl oz	2.54	abc	1.31	ghi

Recommendations for growers



Product	Active Ingredient	Mode of Action	Fungicide grouping (FRAC)*
Merivon	Fluxapyroxad + pyraclostrobin	Complex II in fungal respiration + Quinone outside inhibitor	7+ 11
Torino	cyflufenamid	unknown	U6
Micronized Sulfur**	sulfur	Multi-site inorganic	M2
Pristine	Boscalid + pyraclostrobin	Complex II in fungal respiration + Quinone outside inhibitor	7+ 11
Abound	Azoxystrobin	Quinone outside inhibitor	11
Quintec	quinoxifen	G-proteins in early cell signaling (proposed)	13
Rally 40 W	myclobutanil	demethylation inhibitor	3
Procure	triflumizole	demethylation inhibitor	3
M-Pede**	Potassium salts of fatty acids	soap	NC

