California Certified Strawberry Nurseries: pathogens of regulatory significance for the Santa Maria area

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Applicant must perform pre-plant MeBR fumigation and start with qualified plants from first year propagation from registered or foundation stock.
Applicant must keep varieties separate and rogue any off-types.

Applicant tags plants and keeps track of all paperwork.
Applicant must perform extensive pest management to keep plants “commercially clean”

Requirement for certified nursery field to be at least 1 mile from commercial production is now waved, grower can produce fruit and nursery plants in the same field.
Applicant must pay fees of $150 and

$60/acre if we do the sampling or

$50/acre if grower provides labor for sampling
Steps in the process:

1. Site Approval

Maps

Varieties

Fumigation records
Steps in the process:

2. Two Growing Season Inspections
3. One Inspection at Harvest

Blocks must be *free-from*
Off types, Diseases, Insect problems and Genetic disorders
No visual symptoms of 3 common diseases:

*Colletotrichum* spp.
*Phytophthora* spp.
*Xanthomonas* spp.

Suspects confirmed by the State Pathology Lab
Anthracnose
Pathogen: *Colletotrichum acutatum*

- Stem lesions or characteristic crown symptoms usually precede the collapse of affected plants
- Anthracnose lesions on a runner
Anthracnose
Pathogen: *Colletotrichum acutatum*

- Anthracnose crown infection causes strawberry plants to wilt and die
Anthracnose
Pathogen: *Colletotrichum acutatum*

• Like Phytophthora crown rot, the internal crown tissue is discolored, but with anthracnose the discolored tissue is cinnamon to red in color.
Anthracnose
Pathogen: *Colletotrichum acutatum*

- Fruit decay is common
- Small, sunken, oval-to-round brown spots (on green fruit) or black spots (red fruit) develop and may expand to cover most or all of the fruit surface
Anthracnose
Pathogen: *Colletotrichum acutatum*

- Soil fumigation destroys most residual inoculum but fields can be re-infected.
- Fungicide dips can be used on transplants before planting in production fields.
- Foliar fungicides are available for use on plants when the disease is present and conditions are ideal for foliar and fruit disease development.

- Running water treatments can be used to wash soil from transplants.
- Follow good cultural procedures to prevent disease inoculum from entering the field – keep weeds out.
Angular Leaf Spot
Pathogen: *Xanthomonas fragariae*

- Small watersoaked spots, translucent when viewed against the light
- Delimited by veins
Angular Leaf Spot
Pathogen: *Xanthomonas fragariae*

- Angular leaf spot lesions develop on the upper leaves as the disease progresses.
Angular Leaf Spot
Pathogen: *Xanthomonas fragariae*

- Angular leaf spot generally has a minor impact on fruit yields.
- It is a concern at strawberry nurseries, which may be subject to quarantine regulations for angular leaf spot on nursery stock.

- Chemical controls are typically ineffective
- Copper-containing compounds are registered but have caused phytotoxicity with repeated applications.
Phytophthora Crown Rot

Pathogens: *Phytophthora cactorum, P. citricola, P. parasitica, and P. megasperma*

- Symptoms include plant stunting and small leaves.
- Plant collapse may occur rapidly or slowly.
- Brown discoloration can be seen in the crown vascular tissue or throughout the crown tissue.
Phytophthora Root Rot
Pathogens: *Phytophthora cactorum, P. citricola, P. parasitica*, and *P. megasperma*

- The same *Phytophthora* species also attack roots, causing a brown to black root rot
- Symptoms are not diagnostic

*Phytophthora* is soil-borne.
- Infections can occur during cool to moderate temperatures, which are typical throughout coastal fruit-production cycles.
Phytophthora Root Rot
Pathogens: *Phytophthora cactorum*, *P. citricola*, *P. parasitica*, and *P. megasperma*

- When the soil becomes saturated with water, the pathogen can produce and release zoospores, which swim through water-filled pores to infect plant tissue.
- *Phytophthora* species also produce resilient spores (chlamydospores, oospores) that enable them to survive in soil for long periods without a host or under adverse conditions.
Red Stele
Pathogen: *Phytophthora fragariae* var. *fragariae*

- Symptoms of red stele include severe stunting occasionally followed by death of plants.
- Affected plants become stunted as older leaves die and are replaced by smaller, younger leaves with short petioles.

“B”-rated – extra concern to the nursery industry
Red Stele

Pathogen: *Phytophthora fragariae* var. *fragariae*

- Young lateral roots are often completely rotted.
- New crown roots die from their tips back, producing a symptom called “rat tail”
- Splitting affected roots reveals the red stele symptom
Viral Diseases

- Mottle
- Leafroll
- Veinbanding
- Witchesbroom
- Crinkle
- Latent "C"
- Pallidosis
- Feather leaf
- Necrotic shock
- Mild yellow edge
- Tomato Ringspot
- Pseudo mild yellow edge

- Indexed at the Foundation Stock stage
- Keep Certified nursery stock clean through vector control
Nematode sampling:

Free-from foliar and soil-borne parasitic nematodes

Collect samples on a 40 foot x 40 foot grid interval throughout the planting

Also No Mollusks Allowed
Foliar nematode: *Aphelenchoides fragariae*

- Symptoms of foliar nematode include stunted growth, reddened leaves, small curled or crinkled leaves (crimp), deformed buds and flowers, and a reduction in flowering and fruiting.
Strawberry Nematodes: Soil-borne endo- and ecto- parasites

Root Lesion
(Pratylenchus penetrans)
Stem
(Ditylenchus dipsaci)
Dagger
(Xiphinema americanum)
Needle
(Longidorus elongatus)
Root knot
(Meloidogyne incognita, M. javanica, M. hapla)
Strawberry Nematodes: Soil-borne endo- and ecto- parasites

• Controlled with pre-plant fumigation

• When using certified nursery stock, plant pathogenic nematodes are rarely found to be causing significant damage in production areas
Questions????