

Threats to Carrot Health in the Low Desert: Identification and Management

Imperial, August 22nd, 2025

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

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Topics

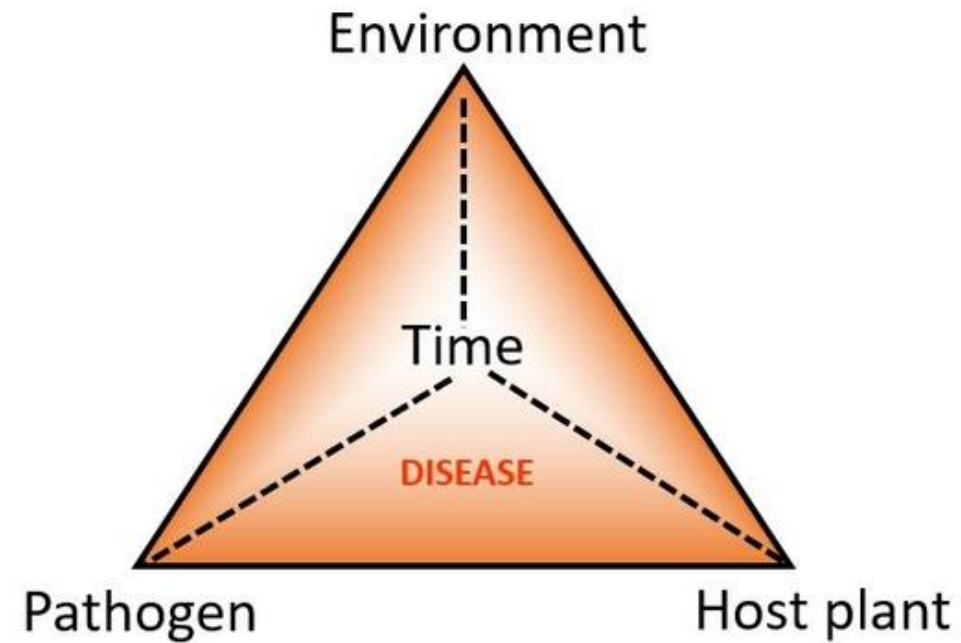
❖ Introduction to Plant Disease

❖ Common Fungal Diseases

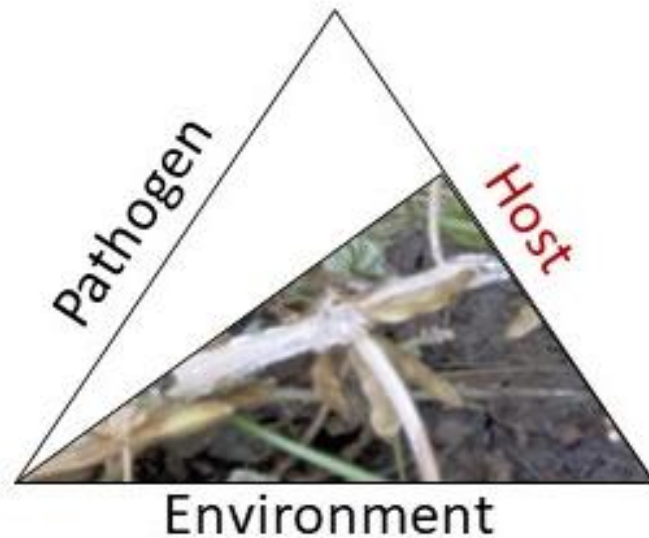
- ✓ Cavity Spot
- ✓ Powdery Mildew

❖ Root Knot Nematode

Disease Triangle



Disease Triangle



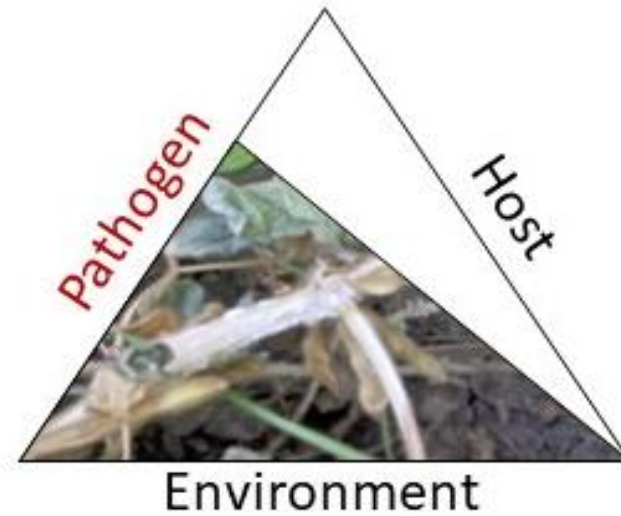
- Choose species that offer certain advantages over salinity tolerance or other growing conditions that could happen in the area

Disease Triangle

- Use proper irrigation techniques
- Apply specific fertilizer according to the needs/ instructions
- Maintain it free of weeds



Disease Triangle



- Work from the cleanest areas to the dirtiest areas.

COMMON DISEASES

CAVITY SPOT

Primary Pathogens:

- ✓ *Pythium violae* and *Pythium sulcatum*

Hosts:

- ✓ Carrots (other root crops may occasionally be affected, but carrot is the primary host)

Symptoms:

- ✓ Small, sunken lesions on the carrot taproot, typically elliptical or irregular in shape
- ✓ Lesions are usually dark brown to black with sharply defined margins
- ✓ Lesions may coalesce and become colonized by secondary organisms
- ✓ Affected roots remain firm (unlike soft rot), but blemishes reduce marketability
- ✓ Aboveground foliage generally appears healthy, so symptoms are primarily root-associated



Management Strategies – Cultural Control

CAVITY SPOT

- ❖ **Infection variability:** The severity of cavity spot can fluctuate greatly from year to year, even within the same field.
- ❖ **Contributing factors:** High fertilizer inputs, excessive soil moisture early in the season, and high soil moisture at carrot maturity are linked to increased risk.

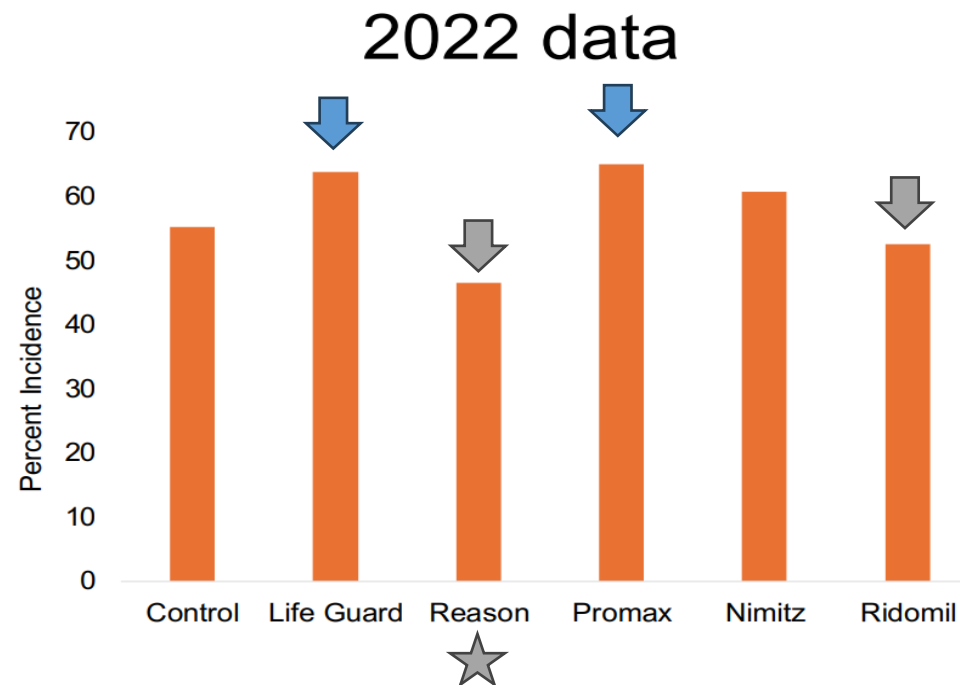
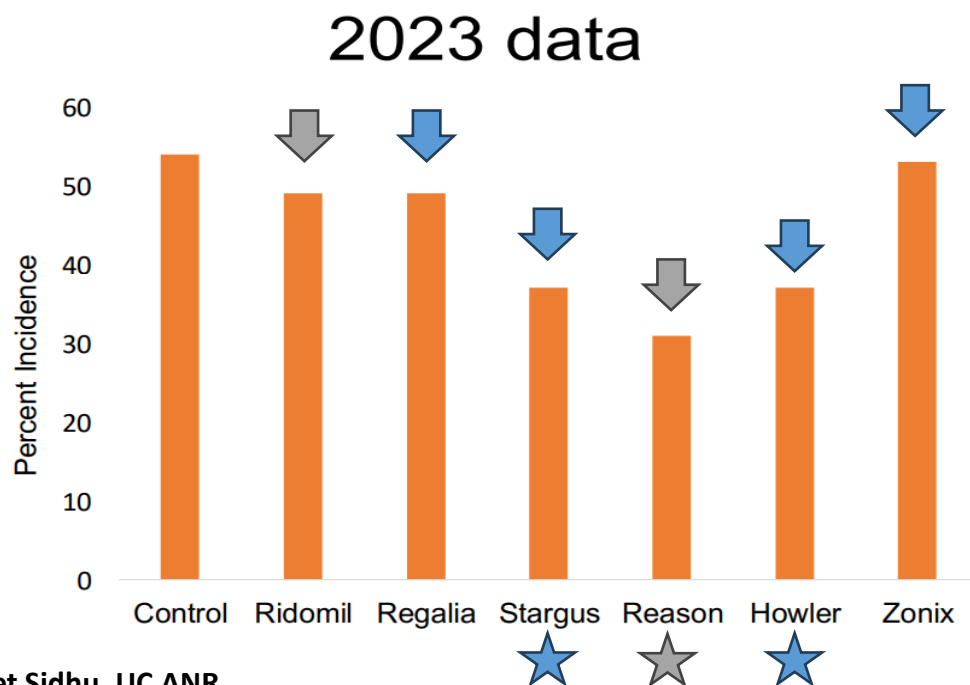
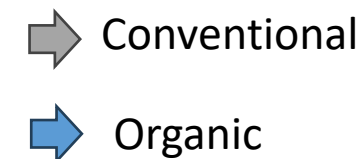
Cultural Control

- ✓ Avoid planting in fields with a recent history of cavity spot.
- ✓ Use raised beds in well-drained soils to improve drainage.
- ✓ Varietal susceptibility: Some purple-colored varieties show higher resistance. Red-colored varieties are generally more susceptible.
- ✓ Rotate crops for 3–4 years; onion is a good preceding crop, while alfalfa is not recommended.
- ✓ Harvest carrots promptly after reaching maturity, as susceptibility increases with crop age.

Management Strategies – Organic Compounds

CAVITY SPOT

- Double Nickel - *Bacillus amyloliquefaciens* strain D747
- Howler - *Pseudomonas chlororaphis* strain AFS009
- LifeGard - *Bacillus mycoides*
- Promax - Thyme oil (3.5%)
- Regalia - extract of Giant Knotweed (*Reynoutria sachalinensis*)
- Stargus - *Bacillus amyloliquefaciens* strain F727



Management Strategies – Conventional Compounds

CAVITY SPOT

Product	Active Ingredient	FRAC Code
Ridomil	mefenoxam	4 (phenylamides)
Reason	fenamidone	11 (QoI / strobilurins)
Ranman	cyazofamid	21 (Qil)
Presidio	fluopicolide	43 (benzamides)

- Ridomil (mefenoxam, FRAC 4) → resistance issues are indeed reported in several oomycete pathogens.
- The others (FRAC 11, 21, 43) have single-site modes of action, so resistance management (rotation/tank mixing with different FRAC groups) is critical.

Please, ROTATE!

Powdery Mildew

Primary pathogens:

- ✓ *Erysiphe heraclei*

Hosts:

- ✓ Carrots
- ✓ Other apiaceous crops may occasionally show infection under favorable conditions (celery, coriander, dill, fennel, parsley, parsnip, etc.)

Symptoms:

- ✓ White to gray powdery fungal growth on leaf surfaces, often starting on older leaves
- ✓ The disease affects the foliage, stems, and umbels
- ✓ Leaf distortion, curling, and yellowing as infection progresses
- ✓ In severe cases, reduced root growth and yield losses due to stress on the plant



Management Strategies

POWDERY MILDEW

- Fungal infection and disease development are **favored by high humidity** during mornings and evenings.
- Although high humidity promotes the disease, spores do **not** require free moisture (wet leaves) to germinate and infect; in fact, **sprinkler irrigation can reduce disease severity**.
- Powdery mildew develops best under moderate temperatures (55° - 90°F) and is more severe in shaded areas, as spores lose viability when exposed to sunlight → Growers should maintain adequate fertility but **avoid overfertilization**, which can create dense canopies with lush, susceptible foliage.
- Drought-stressed plants are also more susceptible → **avoid prolonged periods of drought**.
- **Preventative fungicide applications** may be necessary when carrots are marketed with tops attached, if the disease develops early, or when severity is high, **as is often the case in the Imperial Valley**.

Management Strategies – Organic Options

POWDERY MILDEW

- **Bicarbonate-based:**

- ✓ Kaligreen
- ✓ MilStop
- ✓ Others

- **Biologicals:**

- ✓ Ecoswing (extracto de *Swinglea glutinosa*)
- ✓ Sonata (*Bacillus pumilus* QST 2808)
- ✓ others

- **Sulfurs**

- **OSO 5% SC** (polyoxin D zinc salt, FRAC 19)

- **Oils**

Table 6. The effect of protective treatments applied at the early onset of powdery mildew on disease severity and marketable carrot yield in Experiment 2.

Treatment ^a	Application rate	Disease severity rating (0–5) ^b	Disease coverage ^c %	Weight of marketable carrots ^d
untreated control		4.0a ^e	100a	34.2
paraffinic oil	3.06L/ha	4.0a	100a	32.7
botanical oil	1.53L/ha	3.8ab	96ab	36.4
sulphur	0.61L/ha	1.8e	12d	40.6
botanical oil+sulphur	0.15L/ha+0.61 kg/ha	1.4e	22d	38.1

Watson et al., 2016. <https://doi.org/10.1016/j.cropro.2016.11.017>

Management Strategies – Others

Please, ROTATE!

POWDERY MILDEW

Top Consistent Performers

Product	Active Ingredients / FRAC Group
Merivon Xemium	Fluxapyroxad (7) + Pyraclostrobin (11)
Pristine	Pyraclostrobin (11) + Boscalid (7)
Endura	Boscalid (7)
Quadris	Azoxystrobin (11)
Cabrio EG	Pyraclostrobin (11)

- ✓ Cevya –Tetraconazole | FRAC 3 (DMI)
- ✓ PropiMax EC –Propiconazole | FRAC 3 (DMI)
- ✓ Rally 40 WSP –Triadimefon | FRAC 3 (DMI)
- ✓ Topaz –Penconazole | FRAC 3 (DMI)
- ✓ Switch 62.5 WG –Cyprodinil + Fludioxonil | FRAC 9 + 12
- ✓ Quilt Xcel –Azoxystrobin + Propiconazole | FRAC 11 + 3
- ✓ Inspire Super –Difenoconazole + Cyprodinil | FRAC 3 + 9

Very Good Options

Product	Active Ingredients / FRAC Group
Bravo	Chlorothalonil (M05) – Multi-site protectant
Flint Extra	Trifloxystrobin (11)
Luna Tranquility	Fluopyram (7) + Pyrimethanil (9)
Luna Sensation	Fluopyram (7) + Trifloxystrobin (11)

Okay Options

Product	Active Ingredient / FRAC Group
Tilt	Propiconazole (3)
Rovral	Iprodione (2)
Fontelis	Penthiopyrad (7)

No registered in CA for carrots

Donne et al., 2020. <https://doi.org/10.1094/PHP-12-19-0096-RS>
 Watson et al., 2016. <https://doi.org/10.1016/j.cropro.2016.11.017>

Management Strategies



When choosing a pesticide, consider information related to the pesticide's properties, the timing of application, honeybees, and environmental impact. Always read the label of the product to be used and ensure that you comply with the law.

Root Knot Nematode

Primary pathogens:

- ✓ *Meloidogyne hapla*
- ✓ *M. incógnita*
- ✓ *M. javanica*

Hosts:

- ✓ Highly polyphagous, meaning they attack a wide range of host plants

Symptoms:

- ✓ Galling, forking, and/or stubbing
- ✓ Stunted and less vigorous plants
- ✓ Predisposes to other pathogens and reduces marketability



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