

CARNATION DISEASES: A BRIEF WORK SHEET

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1. Bacterial wilt. *Pseudomonas caryophylli*

A systemic pathogen, causes wilting of branches or entire top, vascular system yellow to brown with a frayed appearance, sticky to touch.

CONTROL: Clean stock program, transmitted through propagation from infected mother stock.

2. Bacterial stunt. *Pectobacterium parthenii* var. *dianthicola*

Systemic pathogen, can be confused with bacterial wilt, stem is thickened, young shoot characteristically short and thick.

CONTROL: Clean stock program, transmitted from rotted tissue to wounded healthy roots. Must be cultured several times to completely eradicate.

3. Fusarium wilt. *Fusarium oxysporum* f. *dianthi*

May develop on one side, yellowing followed by wilt, terminal leaves become chlorotic and curl outward. Stunting. Vascular system similar to bacterial wilt but not sticky. On upper part of stem, vascular tissue is chalky white.

CONTROL: Clean stock program. Distributed by unsuspecting propagators as organism may infect without symptom expression. Infested soil, through wounds. Steamed soil and sanitation, raised benches. New approaches include suppressive organisms.

4. Phialophora wilt. *Phialophora cinerescens*

Gradual wilting, leaves fade, vascular system becomes chocolate brown. Young breaks twisted. Widely dispersed in stems and carried over in cuttings.

CONTROL: Clean stock program, steamed soils and sanitation, raised benches. Benlate at 4 lbs/1000 sq.ft. at planting, followed by 2 lbs/1000 sq.ft. later. OR, 1 lb. per 10,000 gal (3 ppm) continuous with irrigation water. NOT BOTH. Use good agitation or material will settle and clog check valves in proportioners.

5. Fusarium stem or branch rot. *Fusarium roseum* f. *cerealis*

Soil borne, enters vascular system, plants wilt and die from stem rot at base, may reveal reddish-brown lesions at base. Branch stubs may be killed back, growing down stub into main stem. Carried on cuttings, has high pathogenicity, spread by splashing water (Gates system).

CONTROL: Clean stock program with good preventive sprays once weekly on mother stock of Captan. Good sanitation from mother stock into production. Young transplanted cuttings very susceptible. For Captan, use 1½ lbs/100 gal. Some newer work on competitive organisms but no recommendations. Use Benlate at 4 lbs/1000 sq.ft. at planting, followed later with 2 lbs/1000 sq.ft. as drench. OR, continuous with irrigation water, 1 lb/10,000 gal (3 ppm). Must use good agitation. NOT BOTH.

6. Alternaria branch rot and leaf spot. *Alternaria dianthi*

Spots on leaves and stems, small and purple, broad yellow-green border with center becoming gray-brown. Black powdery spores in center under moist conditions. Lesions come together to form large dead areas. Develops first on branch bases and spreads upward. Splashing water and on cuttings.

CONTROL: Clean stock program, ferbam at 2 tsp/gal to cuttings before propagation and thereafter. Maneb and zineb (each 1 lb per 100 gal).

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7. Bacterial leaf spot. *Pseudomonas woodsii*
Sunken, necrotic spots, oval, centers pale brown with purplish concentric rings, outer zone watersoaked and yellow. May have bacterial ooze (sticky) under high humidity.
CONTROL: Wounds necessary for infection, spread by splashing water, feeding punctures from aphids, thrips, red spider, presence of water on leaves. Good insect control, keep foliage dry and greenhouses cool.
8. Fairy ring spot. *Heterosporium echninulatum*
Tan spots on leaves, stems and flowers, with eventual dark powdery spores, frequently in concentric circles. Spores air-borne and favored by wet conditions. Avoid dense planting and excessive moisture. Usual outbreak from imported plants.
CONTROL: Avoid wet foliage, eradication and isolation of diseased plants, zineb and ferbam at 1 lb/100 gal, weekly.
9. Greasy blotch. *Zygothiala jamaicensis*
Leaves lose waxy bloom, appear doused with oil. Under very moist conditions, black, superficial mycelium.
CONTROL: Avoid high moisture, wet leaves, poor air movement. Any good fungicide such as zineb at 1 lb/100 gal.
10. Rust. *Uromyces carophyllinus*
Powdery brown to red spores on leaves, surrounding area becomes yellow. Easily identified. Requires free water for germination.
CONTROL: Attention to moisture control, avoid drips, clean stock, zineb at 1 lb/100 gal. or Plantvax at 20 ppm in water supply, each irrigation (3 oz/1000 gal).
11. Botrytis or gray mold. *Botrytis* sp.
On flowers when environment warm and damp, flowers turn brown, matted by fungus mycelium.
CONTROL: Zineb or Captan, control humidity in greenhouse and in marketing process. Benlate as a spray.
12. Fusarium bud rot. *Fusarium tricinctum*
Inner flower parts moist, brownish and decayed. White cottony mycelium, associated with bud mite.
CONTROL: Eliminate bud mite, remove infected buds.
13. Anther smut. *Ustilago violacea*
Plants stunted, excessive side shoots, purplish, black spores replace normal pollen, and give flower a dirty, sooty appearance. Systemic.
CONTROL: Clean stock program, remove infected plants.
14. Pythium root rot. *Pythium* sp.
Damage to growing root tips. Top appearance usually unremarkable. Fungus may be distributed in water supply, ubiquitous, and easily re-infests steamed soil.
CONTROL: Application of fungus *Trichoderma*, rates now being worked out. Truban (25% EC) at 18 oz/1000 sq.ft. or 8 oz/1000 gal. Combination with steaming and good sanitation, possibility of significant yield increase.
15. Rhizoctonia stem and root rot. *Rhizoctonia solani*
Common soil inhabitator, favored by warm moist conditions, usually attacks plant at soil line, soft, moist rot, difficult to distinguish from fusarium.
CONTROL: Clean stock program, steamed soils and sanitation. Terraclor at 1 lb/100 gal (1 qt per sq.ft.); or Benlate at 1 lb/10,000 gal with good agitation in irrigation water.
16. Virus diseases.
Mosaic, vein-mottle: mottling of foliage and color breaking, transmission by aphid.
Mottle: faint mottling or no symptoms, faint streaking on outer petals, transmission by knife and root contact.
Ring spot: light gray or white target markings, or merely yellow-brown lesions, lateral bending of leaves. Transmitted by knife.
Streak: yellow, red or purple spots and streaks parallel to veins, mostly on lower leaves.
Latent: No symptoms but may have a synergistic effect in conjunction with other viruses.
Etched rings: Very conspicuous chlorotic spots, flecks and rings. Sometimes with knife but mostly transmitted by aphid.
CONTROL: Clean stock, meristem culture with heat treatment. Good sanitation and insect control.

SPECIAL RULES ON STEAMING RAISED BENCHES:

1. Steam at proper soil/moisture content. DO NOT allow soil to become air dry or too wet prior to steaming (the former does not steam well and the latter raises blood pressure at planting).
2. Make sure that entire bench is well tilled. Pay special attention to sides and bottom and break up clods (failure to do so will prevent good steaming).
3. Cover bench so that steam can displace the soil air. Weighting the steam cloth on the ground may prevent adequate steaming. Clamp steam cover at edge of bench.
4. Try to do all soil handling prior to steaming, including leveling the soil.
5. Traditional steaming requires 180 F for 30 minutes. Measure temperature in corners. Coldest spot is often directly behind the steam outlet.

SPECIAL RULES ON SANITATION AFTER STEAMING (cheapest route to disease control).

1. Hang up hose-ends. Never allow them on the ground (puts all employees on notice that you mean business).
2. Keep feet off of benches (not a resting spot for lazy people).
3. Clean and disinfect tools (also helps take care of the tool, use chlorox, Amphyl, Formalin or LF-10).
4. Train employees that if something is dropped on the ground, leave it there. Do not place on a bench unless washed and disinfected.
5. Cleanliness is next to godliness (including weed control). Mow around houses to keep weeds down.
6. Practice your own quarantine. Obtain best propagative material from proven suppliers. Rogue infected plants. Use good pest control and environmental control.
7. Reduce pressure on spray irrigation systems to the minimum allowable. Better yet, go to a trickle system.