

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION,
IRRIGATION, USE IN LANDSCAPE, DISEASE
AND INSECT CONTROL, ETC.]

NARCISSUS DISEASES

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The narcissi or daffodils grown in commercial fields and amateur gardens in the United States rank among the world's best. Like other flowering plants, however, daffodils are subject to certain diseases which are usually caused by fungi (molds), viruses, or nematodes (eelworms).

Eight diseases occur more or less frequently throughout the United States on daffodils. One of these is caused by a nematode, two (Mosaic and Decline) by viruses, and five (Basal Rot, White Mold, Scorch, Fire and Smoulder) by fungi. The two most commonly found to be serious are probably Basal Rot and Nematode. These eight diseases may often be distinguished by the appearance of affected leaves as follows:

Key to Leaf Diseases

1. Leaves yellowed and stunted, bulb affected with a soft, chocolate-brown rot. (Plate 299) *Basal Rot*
2. Leaves brown and "crumpled" or sickle-shaped as they emerge from the ground, dead areas sometimes covered with a velvety-gray mass of spores. (Plate 300) *Smoulder*
3. Leaves with definite dead tips or spots.
 - A. Spots reddish-brown, most frequent near ground level, appearing after flowering and sometimes causing leaves to collapse. (Fig. 167(1)) *Fire*
 - B. Leaf tips dead and brown, sometimes covered with a white mildew-like layer. (Fig. 167(2)) *White Mold*
 - C. Leaf tips dead early in season, yellow, red or brown in color and bearing numerous small dark "pimples" (pyrenidia); reddish-brown scab-like spots often present below tips. (Fig. 168(A)) *Scorch*
4. Leaves mottled in color.
 - A. Yellow-green mottles or streaks scattered on leaves. (Fig. 168(B)) *Mosaic*
 - B. Yellow, purple or white narrow streaks, sometimes dead, tan tips. (Fig. 169) *Decline*

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5. Leaves distorted and exhibiting yellow-green pimples (spikkles). (Fig. 170) *Nematode*

In the following pages these diseases are briefly described. Their control is summarized at the end of the article.

BASAL ROT

(Caused by *Fusarium oxysporum* f. *narcissi* (C. & M.) Syn. & Hans.)
[See Plate 299.]

Symptoms

The bulb is partially or entirely decayed with a soft chocolate-brown or reddish-brown rot; shoots arising from diseased bulbs are sometimes stunted, turn yellow and die prematurely.

SMOULDER

(Caused by *Botrytis narcissicola* Kleb.) [See Plate 300.]

Symptoms

Tips of young leaves are crumpled, yellowed or browned and dead; older leaves may be affected with a wet, pinkish-brown rot on one side which makes them sickle-shaped; gray masses of spores are often present on diseased areas.

FIRE

(Caused by *Sclerotinia polyblastis* Greg.) [See Fig. 167(1).]

Symptoms

Flowers exhibit small, watery spots; on leaves the spots are a bright yellow, chocolate or reddish-brown in color.

WHITE MOLD

(Caused by *Ramularia vallisumbrosae* Cav. [See Fig. 167(2).]

Symptoms

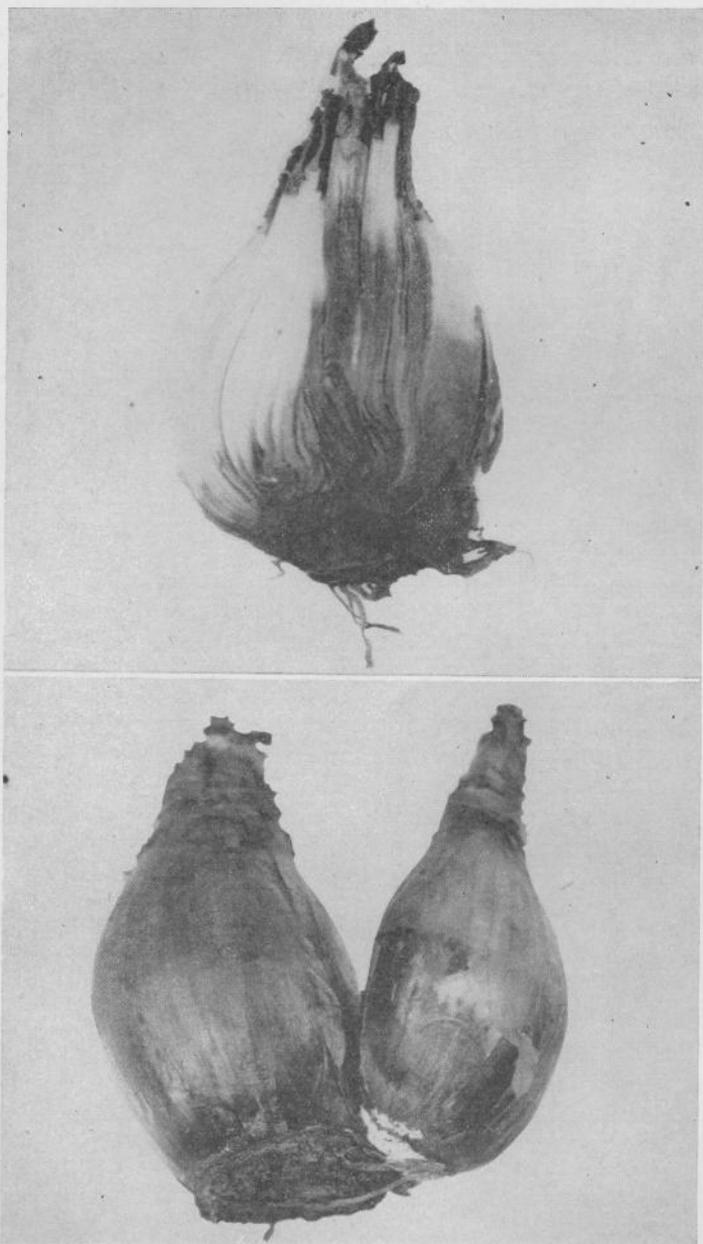
Tips of leaves exhibit sunken grey spots or streaks which become covered with white powdery masses of spores during moist weather. This disease is usually most serious in mass plantings which are left undug for several years.

SCORCH

(Caused by *Stagonospora curtisii* (Berk.) Saac.) [See Fig. 168(A).]

Symptoms

Tips of leaves are dead, yellow, red or brown in color and somewhat wrinkled as they emerge from the soil; reddish-brown, elongated, raised "scabs" sometimes develop below infected tips. This disease is also



Basal Rot of *Narcissus*

most serious in mass plantings which are left undug for several years. The same fungus will attack *Amaryllis*, *Crinum*, *Sprekelia*, *Sternbergia* and *Galanthus*.

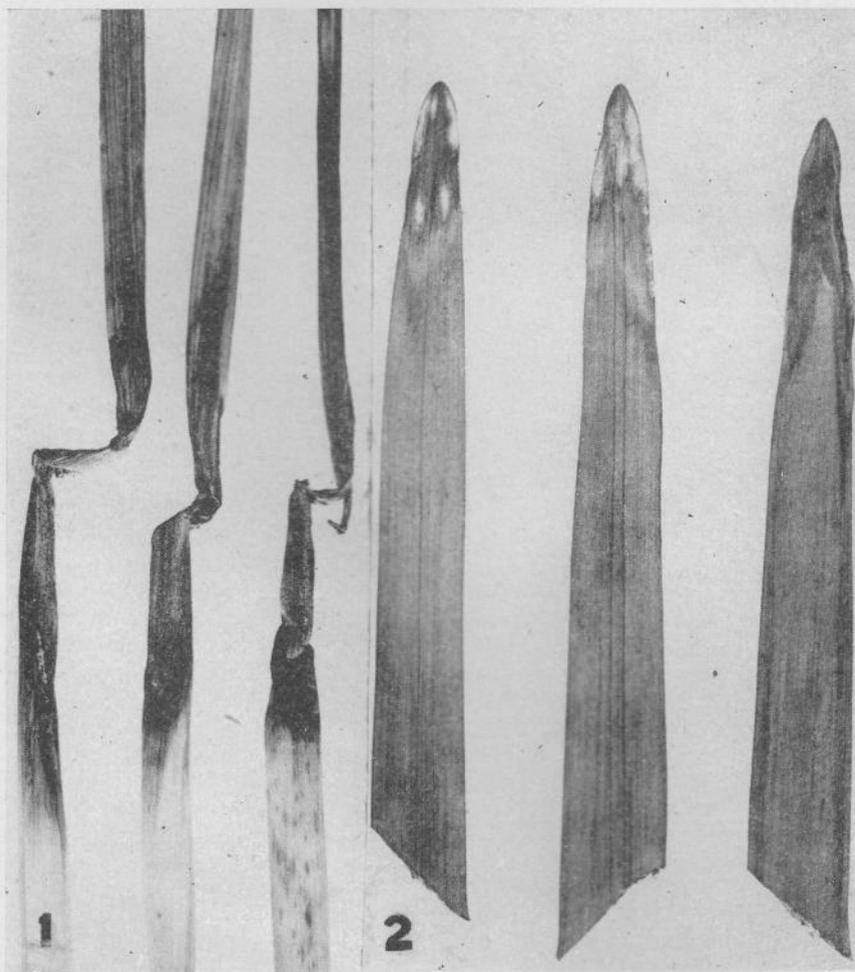


Fig. 167. Symptoms of *Narcissus* diseases— 1, Fire; 2, White Mold.
Photos by Frank P. McWhorter, Oregon State College.



Plate 300

Smoulder of *Narcissus*

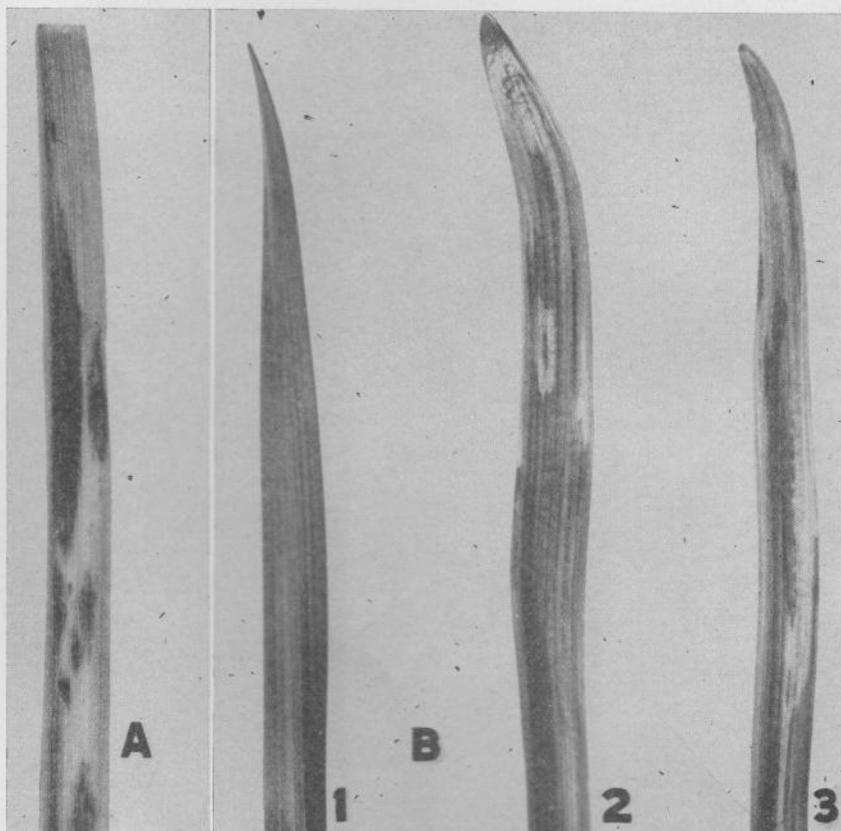


Fig. 168. Symptoms of *Narcissus* diseases— A, Scorch, (Photo) by Frank P. McWhorter, Oregon State College; B-1, healthy *Narcissus* leaf; B-2 and B-3, leaves showing *Narcissus* Mosaic symptoms.

MOSAIC

(Caused by a virus) [See Fig. 168(B).]

Symptoms

Plants are stunted; leaves exhibit light green, grayish-green, yellow or brown stripes or mottles and may be twisted and slightly roughened; flowers exhibit small white streaks or blotches. This disease is most evident before flowering time.

DECLINE

(Also called White Streak. Caused by a virus) [See Fig. 169(2).]



Fig. 169. Symptoms of *Narcissus* diseases— 1, Purple Streak; 2, White Streak; and 3, Papertip.

Symptoms

Leaves exhibit narrow dark green or purple streaks, which often turn white, yellowish-white or gray as the leaves mature; the tip of the leaf frequently turns yellow and dies. This disease is most evident after the time of flowering.

BULB OR STEM NEMATODE

(Caused by *Ditylenchus dipsaci* (Kuhn) Filip.) [See Fig. 170.]

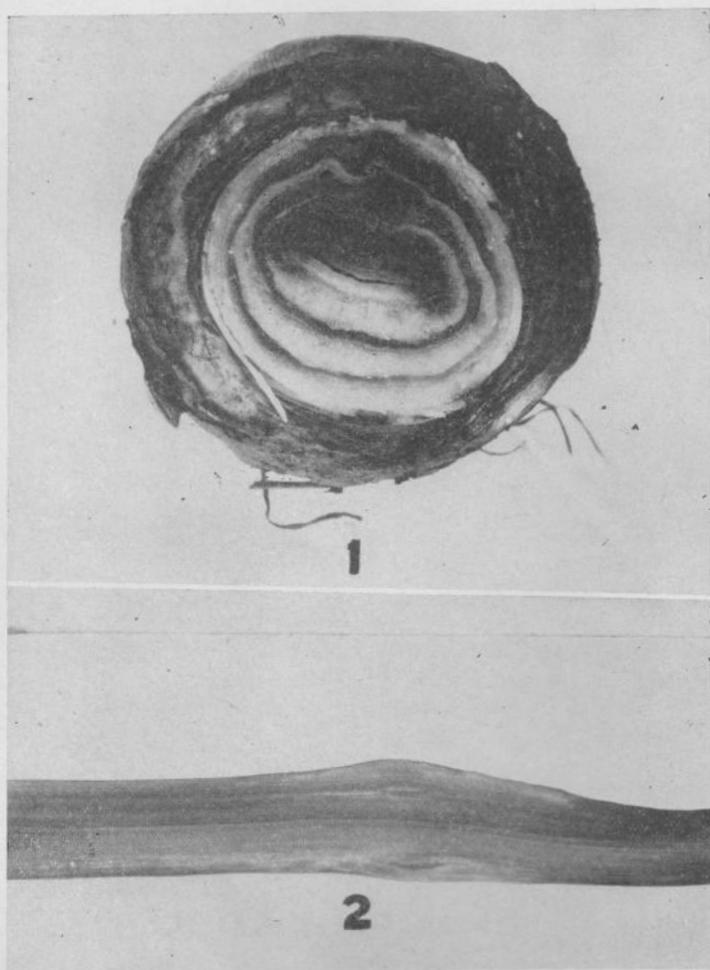


Fig. 170. *Narcissus* nematode disease symptoms— 1, in bulb; 2, in leaf. Photos by W. D. Courtney, Associate Nematologist.

Symptoms

Leaves may be twisted, distorted and exhibit (1) corrugated leaf thickenings near bases of leaves; (2) marginal discolorations; and (3)

pale yellow or yellowish-brown pimples (spikkles). Infected bulbs may be completely rotted, or show one or more rings of brown, disorganized scales lying between white healthy ones. The early stage of the disease starts with yellowish spots in the neck region, whereas basal rot, with which it might be confused, usually begins at the base. This disease is worse in warm climates than in cool ones, such as the Pacific Northwest.

CONTROL MEASURES

Control measures for the various diseases may be summarized as follows:

Leaf Spots

(Smoulder, Scorch, Fire and White Mold)

1. Dig bulbs every year; clean and replant in a new location.
2. If leaf spots are commonly troublesome, disinfect bulbs according to directions given for basal rot control.
3. Avoid planting in locations with poor air and soil drainage; practice wide spacing of plants and clean cultivation.
4. Remove and burn infected leaves; destroy all foliage when mature.
5. If, despite the above precautions, leaf spots continue to be serious, spray plants at two week intervals with 4-4-50 Bordeaux (for small amounts use 4 ounces of monohydrated copper sulfate, 6 ounces of hydrated lime and 3 gallons of water). Add Penetrol ($\frac{1}{2}$ oz.) or DuPont Spreader-Sticker ($\frac{1}{6}$ oz.) to every 3 gallons of spray solution, to enable it to wet the waxy narcissus leaves. Follow the manufacturer's directions on preparation. Commercial growers often spray their narcissi once after flowering, as a matter of insurance, even when diseases do not appear to be present.

Basal Rot

1. Do not plant any bulbs that exhibit even a trace of rot.
2. Store bulbs under cool, well-ventilated conditions.
3. Dip bulbs (for planting outdoors) for two minutes in a Ceresan solution 10 days after digging. "2% Ceresan" (1 lb. in 8 gals. of water, or 2 oz. in 1 gal.) is recommended in the Pacific Northwest, and New Improved Ceresan (1 lb. in 40 gals. of water, or $\frac{1}{3}$ oz. in 1 gal.) in warmer areas. Dry bulbs rapidly, or plant immediately after treatment.
4. Plant in cool, well drained soil. Avoid soils and fertilizers high in nitrogen.
5. Plant in a new location every year.
6. Dig and destroy in the spring all plants exhibiting yellowed leaf tips.

Mosaic and Decline

1. Try to buy daffodils that are Mosaic- and Decline-free. Patronize reputable dealers.
2. Remove and burn all plants that develop symptoms. Look for Mosaic before flowering and for Decline after flowering.
3. Protect seedlings (from aphids, which carry the viruses) with fine-mesh cheesecloth cages.

Nematode

The bulb or stem nematode is controlled in the Pacific Northwest by rotation and by treating bulbs (several tons at a time) every two or three years in a hot water bath (110°-111° F.) for four hours. Formaldehyde solution is added to this bath in the proportion of 1 pint to every 25 gallons of water.

Naturally this procedure would not be practical for the average amateur, so the following measures should be tried:

1. Try to buy daffodils that are nematode-free. Patronize reputable dealers.
2. Remove and burn all plants that develop nematode symptoms.

Most of the control measures listed herein are intended for the amateur. Commercial control measures are discussed in detail in a Bulletin No. 480, "Narcissus Diseases in Washington," published by the State College of Washington (Pullman, Wash.) in Nov., 1946.

I am indebted to many persons for their assistance in preparing this article, and especially to Dr. F. P. McWhorter (Plant Pathologist of the Oregon Agricultural Experiment Station and Agent of the U.S. D.A.) and Mr. W. D. Courtney (Associate Nematologist of the Division of Nematology, Bureau of Plant Industry, U.S.D.A.). Dr. McWhorter furnished photographs for Figure 167(2), taken from the Oregon Station Bulletin #304, 1932; and also for Figures 167(1) and 168(A); Mr. Courtney furnished photographs for Figure 170.