Daffodil eelworm diseases

O M. Goss

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EELWORMS or nematodes are minute worm-like organisms, some of which cause plant diseases. The plant parasitic forms are not visible to the naked eye but the damage resulting from their attack can be quite severe.

Two different eelworms cause damage to daffodils in Western Australia. The eelworms concerned are the stem and bulb eelworm (*Ditylenchus dipsaci* (Kühn) Filipjev) which attacks the bulb, and the root lesion eelworm (*Pratylenchus penetrans* Cobb) which causes rotting of the root system.

**STEM AND BULB EELWORM**  
(D. *dipsaci*)

**Symptoms**

**Bulb:** Externally no symptoms are evident except for the tendency to softening of the bulb with a heavy infestation. The foliage tends to wither prematurely (Fig. 1).

However, when the bulb is cut transversely one or more concentric brown decayed rings are seen (Fig. 2). These tend to be more obvious near the neck of the bulb and to disappear towards the basal plate. This shows more definitely if the bulb is cut longitudinally (Fig. 3).

**Leaves:** Small raised lumps called “Spickels” may be present on the leaves and flower stalks and leaf distortion may occur (Fig. 4).

**Method of Entry and Disease Development**

The eelworm gains entry to a healthy bulb from the soil through the neck region and either passes down into the bulb scale tissues or is carried up with the developing leaves and flower stalks.

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*Fig. 1.—External view of daffodil bulbs affected with stem and bulb eelworm. Note the small size and premature withering of the foliage compared with a healthy bulb on the right.*
In the leaves and stalks they do relatively little damage, causing only the small spickels and some leaf distortion. In the bulbs, however, the worms rapidly multiply and feed on the bulb scale which they originally entered, leaving a ring of dead decaying tissue. The bulb may finally rot down completely in the soil giving rise to soil contamination.

**CONTROL**

*Clean Planting Stock*

When purchasing bulbs avoid any diseased lines and select only firm bulbs.

**Hygiene**

Before planting cull out any bulbs which have softened in storage. Immediately lift any diseased plants noticed (during growth) and destroy by burning.

Never dump diseased plants or bulbs on the compost heap or leave them to rot down in the garden bed.

**Soil Fumigation**

Badly infested bulbs tend to rot down in the soil, so giving rise to soil infestation. It is advisable therefore to fumigate the bed with D.D. or E.D.B. at the rate of 20 to 25 gallons per acre. These fumigants must be used at least three weeks before planting. The bed should be well dug over and moistened before application. As the chemicals are toxic the bed should be free of other plants.

Fumigation can be done by hand injection using a half teaspoonful of fumigant at one-foot centres, or by drip feed into plough furrows. Immediately after treatment, water the surface to seal in the chemical.
fumigant. Leave two weeks and then cultivate loosely to free the gas. Once the fumes have escaped (usually about one week), planting can be carried out.

Hot Water Treatment of Bulbs

When the plant is first infested with stem and bulb eelworm visual detection of disease is impossible, hence it is advisable to treat all bulbs lifted from the bed where the disease has been diagnosed, with a hot water dip. This involves keeping the dormant bulbs in hot water at 110°F for three hours.

DETAILS OF HOT WATER TREATMENT

(1) If a suitable thermostatically controlled water bath is not available, apparatus can be improvised by placing a metal drum in a slightly larger box and insulating the space between with sawdust.

(2) Half fill the drum with water well above the required temperature and add 1 to 2 fluid oz. of formalin to each 5 gallons of water. Wait until the temperature drops to within 1° or 2° of the required temperature. (This heats up the insulation so that the temperature is more easily maintained). Use an accurate thermometer well immersed in the water to determine the temperature.

(3) Place the bulbs to be treated in wire baskets or tie loosely in cheese cloth, and immerse in the water. Cover the top of the bath.

(4) Carefully maintain the temperature at 110°F for three hours. (Keep a supply of boiling water handy, which can be used to raise the temperature if it falls below 110°F).

(5) Remove the bulbs and spread out to drain and dry off in a shady place in a good draught.

(6) Dip the treated bulbs in an organic mercury compound.

NOTE: If damage to subsequent flowering is to be avoided the timing of the hot water treatment is very important. Bulbs undergo a period of maturation during which the parts of the next year's flower are formed within the bulb. The hot water treatment should be delayed until the flower parts are fully formed within the bulb but the root initials have not commenced to develop. This so called "safe period" varies with different varieties and in different localities. Hence it must be determined either by dissecting a bulb or by trial over a period of years. When the hot water treatment is carried out before the flower has formed, flower distortion results.

ROOT LESION NEMATODES

(P. penetrans)

This eelworm attacks the root system of the bulb only. It burrows into the root from the soil and tunnels through it, so damaging the cell tissues. Secondary rots develop in these damaged tissues giving rise first to oval shaped brown to black lesions on the white roots and finally to an extensive root rot (Fig. 5). As a result the plants tend to wilt more rapidly and show unthrifty growth.

Control

As this eelworm attacks only the roots which are cleaned off after digging, no bulb treatment is needed. A soil fumigation as indicated for stem and bulb eelworm, is the main control measure.

Fig. 5.—Root system of daffodil infested with root lesion nematode. Note the dark coloured lesions on the roots and the extensive root rotting. (After H. J. Jensen—"Nematodes affecting Oregon Agriculture". Exper. Stat. Bulletin 579)