

## **NARCISSUS - RECOMMENDATIONS FOR CONTROL OF BASAL ROT OF DAFFODILS**

Basal rot can be a serious problem in daffodil stocks in the Northwest. Certain cultural practices tend to aggravate the problem. Early planting and late digging of infected stocks, in particular, can lead to a rapid increase in the disease.

To understand the control recommendations for basal rot, it is helpful to know something about the life cycle of the disease and conditions which favor disease development.

Basal rot is caused by the fungus *Fusarium oxysporum* F. sp. *Narcissi*. This fungus survives in the soil as microscopic-sized chlamydospores. In early spring or early summer when soil temperatures rise about 55 degrees Fahrenheit the fungus becomes active. It most commonly attacks bulbs at the basal plate. Wounds occurring during harvest also offer an avenue of entry for the fungus. Severely diseased bulbs will rot in storage, and the fungus can spread from these infected bulbs to adjacent bulbs. Some bulbs can have only latent infections; that is, the bulbs are diseased but do not show visible symptoms. When those diseased bulbs are planted, the fungus will become active again. Growth and flower production from diseased bulbs is severely reduced. Depending upon soil temperatures, the fungus may spread from diseased bulbs to adjacent bulbs along roots. Bulbs within a 30 cm. radius of a diseased bulb are vulnerable to attack when temperatures are 55° F. and higher. The fungus produces chlamydospores on the rotting bulbs, which will then survive in the soil to attack future plantings.

The following practices are recommended to control the disease:

- 1. Dig early:** Since activity of this fungus is dependent upon warm soil temperatures, digging early allows the bulbs to be harvested before the fungus becomes active.
- 2. Dry rapidly:** Fungal spores require moisture to germinate; thus, by reducing the time that the bulbs are moist will reduce the potential for disease development.
- 3. Avoid sunburning:** The *Fusarium* fungus is able to gain entry into bulbs through wounds; thus, wounding due to sunburning should be avoided.
- 4. Avoid injury:** (see above)
- 5. Remove diseased bulbs:** Removing diseased bulbs eliminates possible spread of the disease to other bulbs in storage and also the possible introduction of disease to the next field to be planted.
- 6. Treat bulbs:** Fungicide treatment - bulbs should be treated within 48 hours of digging, when possible. Since the fungicides protect only the bulbs and do not eradicate infections (may eradicate very shallow infections), bulbs need to be treated soon after digging. Bulbs that are

already diseased will not be cured by this treatment. Benlate, Nusan 30, EC (Washington only) and Mertect (TBZ) are registered for use. To avoid build up of tolerant strains of the fungus to the fungicides, Benlate or Mertect (TBZ), use Nusan as an alternate material.

Some growers have wondered about spraying the bulbs rather than dipping them in fungicide solutions. I am not aware of any data comparing these two methods of treatment. However, I was able to find three tests in which a short dip was compared to a long dip (Table 1). In all cases, the longer dip gave better control, suggesting that dipping might be superior to spray treatments.

**Hot water plus formalin treatment:** Every three to four years it is recommended that bulb stocks be given a hot water treatment (110° to 111°F) for four hours. Formaldehyde is added at the rate of 1/2 gallon (37 percent) to 100 gallons of water. This treatment will not only give partial control of basal rot but will also control insect and nematode problems. To minimize damage to the leaves and flowers from treated bulbs, treatments would take place when bulbs are in the paracarolla stage of development; this stage normally occurs three to five weeks after digging and is determined by dissecting sample bulbs.

**7. Store below 55°F:** Since the fungus is inactive below this temperature, bulbs should be held at or below 55°F. to avoid spread of the disease in storage.

**8. Disinfect trays and bins:** Residues and soils that could be harboring the fungus should be eliminated to avoid contaminating disease-free stocks. Disinfect using a solution of formaldehyde (1 gallon of formaldehyde (37 percent) to 9 gallons of water).

**Table 1. Effect of fungicide dipping time on yield reduction due to basal rot.** Since data were derived from different tests, do not compare yields from the different fungicide treatments.

Treatment <sup>a</sup>	Concentration	Time	Relative Yield (gms)
Benomyl	1000 ppm	10 min.	1421
		10 sec.	930
TBZ	1000 ppm	10 min.	2677
		10 sec.	2036
TBZ	1000 ppm	30 min.	6430
		10 min.	5770

<sup>a</sup> Gould, C. J. and V. L. Miller, 1970. Effectiveness of Benzimidazole fungicide in controlling fusarium basal rot of narcissus. Plant Dis. Rept. 54:337-380.

**9. Remove diseased bulbs prior to planting:** Bulbs that were not showing obvious symptoms at harvest may have developed disease symptoms in storage and should be removed prior to planting.

**10. Fungicide treatment prior to planting:** Similar to the fungicide treatment immediately after harvest, this is a protective treatment and will not cure infected bulbs. As indicated earlier, fungicides should be alternated, and dipping would probably be expected to give better control than spraying, although specific data is not available to clarify this point.

**11. Plant in cool soil:** It is important to delay planting of stocks that have had basal rot or planting into fields having a history of basal rot. Ideally, planting should be delayed until after the soil temperatures are below 55 to 60°F.

**12. Deep covering:** Deep covering (12 to 17 cm) will place the bulbs in cooler soil, thus reducing the potential for disease.

**13. Plant in accessible area:** Stocks that are known to be infected with basal rot should be planted in fields that are readily accessible in the spring to facilitate early digging.

**14. Plant in north-south running rows.** Fields having east-west running rows have south-facing ridges which act as solar collectors and allow the soil to warm faster in the spring, thus increasing the disease potential. Therefore, north-south running rows are recommended to reduce soil temperature and reduce disease potential.

**15. Avoid excessive planting:** The higher the rate of planting, the greater will be the number of bulbs that are exposed to infections from diseased bulbs.

**16. Avoid excessive nitrogen and phosphorus fertilizers:** High rates of fertilizer applications have been shown to increase the amount of basal rot.

**17. Avoid complete weed control.** Weed development during the late spring and early summer keep the soil temperatures lower by shading the soil and thus reduces disease potential.

**18. Rotate at least three years:** Fusarium chlamydospores are able to survive several years in the soil in the absence of a host plant. By avoiding planting of daffodils for several years, the populations of spores in the soil gradually decline.

**19. Repeat above controls to combat latent infections:** Because latent infections are not visible, it is not possible to visually examine the stock and determine how much disease is present. When attempts are being made to clean up stock from basal rot, maximum efforts should be taken to control the disease for several years in a row, even though visible symptoms are no longer present.

Many of the above practices can be carried out on a routine basis to avoid basal rot from building up in a stock. Stocks known to have basal rot should be handled specifically to utilize as many of these disease control practices as possible.

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