Chemical management

- A variety of chemicals are available that have been designed to control plant diseases by inhibiting the growth of or by killing the disease-causing pathogens.
- Chemicals used to control bacteria (bactericides), fungi (fungicides), and nematodes (nematicides) may be applied to seeds, foliage, flowers, fruit, or soil.
- They prevent or reduce infections by utilizing various principles of disease control.
  - **Eradicants** are designed to kill a pathogen that may be present in the soil, on the seeds, or on vegetative propagative organs, such as bulbs, corms, and tubers.
  - **Protectants** place a chemical barrier between the plant and the pathogen.
  - **Therapeutic chemicals** are applied to combat an infection in progress.

- Soil treatments are designed to kill soil-inhabiting nematodes, fungi, and bacteria. This eradication can be accomplished using steam or chemical fumigants. Soilborne nematodes can be killed by applying granular or liquid nematicides. Most soil is treated well before planting; however, certain fungicides can be mixed with the soil at planting time.

Fungicides are broadly grouped into two

Protective

- +/- Absorbed
- +/- Translocate
- Prevents infection or sporulation
- Use before infection
- E.g. Strobilurin, Chlorothalonil

Curative

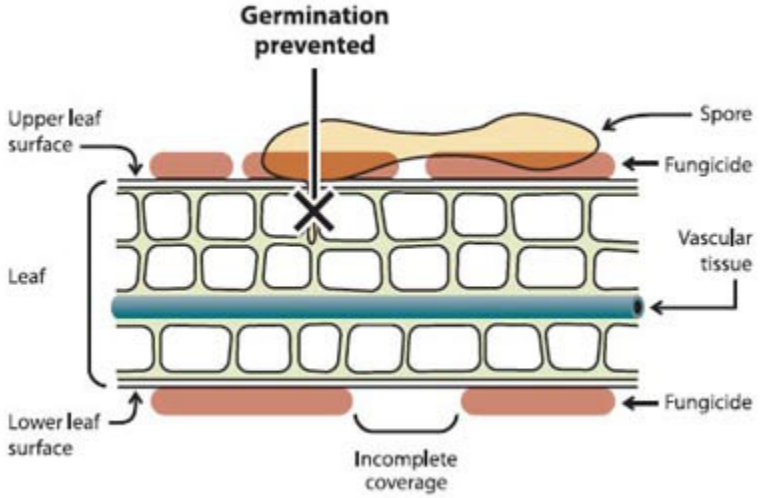
- Absorbed
- Translocate
- Kills fungal tissue
- Use after infection
- E.g. Triazoles

Eradicants

- Seeds, bulbs, corms, and tubers are frequently treated with chemicals to **eradicate** pathogenic bacteria, fungi, and nematodes and to protect the seeds against organisms in the soil—mainly fungi—that cause decay and damping-off.
- Seeds are often treated with systemic fungicides, which are absorbed and provide protection for the growing seedling.

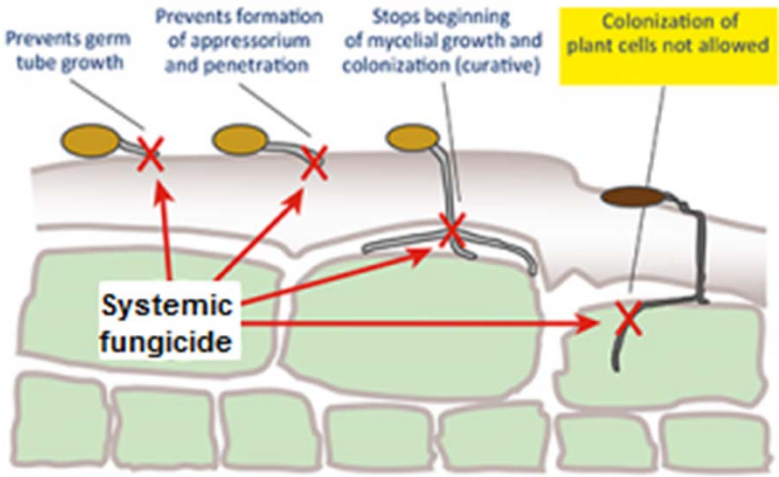
Protectants

- **Protective sprays and dusts** applied to the foliage and fruit of crops and ornamentals include a wide range of organic chemicals designed to prevent infection.
- Protectants are not absorbed by or translocated through the plant; thus they protect only those parts of the plant treated before invasion by the pathogen.
- A second application is often necessary because the chemical may be removed by wind, rain, or irrigation or may be broken down by sunlight. New, untreated growth also is susceptible to infection.



Systemic fungicides

- Systemic fungicides can be absorbed by the plant without harming it, and transported to other tissues where they are toxic to fungi.
- These compounds can control and eradicate established infections, but they are also vulnerable to fungi developing resistance, as they generally only target one step in a biosynthetic pathway to kill the fungus.
- To minimise the development of resistance by chemical overuse fungicidal uses are alternated between different classes of fungicides. Thus, the fungal population has less opportunity to build up resistance to one chemical.



ANTIBIOTICS

- Relatively few antibiotics are routinely used to control plant diseases. Antibiotics are chemical produced by micro-organisms, which destroy or injure living organisms, in particular, bacteria. Streptomycin is effective against a few fruit pathogens, such as blights and cankers, and cyclohexamine can be used to control some fungal pathogens of crops, particularly powdery mildews and rusts. Bacteria, as well as fungi, have the ability to develop resistance to antibiotics, which is a major disadvantage of using these compounds, and one of the reasons that they are not widely used.

NEMATICIDES

- The use of nematicides is confined largely to high-return horticultural crops, because they are expensive. Additionally, they are all highly toxic, and alternative measures for controlling nematodes are being investigated.

Methods of application

Soil fumigation

Soil drenching

Drip application

Seed dressing/treatment

Spray techniques

Seedling dip method

Seed bed treatment