



# INTEGRATED DISEASE MANAGEMENT FOR Black Root Rot

INTEGRATED  
DISEASE  
MANAGEMENT

SEEDLING  
DISEASES

BLACK ROOT  
ROT

VERTICILLIUM  
WILT

FUSARIUM WILT

ALTERNARIA

BACTERIAL  
BLIGHT

BOLL ROTS

MYCORRHIZAS

OTHER DISEASES  
AND DISORDERS

TIMETABLE

FARM HYGIENE

ASSESSING  
DISEASE

GLOSSARY

APPENDICES

## THE PATHOGEN

The fungus *Thielaviopsis basicola* (synonym *Chalara elegans*)

## SYMPTOMS

Slow growing or stunted cotton, especially during the early part of the season, sometimes in distinct patches initially, often spreading throughout the field in later seasons.

Blackening of the roots due to destruction of the root cortex (the outer layer of cells).

Some roots may die but *T. basicola* does not kill seedlings by itself. Severe black root rot, however, will enhance seedling death caused by *Rhizoctonia* or *Pythium*.

Plants that are badly affected early in the season may not show symptoms later in the season because the dead cells of the root cortex are sloughed off when growth resumes in warmer weather.

Internal stem rot in a proportion of older plants, usually appearing as a black to brown stain in the centre of the stem that extends a few centimetres along the tap root at, and just below, the soil surface.

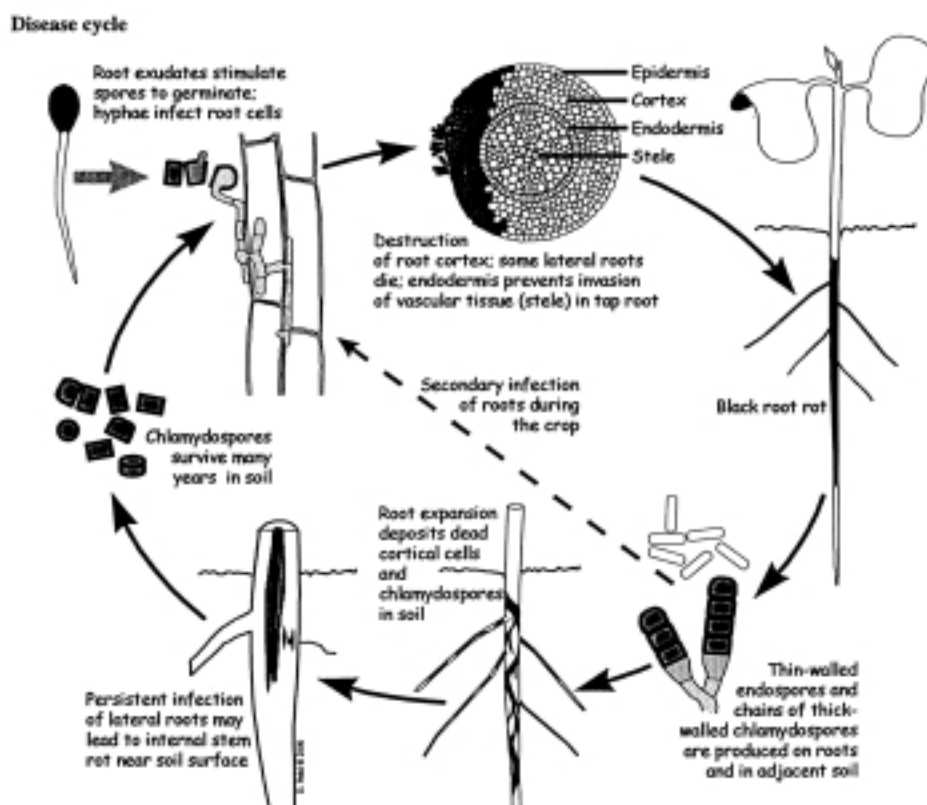
## ECONOMIC IMPACT

Black root rot delays development of the crop and, in effect, 'steals time' from the crop. If conditions later in the season are warm then the crop may compensate and yield well. Severe black root rot leads to delays in maturity of up to four weeks and yield reductions as high as 40%.

## ASSESSMENT

Look for patches or large areas of slow growing cotton (with or without reduced stand). If symptoms are present, then it may be possible to estimate visually the area of the field affected. The incidence of black root rot in the crop can be assessed using the step point method (see glossary) for ten lots of ten seedlings, preferably between three to six weeks after sowing. Count the number of seedlings with or without characteristically blackened roots and express as a percentage of the total. Later in the season, the incidence of the internal stem rot (if present) can be assessed in a similar way by splitting stems at soil level.

## DISEASE CYCLE



## FAVOURED BY

Cool wet conditions. Soil temperatures below 20°C are most favourable but infection will still progress at temperatures between 20 and 25°C.

Medium to heavy clay soils. Lighter textured soils as well as very heavy clays are less favourable.

## DISPERSAL

*T. basicola* is dispersed in soil adhering to vehicles and machinery. The fungus is dispersed in tail water or in soil adhering to trash floating in tail water.

## SURVIVAL

*T. basicola* survives as thick walled spores (chlamydospores) that lie dormant in the soil for many years until cotton or some other suitable host is present. Thin walled spores (endospores) are short lived but may cause secondary infection during the crop. Huge quantities of spores are produced on cotton roots and in the adjacent soil.

*T. basicola* can only reproduce on living host plants and cannot grow on crop residues. Therefore, the cropping sequence determines its density in soil.

## HOST RANGE

All varieties of cotton are susceptible. Most legumes are susceptible, including faba bean, soybean, cowpea, field pea, chickpea, mung bean, lablab and lucerne. *Datura* (variously known as thornapple, castor oil, false castor oil etc. etc.) is a host but little is known about the susceptibility of other weeds. Non-hosts include all the cereals, sunflower, brassicas such as canola and broccoli, onions and woolly pod vetch.

# A CONTROL STRATEGY FOR Black Root Rot

## PLANNING

- Choose indeterminate varieties that have the capacity to 'catch up' later in the season

## GROUND PREPARATION

- Good bed preparation to optimise stand establishment and seedling vigour
- Pre-irrigate in preference to 'watering up'

## EARLY SEASON

- Time sowing to avoid cool temperatures if possible, but sow early if conditions are warm enough (a soil temperature of 16°C is OK, 20°C is better) and soil temperature is rising. Temperature measurements should be taken in the fields where black root rot occurs.
- Replanting decisions should be made on the basis of stand losses, not the size of the seedlings.
- Watch for early onset of water stress (ie. because the root system is weak) and irrigate accordingly, but avoid waterlogging.

## LATE SEASON

- Anticipate delayed growth and later maturity and manage the crop accordingly (black root rot 'steals' time from your crop).

## AFTER HARVEST AND AT ALL TIMES

- Practice good farm hygiene. Farmcleanse (used at 10%) is effective against *T. basicola* and is a useful aid to decontaminate vehicles after mud is removed – COME CLEAN, GO CLEAN

## ROTATION

- Rotate with non-host crops (eg. cereals, canola) for more than one season if possible.
- Biofumigation with woolly pod vetch or mustard (canola?) between consecutive cotton crops or after a wheat fallow. The success of biofumigation depends upon the growth of the biofumigation crop and good incorporation (at least four weeks before cotton).
- Avoid rotation with legumes (except vetch) and control alternative weed hosts (eg. *Datura*).
- Flooding of fields for 30 days during summer reduces the population of *T. basicola* dramatically. This option will be limited by the topography of fields and the availability of water.