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# Other Diseases & Disorders

## ALLELOPATHY

Toxic metabolites are produced during the breakdown of residues of some weed and crop plants. Cotton stand establishment may be affected if cotton is planted into areas where such plants have been recently incorporated. Symptoms include patchy stand establishment and slow seedling growth as well as poor, impaired or distorted root development. Legume crops and medics as well as sorghum have been implicated. It has been suggested that legume residues should be incorporated at least two weeks prior to planting cotton.

## BACTERIAL STUNT

Bacterial stunt (also known as early season growth disorder or Galathera syndrome) occurs in many cotton growing areas and is usually associated with very heavy clay soils. Slow early season growth and severe stunting are often the only above-ground symptoms although the leaves of badly stunted seedlings may have symptoms of zinc deficiency: Root browning develops rapidly in response to pathogenic bacteria that colonise the roots and hinder their function. Colonisation by mycorrhizal fungi is slow. The disease is caused by a combination of soil properties and weakly pathogenic bacteria that infect the roots. One of these bacteria appears to be an undescribed species of *Pseudomonas* which is relatively common in soil and widespread in the cotton growing areas.

Bacterial stunt delays the maturity of the crop and yield can be reduced by as much as 50%; although plants in some areas recover after December and yield well if the season is long enough. No direct control measures are currently available for bacterial stunt. Fertilising with zinc may be advantageous. Cover crops (eg. winter cereal, sprayed out before sowing cotton) have increased early season growth in fields where bacterial stunt occurs. The crop should be managed to give maximum time for recovery of growth late in the season. (See 'Cotton Disease Symptoms Guide')

## BEAN ROOT APHID

Areas of poor stand establishment, stunting and uneven seedling growth. Affected patches may be circular or irregular and may vary in size from a few square metres to several hundred square metres. Careful examination of the roots and surrounding soil will reveal a network of tunnels down along the taproot, small (1mm) aphids feeding on the roots and small brown ants 'farming' the aphids. The tunnels collapse and the aphids and ants usually disappear after flood irrigation. (See 'Cotton Disease Symptoms Guide')

## BOLL DANGLE/CAVITATION

The development of young bolls is 'frozen' and the immature small (up to 15mm) boll, bracts and stalk dies and dries on the plant. An elongated dead patch also develops on the fruiting branch below where the stalk of the 'frozen' boll is attached. The condition has been attributed to cavitation and is usually associated with heat and/or water stress and plants with a full fruit load. The fungus *Phomopsis* sp. is frequently, but not always, present and similar symptoms may also result from insect larvae feeding on very young fruit. (See 'Cotton Disease Symptoms Guide')

The term 'cavitation' has been used to describe a breaking of the water column and entry of air into the plant's vascular tissue just below the developing fruiting structure. Some have argued that water entering the young developing boll is actively transported through the phloem rather than the xylem and that it is impossible for the water column in the xylem to break and cause the condition!

## BUNCHY TOP

A proliferation of small leaves, short internodes and small bolls usually becoming apparent as the crop approaches maturity and usually on the upper parts of the plant. When bunchy top is severe the whole plant is affected and the crop takes on a 'climbing ivy' appearance. Some leaves may exhibit a mottling with pale green margins and darker green centres. Symptoms may be more common in unsprayed or poorly sprayed areas of the field. (See ['Cotton Disease Symptoms Guide'](#))

The cause of bunchy top is uncertain and it is possible that there could be several agents capable of producing similar symptoms. The condition usually occurs in circular patches and often in association with prolonged aphid activity. There is some evidence for the involvement of a 'virus-like' pathogen vectored by aphids. Plants with sub-lethal infection by the Fusarium wilt pathogen also may develop bunchy top symptoms as they approach maturity. Varieties vary considerably in symptom expression with some varieties severely affected and others seemingly immune.

## CAVITATION (SEE - BOLL DANGLE)

### CAVITOMA

'Cavitoma' is a term coined in the 1950's to describe microbial damage to cotton fibre or the breakdown of the cellulose in fibre by micro-organisms. This damaging microbial activity starts in the field when lint in mature open bolls is exposed to wet weather and may continue while the seed cotton is in the module and when the lint is stored in the bale. Symptoms of fibre damage include elevated pH, reduced length and strength and reduced affinity for dyes. When harvest is delayed by rain it is important to keep module and bale moisture contents to a minimum.

Microbial damage to fibres can be observed microscopically after placing fibres in 10% Potassium hydroxide. Unaffected fibres are cylindrical while affected fibres are distorted, swollen and obviously damaged.

### CHARCOAL ROT

Charcoal rot is caused by the fungus *Macrophomina phaseolina* which is a common and widespread pathogen of sorghum and sunflower and many other hosts. Affected plants die prematurely and become brittle. Numerous small black microsclerotia are produced in plant tissues at the base of the stem. This gives these parts of the plant a grey appearance when broken or cut open.

The disease is favoured by very hot and or dry conditions.

### CULTIVATION DAMAGE

May occur along narrow guess rows during cultivation, when cultivator 'knives' are set too close to the row or when the concentration of a tractor driver wanders temporarily! Cultivation damage may be exacerbated when hills/beds are very dry and blocky.

### FERTILISER BURN

Root tips are 'pinched off' and sometimes blackened. All roots of affected plants are affected at the same level. If a particular row, or rows, are infected in each set across the field then a problem with the fertiliser rig is implied. Fertiliser burn occurs when either solid or liquid fertiliser is placed too close to, or directly under, the planting line. Very dry soil conditions between fertilizer application and planting may exacerbate the problem. (See ['Cotton Disease Symptoms Guide'](#))



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## HERBICIDE DAMAGE

Herbicide damage is most prevalent during the early stages of growth and symptoms vary considerably according to the type and rate of herbicide used. Symptoms may include yellowing between the veins on cotyledons and lower leaves, stunting and slow growth, root pruning and poor root development, death and defoliation of leaves and cotyledons, seedling death, declining plant stand, etc. etc.

Assuming that the rates of application are correct and appropriate for the soil type and assuming the spray equipment is well maintained and calibrated correctly - then - problems are most likely to occur when pre-plant herbicides are incorporated too deeply or when herbicides applied at planting are washed into the root zone by rain that falls after planting. Damage may be accentuated if the press-wheel on the planter has left a depression along the planting line on top of the bed or if the beds are poorly prepared and loose or have dried considerably prior to the rainfall after planting. (See 'Cotton Disease Symptoms Guide' and 'WEEDpak')

## LIGHTNING

A circular, or sometimes irregular, patch of dead plants that may be from two to over fifty metres across. All plants are killed or affected simultaneously and there should be no effect on plant stand. Most plants are completely killed, wilt immediately and dry quickly with leaves 'frozen' on the plant. Sometimes only the top of the plant is killed and the roots and lower stem appear unaffected. These plants may shoot again from the live portion of the stem. (See 'Cotton Disease Symptoms Guide')

## MITES

Mite activity results in a circular, defoliating patch of plants with reddened leaves that may vary in size from only one or two plants up to a patch many metres across. The mites and their webs may be observed on the under surface of the leaves and in the growing point of the plant. Affected parts of the plant (including bolls?) may develop a 'sandpaper' brown appearance and texture. These mite 'hot-spots' are usually more common towards the end of the growing season. (See IPM Guidelines and ENTOpak)

## NUTRIENT DEFICIENCY

Nutrient deficiency symptoms are not common and are usually induced by other factors such as waterlogging (Iron and Potassium), the absence of mycorrhizal fungi (Zinc and Phosphorus) or extended periods of overcast, cool weather late in the season when bolls are filling (Potassium). Some soil types are inherently low in Phosphorus or Zinc or Potassium and the addition of foliar or pre-plant fertilizer is therefore advantageous.

**ZINC** – plants stop growing and leaves become more 'shiny', cupping upwards with yellowing, and sometimes dead spots, developing between the veins.

**PHOSPHORUS** – slow, poor growth with leaves becoming a darker green.

**POTASSIUM** – See 'Premature senescence'

**IRON** – transient yellowing (usually following an irrigation or waterlogging event) especially of the younger leaves and shoots at the top of the plant.

See NUTRIpak for a more detailed description of symptoms and information on addressing nutritional issues.

## PREMATURE SENESCENCE

The cotton plant's peak demand for Potassium occurs during boll filling. Potassium is mobile within the plant. If the levels of Potassium in the soil are inadequate or if prevailing weather conditions are not conducive to Potassium uptake from the soil, then there is a relocation of Potassium within the plant from younger leaves to maturing bolls. The younger leaves towards the top of the plant turn red and senesce prematurely. Well shaded leaves and branches remain green. Plants with a heavy boll load are affected first while plants with few bolls are usually unaffected. The plants in the row along the edge of the field are also less affected because of less competition for available soil nutrients.

Premature senescence often develops during extended periods of overcast, cool weather late in the season when bolls are filling. Crops affected by premature senescence are very susceptible to epidemics of *Alternaria* leaf spot if exposed to further periods of wet weather. (See '[Cotton Disease Symptoms Guide](#)')

## SAND-BLASTING

The combination of lighter soil types and strong winds blowing across adjacent bare fallow fields or along rows may result in sand-blasting. Symptoms are obvious on one side of the plant. Affected cotyledons or leaves become desiccated and may shrivel up. The exposed side of stems and branches may also become dry and brown. Sand-blasting can significantly exacerbate development of bacterial blight on susceptible varieties. (See '[Cotton Disease Symptoms Guide](#)')

## SEED ROT

A brown to black 'rotting' of the seed coat and adjacent lint that develops prior to opening of the boll. The condition is often confined to one lock in a boll and affected seeds are sometimes hollow. When the boll opens the affected lock does not fluff out and remains in the boll. Similar symptoms have been attributed to the activity of sucking insects attacking young developing bolls.

A condition known as seed rot has also been described in the USA. All varieties appear susceptible and the cause has yet to be determined.

## SOIL COMPACTION, SMEARING AND PLOUGHSPANS

Soil compaction and smearing occur when field operations such as picking or planting are completed over moist soil. Smearing of the seed slot during planting results in poor stand establishment and slow seedling growth. Seedling roots may grow horizontally along the bottom of the seed slot or may become twisted and contorted.

When warm dry weather follows planting under wet conditions the smeared seed slot may dry out and the bed may crack open along the seed line. Further problems may occur if rain then washes soil-applied herbicides into the crack and directly into the root zone.

Under certain conditions, when there are compacted areas beneath the plant line, some cotton plants grow 15–50 cm taller than other plants in the field. These larger plants feature a well developed shallow root system, few bolls and reddened stems and long branches, especially towards the top of the plant. Similar symptoms have been described as 'acromania' or 'crazy top' in the USA.

Significant ploughspans may develop immediately below the zone of cultivation in fields used for rain-grown or dryland cropping. There may be sufficient soil moisture for seed germination and seedling growth but not enough to soften the ploughspan and allow the tap root to penetrate and grow into the sub-soil. The consequences are a poor stand with surviving plants unthrifty and featuring a nub root. (See '[Cotton Disease Symptoms Guide](#)')

## SOIL CRUSTING

Some soil types are prone to crusting after rain. When this occurs soon after sowing then the germinating seedlings are unable to emerge and poor stand establishment results.

## SOWING DEPTH

Seed should be sown very shallow when planting into a dry loose seedbed as they tend to sink further into the soil when water is applied. Seedlings emerging from depth feature small cotyledons and poor vigour early in the season.



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## SUDDEN WILT

Sudden wilt most commonly occurs mid-season when the final cultivation is followed by an irrigation or rainfall event and then fine hot weather. The plants wilt suddenly, drop their leaves and squares and, in some cases, then shoot again. Affected plants usually occur in patches extending along the rows, especially in low-lying areas of the field. All of the plants in a patch are affected simultaneously. Symptoms include a brown discolouration of the vascular tissue just below the bark on the lower stem and roots.

Sudden wilt is not common and only occurs spasmodically. It does not re-occur in the same patch in subsequent years. Weakly pathogenic *Fusarium* spp. have been found associated with the condition. (See '[Cotton Disease Symptoms Guide](#)')

## SUNSCALD

The symptoms of sunscald have been compared to those resulting from an early application of defoliant. Upper leaves become desiccated, bleached and twisted before eventually dropping off the plant. Sunscald develops when a period of wet overcast weather is followed by a quick return to fine hot weather late in the season when bolls are filling. Well grown dryland (rain-grown) crops are most susceptible although symptoms have also been seen in small areas of some irrigated crops. (See '[Cotton Disease Symptoms Guide](#)')

## SUPERNUMERARY CARPELS

James Stewart from the University of Arkansas described supernumerary carpels as the result of a genetic stutter. A boll starts undergoing normal development of carpels, but instead of development stopping when it should, a second round of carpel development starts so that a "mini-boll" with one or two carpels forms on the inside of the first one.. It can best be seen in a cross section of the boll. They appear as a light-green, elongated growth in the centre of a normal boll.

## THRIPS

Thrips are sucking insects that attack seedling cotton soon after emergence and cause newly formed true leaves to be small and deformed. Effective control can be achieved by the use of appropriate insecticide seed treatments. Despite the damage done by thrips they provide a valuable contribution to the control of mites later in the season. (See IPM Guidelines and ENTopak)

## TROPICAL RUST

Tropical rust, caused by *Phakopsora gossypii*, has been recorded on wild cotton and tree cotton in the Northern Territory and North Queensland. Under favourable conditions numerous small (1-2mm) pustules develop on the undersurface of the leaf. Each pustule is a mass of powdery spores that may be effectively dispersed by wind over long distances. The disease has not been recorded on cultivated cotton in Australia but has previously caused significant losses in parts of North and South America. (See '[Cotton Disease Symptoms Guide](#)')

## WIND-BURN

Young seedlings may be killed by exposure to strong, hot, dry winds. Plants become completely desiccated with leaves remaining attached to the plant and the plant leaning in the direction the wind was blowing. (See '[Cotton Disease Symptoms Guide](#)')

In less severe conditions one side of the seedling stem, between the soil surface and the cotyledonary node, becomes blackened and seedlings die or further growth is inhibited. The blackened lesion occurs on the same side of every seedling in the affected area. Symptoms are more likely to develop if the wind is blowing along rows rather than across rows.

## WIREWORM

Wireworms can cause death of scattered seedlings throughout a field. Either single plants or small groups of just a few seedlings may be affected. The wireworm, which is the larvae of a beetle, attacks the plant 10-30mm below the soil surface by 'chewing' a hole in the taproot or lower stem leaving a characteristic wound. (See IPM Guidelines and ENTopak)