# 1980 Different Forms of Seed and Boll Damage in Australia

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**Cotton boll rots and fiber damage are usually associated with excessive rainfall. Most cotton growing areas in Australia have a distinct summer rainfall pattern with the bulk of the Australian cotton harvest completed in March and April which are the driest months of the year. Annual surveys of commercial crops in all production areas monitor the distribution, incidence and severity of diseases of cotton in Australia. Generally the incidence of boll rots has been very low but there have been exceptions in some seasons and regions. Boll rots were particularly prevalent in the Macquarie Valley in the 1999/00 season when the average incidence was 12.6% with 37% of bolls affected in one crop. Phytophthora boll rot is the most common form of boll rot observed in Australia. The disease is somewhat sporadic in its occurrence. Crops with up to 30% of bolls affected have been observed in surveys. Other boll rots encountered on surveys include Fusarium boll rot, Sclerotinia boll rot and bacterial blight on bolls of Pima cotton. Other minor problems discussed briefly include tight lock, boll abortion, microbial damage to fibers, module rot and seed rot.**

**Keywords: Blight, Disease survey, Module rot, Phytophthora, Sclerotinia, Seed rot**

## Introduction

Cotton (*Gossypium hirsutum* L.) boll rots and fiber damage are usually associated with excessive rainfall. Most cotton growing areas in Australia have a distinct summer rainfall pattern with March and April, being the driest months. The bulk of the Australian cotton harvest is completed in March and April. However, the seasons vary and rainfall at inappropriate times is not uncommon. Boll rot, seed problems and fiber damage are generally, not significant in Australia.

## Annual Disease Surveys

The distribution, incidence and importance of diseases of cotton have been monitored by annual surveys of commercial cotton crops across all production areas in NSW since 1984. Cotton production areas in Queensland have been included in the survey since 2002 (Allen and Lonergan, 2000; Allen et al., 2001; Nehl et al., 2002, 2003, 2004, 2005, 2006). Crops are inspected soon after stand establishment and again prior to defoliation. The incidence and severity of those diseases present is assessed and field history, trash carryover, ground preparation, cotton cultivar, sowing date and seed rate are recorded for up to 140 fields in each survey.

The average incidence of boll rots in commercial crops in NSW has varied from 0.2% to 5% over the last eight years (less than 1% in four of those seasons). Boll rots were particularly prevalent in the Macquarie Valley in the 1999/00 season when the average incidence of boll rots was 12.6% with 37% of bolls affected in one crop. Phytophthora boll rot was generally the most common boll rot observed in NSW.

The average incidence of boll rots in commercial crops in Queensland has varied from 1% to 4.5% over the last four seasons. In both the 2003/04 season (3.1%) and the 2006/07 season (4.5%) early sown crops in the far northern, Emerald production area were affected

by extended periods of wet weather. Over 200mm of rain was recorded over 24 days during January and February 2007 in the Emerald area, resulting in a mean incidence of 14.5% with 25% of bolls affected in one crop. The most common fungi associated with boll rots in Queensland were *Fusarium* spp., *Aspergillus niger*, *Colletotrichum* sp. and *Phytophthora* sp.

**Boll Rots**

Phytophthora boll rot (Allen and West, 1986) caused by *Phytophthora nicotianae* Breda de Haan var. *parasitica* (Dastur) Waterh. is the most common form of boll rot observed in Australia. Oospores of the pathogen germinate in wet soil to produce zoospores which can be splashed up onto low mature bolls that are about to crack open. Infected bolls quickly turn dark brown to black and open prematurely with locks remaining 'tight', becoming a light brown colour and eventually falling out of the boll and onto the ground. Low bolls may also be infected if they are temporarily submerged during irrigation. Phytophthora boll rot is most severe in crops that are lodged or have bare soil exposed between the plants and then have the coincidence of heavy rain onto wet soil when bolls are about to open. These requirements mean that the disease is somewhat sporadic in its occurrence. Crops with up to 30% of bolls affected have been observed in surveys.

Fusarium boll rots (*Fusarium* spp.) are not common and usually occur within the humid canopy of tall rank crops that have been exposed to extended periods of wet weather late in the season. Affected bolls are frequently covered in masses of characteristic pink spores.

Sclerotinia boll rot (*Sclerotinia sclerotiorum*) has only been observed during three of the last 8 seasons. In the cool and wet 1999/00 season it was observed in three fields with 2% of bolls affected in one of the crops. Sclerotinia boll rot usually occurs within the humid canopy of tall rank crops. Characteristic large black sclerotia are formed within and on affected bolls and sometimes also on adjacent branches and stems.

Bacterial blight on bolls of *G. barbadense*. All Australian cultivars of *G. hirsutum* are immune to the bacterial blight pathogen. However, the 'barbadense' cultivars have been very susceptible. Bacterial blight symptoms were observed on 72% of bolls in a crop of Pima cotton that was inspected during the 1997/98 survey. For this reason, many growers have been hesitant to grow 'barbadense' cotton. CSIRO plant breeders in Australia have recently released a cultivar that is blight resistant.

**Tight lock**

According to Hillocks (1992), 'tight lock' describes the condition where the boll is able to open normally but one or more locks remain compact and fail to fluff out due to fungal or bacterial infection. In Australia tight lock symptoms are most commonly associated with Phytophthora boll rot but may also occur when the crop is exposed to extended periods of wet weather as bolls are opening.

**Boll Abortion**

The abortion of large squares and very young bolls has been referred to as 'boll dangle' or 'cavitation'. There is some debate as to whether cavitation is an appropriate term. Large squares and very small bolls die and become dessicated but remain attached or 'frozen' on the plant. A necrotic lesion usually extends along the branch from the base of the aborted

fruiting structure. These symptoms are more common in seasons when there have been periods of very high temperatures and/or water stress. The incidence of aborted bolls is generally low.

**Microbial damage to fibers / Weathering**

Microbial damage to fiber occurs when mature fibers in open bolls are exposed to wet weather or when moisture content in modules and bales are too high. There are many common fungi that can produce cellulases that degrade the pure cellulose in cotton fibers. Fiber strength and the ability to absorb dyes are reduced and as a consequence of this damage significant problems for spinning and knitting mills may occur. Affected fiber has a high pH and the damage can be assessed by direct observation of fibers mounted in 18% NaOH under the microscope (Allen et al., 1995). Microbial damage to cotton caused problems in Australia when rain fell on 16 consecutive days in April 1990 and the harvest was significantly delayed.

**Module Rot**

In Australia, seed cotton is machine-harvested and built into modules at the end of the field. When completed, the top of each module is covered with a large tarpaulin, which is tied down with ropes that pass through the module. Modules may stand in the field for several weeks prior to transport to the gin and also for several weeks in the gin yard waiting to be ginned. If wet weather occurs during this period, water is able to enter the module along the ropes or through small holes in older tarpaulins. Wet seed cotton becomes discolored and the temperature rises and basisidiocarps of the inky cap mushroom, *Coprinus cinereus* (Schaeffer: Fr.) S.F. Gray, commonly grow in dense clusters both within and on the surface of the module (Allen and Young, 1993). The problem can be largely avoided by using tarpaulins, which have an apron that hangs down over the ropes.

**Seed Rot**

There were two reports of a seed rot in the 2005/06 season that was accompanied by a significant boll drop. One grower first noticed the problem when his irrigation run-off system became blocked with large quantities of small, green, immature bolls. When cut open, the bolls that had dropped, as well as many of the young green bolls remaining on the plant, were found to have a light-brown, watery discoloration of the seed. Evidence of insect feeding was apparent on the surface of most bolls. The seed rot symptoms were attributed to inadequate control of piercing/sucking insect pests.

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