

Pythium comes in from the cold

By David Nehl, NSW Agriculture and Australian Cotton CRC

Climatic conditions in the 2003 spring were very favourable for seedling disease in cotton. In most areas, a large number of cold shock days in October were capped off by a cold snap at the start of November.

These conditions were ideal for seedling disease and seedling mortality as high as 60 per cent was observed in some fields. Symptoms consistent with infection by *Pythium* were observed in many crops.

Seedling disease includes seed rots and pre and post-emergent damping-off (collapse and death of seedlings). Seedling disease occurs when cotton is attacked by a range of soilborne fungi, including *Pythium*, *Rhizoctonia* and others. These other fungi may include the strains of *Fusarium* that cause Fusarium wilt, or strains of *Fusarium* that do not.

Cotton is most susceptible to seedling disease pathogens in the early stages of growth. *Rhizoctonia* and *Pythium* can infect seeds directly when the soil is very cool and/or wet. If emergence is delayed by cool conditions then the seedling is particularly vulnerable.

Newly emerged plants are vulnerable to post-emergent damping off because the cells in the hypocotyl and tap root are still thickening their walls and cementing themselves together. Later, the seedlings become resistant. Damping-off by *Rhizoctonia* and *Pythium* rarely occurs in older seedlings (after the two-leaf stage) except with very cool wet conditions. In contrast, the Fusarium wilt fungus can kill cotton plants at any



Pythium causes a soft-rot on the hypocotyl.

stage, from sowing to harvest.

Symptoms

Post-emergent damping-off occurs when infections breach the hypocotyl, effectively 'strangling' the plant. The black root rot fungus (*Thielaviopsis basicola*) is frequently blamed for stand loss but, in contrast to *Pythium* and *Rhizoctonia*, *Thielaviopsis* only infects the outer layers of the roots and does not kill cotton seedlings.

Pythium and *Rhizoctonia* both cause sunken, orange/brown lesions on the hypocotyl below soil level. If conditions are very wet these lesions may progress above the soil surface. *Pythium* characteristically causes a soft rot (see photo Page 12) but this will be less obvious in seedlings that are dead and shrivelled (see photo this page). *Rhizoctonia* grows as fine threads (hyphae) across the surface of the hypocotyl. When the soil is dry enough, characteristic 'dancing soil' may be visible on the hypocotyl (see photo next page).

Seed treatments

Each year, NSW Agriculture evaluates the effectiveness of seed-treatment fungicides against seedling disease diseases. The standard fungicides for cotton in Australia are PCNB (Quintozene) and metalaxyl (Apron, Mantle).

Seed with these fungicides and others in various combinations was sown in a field at the Australian Cotton Research Institute on September 29, 2003 and irrigated the next day. Seedling mortality was extremely high if the seed was untreated (Figure 1).

Seedling mortality was much lower in any treatment that included metalaxyl, which is active against *Pythium* but not *Rhizoctonia*. PCNB by itself had no effect on mortality. So in this particular trial, the disease pressure was dominated by *Pythium*. In other years and at other sites *Rhizoctonia* has been the major



Severe infections of the hypocotyl by *Pythium* coincided with the cold snap in November (healthy seedling at left).



'Dancing soil' on the hypocotyl is characteristic of *Rhizoctonia*.

contributor to seedling mortality and sometimes Rhizoctonia and Pythium appear to contribute equally.

Although the standard combination of PCNB and metalaxyl performed well, some of the other combinations performed as well or better (Figure 1). PCNB was applied at 1.1 g/kg seed, whereas azoxystrobin and fludioxonyl were each applied at 0.2 g/kg seed. So there is potential to reduce the amount of fungicide entering the soil environment while maintaining at least the same level of control as the current standard.

Control of seedling disease

Although the weather will always determine a 'good' or 'bad' year for seedling disease, several steps can be taken to minimise damping off and ensure acceptable stands. These measures are outlined in the Integrated Disease Management Guidelines produced by the Cotton CRC and the Cotton R&D Corporation.

- Choose varieties with good seedling vigour;
- Use effective seed treatment fungicides;
- Sow into well-prepared, high, firm beds;
- Sow into moist soil in preference to watering up;
- Position fertiliser carefully to avoid 'burning' the roots (that is away from the planting line);
- Plant when temperatures are greater than 15° C and on a rising plane;
- Incorporate rotation crop residues early (especially legumes); and,
- Incorporate green manure crops at least four weeks before sowing cotton and, if possible, with enough moisture to enable good breakdown.

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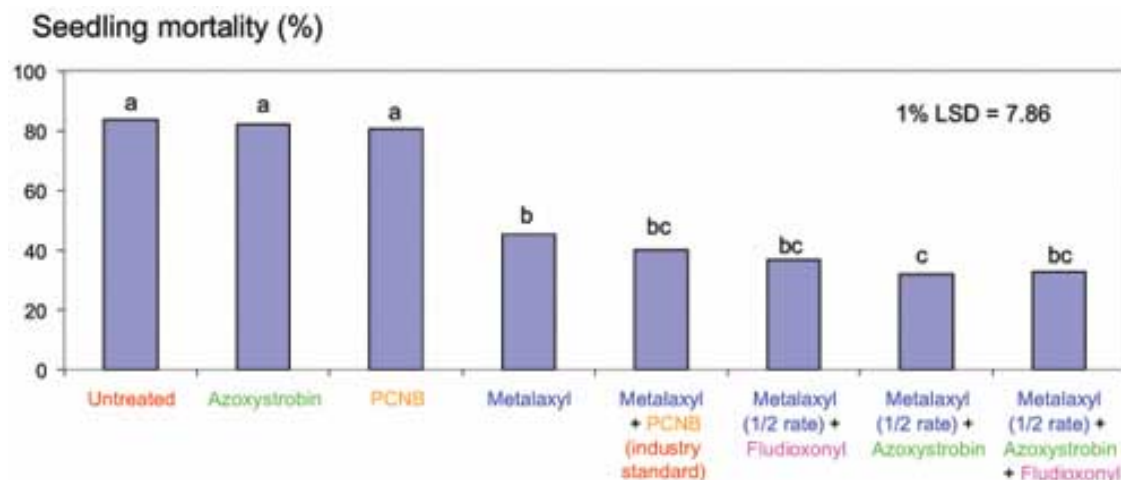


FIGURE 1: Fungicides reduce seedling mortality

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