SOY AUSTRALIA LTD
Australian Soybeans
Soybean Fact Sheet
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Diaporthe disease complex of soybean

Background

Several species of the fungal genus *Diaporthe* (pronounced dye·a·por·the) have been implicated in the diaporthe disease complex of soybean.

Overseas, *Diaporthe phaseolorum* (also known as *D. phaseolorum var. sojae*, *D. sojae* and *Phomopsis phaseoli*) has been identified as the major pathogen causing pod and stem blight, *Diaporthe caulivora* (= D. *phaseolorum var. caulivora*) as the main cause of stem canker and dieback, and *Diaporthe longicolla* (= *Phomopsis longicolla*) as the primary cause of seed decay.

However, these species are not confined to a specific plant part; for example, *D. phaseolorum* has been isolated from leaves, petioles, stems, pods and seeds.

In Australia, several new *Diaporthe* species have been found recently on soybeans but there is little knowledge of their biology and the symptoms that they cause.

Losses due to this complex of diseases vary considerably from region to region and season to season. In the United States, yield losses of up to 50% have been recorded in varieties which were highly susceptible to *D. caulivora*.

Figure 1:
Lines of pycnidia of a *Diaporthe* species on a leaf petiole and clustered near stem nodes.
Photo: Dr M Ryley

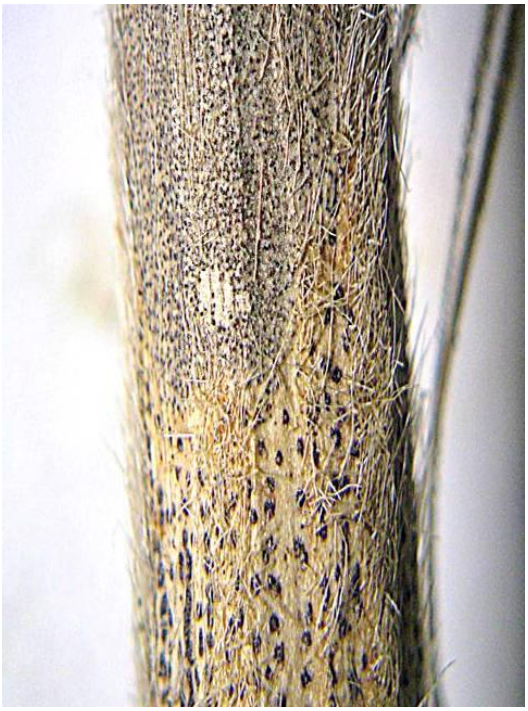

Figure 2:
Fruiting bodies of *Macrophomina phaseolina* (upper part) and of a *Diaporthe* species (lower part) on a stem.
Photo: K Wessels/H Brier, Qld DAFF

The incidence and severity of stem and seed infection by *Diaporthe* species is increased by prolonged wet weather. In a study of the *Diaporthe* disease complex in New South Wales (Stovold and Francis, 1987), the incidences of the pathogen(s) on plants and seeds were higher in the moister Manning and North Coast regions of northern New South Wales than in the drier North West Plains and Riverina regions.

In one year, infection levels of approximately 75% were found in seed lots from the Manning region. Whereas *Diaporthe* was not found in seed lots from the North West Plains and Riverina regions.

Both seed weight and germination are reduced as *Diaporthe* seed infection levels increase.

Biology and epidemiology

The major mode of survival of *Diaporthe* species is living plants and residues of soybeans and other hosts, and infected soybean seeds. For *D. phaseolorum* and *D. caulivora* and perhaps other species, another type of flask-shaped fruiting body (perithecium; pl. perithecia) often develops on infected soybean residues.

All of the *Diaporthe* species associated with soybeans in Australia have been isolated from living plants and dead residues of a range of alternative hosts including common weeds.

During periods of moist weather, spores in the *Diaporthe* fruiting bodies (pycnidia and/or perithecia) on infected living plants or residues ooze out of the top of these fruiting bodies and are dispersed by rain/water splash. Spores which are deposited on plant parts germinate rapidly in free water and the resultant fungal threads grow into the plant tissue.

Figure 3:
Lesions of a *Diaporthe* species at the stem nodes and on leaf petioles.

Photo: S Thompson

Figure 4:
Close up of a nodal stem lesion and pycnidia of a *Diaporthe* species on a petiole.

Photo: S Thompson

It is believed that stem infection results from fungal threads which firstly colonise the leaves then grow down the leaf petiole, and finally into the stem. For *D. phaseolorum* and other species the sudden blighting of the whole plant with concurrent appearance of pycnidia over much of the stem suggests multiple stem infections which remain latent until the late reproductive plant stages.

Pod infection, and subsequently seed infection, is favoured by prolonged rainfall during pod development, with lower pods being infected first. Fungal threads from germinated spores on the pod surface grow through the pod into the developing seeds; splitting and deterioration of pods caused by delayed harvest exacerbates seed infection.

The available evidence suggest that infection of pods is independent of stem infection, that is, *Diaporthe* species do not grow from invaded stems into pods and seeds.

Symptoms

The symptoms of pod and stem blight are usually not evident until infected plants approach maturity, a situation known as latent infection.

Infected plants die prematurely, leaves drop off and small, flask-shaped, black fruiting bodies (pycnidia) appear on petioles and stems often in rows, particularly in the lower parts of plants.

For *D. caulivora* and other species that cause stem canker, small dark red and sunken lesions (cankers) appear at the stem nodes often in the early vegetative growth stages, initially in the lower parts of plants. The lesions gradually grow up to 5 cm long and may girdle the stem, with pycnidia being confined to the lesions.

Pod lesions caused by *Diaporthe* species are usually dark brown, with early infection causing pod abortion and later infection causing flattened pods due to poor seed development. Infected pods die prematurely and pycnidia develop over the surfaces of the pods.

Figure 5:
Pods infected by (left and middle) *Diaporthe* species (note scattered pycnidia), and by (right) a species of *Colletotrichum* (extensive black area), with pycnidia of *Diaporthe* near the base.

Photo: Dr M Ryley

Seeds infected by *Diaporthe* species are usually elongated, shrivelled, cracked and are often covered by a fluffy, white growth consisting of fine fungal strands; however, infected seeds may show no signs of infection. Severely infected seeds rarely germinate; however seedlings which do develop from lightly infected seeds typically display dull brown lesions on the cotyledons.

Figure 6:
Seeds displaying symptoms of infection by species of *Diaporthe* and/or *Colletotrichum*; healthy seed in middle.

Photo: Dr M Ryley

The symptoms and signs of *Diaporthe* diseases can be confused with those caused by other fungal diseases, particularly anthracnose (caused by *Colletotrichum* species) and charcoal rot (caused by *Macrophomina phaseolina*).

Management options

Successful management of *Diaporthe* diseases on soybeans relies on an integrated approach, using as many of the following practices as possible.

- **Paddock selection** – as the *Diaporthe* species which attack soybean can survive in infected soybean stubble, avoid paddocks where *Diaporthe* has been a problem in the past 2 seasons or until infected soybean stubble has completely broken down.
- **Varietal selection** – the resistance of Australian soybean varieties to *Diaporthe* species is unknown, but coastal NSW varieties which have high levels of weathering tolerance often have lower levels of *Diaporthe* seed infection than varieties with lower weathering tolerance.
- **Planting seed** – do not use seed which displays the signs of *Diaporthe* infection or which has been harvested from a known infected crop.
- **Volunteer and weed control** – *Diaporthe* species have a broad host range including many common weeds, so effective control of soybean volunteers and weeds all year round is essential.
- **Fungicides** – although several in-crop foliar fungicides are registered overseas for the management of *Diaporthe* species, none are currently registered or under permit for this use in Australia.
- **Harvest** – harvest mature seed promptly as delayed harvesting increases the likelihood of seed infection during wet weather.
- **Stubble management** – in situations where *Diaporthe* has been identified as a significant disease issue, consideration should be given to using practices, including ploughing and slashing, that will encourage the rapid breakdown of infected stubble.
- **Hygiene** – follow practices which minimise the entry and movement of *Diaporthe* infected stubble and seed on your property.

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Further reading

Mungbean and Soybean Disorders: The Ute Guide. The Grains Research & Developent Corporation, Queensland Department of Primary Industries.

Compendium of Soybean Diseases, 4th edition (eds GL Hartman, JB Sinclair, JC Rupe). The American Phytopathological Society, St Paul MN, USA.

Stovold GE, Francis A (1987). Incidence of *Phomopsis phaseoli* (Desm.) Sacc. in crops and seed of soybean in New South Wales. *Australian Journal of Experimental Agriculture* 27: 317-321.

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