CAUSAL ORGANISM
Fungus: Gibberella zeae (Fusarium graminearum)

COMMON NAMES
Root rot of maize; stalk rot of maize; gibberella stalk rot

HOST RANGE
Primary hosts other than maize include: Avena sativa (oats), Glycine max (soybean), Hordeum vulgare (barley), Secale cereale (rye), Sorghum bicolor (sorghum), Triticum aestivum (wheat).

Secondary hosts include: Brassica spp., Lycopersicon spp., Medicago spp. (medic), Panicum mlliaceum (millet), Solanum spp. (nightshade), Triticalespp.; crops within Fabaceae family.

IMPORTANCE
Gibberella stalk rot is a common problem in maize production areas worldwide and also in South Africa. Yield loss data for most stalk rots is difficult to ascertain as the disease is often secondary and part of a complex of factors such as stress, which in turn can be caused by dry conditions or excess water, poor leaf disease control, insect or mechanical damage. Damage and losses are caused by premature plant death, lodging and interference with translocation of water and nutrients during grain filling, leading to poor yields. Management issues caused by Gibberella, such as lodging, make this an important disease. Lodging complicates mechanical combining, necessitating the picking up of plants and hand harvesting, which cause serious time constraints.

Avoiding early senescing of plants will reduce the disease severity. Leaf diseases such as grey leaf spot, northern corn leaf blight and common rust are well known to predispose plants to stem rots. After flowering, the grain acts as a sink for carbohydrates within the plant. Under high leaf disease pressure, nutrients are removed from the roots and stem tissue to compensate for the reduced photosynthesis of the leaves. Stems are weakened, senesce prematurely and susceptibility and subsequent colonisation by opportunistic stem rot organisms is increased. Thus, selecting hybrids with good leaf disease resistance and good leaf disease control will also reduce stress and therefore stem infections.

SYMPTOMS
Symptoms of Gibberella stalk rot are similar to those of other stalk rots, but it is the pink/red discolouration that is diagnostic. Affected plants die prematurely, wilt, suddenly turn a dull greyish-green and the lower internodes soften and turn straw-coloured. Similarly, the prop roots rot, turn brown, become brittle and break. Internally, the pith shows a characteristic reddish discolouration (Fig. 1 and Fig. 2). The fungus causes disintegration of the pith, leaving only the vascular bundles (Fig. 4). The disintegration of stem tissue causes stem lodging and rotting of the root system which leads to root lodging (Fig. 5). Small, round, black fruiting bodies (perithecia) may be produced superficially on the stalks, often at the internode (Fig. 3).

SIMILARITY TO OTHER DISEASES
This disease can be differentiated from Diplodia stalk rot by the red pith discolouration and the small, black perithecia produced superficially on the stalks, unlike the subepidermal, black pycnidia which are embedded in the rind tissue of the lower stem of plants infected with Diplodia. Although Fusarium stalk rot also results in a pinkish pith discolouration, it can be distinguished by the absence of these black fruiting bodies.

DISEASE INFORMATION
The fungus overwinters on maize debris and rarely on the seed. During cool, moist weather spores are carried by air currents to ears and stalk where they infect maize plants. Stalk infection usually occurs shortly after pollination, developing at the origin of the leaf sheaths or around the brace roots. The fungus may also enter through the roots and grow up into the lower stem. G. zeae also causes scab and seedling blights of wheat, barley, oats and rye.
Gibberella stalk rot

**Figure 2.** Internal red discolouration of pith.

**Figure 3.** Black fruiting bodies at internode.

**Figure 4.** Disintegration of pith (left) compared with healthy stem (right).

**Figure 5.** Stem lodging as a result of Gibberella stalk rot.

**CONTROL**

**Cultural control:**
- Hybrids resistant to other stalk rot diseases are also resistant to Gibberella stalk rot.
- Cultural practices that lessen plant stress can help reduce the incidence of stalk rot. Common stresses include: high nitrogen, low potassium fertility, high moisture in the mid to late season after a dry early season, moisture stress early in the season and during grain fill, high leaf disease incidence. Physical damage that creates wounds allowing the pathogen to enter such as insect damage or hail storms may also predispose maize plants to stalk rot.
- Crop rotation will allow stubble to break down, without providing a host on which to survive, reducing inoculum.

**Chemical control:**
- There are no fungicides currently available for managing Gibberella stalk rot. However, fungicide applications for the control of leaf diseases may be beneficial in reducing the stress placed on the plant, thus lessening stalk rot severity and ultimately lodging.