

Research on and control of *Diplodia* in maize

DR BELINDA JANSE VAN RENSBURG, ARC-Grain Crops, Potchefstroom and
PROF VINESH MAHARAJ, Department of Chemistry, University of Pretoria

Diplodia stalk and ear rot is caused by the fungus *Stenocarpella maydis* and can be encountered throughout the world. Diplodia ear rot is usually noted in seasons with early drought followed by excessive and extended rainfall during the maturation stage of the maize plant. Diplodia stalk rots become common in seasons where early season rainfall is followed by a midseason drought period during grain fill.

Diplodia ear and stalk rot disease produces specific mycotoxins which have been shown to affect animals differently in various studies, many of which were originally determined in South Africa where field symptoms of diplodiosis were initially reported.

Diplodiosis is defined as a nervous disorder of cattle and sheep resulting from the ingestion of mouldy cobs infected by *S. maydis*.

The past

The first record of diplodiosis in South Africa is a report by Van der Bijl in 1914 in the region of the Mooi River in the KwaZulu-Natal province. He reported an outbreak of 'sickness' in cattle which was characterised by paralysis following grazing on harvested maize fields.

Over the past three decades in South Africa, various reports of diplodiosis in livestock were received from veterinarians and producers. However these outbreaks have not been confirmed to be caused by Diplodia contaminated residues.

The present

Stenocarpella maydis (*Diplodia*) ear rot

Drought during the early season, followed by rain during the late season, can lead to Diplodia ear rot epidemics, especially where high inoculum sources are present on stubble covering soil.

This fungus has the ability to produce spore producing structures that can survive on maize stubble through the winter while producing spores during spring.

These spores then infect plants throughout the growing season. After rain or

during high humidity, these structures release spores in the air, which land on maize plants and infect the base of the ear/leaf junction and ramifies upwards into the ear. The entire ear becomes overgrown with a white mycelial growth (**Photo 1**).

If a cross section is made of an infected ear, black spore-producing bodies at the kernel bases can be seen (**Photo 2**). Late season infections may occur when kernel moisture is low, but these symptoms are less obvious. Infections that show little or no symptoms are locally referred to as 'skelm Diplodia'.

Diplodia ear rot can re-occur (epidemic) in certain areas and infected grain is then harvested with the healthy grain, thereby reducing grain quality. Reduced grain quality will have negative financial implications as this reduces the price the producer receives for his grain. During such an epidemic when early infections are present, yield losses can be of great economic importance.

Stenocarpella maydis (*Diplodia*) stalk rot

This fungus is common in all maize producing areas and in seasons with early rains and persisting late season droughts, this disease becomes very damaging, resulting in lodging and poor grain fill.

Diplodia stalk rot reduces yield by reducing nutrient and moisture uptake to ears during grain fill. This sink (the ear) extracts sugars from the stalk which further predisposes the stalk to fungal growth and further reduces nutrient uptake.

This continual sink-source cycle reduces yield. The onset of windy conditions whilst plants are drying results in lodging (**Photo 3**) and further economic losses as ears have to be picked by hand. Estimated annual yield losses of 5% to 20% may occur due to Diplodia stalk rot and lodging.

The fungus overwinters in a mycelial form in maize stubble (buried or on the soil surface) throughout the winter. Under warm, moist conditions, pycnidia develop which release spores which are spread by wind and rain.

Infections of plants occur mainly through the crown and roots and occasionally at the nodes between the crown and ear. Infection

usually takes place two to three weeks after silking under favourable conditions. Dry early season conditions followed by rain during silk formation favour Diplodia ear rot, whereas a wet early season followed by drier conditions or heat stress is likely to result in more severe Diplodia stem rot.

Stalk rot symptoms appear several weeks after silking. Leaves of infected plants wilt, become dry and appear greyish-green. Lower internodes become brown and spongy. Small, black fruiting bodies (pycnidia) cluster near the nodes of the rind.

The rind may also be covered by a white mycelial growth. The stalk pith discolours and disintegrates with vascular bundles remaining intact. This weakening of the stalk predisposes plants to lodging during strong winds and rain prior to harvest.

Control measures for *Diplodia* ear and stalk rots

It is critical that Diplodia ear and stalk rot control is seen holistically and that other control measures are included in an integrated control programme to manage both Diplodia ear and stalk rots.

Stubble reduction/retention

Control of Diplodia ear rot includes surface stubble reduction by means of grazing, burning, baling or ploughing in of surface maize stubble. As the fungus (*S. maydis*) survives on maize stubble and survives poorly in soil, any management practice that reduces levels of infected surface stubble will reduce inoculum concentrations in the field.

The removal of stubble for a single season and then resorting back to stubble retention practices, only reduces Diplodia ear rot for that specific season. Where stubble is present the following season, the risk of Diplodia ear rot will increase to its original level, should weather conditions be favourable.

Stress reduction

Avoid planting unrealistically high plant populations on marginal soils and in areas where there is a high probability of drought, leaf or alternate stalk rot disease conditions. Ensure plant nutrition is adequate and balanced relative to the yield potential of the land or area to be planted.

