

MAIZE DISEASES AND NUTRIENT DEFICIENCIES

A FARMER'S GUIDE



Grey Leaf Spot





Causal organism:

Fungus: *Cercospora zea-maydis*

Symptoms:

1. Lesions are pale brown or grey to tan, long, narrow and rectangular, being characteristically restricted by veins
2. The lesions may merge forming large grey blotches with irregular margins killing the leaves
3. Starts on lower leaves progressing upwards

Management and Control

1. Grow Seed Co tolerant hybrids
2. Clean ploughing with crop rotation will reduce disease severity
3. Apply foliar fungicide sprays e.g Tilt, Amistar, Bravo, Duett and Score

Phaesosphaeria Leaf Spot





Causal organism:

Fungus: *Phaeosphaeria maydis* and *Phoma sorghina*

Symptoms:

1. Circular or oval necrotic lesions, bleached, and dried with dark brown margins, similar to herbicide damage
2. Lesions can coalesce and blight the entire leaf, black fungi fruiting bodies develop within lesions

Management and Control

1. Grow Seed Co tolerant hybrids
2. Destroy infected crop residues to reduce disease inoculum
3. Apply foliar fungicide sprays e.g Abacus, Amistar, Bravo, Duett and Score

Northern Corn Leaf Blight (NCL/Ht)



Causal organism:



Fungus: *Helminthosporium turcicum* (Syn. *Exserohilum turcicum*)

Symptoms:

1. Long, elliptical, grayish-green or tan lesions ranging from 2.5 to 15cm in length develop first on the lower leaves
2. Severe infection causes premature death and gray appearance that resembles frost or drought injury

Management and Control

1. Grow Seed Co tolerant hybrids
2. Apply foliar fungicide sprays e.g Abacus, Amistar, Bravo, Duett and Score when lesions occur on 1/3 of the leaves before pollination
3. Clean ploughing, crop rotation, or both may reduce early season inoculum levels

Northern Corn Leaf Spot (NCLS)

Causal organism:





Fungus: *Bipolaris zeicola* (Syn. *Cochliobolus carbonum*)

Symptoms:

1. Produces circular or oval foliar lesions with concentric zones within them
2. These lesions may have a reddish-brown appearance on the leaves, sheaths and husks
3. Infected kernels can develop a black, feltlike mold

Management and Control

1. Grow Seed Co tolerant hybrids
2. Apply foliar fungicide sprays e.g Abacus, Amistar, Bravo, Duett and Score when lesions occur on 1/3 of the leaves before pollination
3. Clean ploughing, crop rotation, or both may reduce early season inoculum levels

Causal organism:

Physoderma brown spot





Fungus: *Physoderma maydis*

Symptoms:

1. Lesions start as small yellowish spots that latter turn dark-purple to black, oval spots usually occur on the midribs of leaves
2. Dark-purple, round spots may also occur on leaf sheaths, stalk, and sometimes on the outer ear husks and tassels of maize

Management and Control

1. Grow Seed Co tolerant hybrids
2. Applying foliar fungicide sprays e.g Folicur, Ridomil Gold, Bravo and Score, starting when lesions first occur

Common rust

Causal organism:



Causal organism:

Fungus: *Puccinia sorghi*

**Symptoms:**

1. Produces brown to brick-red pustules on both upper and lower leaf surfaces, whereas southern rust has orange to light-brown pustules on primarily the upper leaf surface
2. The pustules produced by common rust are less densely clustered than those produced by southern rust
3. The presence of ruptured epidermal leaf tissue surrounding lesions can help distinguish common rust from gray leaf spot

Management and Control

1. Grow Seed Co tolerant hybrids
2. Applying foliar fungicide sprays e.g Copper oxychloride, Folicur, Amistar, Bravo and Score, starting when pustules first appear on the leaves, may be feasible, especially in seed-production fields

Southern rust



Causal organism:

Fungus: *Puccinia polysora*

**Symptoms:**

1. Produces pustules that are bright orange, located predominantly on the upper surface, and generally more densely clustered than those of common rust
2. The pustules produced by southern rust are also more oval to round and those of common tend to be more elongated.
3. The pustules turn chocolate brown to black as the plant matures. When severe, the leaves may turn yellow, wither and die early

Management and Control

1. Grow Seed Co tolerant hybrids
2. Applying foliar fungicide sprays e.g Copper oxychloride, Folicur, Amistar, Bravo and Score, starting when pustules first appear on the leaves, may be feasible, especially in seed-production fields

Eyespot



Causal organism:

Fungus: *Aureobasidium zeae*

**Symptoms:**

1. Numerous, round to oval spots, up to ½ cm in diameter, with tan to cream center, brown to purple margin, and surrounded by a yellowish halo, form the leaves
2. Upper leaves may wither and die prematurely, develop early or late in the season in zones or patches

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Management and Control

1. Grow Seed Co moderate to tolerant hybrids
2. Clean tillage, crop rotation, or both reduces early season inoculum levels
3. Apply foliar fungicide sprays e.g Vanguard, Unix, Amistar, Bravo and Score

Common smut or Boil Smut



Causal organism:

Fungus: *Ustilago maydis*

**Symptoms:**

1. Kernels are replaced by galls
2. The galls are at first covered with a glistening, greenish-white to silvery-white tissue that later ruptures to release masses of black smut spores
3. Severe in young, actively growing plants after mechanical injuries

Management and Control

1. Grow Seed Co tolerant hybrids
2. Avoid mechanical injuries to plants during cultivation and spraying
3. Maintain well-balanced soil fertility
4. Remove and burn galls from infected plants before they rupture

Bacterial Stalk Rot



Causal organism: Bacteria: *Erwinia* species **Symptoms:**

1. Causes decay of one or more internodes above the soil. The outer stalk and the pith become slimy, soft, brown, and water soaked, the decayed tissue usually has a strong odour
2. The stalks typically twist and fall over, but the plant may remain green for several weeks
3. The leaves that form the whorl die before tasseling, and affected leaves can be easily pulled from the whorl



Management and Control

1. Hybrids with strong stalks are less susceptible to lodging
2. Residues should be incorporated during offseason to reduce inoculum.
3. Ensuring balanced fertilization, maintaining appropriate plant populations, and providing good drainage will reduce the stress that predispose plant to stalk rot

Fusarium Stalk Rot



**Causal organism:**

Fungus: *Fusarium* species

Symptoms:

1. A whitish-pink to salmon discoloration of the pith, stalk breakage, and premature ripening.
2. Rot normally begins soon after pollination and becomes severe as the plant matures

Management and Control

1. Grow Seed Co tolerant hybrids. Hybrids that are more resistant to foliar diseases are at less risk of developing stalk rot, since the stress caused by leaf blight increases susceptibility to stalk rot
2. Balance soil fertility, avoid high levels of N and low levels of K
3. Maintain appropriate plant populations, practicing adequate insect control, and providing good drainage
4. Early harvesting is also an option to avoid losses caused by lodging

Gibberella Stalk Rot



Causal organism:

Fungus: *Fusarium graminearum* **Symptoms:**

1. Stalks often show an internal pink to reddish discolouration of the diseased tissue
2. Shredding of the pith and may produce small, round, black specks superficially on the stalks

Management and Control

1. Grow Seed Co tolerant hybrids. Hybrids that are more resistant to foliar diseases are at less risk of developing stalk rot, since the stress caused by leaf blight increases susceptibility to stalk rot
2. Balance soil fertility, avoid high levels of N and low levels of K
3. Maintain appropriate plant populations, practicing adequate insect control, and providing good drainage
4. Early harvesting is also an option to avoid losses caused by lodging



Aspergillus Ear Rot





Causal organism:

Fungus: *Aspergillus flavus*

Symptoms:

1. Produce greenish yellow powdery mold on and between or within kernels

Management and Control

1. Grow Seed Co tolerant hybrids
2. Control earworms, stalk borers and other ear feeding insects with insecticides e.g Dipterex, Thionex, Karate Zeon and Decis Tab
3. Harvest as soon as moisture levels permits

Fusarium Ear Rot



Causal organism:

Fungus: *Fusarium verticillioides*

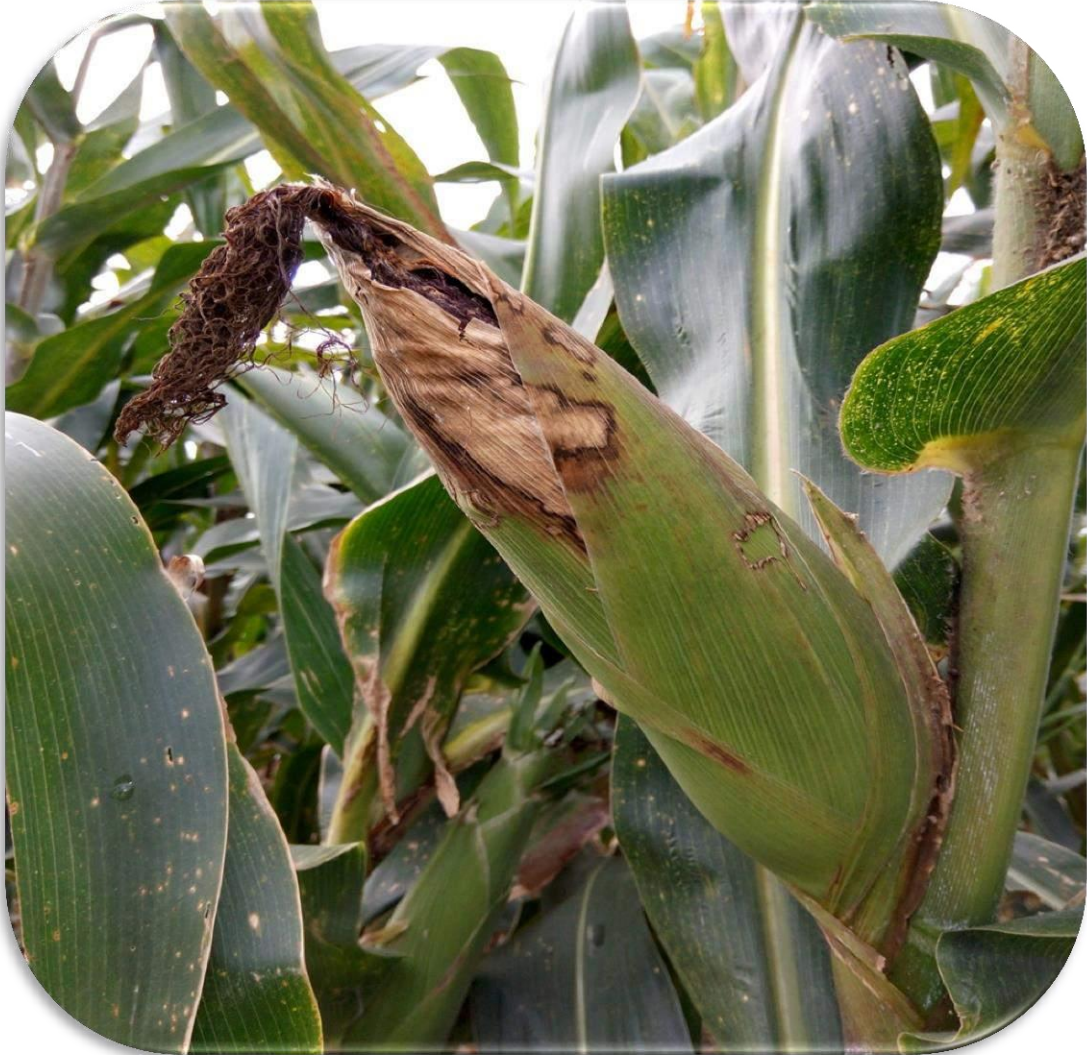
**Symptoms:**

1. The caps of individual kernels or groups of kernels scattered over the ear develop a salmon pink to reddish discoloration
2. A powdery, cottony pink mold forms later. Infection commonly follows channels made by earworms or stalk borers

Management and Control

1. Grow Seed Co tolerant hybrids
2. Control earworms, stalk borers and other ear feeding insects with insecticides e.g Dipterex, Thionex, Karate Zeon and Decis Tab
3. Harvest as soon as moisture levels permits

Gibberella Ear Rot





Causal organism:

Fungus: *Gibberella zeae*

Symptoms:

1. A pink to reddish mold, often starting at the ear tip, grows on and between the kernels and tightly stuck husks

Management and Control

1. Grow Seed Co tolerant hybrids
2. Provide adequate fertility
3. Control earworms, stalk borers and other ear feeding insects with insecticides e.g Dipterex, Thionex, Karate Zeon and Decis Tab

Diplodia Ear Rot



Causal organism:

Fungus: *Diplodia maydis* (Syn: *Stenocarpella maydis*)

**Symptoms:**

1. Husks of early infected ears appear bleached or straw-coloured.
2. Entire ear may rot, turn grayish brown, shrink, is very lightweight and remain upright with the husks stuck tightly together. White mold grows between the kernels.
3. Black specks (pycnidia) may form at the base of the husks or on the sides of the kernels.
4. Infection usually begin at the base of the ear and progress toward the tip

Management and Control

1. Grow Seed Co tolerant hybrids
2. Early harvest.

Penicillium Ear Rot



Causal organism:

Fungus: *Penicillium oxalicum* **Symptoms:**

1. Powdery, green or blue-green mold on and between the kernels, usually at the ear tip



2. Infected kernels are typically bleached and streaked
3. Occurs on stored grain with high moisture content

Management and Control

1. Grow Seed Co tolerant hybrids
2. Control earworms, stalk borers and other ear feeding insects with insecticides e.g Dipterex, Thionex, Karate Zeon and Decis Tab
3. Harvest as soon as moisture levels permits

Maize Streak Virus (MSV)





Causal organism:

Virus: Maize streak virus

Symptoms:

1. Long discontinuous chlorotic streaks distributed uniformly over all leaf surfaces
2. Chlorosis with broken yellow streaks along the veins that contrast with the dark green of normal leaves
3. Poorly filled cobs or lack viable kernels

Notes:

1. Grow Seed Co tolerant hybrids
2. Control vectors using seed treatment with insecticides e.g Gaucho and Criuser followed by foliar sprays with insecticides e.g Dimethoate, Fenvalerate and Imidacloprid, plant certified seed only

Maize Chlorotic mottle virus (MCMV)



Causal organism:

Virus: Maize Chlorotic mottle virus

**Symptoms:**

1. Fine chlorotic streaks in the youngest leaves 7-10 days after inoculation
2. Streak merge into uniform, systemic chlorotic mottling followed by necrosis and death of leaves
3. Stunted growth, distorted male inflorescences and poorly developed ears

Management and Control

1. No tolerant varieties to date
2. Control vectors using seed treatment with insecticides e.g Gaucho and Cruiser followed by foliar sprays with insecticides e.g Dimethoate, Fenvalerate and Imidacloprid, plant certified seed only

Sugarcane Mosaic Virus (SCMV)



Causal organism:

Virus: Sugarcane Mosaic Virus **Symptoms:**

1. The most distinctive symptom is a pattern of contrasting shades of green, often islands of normal green on a background of paler green or yellowish chlorotic areas on the leaf blade.
2. The infection may be accompanied by varying degrees of leaf reddening or necrosis.
3. Chlorotic areas are most evident at the base of the leaf

Management and Control

1. Johnson grass control with herbicides e.g Atrazine, Dual, Basagran and use of certified seed combine to keep the risk of virus infection and damage away.
2. No effective insecticides or tolerant hybrids.



Maize Lethal Necrosis Disease (MLND)



**Causal organism:**

Virus: A double infection of Maize chlorotic mottle virus (MCMV) and Sugarcane mosaic virus (SCMV) or any of the cereal viruses in the Potyviridae group (e.g. Maize dwarf mosaic virus or Wheat streak mosaic virus).

Symptoms:

1. Chlorotic mottling of the leaves, usually starting from the base of the young leaves in the whorl and extending upwards toward the leaf tips.
2. The leaves can experience necrosis at the leaf margins that progress to the mid-rib resulting in drying of the whole leaf. Shortened male inflorescences with few spikes.
3. Severely affected plants form small cobs with little or no grain set. The entire crop can frequently be killed before tasseling

Management and Control

1. No tolerant varieties to date.
2. Control vectors using seed treatment with insecticides e.g Gaucho and Criuser followed by foliar sprays with insecticides e.g Dimethoate, Fenvalerate and Imidacloprid, plant certified seed only

Nitrogen Deficiency



**Symptoms:**

1. Stunted, spindly growth and pale, yellowish-green foliage in young plants
2. Older plants develop a V-shaped yellowing along the midrib to the tips of the bottom leaves
3. Stalks remain thin and spindly
4. Ears tend to be pinched at the tips, kernels are glossy, hard and flinty.

Notes:

1. Favored by cold, wet, or flooded soils, drought (especially after midseason), sandy soils low in organic, heavy leaching rains and ponded areas in warm weather
2. Apply ammonium nitrate fertilizer at the recommended rate (400kg/ha)

Magnesium Deficiency



Symptoms:

1. Manifests in seedlings as general yellowing of upper leaves.
2. Eventually, yellow-to-white interveinal stripping develops, and older leaves appear reddish purple along their edges and tips

**Notes:**

1. Favored by strongly acid, sandy soils in regions of moderate to high rainfall, high K, and soil treated with limestone low in magnesium.
2. Apply foliar spray of Magnesium sulphate

Phosphorous Deficiency



**Symptoms:**

1. Purpling or reddening of the leaves beginning early in the growing season.
2. Leaf tips die and turn dark brown
3. Ears on affected plants are small and often appear twisted with irregular kernel rows and with imperfectly developed ear tips

Notes:

1. Favoured by: cold, too wet or too dry soils, restricted root growth in compacted soils and root damage by insects, cultivator or herbicides.
2. Apply basal fertilizer (N,P,K) at the recommended rate (400kg/ha)

Potassium Deficiency





Symptoms:

1. Yellowing and dying of the leaf margins beginning at the tips of the lower leaves.
2. Plants often lodge due to increased susceptibility to stalk rot
3. Ears maybe small, chaffy, and dull with pointed, poorly developed tips

Notes:

1. Favoured by sandy, organic, wet or compacted, strongly weathered soil and heavy K removal by the preceding crop(s)
2. Apply basal fertilizer (N,P,K) at the recommended rate (400kg/ha)

Pinking





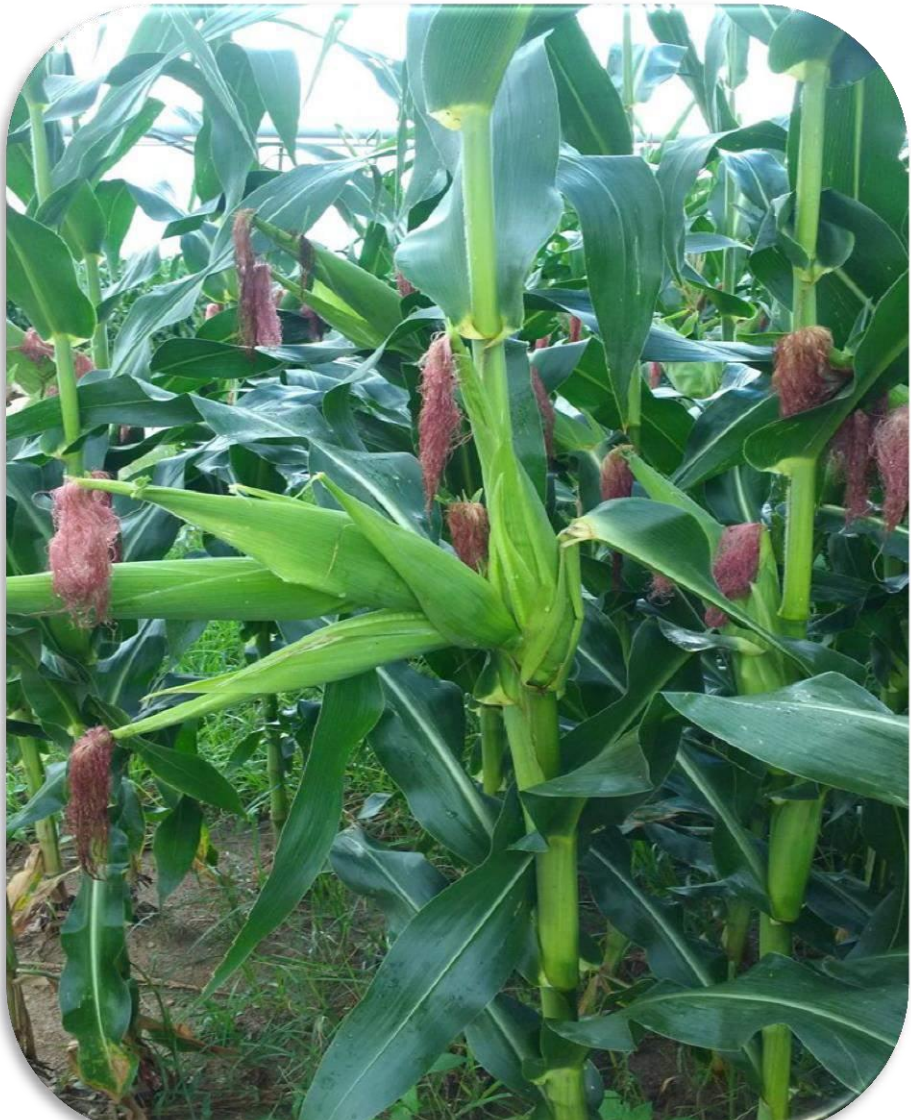
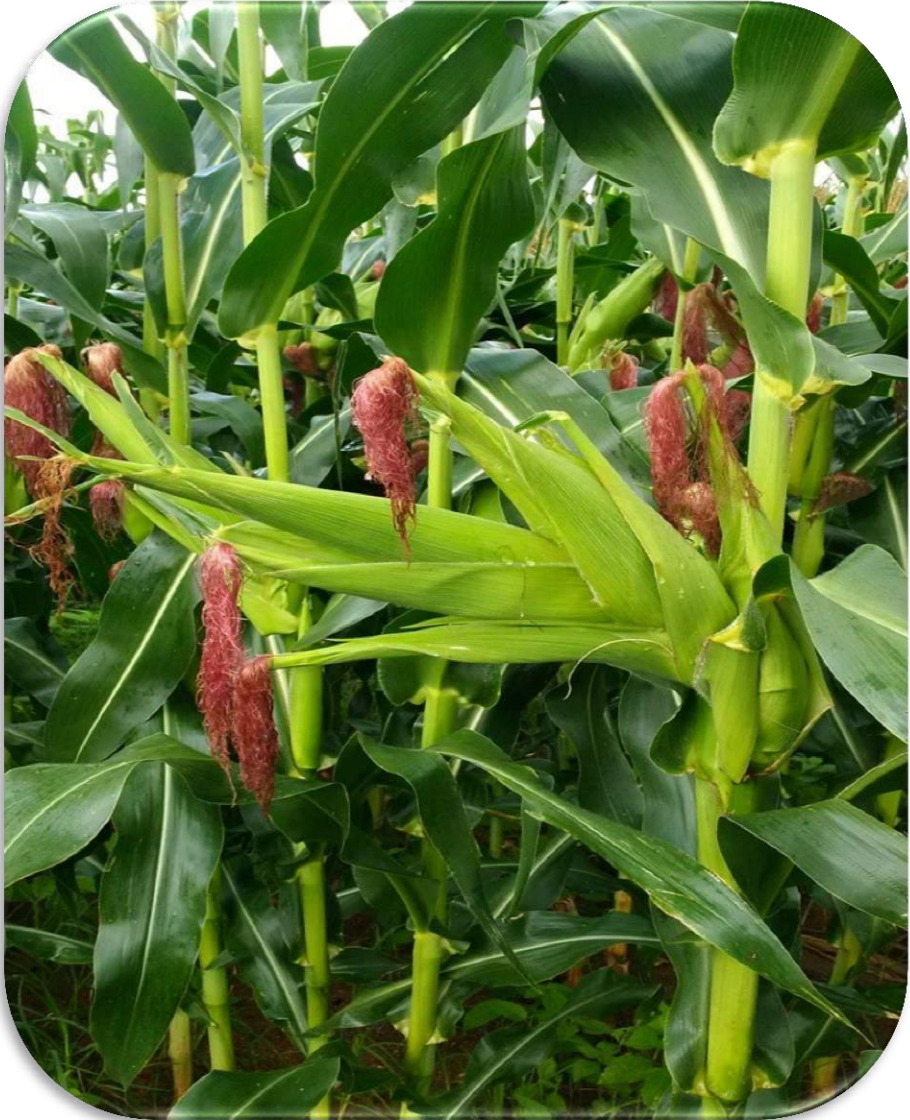
Cause:

1. A physiological disorder caused by genotype by environment interaction and occurs sporadic in nature
2. Common on hybrids with loose husks that expose the kernels at the tip of the cob to sunlight, which triggers the pink pigment formation

Notes:

1. Should not confused with Gibberella ear rot that causes a red discolouration starting from the cob tips due to fungal growth
2. Pinking is restricted to the pericarp and does not affect flour colour after milling

Multiple Ears on Same Shank (MESS) Syndrome



**Cause:**

1. The condition is rare but some hybrids may be genetically prone to developing multiple ears on a single ear shank. A threshold genetic trait may be triggered by particular stress events that occur during primary ear formation
2. A secondary ear may develop if the first ear does not adequately set seed during pollination
3. A third, fourth, and fifth ear could develop on the same node, as each preceding ear did not set adequate seed

Management and control

1. Minimizing crop stress conditions that might impact normal development of the primary ear, including using appropriate pest management practices, maintaining appropriate soil fertility, selecting adapted hybrids and seeding rates consistent for soil yield potential and date of planting
2. Favourable growing conditions also result in more than one ear per plant in certain hybrids especially at lower-than-normal plant populations.

Herbicide toxicity





Rating scale

Scale	Description
0%	Tolerant (T)
1-5%	Tolerant (T)
6-15%	Tolerant (T)
16-25%	Moderately tolerant (MT)
26-35%	Moderately tolerant (MT)
36-50%	Susceptible (S)
51-65%	Susceptible (S)

66-80%	Susceptible (S)
81%+	Susceptible (S)

Disease	Seed Co tolerant Hybrid
Grey Leaf Spot	SC301 (MT), SC403 (MT), SC529 (MT), SC627 (T), SC649 (T), SC719 (MT),
Maize Streak Virus	SC301 (T), SC403 (T), SC529 (MT), 649 (T), SC719 (MT)
Leaf Blights	SC301 (MT), SC403 (MT), SC529 (MT), SC627 (T), SC649 (T), SC719 (MT)
Cob Rots	SC301 (T), SC403 (T), SC529 (MT), SC627, SC649 (MT), SC719 (MT)
Stalk Rots	SC301 (T), SC403 (T), SC529 (MT), SC627 (T), SC649 (T), SC719 (T)

Key

T- Tolerant

MT- Moderately tolerant

