



# Cultivar screening, the answer to charcoal stalk rot of maize

DR BELINDA JANSE VAN RENSBURG, ARC-Grain Crops, Potchefstroom

Charcoal stalk rot is caused by the fungus *Macrophomina phaseolina* and is favoured by soil temperatures of 30°C to 42°C and low soil moisture. Initial symptoms in maize can be observed after flowering with the abnormal drying of upper leaf tissues, stalk lodging and premature death.

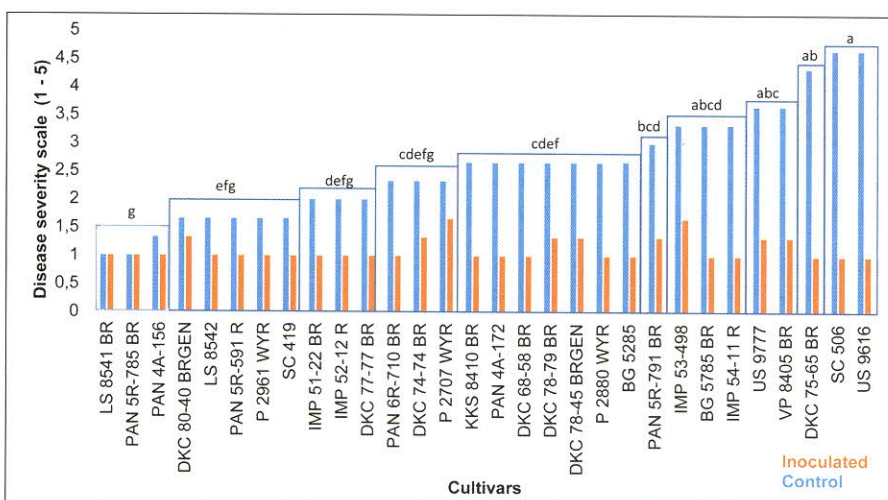
When plants approach maturity, the lower stalk nodes (usually limited to the first five nodes) show a typical charcoal, grey-black discoloration. When the stalk is cut open, numerous black specks (microsclerotia) are visible (Photo 1) in the shredded vascular bundles and on the inside of the stalk.

The charcoal rot pathogen (fungus) has a broad host range that includes soybean, sunflower, sorghum, maize, tobacco and a range of vegetable crops, making crop rotation ineffective as management option. The most effective and environmentally friendly management option remains the use of cultivars with resistance to charcoal rot.

No information was available regarding the resistance of commercial cultivars to charcoal stalk rot and therefore, in a project funded by the Maize Trust, 30 commercial maize cultivars were screened for resistance during the 2017/2018 maize growing season.

The 30 cultivars were selected from the national cultivar trials and planted in a field trial in Potchefstroom, with three replications. Maize stalks were inoculated with *M. phaseolina* infected toothpicks (Photo 2a) and the controls were inoculated with sterilised clean toothpicks.

To conduct disease ratings of the stalks from the individual cultivars, the stalks were split open and the lesion size captured



Graph 1: Mean *M. phaseolina* stalk rot disease severity (%) in 30 commercial cultivars planted in a field trial in Potchefstroom during the 2017/2018 maize growing season.

Different letters indicate significantly different reactions of cultivars to *M. phaseolina* infection.

(Photo 2b) according to a disease severity scale (Shekhar and Kumar, 2012) ranging from 1 (healthy or slightly discoloured at the site of infection) to 8 (discoloration of five or more internodes and premature death of plant).

Cultivar disease scores in this study ranged from 1 to 5, where a score of 1 indicates a healthy stalk or slightly discoloured stalk at the site of inoculation. A score of 2, 3 or 4, means that up to 50%, 51% to 75% and 76% to 100% of the inoculated internode is discoloured, respectively.

A score of 5 means that 100% of the inoculated internode is discoloured, with less than 50% of the adjacent internode.

The data were analysed by Ms Nicolene Cochrane (ARC-Biometry Services) using a split-plot ANOVA with cultivars as main treatments and treatments (inoculated and

control) as sub-plots. Significant cultivar differences were observed ( $P = <.0001$  – see Graph 1).

LS 8541 BR, PAN 5R-591 R and PAN 4A-156 had the lowest disease ratings (healthy or slightly discoloured at the site of inoculation) and cultivars SC 506 and US 9616 the highest (100% of the first internode discoloured, with less than 50% discolouration of the adjacent internode).

*M. phaseolina* resistance information generated can now for the first time assist producers with cultivar choices for the management of charcoal stalk rot. ■



## Reference

Shekhar, M and Kumar, S. 2012. *Inoculation methods and disease rating scales for maize diseases*. Directorate of Maize Research, Indian Council of Agricultural Research. Pusa Campus: New Delhi, India.



- ◀ 1: Microsclerotia visible as black specks in the shredded vascular bundles.
- ▶ 2a and 2b: Maize stalk inoculated with a *M. phaseolina* infected toothpick and lesion size at infected site.