Improved germplasm can lead to a brighter farm future

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Scab/Fusarium head blight is one of the most important small grain diseases in the world. In South Africa, outbreaks are becoming more severe and frequent due to the changing climate that mediates the development of optimal micro-environmental conditions, which facilitate infection.

In addition, maize/wheat cropping systems, planting of susceptible cultivars and the expansion of irrigation areas favour the spread of Fusarium head blight. Currently there are no fungicides officially registered to control this disease in South Africa and this complicates the control of this disease.

Stubble from no-till may also harbour *Fusarium* inoculum and this might become a problem when conditions are conducive to infections. It must also be noted that in the world, there are two *Fusarium* species which have displayed chemical resistance already.

During a recent conference in Brazil, concern was raised during fungicide testing research conducted by different groups over several years, that fungicides of the strobilurin group significantly increase DON mycotoxin levels (6% to 18%) in the harvested grain after treatment. In addition, researchers have also found that BT-maize could host *Fusarium* spores for longer periods of time, since the stubble will take longer to degrade or decompose.

Severe yield losses (0,5 t/ha to 2 t/ha) may occur depending on the timing of infection and presence of optimal micro-environmental conditions at flowering stage. Infected grain may also contain mycotoxins that are harmful to both humans and animals.

Since there are currently no local resistant cultivars available and no fungicides registered to control scab on wheat, a Winter Cereal Trust project was initiated to improve the Fusarium head blight resistance levels of our current susceptible South African cultivars.

This project combines the use of phenotypic field screening and marker-assisted selection to develop diverse scab and mycotoxin resistant germplasm. DON is one of the most important and prevalent mycotoxins that might accumulate in the seed after *Fusarium* infection, which has recently received more interest.

The reason why mycotoxins are important is the health issues associated therewith (such as cancer causing/inducing) if ingested for a prolonged period. As these mycotoxins are harmful, there are now new regulations in place, which allow a maximum limit in cereal grains (of ≤ 2 000 µg/kg DON) and derived processed products (such as flour, meal, semolina and breakfast flakes etc of ≤ 1 000 µg/kg DON) meant for direct human consumption.

Mycotoxins are also very important to the barley industry, as these mycotoxins may lead to gushing of the beer. So, both the wheat and barley industries have identified Fusarium head blight/scab management as a national research and development priority.

The question now is how the Fusarium head blight resistance of our local cultivars can be improved to prevent an imminent disaster? Since we know that our local cultivars are not resistant, it is of utmost importance to import resistant donor lines and/or cultivars that have known stable Fusarium head blight resistance QTL/genes from different parts of the world.

In this study, it has become imperative to import well-documented and characterised *Fusarium* resistant wheat lines that are known to have different types of resistance. Resistance is categorised into five specific types (**Table 1**) in which we are interested, to incorporate into local germplasm.

▲ 1: Entries tested in the field annually at ARC-Small Grain under supplementary irrigation.