Maize Diseases: Reflection on the 2004/2005 season

Rikus Kloppers: PANNAR research services, P.O.Box 19, Greytown 3250

We are heading for a record harvest in the 2004/2005 maize season. It is an unwritten rule that a good season for a crop is also a favourable season for plant diseases. This was no exception and has provided its share of problems in the form of leaf diseases earlier in the season, followed by the stem rots, and later the cob rots and associated grading problems which are now beginning to crop up with harvesting. The presence of disease must not been seen in isolation – leaf diseases that occurred earlier in the season can lead to an increase in the root, stem and cob diseases later in the season.

The impact of maize diseases is generally greater with the ultra-short season hybrids. This is as a result of a combination of factorssuch as their inherent susceptibility to the majority of diseases and the high plant populationsthat provide a favourable microclimate for diseases. In addition, the shorter growingseason provides little chance for corrective action and recovery, and control is often toolate or less effective.

Diseases earlier in the season

The dry conditions earlier in the season meant that there was initially a low incidence of leaf diseases. Nonetheless, common rust (Puccinia sorghi) (Fig. 1) was again conspicuous on susceptible hybrids and especially on the ultra-quick hybrids. The build-up of inoculum resulting from the changed hybrid composition over the past few years has meant that the disease now warrants a fungicide application every year. Fungicides in the strobilurine group are particularly effective against common rust. A lot of attention is being given to breeding common rust resistance into some of the short season hybrids. PAN 6114, which has exhibited excellent rust resistance in KwaZulu-Natal, shows just how effective plant breeding can be.

A leaf disease that made a big impact over the past season was northern corn leaf blight, which is caused by the fungus Exserohilum tursicum (Fig. 2). This fungus is now widespread, from the eastern maize producing areas of the country to the irrigation areas in the west and the Northern Cape, where it is very common. Control of this disease using chemicals is particularly difficult, more so than for any of the other leaf diseases, and good preventative measures are necessary. Fungicides from the triazole/carbendazim group must be used where disease symptoms are visible.

Fig 2: Northern corn leaf blight: Resistance reaction (left) and the typical susceptible symptom(right)

It is again in the ultra-short season group of hybrids that the disease hit the hardest. This season Pannar had a number of hybrids available with good genetic resistance to northern corn leaf blight. The symptom of the resistance reaction is clearly distinguishable as a smaller reddish brown lesion (Fig. 2). Although the fungus is able to cause an initial infection, the resistance limits the lesion development to such an extent that no spores are formed on the lesion, so limiting the spread of the disease in the fields and curbing the epidemic. A chemical control programme, which is in many cases ineffective against northern corn leaf blight, is probably now unnecessary with this group of hybrids, but where it is still necessary against other diseases that might occur, it is that much more effective. The Pannar hybrids in which this resistance has already been identified include PAN 6124B, PAN 6128R, PAN 6118, PAN 6114, PAN 6126, PAN 6238R and PAN 6236B.

Grey leaf spot (Fig. 3), caused by the fungus Cercospora zeae-maydis, is generally first visible a bit later in the season, when maize is forming tassels. The incidence of grey leaf spot in KwaZulu-Natal was higher than in the previous season as a result of higher rainfall during this period. This disease is also progressively spreading to the western irrigation areas (Grootpan near Lichtenburg, Christiana, Vaalharts and Northern Cape irrigation areas) and producers must take note of this disease and not underestimate it due to disease levels still being low at this stage. The fungus survives in the crop residue and builds up slowly but surely to levels where it eventually can cause large yield losses and here chemical control is imperative. Grey leaf spot is still the most important and destructive leaf disease in KwaZulu-Natal and it must not be allowed to become established in other areas. There are a number of maize hybrids in the Pannar range with good natural resistance, for example the wellknown PAN 6777.

Fig 3. Grey leaf spot symptoms

Maize streak disease is caused by the maize streak virus (MSV) and is certainly a disease that deserves special mention this season as it caused one of the greatest losses in years. The emphasis has shifted from where it was seen as a “small-scale farmer maize disease” to becoming a large-scale commercial problem. It was particularly prevalent in theBergville/Winterton area, the Free State and the Northern Cape. The disease is transmitted by a leaf

hopper and the earlier it infests a maize field the greater the damage. The growth of young plants infected with MSV is completely inhibited (Fig 4) and replanting (where possible) is often the only solution. Where infection occurs later in the growing season, the typical streak symptom is only visible on individual leaves but ear development and pollination is still seriously affected (Fig. 5). These smaller weakened cobs are also those that remain upright later in the season and are more inclined towards cob diseases, which can have a very negative effect on the grade of the grain.

Fig 4: Commercial maize planting with 100%stunting as a result of maize streak virus

Fig 5: Maize streak disease symptoms on theleaf and its effect on cob development and pollination

This is a typical example of a disease which is initially visible early in the season, but which raises its head in another form later on when the problem is almost forgotten, to contribute to further secondary damage. Control should be aimed at the insect that transmits the virus and must take place at planting, in the planting furrow or as a suitable seed treatment. There is no chemical control measure that can inhibit the disease once the symptoms become visible. It is once again the ultraquick hybrids that are more sensitive to this disease, as compared to the locally-bred medium and longer traditional hybrids which have greater tolerance. The ultra-quick hybrids can be planted over a longer time period and there can be overlap with wheat, on which the insect and virus also occur. This provides a “green bridge” which makes the vector’s chance of survival that much better. Pannar is giving this disease a great deal of attention in its breeding programmes and there is exciting technology in the offing, which will be discussed in a later issue.

Stem, root and cob diseases

Harvesting is still continuing in many areas of the country and there are reports of stem and root diseases that have caused lodging problems, while the occurrence of cob rots and grading problems are also now emerging. In the stem, root and cob rot disease complex there are three fungal diseases that most commonly occur on commercial maize in South Africa, namely Diplodia cob and stem rot (Stenocarpella maydis), Fusarium (Fusarium verticilliodes) and Gibberella (Fusarium graminearum) stem, cob and root rot. Apart from causing problems with yield and grading, these fungi also have the capacity to form mycotoxin which can present a health risk for both people and animals. Choice of hybrid is, with all these diseases, one of the few successful control measures in an integrated control programme, while technology like insect resistant (Bt) maize also contributes to inhibiting the occurrence of secondary cob diseases.

Fig 6: Diplodia cob rot

Fig 7: Secondary Fusarium cob rot associated with stalk borer damage

This disease complex was discussed in detail in the September 2004 issue of SA Grain. The symptoms of the three are relatively easy to distinguish and are briefly summarized below. Diplodia cob rot typically starts at the base of the cob and grows upwards. It is clearly visible as white fungal growth on the cob surface (Fig. 6). Fusarium cob rot appears as a pink/white fungal growth that occurs on damaged kernels at any point on the cob. There are actually a number of Fusarium species that may be responsible for this damage but the most common is Fusarium verticillioides which is very often associated with maize stalk borer damage (Fig. 7). Gibberella cob and stem rot is caused by Fusarium graminearum (Gibberella zeae). In KwaZulu-Natal, where there were extended periods of high rainfall there were instances of stem rot (Fig. 8) which in more severe cases led to lodging problems, but also to loose kernels on the cob. As already mentioned, these diseases do not occur in isolation from one another and the appearance of stem rots is more prevalent where the crop was stressed by inadequate leaf disease control. Gibberella cob rot is visible as a dark red discolouration and fungal growth that starts at the tip of the cob and grows downwards. The entire cob may rot together with the husk leaves that surround it (Fig. 9).

Fig 8: Gibberella stem rot

Fig 9: Gibberella cob rot