Disease fight begins with seed

Knowing a variety’s resistance profile can help strengthen defences against disease

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Plant breeding has had a profound effect on the performance of cereal crops grown today. According to NIAB, 90% of the wheat yield increase from 1982 to 2008 has come as a result of how the crop’s gene pool has been tweaked. With these advances in yield, it comes as no surprise that there is some divergence in disease resistance on this HGCA Recommended List. With increasing legislation and environmental concerns around pesticides, and with fewer active ingredients to choose from, it is likely disease resistance will become more of a priority for farmers. But the science is technology. As ingredient options become more of a priority for farmers, it is likely disease resistance will become more of a priority for breeders in future. Certainly gene-marker technology should help with this, without the cost in terms of yield often associated with current technology.

In the meantime, there is scope to use varieties to adapt fungicide programmes. But the science is not straightforward – disease is a moving target and it can adapt to varietal resistance. Understanding some of the parameters can help growers stay one step ahead.

How do varieties acquire resistance to disease?

* This is down to the genes of a particular variety. But it may have multi-gene or single-gene resistance. Multi-gene resistance tends to give a variety non-race specific resistance to a range of fungal diseases.

Single gene resistance, particularly single major genes, tends to give race-specific resistance – for example, to a race of yellow rust. This is significant because a variety with an apparently high rust rating can be susceptible if a new race overcomes that single gene resistance. This is what happened with a number of varieties in recent years, such as Oakley and Solstice.

And you cannot predict a variety’s resistance rating by studying its parentage – Stag has the highest resistance on the Recommended List for Septoria tritici, but one parent is Tanker, a relatively weak variety.

In what situations will variety make a significant difference?

* The best way to use varieties to your own advantage is to plant those that are resistant to the greatest disease threats in your region.

Brown rust is a greater risk in the East and South, for example. Septoria is favoured by mild, wet conditions in the West. Mildew is a problem on fertile, organic soils of the Fens (see table, below right).

How do you take account of yellow rust?

* Since varietal resistance is race-specific, an epidemic year can tear apart some varieties, but leave others unaffected. You cannot predict which race will cause the epidemic, so therefore which variety is most susceptible. The damage can also be quite severe – the impact of race changes hit several popular varieties in 2009.

To reduce the risk of rust damage, you can plant varieties with a high Recommended List rating. But this is only part of the story as it may leave crop areas susceptible to the same race. So it makes sense to reduce the risk further by planting varieties with susceptible to different races. This is the aim of the yellow rust diversification scheme – a guide as to whether one variety grows near Solstice is to encourage the spread of the disease. Oakley grown near Solstice is very high risk, for example, since they are both susceptible to the same race. But Oakley and Alchemy are a low risk combination. Details can be found at www.niab.com.

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Examples of varying fungicide response (HGCA Recommended list 2011-12)

<table>
<thead>
<tr>
<th>Variety</th>
<th>Treated yield (%)</th>
<th>Difference</th>
<th>Response to treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallant</td>
<td>80.8</td>
<td>9.6</td>
<td>10.5</td>
</tr>
<tr>
<td>Stolice</td>
<td>78.5</td>
<td>8.3</td>
<td>9.7</td>
</tr>
<tr>
<td>Panorama</td>
<td>87.5</td>
<td>9.9</td>
<td>10.3</td>
</tr>
<tr>
<td>Brown rust</td>
<td>73.9</td>
<td>8.8</td>
<td>10.4</td>
</tr>
<tr>
<td>Yellow rust</td>
<td>73.9</td>
<td>8.8</td>
<td>10.4</td>
</tr>
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<td>Brown rust</td>
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</tbody>
</table>

How does fungicide timing affect different varieties?

* How a variety progresses through growth stages can make a difference to its disease burden.

One variety may have reached the ideal timing for T2 a long way in front of another. So it’s worth finding out which matures earlier and prioritising your spray programme accordingly. Some varieties go through growth stages quite quickly. So the ideal timing on a variety such as Cordiale can easily be missed. Again it’s worth focusing your strategy to prioritise those with a narrow window.

How do you plan your spray strategy to optimise varietal resistance?

* The first step is to be careful with your choice of varieties. Try to go for those with high resistance ratings, and bear yellow rust diversification in mind. It is then a case of knowing where your weaknesses lie, so you can tweak your strategy according to the disease pressure you get. Other factors will also have a bearing on the risk of a disease developing (see table, bottom).

Golden rules

* Select varieties with a high degree of resistance to diseases prevalent in your area.

* Monitor crops regularly for disease.

* Avoid large areas of susceptible varieties, for yellow rust in particular.

Yellow rust is particularly good at breaking down varietal resistance.

Yellow rust West

East – particularly fertile coastal areas.

Test your knowledge

* Visit the page to try or go to www.fwi.co.uk/springfungicides

www.agriCentre.basf.co.uk ®=Registered trademark of BASF. Ignite® and Opus® contain epoxiconazole. Always read the label. Use pesticides safely.