

Lecture 3

Wheat Rusts : Breeding for resistance

Which rust?

- The options for breeding for resistance to each disease will be different
- For LR and YR there are well established sources of highly effective additive minor gene APRs. Some are effective against both diseases
- For stem rust the minor gene options may be less. *Sr2* sources continue to remain the most promising

Breeding for resistance

- Usually quite easy
- **Must decide on the preferred strategy**
- The disease testing must be integrated into the breeding program in an efficient manner
- **Because disease response quantitative, some minimum level must be envisaged or defined for variety release**

Considerations -1

- How much genetic information is available
- **What testing facilities sites are available – greenhouse or field?**
- Seedling or APR
- **What field testing sites? Why?**
- Will test sites be disease hotspots or inoculated?
- **If inoculated, What pathotypes?**

Considerations -2

- Single pathotypes or mixtures? If mixtures, how many? How will each pathotype be monitored?
- **How will tests with new races of limited distribution be performed?**
- Who will do the disease testing and will they have the confidence of breeders?
- **Who will be responsible for the inoculum?**
- Is resistance a requirement for variety release
- **How will molecular markers be integrated into the program?**

Rules and realities -1

- Yield cannot be sacrificed for resistance
- **Resistance testing and selection must fit the breeding program**
- If slow rusting APRs are preferred how will major genes be avoided?

Rules and realities -1

- **Methods and procedures must be simple**
- **What resistance standards will apply?
What information is needed to apply them?**
- **Resistance must be relevant to the present, and if possible pre-emptive**

Pre-emptive breeding strategies

Pre-emptive resistance breeding is breeding for resistance to future races. Where will those races come from?

- **Mutants of current races? Which ones?**
- Migrant races from neighbouring countries. For many of us, Ug99
- **Sexual and asexual recombinants (not predictable)**
- Races introduced by human activities (not predictable)

The BGRI program is an excellent
example of an international pre-
emptive breeding program

Disease Hotspots

- What is a rust hotspot?
 - An ideal environment for rust development, e.g. East Africa
 - Often infers high pathogenic variability, but that needs to be confirmed periodically
 - May be a consequence of the physical environment, or of farming systems (long-season crops, continual cropping)

Discussion