

# 2010 Clubroot Summit – Meeting Notes

10-March-2010

Leduc, AB

About 75 individuals, mainly researchers, representing universities, government research, private companies, and industry bodies came together to exchange ideas on clubroot research.

The 2010 Clubroot summit had three goals:

1. To review current clubroot research both inside the Clubroot Risk Mitigation Initiative and outside that program.
2. To identify the remaining gaps in research and to set direction to where new research should be focused
3. To examine how some of the future research should be coordinated.

The day began with updates as to the clubroot disease situation by Murray Hartman (AARD), Dr. Randy Kutcher (filling in for Faye Dokken-Bouchard, SAF) and Dr. Mary-Ruth McDonald (UofG).

Presentations on clubroot research were made by Dr. Steven Strelkov (UofA), Dr. Sheau-Fang Hwang (AARD), Dr. Ron Howard (AARD), Dr. Habibur Rahman (UofA), Dr. Dilantha Fernando (for Dr. Genyi Li UofM), Dr. Gary Peng (AAFC), Dr. Randy Kutcher (AAFC), Dr. Kelly Turkington (AAFC), Dr. Henry Klein-Gebbink (AAFC), Dr. Bruce Gossen (AAFC), Dr. Dave Greenshields (NRC), Dr. Yangdou Wei (UofS), Dr. Anoop Sindhu (UofS), Dr. Mary-Ruth McDonald (UofG), Ralph Lange (AITF), Dan Stanton (PHI), Dr. Chunren Wu (Monsanto), and Dr. Hossein Borhan (AAFC).

Breakout groups were formed to discuss three questions:

1. What is the end goal for controlling clubroot? What is the ultimate solution(s)?
2. What are the research gaps that we still have not addressed? What research is still needed? Can you prioritise these? How do we determine who should do what research and what techniques should be used?
3. Should public money be spent on molecular markers for clubroot resistance? Will private companies share material, molecular markers, or information on chromosomal location of resistance gene etc? If they are not willing to share, should public funding (grower commissions and public research funding) cover only varieties that have been registered to determine differences in resistance source? What is the best marker technology?

To summarise these discussions:

1. An integrated strategy that ensured resistance durability and a thorough understanding of *P. brassicae*. This strategy would include mechanisms that will reduce the spread of this pathogen. Growers would like the option that clubroot would not reduce their ability to have short rotations. In the end, this toolbox should be one that is better than blackleg.
2. Research gaps remaining:

#### Group 1

- o More comprehensive models (a separate pillar in addition to existing pillars)

- Building on existing models
- Focus on risk management and assessment
  - Have risk better defined for farmers and people in the field
    - i.e. What does X number of spores on a seed mean for risk in the field?
    - assist in on-farm decision making and management of the disease
- More of the work that is already being done – proceeding in the right direction, but there continue to be many unanswered questions - especially when it comes to translation to the field and management (what research means for farmers)
- How is resistance going to be managed? (under breed pillar)
  - Sustainability of genetics
  - Most companies comment that stewardship of genetics is necessary, but a strategy on ‘how’ is less vocalized

#### Group 2

- Broadening the base of genetic resistance
- Determining why disease has not emerged in other areas like MB where the models would indicate high risk. Conversely, why has it developed into such an issue in AB. What are the contributing factors?
- What are the impacts of tillage system on the disease? Does zero tillage affect soil factors like organic matter, pH, etc. over time which in turn affects the severity of the disease.
- Many factors like temperature and moisture effects on disease pathology are being studied in isolation, but we need to look at how interactions affect the disease.
- Future research will be required to look at the cumulative effects of implementing several components of an IPM strategy as opposed to just relying on resistance. What are the risks of not taking an integrated approach?
- Manipulating the disease to make it work for us???

#### Group 3

- How to reduce inoculum levels?
- Why is pathotype 3 so virulent on canola?
- What level of seed infection is required to initiate a new field infection?
- Identification and characterization of resistance in current varieties to help in advocating varietal rotation?
- What transitional steps can be used to help control the disease in isolated areas?
- What is the genetic recombination ability of clubroot?
- What advantage is zero or min tillage vs. conventional tillage in controlling the spread of the disease?

#### Group 4

- What resistance genes are in current resistant products?
- Identify races of clubroot
- Targeting specific clubroot races with specific resistance genes
- Quantify the durability of resting spores in Canada - what is the half-life?
- Identify genes involved in infection – on both the host and pathogen – identify avirulence genes
- Build a pathogen library

- Soil reclamation – reduce or eliminate the disease in waterways, field entrance, oil lease
- Interaction of clubroot with other diseases and insects

To summarise, these ideas, then the top research areas to study yet are:

1. Host resistance
    - knowing what resistance genes are currently available and strategies needed to ensure that they remain durable
    - strategies to implement new resistance genes when needed
  2. Host-pathogen interactions
    - identify the processes and genes involved infection on both the pathogen and host
  3. Risk analysis – what are the risks associated with:
    - using contaminated inputs (such as seed) at introducing the disease
    - different agronomic practices, such as tillage regime
    - not using an integrated approach to managing the disease
  4. Epidemiology of the disease
    - Interactions of abiotic factors on the disease
    - Studies on the longevity of resting spores
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3. Molecular markers and research
    - It was agreed that the industry needs to know what resistance genes are in current products so that management/stewardship strategies can be correctly implemented to ensure the durability of these tools.
    - How this can be achieved when private companies may not be willing to share their marker technology was discussed. If this information cannot be shared then public research may be warranted.
    - Public research funds should be utilised to find new sources of resistance, and perhaps research consortiums can be established that would be of benefit to both public and private researchers.
    - Another strategy would be have a third party group under some type of confidentiality licence utilise these privately-owned markers to identify clubroot resistance genes, and those labelled genes can be communicated to the public.
    - If grower or public funds are utilised to find new resistance sources which become commercial, there was some discussion about the need to ensure that there is a “royalty” program so that investment is recouped.
    - Need to ensure that sources are identified to the gene level so it is easier for companies to utilize the sources.
    - Need to ensure qualified researchers with the appropriate technology are involved in this aspect of the research efforts.