

OAT RUST FORUM 2016 - April 4-5, 2016 **SUMMARY REPORT**

Oat rusts are a serious problem and oat rust resistance is a fundamental need in the oats industry worldwide. Oat scientists have been working on this topic for many years and a rich "toolkit" for resistance breeding is currently available but standing idle and less effective due to changes in personnel, funding, and loss of sources of resistance due to pathogen evolution. The time is right for the oat community to take a coordinated approach to ensure that host resistance and agronomic practices can stay ahead of pathogen evolution over time.

In February of 2015 the University of Minnesota Stakman-Borlaug Center (SBC) brought together key representatives from the oat research and stakeholder community for the 1st Oat Rust Forum (ORF). A list of priority research areas was defined during ORF2015, which formed the basis for a 'roadmap' to move forward. ORF2015 participants concluded that sources for funding should be explored and pursued to address these identified research areas. It was agreed that the ORF should transform into a community-wide public/private "Oat Rust Initiative" with structured leadership and governance, which will serve as the foundation to attract and coordinate funding and develop and support research activities. A Board of Directors for the Rust Initiative was formed with sponsorship from General Mills, Grain Millers, PepsiCo, Richardson Milling, NAMA, and the College of Food, Agricultural, and Natural Resource Sciences of University of Minnesota.

Following the 'roadmap' from ORF 2015, the SBC brought key representatives together again for the 2nd **OAT RUST FORUM (ORF2016)** on APRIL 4-5, 2016 in St. Paul, MN. The meeting agenda is included with this report (see below).

The aim of **ORF2016** was:

- 1) To continue the journey started last year at ORF 2015 towards a community-wide oat rust resistance management platform/approach.
- 2) To frame technical strategies for executing the 'roadmap' defined together last year, forming 'Project Teams' to focus on work in these priority areas.
- 3) To introduce and further define the Oat Rust Initiative that has evolved from ORF2015.

Participants reviewed the 'roadmap' developed after ORF2015, and then broke into small groups to discuss the order of priorities from the 'roadmap'. To facilitate this discussion, participants used the information provided in Table 1. Based on that discussion, the Project Team 'topics' in Table 2 were defined. The project team topics are:

- 1) Data Knowledge and Management
- 2) Pathogen Genomics
- 3) Epidemiology

- 4) Isolate Collection
- 5) Breeding Enablement
- 6) Phenotyping
- 7) Novel Genetic Technologies
- 8) Gene Release/Use Strategy
- 9) Integrated Pest Management & Agronomic Practices (including extension & education aspects)

Tentative Project Teams and team leaders were identified, and these teams met in small groups to begin formulating the projects. (See next steps below.) This project teams need further validation by the global community at large, especially from those who couldn't attend the meeting but are willing to be part of the initiative moving forward.

The participants also discussed the plans for structure and governance of the Oat Rust Initiative and avenues for funding. The ORI Board of Directors will now develop these plans further while campaigning for a 10-year, ~1.5 million USD/year public funding pool.

NEXT STEPS:

- 1) SBC will develop and rollout a communication platform for the Oat Rust Initiative.
- 2) SBC will circulate the tentative list of Project Teams to the community with instructions for advancement, to include finalizing team compositions and creating project charters (purpose, objectives, outcome, and milestones) by mid-May.
- 3) The ORI Board of Directors will meet end of May to further implement the ORI strategy based on input from the community at ORF 2015-16.
- 4) SBC will update the community after the BOD meeting.

ORF2016 ATTENDEES:

| | |
|---|---------------------------------------|
| Shaukat Ali, SDSU | Haiyan Jia, PepsiCo |
| Yong Bao, PepsiCo | Yue Jin, USDA-MN |
| Jim Bradeen, UMN | Shahryar Kianian, USDA-MN |
| Emmanuel Byamukama, SDSU | Kathy Klos, USDA-ID |
| Melanie Caffè-Tremi, SDSU | Georgiana May, UMN |
| Marty Carson, USDA-MN | Mike McMullen, NDSU-ND |
| Shiaoman Chao, USDA-ND | Marissa Miller, USDA-MN |
| José Costa, USDA-DC | Phil Pardey, UMN |
| Greg Cuomo*, UMN | Tom Rabaey**, General Mills-MN |
| Eric DeBlieck, Grain Millers Inc | Paul Richter, General Mills-MN |
| Melania Figueroa, UMN | Howard Rines, UMN |
| Dave Garvin, USDA-MN | Bruce Roskens*, NAMA-MN |
| Gabe Gusmini*, PepsiCo | Deborah Samac, USDA-MN |
| Lucia Gutierrez, UW-Madison | Madeleine Smith, UMN |
| Steve Harrison, LSU | Kevin Smith, UMN |
| Karen Hokanson, UMN | Tyler Tiede, UMN |

*Oat Rust Initiative Board of Directors Member; **Chairperson of the Board

Table 1. Activities from the 'Roadmap' identified during ORF2015.

| Data & Knowledge Management | Pathogen Biology & Epidemiology | Genomics & Genetics of Plant Resistance | Phenotyping | Pre-Breeding & Germplasm Circulation | Community-Wide Resistance Management |
|---|--|---|--|--|--|
| Gene nomenclature | Community-wide standard isolates collection program | Reference genome oat (ongoing) and pathogen | Community phenotyping platforms beyond Buckthorn Nursery, include both crown and stem rust | Pre-breeding leadership and breeder support for operations | Strategy for gene deployment and IPM |
| General crop ontology | Standard Biotype onthology | Genome annotation platform | Stem rust seedling screening in Canada | Leverage of Quaker International Oat Nursery | Process for clearing of genes for deployment |
| Publications and www.oatgloab.org | Biotype sequencing | Mapping population program | | | Governance |
| Classificaiton of pathogen biotypes | Monitoring of evolution of biotypes | Generation acceleration methods/ platforms | | | |
| | Epidemiology and plant pathogen interactions | MAS platform: data generation, analysis, interpretation | | | |
| | Pathogen population genetics and dynamics, alternate hosts | | | | |

Table 2. Priority Areas for Project Team Discussion.

| Priority Areas & Teams | Priority | Timing/Action | Topics |
|-----------------------------|----------|---|--|
| Data & Knowledge Management | High | Start ASAP | Gene nomenclature (update, provide guidelines for rust genes); role of Graingenes? |
| | | | General crop ontology (leverage available components, finalize) |
| | | | Energizing Oat Newsletter for informal communication |
| | | | Expand www.oatgloab.org and T3 to be the main database platforms for plant and pathogen data |
| Pathogen Genomics | High | Continue and Expand | A Classificaiton of pathogen biotypes (2) |
| | | | A Standard Biotype ontology |
| | | | Biotype sequencing and annotation |
| Epidemiology | Med | Hold-off until data/platforms ready | Pathogen population genetics and monitoring over time |
| | | | Plant/pathogen interactions |
| Isolate Collections | Low | Start among collection managers | Expansion and back-up of current CDL collection platform |
| | | | Alignment in collection and storage among key platforms worldwide |
| | | | Determination of global scope of collection in light of handling/sharing complexities |
| Breeding Enablement | High | Start ASAP | Pre-breeding for the community |
| | | Expand on current ARS-Aberdeen platform | Development of community discovery populations (mapping, EMS, etc.) |
| | Low | Hold-off | MAS operating platform (data generation, analysis, and interpretation) |
| Phenotyping | High | Start ASAP | Leverage QION for R-germplasm distribution |
| | | Follow upon strategy delivery | Strategy for screening for new resistance genes |
| | | | North American community-wide platform(s) for screening (crown and stem rust) |
| | | | Alignment/support to local platforms outside of North America |
| Novel Genetic Technologies | Med | Leverage ref. genome | Oat genome annotation for future resequencing post-ref genome |

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|--|------|---|---|
| | | project - engage ASAP | |
| | High | Continue and Expand | Gene editing application in oat Gene cloning techniques (res???) |
| Gene Release/Use Strategy | High | Develop in 2016-17/ Hold-off deploying new genes | Guidelines vs. governance Pyramiding and other approaches Maintenance and communication of community strategy |
| Integrated Pest Management & Agronomic Practices | High | Start Scoping and Framing | Implement short term grower strategy |
| | Med | | Design research program, engage broader team Regulatory? |
| Funding | High | Continue and Expand (BoD + InStEpp) | Bio-economics modeling Fundraising Advocacy |
| Extension & Education | Low | Start scoping and framing | TBD |

ORF 2016 AGENDA

| DAY 1 – Afternoon April 4 310 Alderman Hall, St. Paul Campus | | |
|--|--|-----------------|
| | | Facilitator |
| 12:00-1:00 | LUNCH - Registration | |
| 1:00-1:30 | Introductions | Karen Hokanson |
| 1:30-2:30 | Review of ORF 2015 and Roadmap | Gabe Gusmini |
| 2:30-3:00 | Objectives for ORF2016 | Jim Bradeen |
| 3:00-3:15 | BREAK | |
| 3:15-3:45 | Discussion | Karen Hokanson |
| 3:45-4:30 | Prioritize and Plan Implementation of Roadmap | Breakout Groups |
| 4:30-5:30 | Report Back | Gabe Gusmini |
| 7:00pm | DINNER (Kafe 421 – 421 14 th Ave SE, Minneapolis) | |
| DAY 2 – Morning April 5 310 Alderman Hall, St. Paul Campus | | |
| 7:00-8:00 | BREAKFAST (Continental) | |
| 8:00-8:50 | Defining Project Teams -Exercise | Karen Hokanson |
| 8:50-9:00 | BREAK | |
| 9:00-9:30 | Oat Rust Initiative – Structure and Governance | Tom Rabaey |
| 9:30-10:15 | Avenues for Funding - Brainstorming | Gabe Gusmini |
| 10:15-10:30 | BREAK | |
| 10:30-11:15 | Project Team Breakout Session | Project Teams |
| 11:15-11:30 | Brief Report Back | Project Leads |
| 11:30-12:00 | Debrief and Closing | Jim Bradeen |
| 12:00-1:00 | LUNCH (Box) | |