

Canadian Wheat Alliance - Research Projects

January 13, 2016

Evaluation of Exogenous dsRNA Application for Species-specific Control of Fusarium Head Blight (20150355)

Objectives:

- Characterize the ability of soil drenched or foliar spray applied dsRNA to reduce FHB symptoms on wheat.
- Characterize the transfer of dsRNA from plant to fungi. We will determine the concentration of dsRNA required in the wheat plant to cause effective silencing of target genes within the pathogen.
- Identification of effective gene targets to maximize the suppression of *F. graminearum* growth and symptoms on the treated wheat plants.

ADF Funding: \$74,403

Sask Wheat: \$74,403

Organization: National Research Council Canada

Contact: Shawn Clark, (306) 975-5243

TOR Signaling Targets to Improve Photosynthetic Efficiency in Wheat (20150356)

Objectives:

- Establish functional roles for TOR signaling in wheat photosynthesis using light regulated TOR expressing wheat lines (Raju Datla and Martin Parry).
- Physiological and biochemical assessment of photosynthetic efficiency in these lines.
- Identify other important TOR signaling components and their downstream targets with influence on photosynthetic efficiency by applying genomics, proteomics and metabolomics based approaches.
- Define the molecular, biochemical and physiological programs underpinning these new gene targets and their respective functions in photosynthetic efficiency in wheat.
- Perform molecular and phenotypic screens using wheat germplasm accessed through CIMMYT and Canadian resources to identify desirable natural allelic variants for selected gene targets.
- Apply complementary and alternate precise gene editing approaches based on CRISPR technology to develop desirable expression variants of selected gene targets.
- Deployment of these gene targets and their corresponding appropriate alleles into elite cultivars to critically assess their respective genetic potential for improved photosynthetic efficiency under controlled and field conditions.

ADF Funding: \$264,374

Global Institute for Food Security: \$100,000

Sask Wheat: \$86,957

Alberta Innovates Bio Solutions: \$100,000

Organization: National Research Council Canada

Contact: Raju Datla, (306) 975-5267

Standing Strong: Maximizing Yield Potential by Optimizing Stem Strength and Biomass Partitioning
(20150357)

Objectives:

- Identify, dissect, and prioritize traits that contribute to maximize standability and harvest index in different environments in Saskatchewan and Manitoba. The dissection of traits includes a thorough characterization at cellular, biochemical, and physiological levels.
- Understand the genetic basis of traits contributing to standability and harvest index to identify functional alleles and markers conferring preferred traits appropriate for incorporation into breeding programs.
- Assess whether the preferred target traits and functional markers for standability and biomass allocation are optimized or whether more favourable alleles exist in Canadian or novel germplasm.

ADF Funding: \$196,445

Sask Wheat: \$294,667

Manitoba Wheat & Barley Growers Association: \$196,444

Organization: National Research Council Canada

Contact: Allan Feurtado, (306) 975-5567

Development of Male Sterile Lines in Wheat by Genome Editing (20150358)

Objectives:

- Generate a genic male sterility system in wheat by applying modern genome editing technologies with previously identified candidate genes in our work.
- Testing this male sterility system.
- Establish an easy pollination system.

ADF Funding: \$201,102

Organization: National Research Council Canada

Contact: Manoj Kulkarni, (306) 975-6143

Exploring the Extent and Potential of Epigenetic Variation in Wheat (20150360)

Objectives:

- Objective 1: Development of wheat genomic resources
 - Development of a NimbleGen regulatory sequence capture array (CTAG2)
 - Determine the DNA methylation patterns in wheat
- Objective 2: Expand the gene pool available to wheat breeders
 - Generate new resynthesized lines using germplasm identified as valuable by Canadian wheat breeders
 - Introduction of the valuable alleles from resynthesized lines into elite Canadian breeding programs
- Objective 3: Application of newly developed genomics resources to stress and disease improvement
 - Characterize and correlate epigenetic changes (small RNA and DNA methylation) induced by heat stress with gene expression (RNASeq) to unravel the role of small RNAs and DNA methylation in heat response
 - Characterize underlying epialleles contributing to fusarium headblight (FHB) resistance.

ADF Funding: \$524,000

Organization: Agriculture & Agri-Food Canada

Contact: Steve Robinson, (306) 956-2831

Canadian Wheat-NAM (Can-NAM): Capturing Genetic Variation for Canadian Wheat Improvement
(20150361)

Objectives:

- Establishment of the Can-NAM as a platform for community access:
 - A population resource with multiplied seed stocks for ~5,000 lines.
 - A high density genetic map of the Can-NAM population for precise QTL mapping.
 - Bioinformatics and statistical pipeline for NAM analysis.
 - Promote phenotyping efforts in the Can-NAM population.
- Genome wide characterization of Rust and FHB resistance:
 - Identification of novel major race-specific rust resistance genes for leaf, stem and stripe rust and race-non-specific adult plant resistance (APR) genes for leaf rust within the Can-NAM population.
 - Identification of novel QTLs contributing FHB resistance within the Can-NAM population.
 - Develop adapted pre-breeding lines with improved rust and FHB resistance.
 - Availability of optimal material for inclusion in AAFC and U of S CDC breeding programs .

ADF Funding: \$287,813

Sask Wheat: \$200,000

Western Grains Research Foundation: \$200,000

Manitoba Wheat & Barley Growers Association: \$10,000

Alberta Wheat Commission: \$200,000

Organization: National Research Council Canada

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