DropXL Sorghum

A **Toolbox** for **Water Smart** Crop Seed Technologies

CENTER FOR SORGHUM IMPROVEMENT

Presenter:
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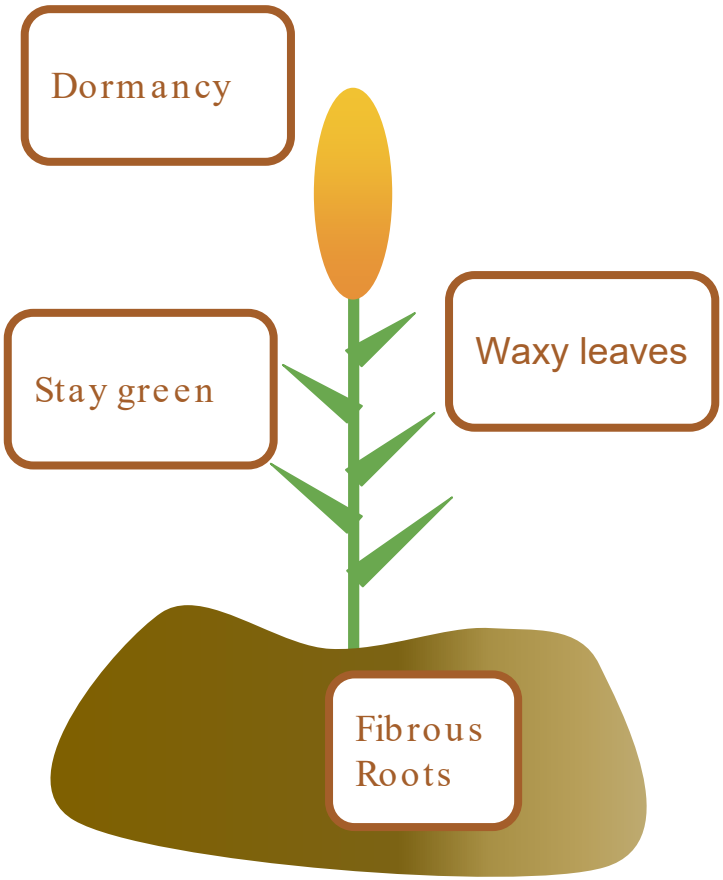
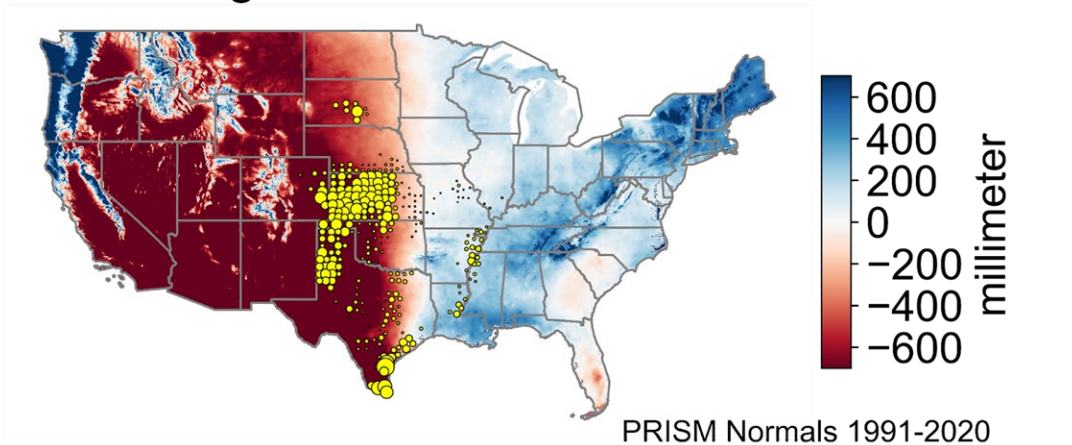
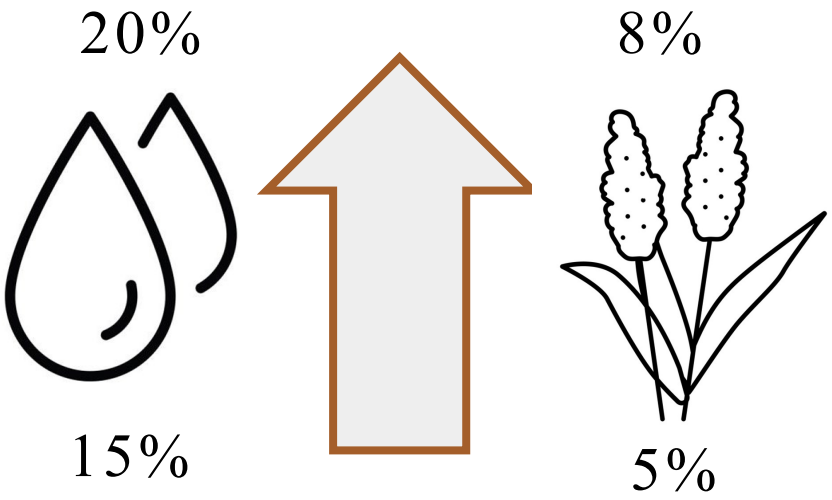


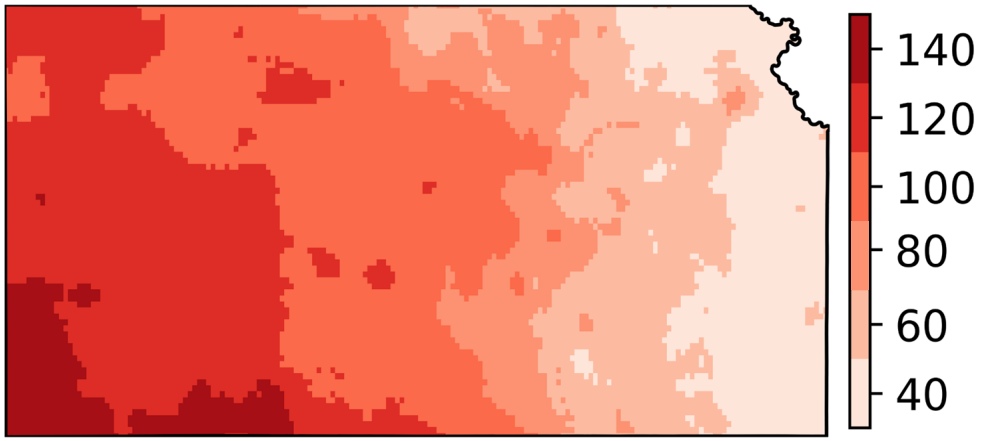
Atmospheric Water Deficit and Sorghum Planted Area



PRISM Normals 1991-2020
TerraClimate Normals 1981-2010
USDA NASS 2012-2021



Days in Year of High Vapor Deficit



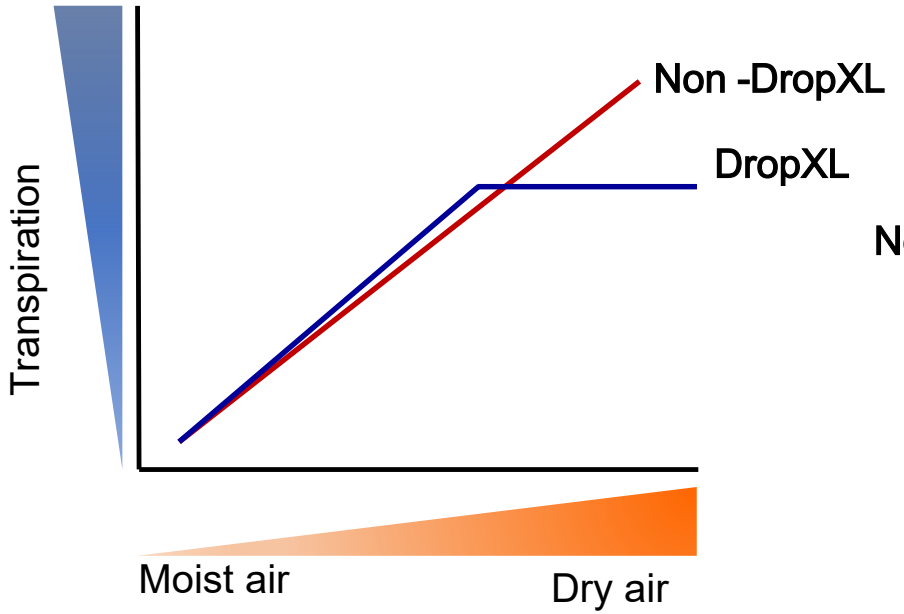
Source: PRISM Climate Normals

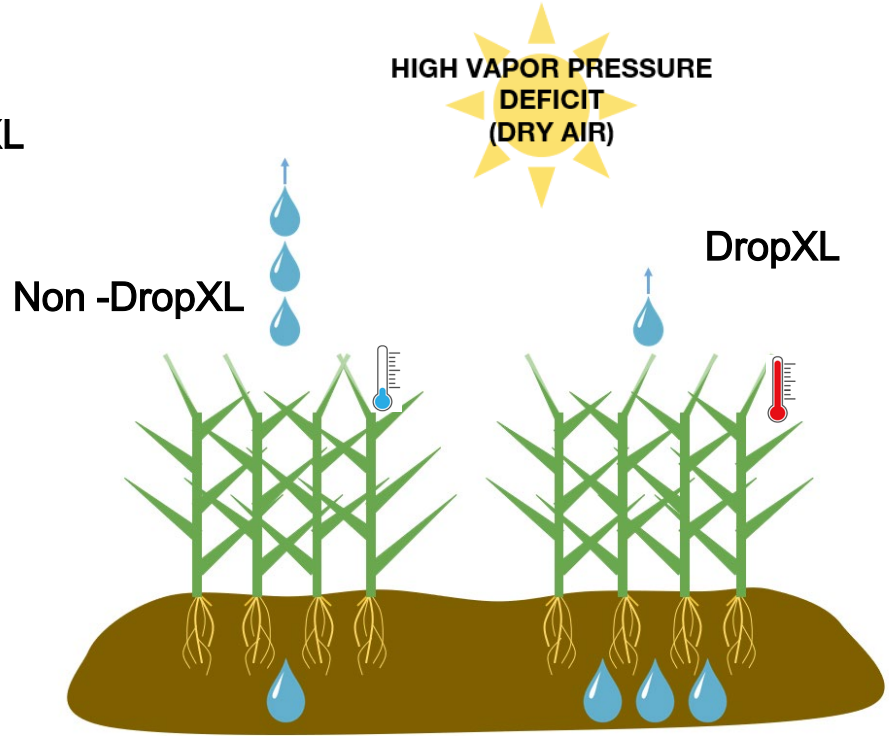
TRAIT MAP

TRAIT MARKER

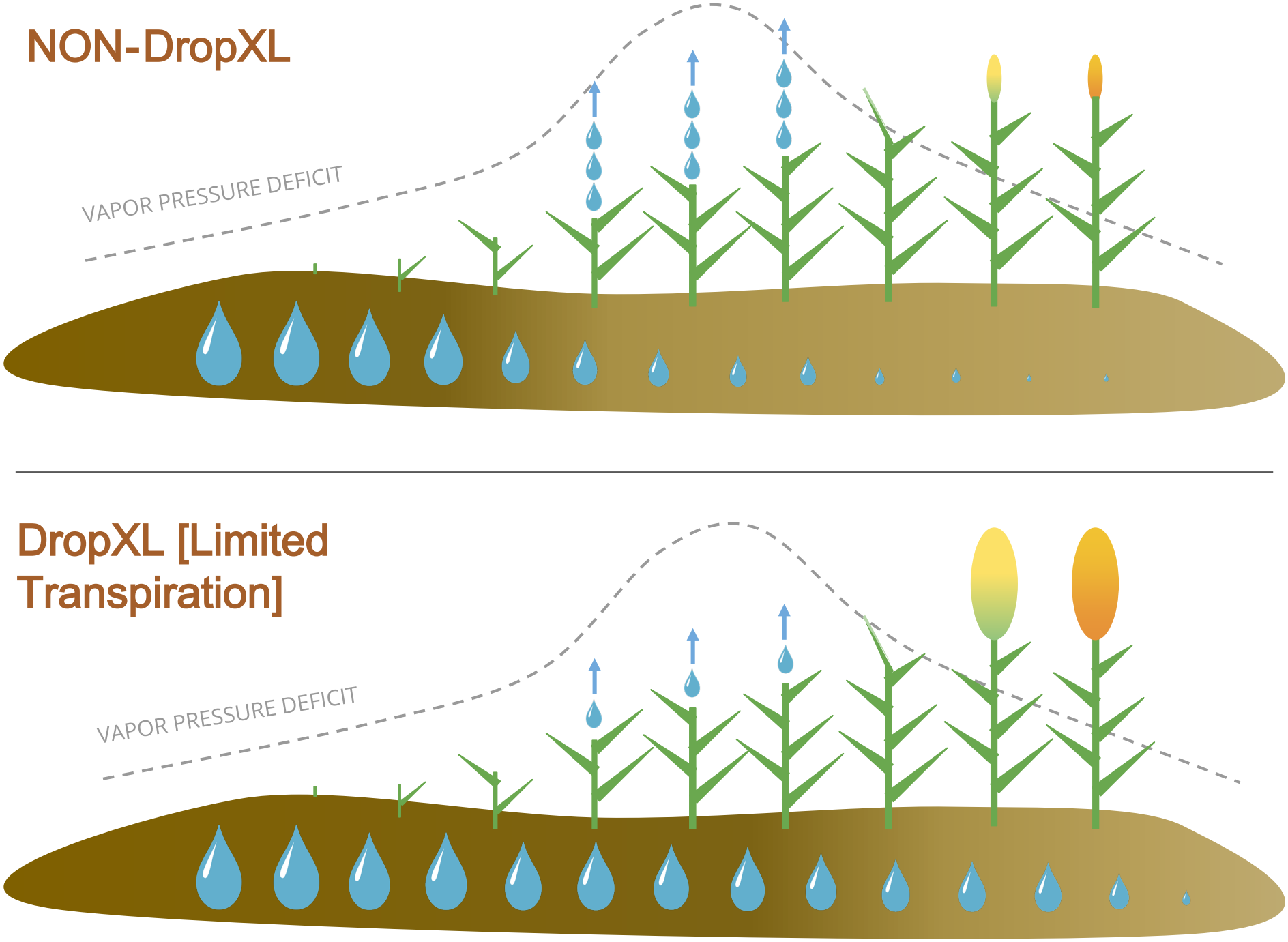
TRAIT DONOR

How to Optimize Water Resources in Growing Crops?





DropXL: Limited Transpiration
Non -DropXL : Non -Limited Transpiration


NON-DropXL
VAPOR PRESSURE DEFICIT
DropXL [Limited Transpiration]
VAPOR PRESSURE DEFICIT

Trait Discovery and Deployment

Trait Diversity

Mapping Population

Selection → Crossing → Mapping → Products

Trait Parents

Trait Introgression

Trait Discovery Questions

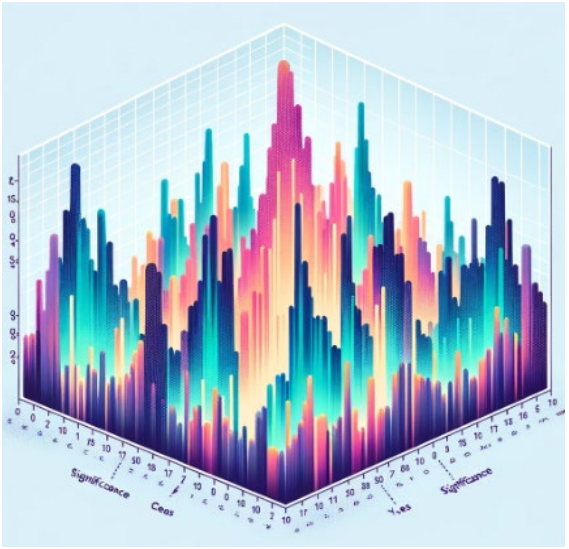
Can I observe the trait?

Can I map the trait?

Can I predict the trait?

Rapid Evaluation

DNA Profiling



Genetic Analyses

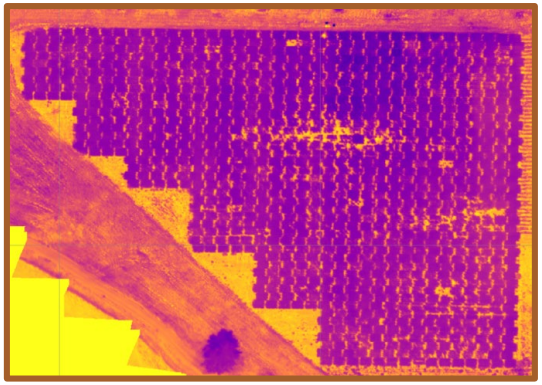
Trait Discovery Questions

Can I observe the trait?

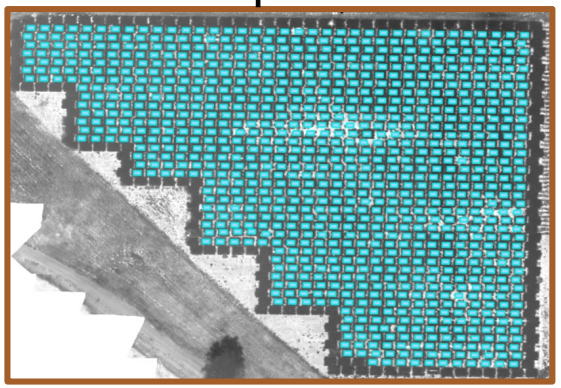
4 acres, ~1000 plots in 20 minutes

Rapid Evaluation of Trait

Orthomosaic



Plot level temperature



Trait Discovery Questions

Can I map the trait?

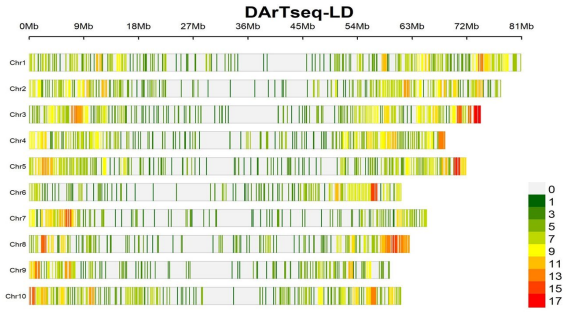
DNA Profiling

- Screened ~40 diverse lines to find
- DropXL Parents [SC979, BTx2752 & Non-DropXL Parent - RTx430]
- Mapping population of ~320 lines

- 2022 & 2023 locations (Manhattan, Colby, Tribune of KS) covering 12 acres, under well watered condition

Trait Discovery Questions

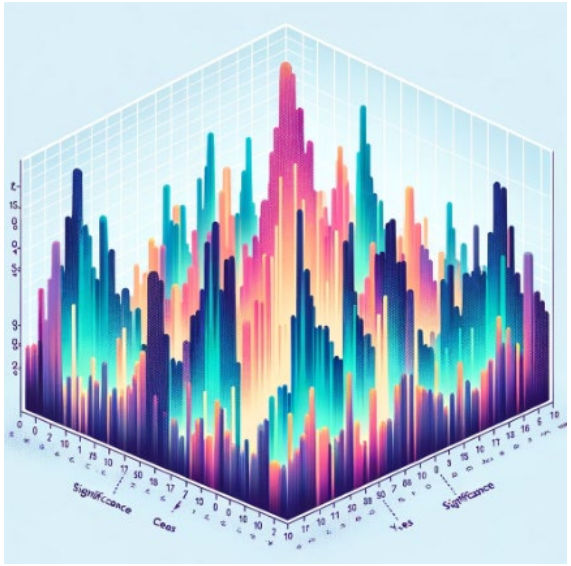
Young Sorghum for DNA profiling



Distribution of SNPs Across Sorghum Chromosome

Can I predict the trait?

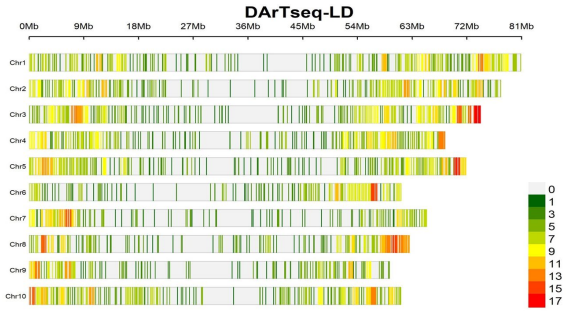
- Young leaves were collected from sorghum plants for DNA extraction
- Mapping population were profiled using DArT-seqLD
- 2,738 informative SNPs were retained from 320 sorghum genotypes



Genetic Analyses

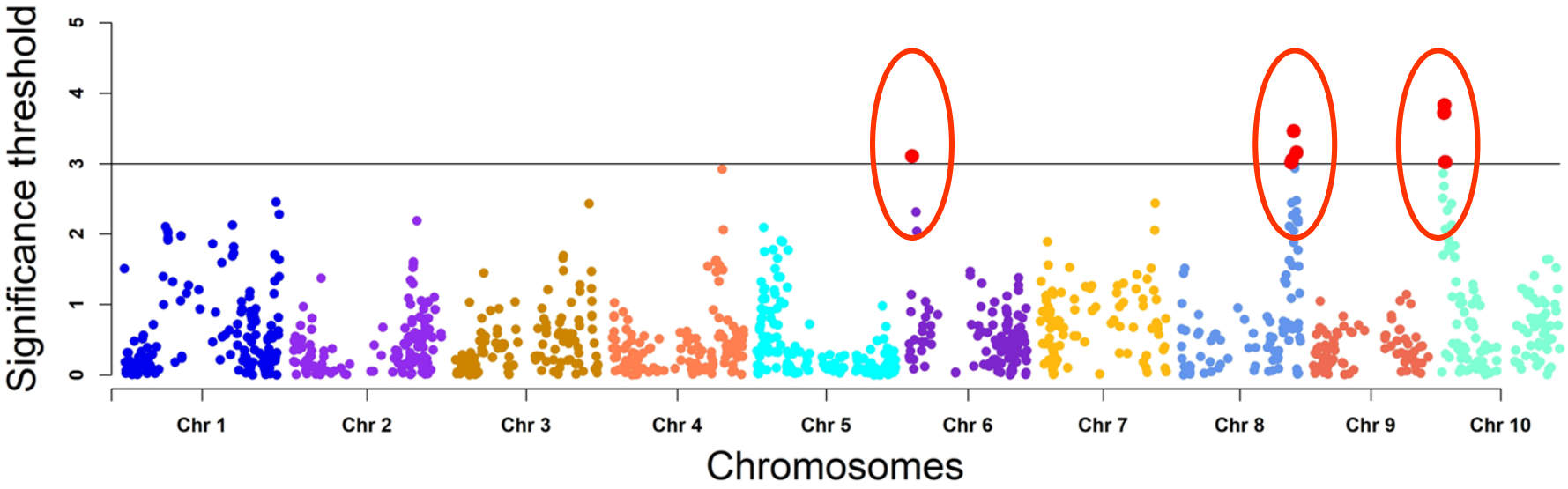
Trait Discovery Questions

Young Sorghum for DNA profiling

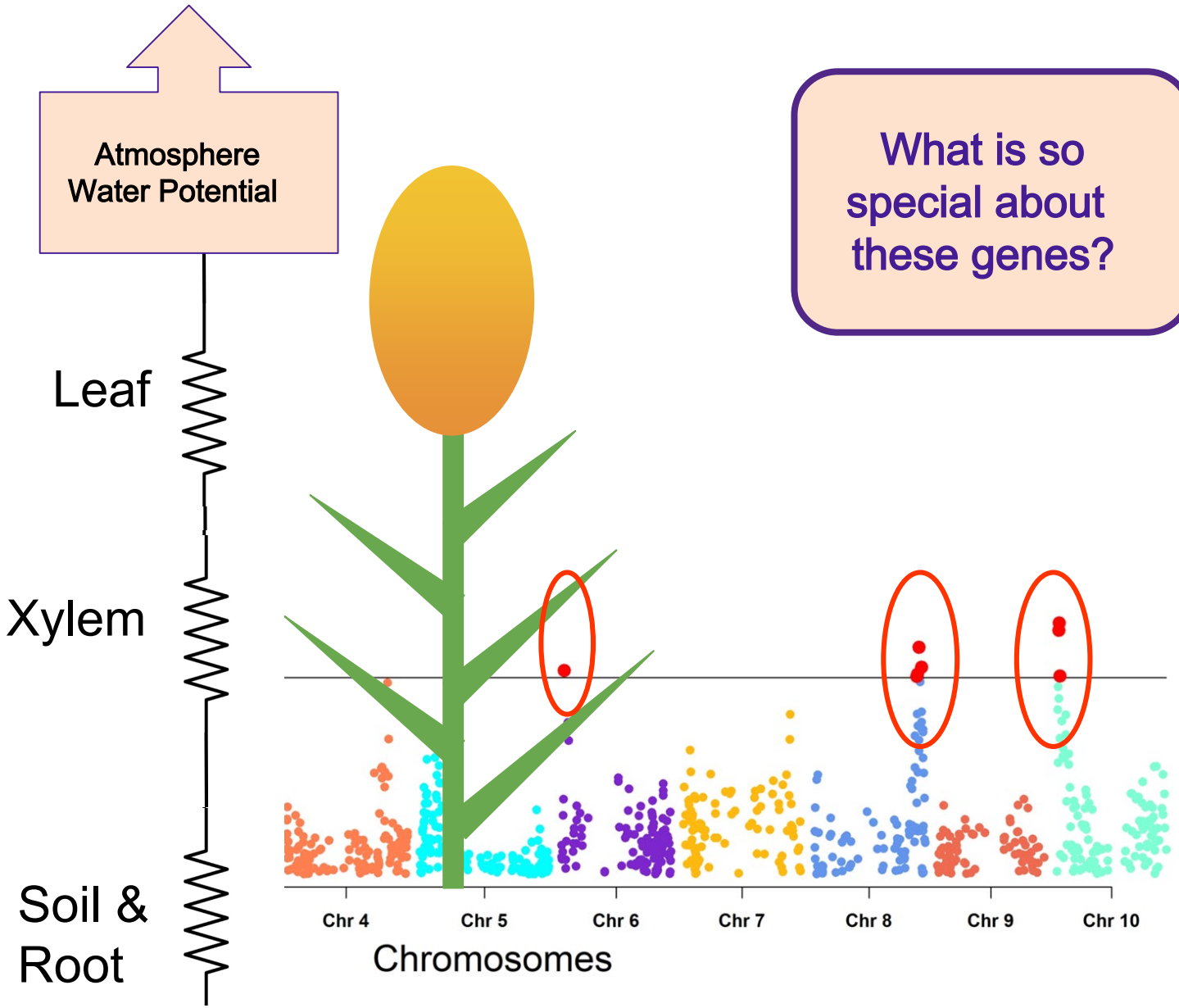


Distribution of SNPs Across Sorghum Chromosome

Can I predict the trait?



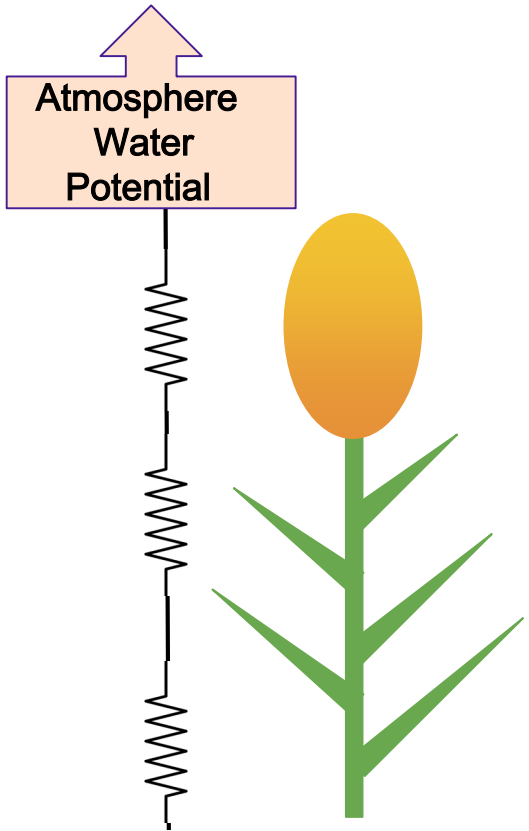
Preliminary Genetic Analysis



Preliminary Genetic Analysis

Gene ID	Function
Sobic.001G505100.1	Aquaporin -like superfamily protein
Sobic.001G195800.1	Boric acid specific transporter of the aquaporin family
Sobic.001G389900.1	Facilitate the passive transport of small molecules across membranes
Sobic.006G170600.1	Aquaporin -like superfamily protein
Sobic.006G150100.1	Plasma membrane intrinsic protein PIP2
Sobic.006G150100.1	plasma membrane intrinsic protein PIP
Sobic.010G146100.1	Aquaporin -like superfamily protein
Sobic.010G164100.1	Encodes an aquaporin homolog. Functions in arsenite transport and tolerance
Sobic.010G080300.1	Peptidase M20/M25/M40 family protein

What is so special about these genes?



Deliverables

TRAIT MAP

Characterize the trait impact, Identify traits, optimize trait combinations

TRAIT MARKER

Identify trait donors, pin point causal gene, develop stable markers

TRAIT DONOR

Delivering DropXL germplasm, inbred lines, hybrids

FY2024 & 2025

The Partners and People

Kansas Water Office

Kansas Department of Agriculture

KANSAS GRAIN SORGHUM
Growers Working Together

The Team

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Sorghum Genetics & Molecular Breeding