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Consortium for Advanced Sorghum Phenomics (CASP)

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Partners: Blue River Technology, Inc., Lawrence Berkeley National Laboratory, Chromatin Inc., Kearney Agricultural Research & Extension Center

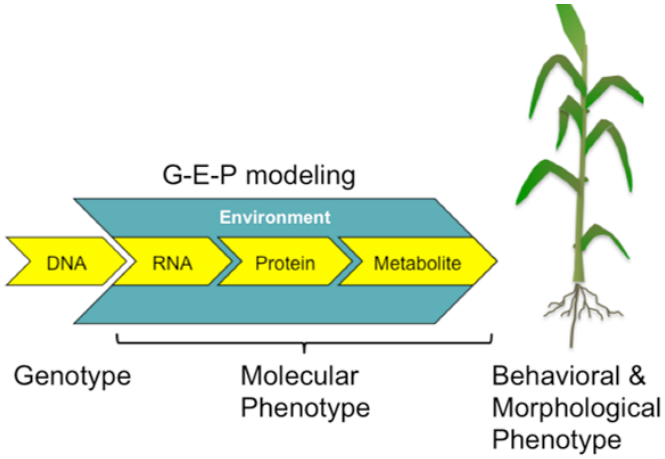
SUMMARY

Drought and salinity put stress on plants, making it difficult for them to flourish. PNNL is addressing this problem through The Consortium for Advanced Sorghum Phenomics, a collaborative effort with Blue River Technology, Inc., Lawrence Berkeley National Laboratory (LBNL), Chromatin Inc., and Kearney Agricultural Research & Extension Center (KARE).

The mission of the CASP project is to accelerate the breeding of biomass sorghum to maximize compositional yield under drought field conditions.

The project will focus on simulating drought and salinity stresses in order to develop plant varieties that are more resilient to these environmental challenges. Using novel phenotyping platforms, predictive modeling techniques and image processing tools, PNNL will generate maps of plant composition and predict plant growth. Research will include the use of aerial drones and customized algorithms to provide high-throughput field-based measurements.

PNNL and LBNL will perform molecular phenotyping to identify breeding markers for these biotic stresses. Blue River Technology will develop a drone-based phenotyping system that can create 3-D models of crops and map plant traits such as height, leaf area, and water stress. Chromatin Inc. and KARE will advance improved commercial seed cultivars.

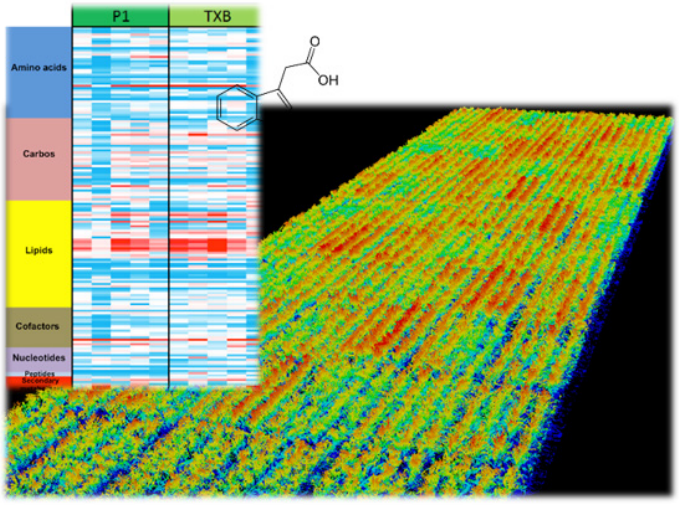


A major technical goal of the CASP project is to develop predictive genotype-environment-phenotype (G-E-P) models for sorghum, allowing pairwise correlations of morphological, behavioral, and molecular phenotypes, and of genotype with phenotypic data. Data collected from genotyping by sequencing will be used for genome-wide association studies. RNA-Seq and high-resolution metabolite and protein profiling of selected lines will be used to identify critical genes and to obtain mechanistic understanding for observed field traits.

IMPACT

The CASP project will result in the creation of a sorghum pangenome to enhance the resolution and accuracy of G-E-P models and genomic selection.

In addition, research from the CASP project will increase production of renewable transportation fuels and expansion of bioenergy production into affected areas, both of which will enhance the economic and energy security of the United States. G-E-P tolls and processes being developed for this project can have broad applicability to other bioenergy and food crops as well, where they can also accelerate the rate of genetic gain.



INNOVATION

The CASP project will:

- Combine field and controlled-environment phenotyping of morphological and behavioral traits with molecular phenotyping of transcript, protein, and metabolite profiles that provides a mechanistic understanding of observed traits
- Assimilate much richer, higher volume, and deeper data sets with holistic predictive power and less tool-bias, including metabolite markers as phenotype predictors for growth
- Use a drone-based sensor suite in LiDAR, NIR, and thermal cameras to measure plant traits required for selection of drought and saline tolerant lines and yield prediction
- Leverage large collections of diverse and pre-selected sorghum germplasm

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BLUE RIVER TECHNOLOGY

BERKELEY LAB

Chromatin

University of California Agricultural and Natural Resources
Kearney Agricultural Research & Extension Center

Sorghum Phenomics (CASP) Consortium for Advanced

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