

Understanding and using diversity

The genotypic data provide unifying information across landraces, acting as a common backbone to which other valuable information can be added. This knowledge framework serves as a catalogue enabling germplasm bank users to select products to meet their needs.



“These landraces likely offer my **needed disease resistance!**”

The molecular atlas is a knowledge and information platform that brings these data resources and associated tools together. Similar to satellite navigation systems in a car, the molecular atlas enables navigation through a framework of complex data to help move effectively from a genetic diversity need to a potential solution. The atlas facilitates unparalleled access to the vast range of unused diversity available on germplasm bank shelves – crucial diversity for the development of nutritious, climate change responsive varieties of the future.



The molecular atlas – navigating diversity

The maize molecular atlas brings landraces into active use by germplasm bank users – current examples include the use of landraces in heat tolerance research, development of new drought tolerant breeding lines, and participatory maize breeding with smallholder farmers to improve landrace disease tolerance.

ATLAS USE

Identify new variation for heat tolerance

Process

- Find all landraces in target environment of interest
- Find landraces which come from places with long term high temperatures during flowering or perform well under high temperature stress
- Use genotypic data to conduct diversity analysis and define small representative set of landraces for field evaluation
- Conduct field evaluations to identify the best heat tolerant landraces
- Upload data to germinate to share with the broader community

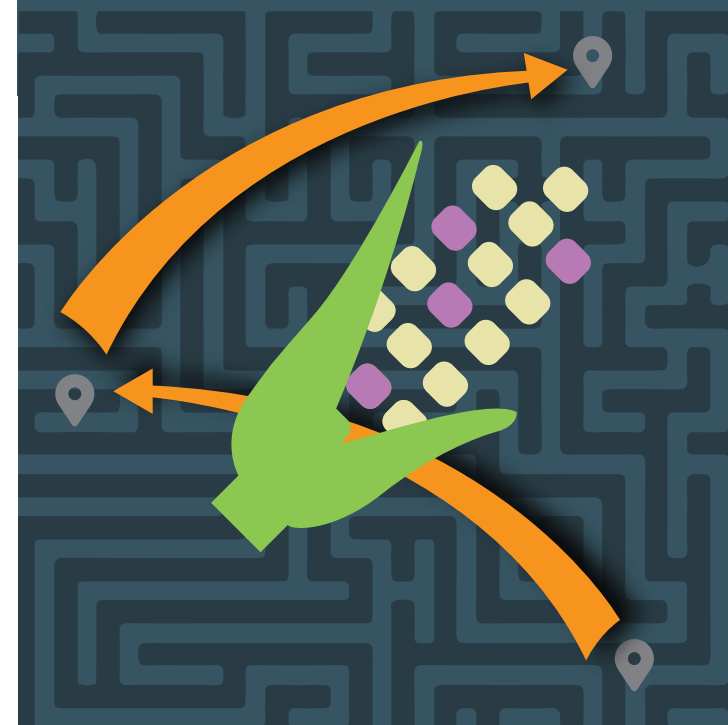
Molecular Atlas Tool/Resource

Germinate 3



Maize Molecular Atlas

Navigating genetic diversity



CIMMYT
International Maize and Wheat Improvement Center

SAGARPA
SECRETARÍA DE AGRICULTURA,
GANADERÍA, DESARROLLO RURAL,
PESCA Y ALIMENTACIÓN



RESEARCH
PROGRAM ON
Maize

BBSRC
bioscience for the future

MasAgro

For more information
email us at seed@masagro.org
Websites:
www.seedsofdiscovery.org
www.cimmyt.org



The molecular atlas

The molecular atlas provides the data, tools and resources to allow germplasm bank users – maize breeders, researchers, extension agents etc., to identify the diversity of likely value for their specific needs from the tens of thousands of landraces available to them.

The molecular atlas – a public knowledge resource

The molecular atlas framework is available providing;

Data – genotypic, phenotypic, GIS, passport.

Knowledge – marker-trait associations, germplasm panels.

Tools – data collection software, online query tools, data visualization tools and software, statistical analysis methods, training links.

The information and tools of the atlas are international public goods. Contents are publically accessible within a proactive intellectual property framework ensuring that the genetic resources and benefits arising from their use remain in the public domain, within reach of smallholder farmers.

The atlas currently consists of several components.

Molecular atlas components



Diversity to meet challenges

Use of landraces

Until recently it was very difficult for the users of germplasm banks to identify which landraces were of the most potential value for their needs. The information needed to make a selection was scarce, rather like a library without a catalogue.



“Which landraces can help me develop a variety with – **heat tolerance?** **higher nutrient content?** **disease resistance ...?**”

Making diversity more accessible

Recent advances in DNA sequencing techniques provided an opportunity to rapidly and cost effectively genetically fingerprint or genotype germplasm bank collections. Using these methods, MasAgro genotyped the entire international maize collection – 28,000 maize accessions, publically available and held in trust for humanity by CIMMYT. This genotypic data, helps understand and use the germplasm bank diversity.



MAIZE DIVERSITY

Maize and Mexico

Maize was domesticated in Mesoamerica, around 10 thousand years ago. Today it is one of the three most important food staples globally and is central to the diet of many regions particularly so in Mexico where the crop has large cultural significance.

Landraces – past and present

Landraces are the varieties of maize that farmers across the globe have adapted to their local environments over tens, hundreds or thousands of years. They represent the broadest range of maize genetic diversity and are the ancestors of all modern maize varieties. Landraces are still grown in some farming communities today, though the extent of their use has declined for many reasons. To ensure the availability of this diversity for future generations, many of these landraces have been conserved in germplasm banks – safeguarding the vast range of diversity cultivated over millennia.