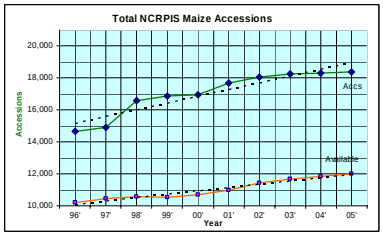
NCRPIS MAIZE CURATION PROJECT

Mark Millard – Curator, USDA-ARS
Matt Lively – Technician, USDA-ARS
Dave Losure - Technician, Iowa State University

Teosinte Harvest



Maize Evolution

• The closest relatives of maize are the teosintes, a group of wild grasses found in Mexico and Central America (Beadle 1939). The direct progenitor of maize is believed to be the teosinte *Zea mays* ssp. *parviglumis* (Matsuoka et al. 2002).

• The domestication of maize is believed to have happened 6,000 – 10,000 years ago in what is now southern Mexico (Piperno and Flannery 2001, Matsuoka et al. 2002).

•Most of the world's maize is now grown in temperate areas and used for animal feed and industrial materials, but maize is also still an important crop for many subsistence farmers in tropical areas and throughout the developing world (Salvador 1997).

Modern Corn

DENT

FLINT

Maize Collection Description

The maize collection at the NCPRIS has over 18,300 accessions from all over the world. It was here at the NCRPIS at the start in 1948 when the largest collection was from Turkey. Of these 16,000 are maize accessions with population level genetic diversity and over 2000 are inbred lines with little segregation. Accessions vary in size from the 2-3 foot tall Gaspe Flint to the 15-20 foot tall tropical collections.

RICE POP

ORNAMENTAL

Impacts and Uses of Maize Germplasm

•Plant Genetics – mapping, maize genome sequencing, cytogenetics

•Breeding – kernel yield, silage yield, ethanol yield, sweet corn flavor, popcorn expansion

•Plant Physiology – acid soil reactions, photosynthetic rates

•Teaching and demonstration of plant biology, all levels

•Plant Pathology – resistance, susceptible standards

•Archeology and Ethnobotany

•Organic growers startup germplasm, heirlooms, unusual types

•Trait discovery in all disciplines

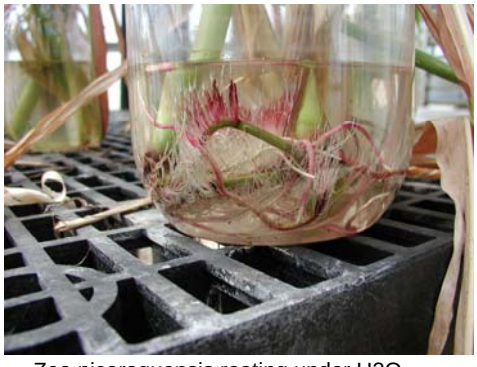
Maize Collection Features and Program Objectives

Main objectives of the maize curation project currently include:

- Regenerating accessions to meet demand and maintain viability while maintaining genetic diversity and purity.
- Generating and making available characterization and evaluation descriptions (resistance, susceptibility etc..) of all accessions. This greatly increases the value of any accession.
- Develop improved methods in regeneration and processing to improve efficiency. This includes incorporating molecular techniques to monitor purity.

Current projects and challenges include:

- Increase availability of materials.
- Regenerating wild relatives of maize with limited greenhouse facilities.
- Control height of tall populations using growth regulators.
- Developing a method to artificially limit day lengths experienced by field grown tropical accessions at NCRPIS in order to initiate earlier flowering.
- Develop ways of querying images and obtaining data points from images.
- Finding cooperators with tropical nurseries who can regenerate accessions that can not be grown in Iowa and are able to achieve consistent quality. Highland tropical locations needed!



Zea nicaraguensis rooting under H2O

Pollinating a trimmed ear shoot

Beadle, G.W. 1939. Teosinte and the origin of maize. J. Hered. 30: 245-247.

Matsuoka, Y., Y. Vigouroux, M.M. Goodman, J. Sanchez, E.S. Buckler, and J.F. Doebley. 2002. A single domestication for maize shown by multilocus microsatellite genotyping. Proc Natl. Acad. Sci. USA. 99: 6080-4.

Piperno, D.R. and K.V. Flannery. 2001. The earliest archaeological maize (*Zea mays* L.) from highland Mexico: new accelerator mass spectrometry dates and their implications. Proc. Natl. Acad. Sci. USA 98: 2101-3.

Salvador, R.J. 1997. The Maize Page, Maize.[Online]. Available at http://maize.agron.iastate.edu/maizearticle.html (verified 26 June 2006). Department of Agronomy, Iowa State University, Ames, Iowa.