

GEM COOPERATOR MEETING

December 10, 2008

Crystal Ball Room C

Hyatt Regency Hotel

Chicago, Illinois

Attendees: GEM TSG Members, GEM Cooperators, Invited Speakers, and Guests from the public and private sectors.

The meeting was called to order by Tom Hoegemeyer, TSG Chair. Tom welcomed all in attendance.

1). Minutes from the GEM Cooperator Meeting, December 5, 2007: **Jerry Rice** (presenter) – minutes from the previous GEM Cooperator Meeting held in Chicago in December 2007 were reviewed and approved.

2). Election of TSG Members: **Jerry Rice** (presenter).

Jerry Rice indicated that Freeman Whitehead had completed his first (3 year) term as a member of the GEM TSG. Because of Freeman's very active role as a TSG member and his numerous contributions to the GEM program, the TSG encouraged Freeman to serve a second term as a TSG member. A formal nomination of Freeman Whitehead to serve a second term with the TSG was presented by David Bubeck and seconded by Walter Trevisan. There were no additional nominations from the floor and Freeman Whitehead was elected to a second term as a TSG Member by acclamation.

3). GEM Annual Report: **Mike Blanco** (presenter).

Mike discussed the highlights and accomplishments of the 2008 GEM Program. He presented the new GEM Releases and discussed the data behind the new lines going forward in the program. Mike referenced the SCA Cooperator Projects and thanked these programs for their continued research efforts and contributions to the GEM Program. He expressed appreciation to Bill Dolezal, Jim Dodd, and Ed Baumgartner for their support of disease & insect screening contributions to the GEM Program. With regard to quality traits, Mike referenced Mark Campbell's work utilizing selected GEM breeding materials as a source of high amylose genes in the development of high amylose germplasm. Mike also indicated that many of the key traits of the GEM lines were currently posted on the GEM website under the section "GEM germplasm releases and key traits".

Mike discussed the status of the Allelic Diversity (AD) Project and the nursery efforts underway at the Ames location. He indicated that he would be encouraging GEM cooperators to provide assistance with some portions of the AD Project. Mike mentioned the addition of 9 new GEM cooperators in 2008: 5 Private Companies, 3 U.S. Public Sector, and 1 International Public Sector Cooperators.

4). Yield Test Results and Recommendations – Midwest & Southeast: **Mike Blanco, Mack Shen, and Matt Krakowsky** (presenters).

Mack initiated the presentation by discussing the GEM website, reviewing the GEM Cooperator listing, the GEM data, and GEM reports. He referenced the 43 images that are currently available on the website. Mack discussed the ability to track visitors to the GEM website and indicated that most visits to the website were for data. He mentioned that the GEM program at Ames managed some 17,000 yield trial plots, 6125 nursery rows, and approximately 1500 isolation rows during the 2008 season. Mack thanked the cooperators for their data contributions to the GEM program.

Mike discussed more of the specific results of the 2008 yield trials. He highlighted the changes in the check hybrids and then focused on the 7 new GEM line releases from the Ames program. Mike presented supporting summaries of yield data (grain yield, harvest moisture, Y/M ratios, and stalk & root lodging) and NIR data (protein, starch, oil). Of the 7 new releases, 6 were from the 25% tropical breeding crosses and 1 from a 25% temperate breeding cross. Two new releases were derived from SROGP3, which are from the tropical Tuson race and 1 release from ANTIG03 (the Criollo race). These were the first releases from these accessions. Mike discussed the attributes of the new releases.

Mike also referenced a compilation of GEM releases and their key traits currently available on CD. From a quality trait standpoint, there were 33 GEM releases with high protein content, 17 lines with very desirable amino acid indices, and 13 lines with high oil content. There were numerous GEM lines carrying tolerance to foliar diseases (20 lines for GLS, 34 lines for NLB, and 50 lines for SLB). There were 19 lines carrying tolerance to Fusarium, 5 lines exhibiting reduced levels of Fumonisin, and 6 lines exhibiting reduced levels of Aflatoxin. The discussion emphasized the numerous key traits available from GEM germplasm.

Matt indicated that the 2008 Raleigh, NC program had approximately 14,700 yield trial plots. The Raleigh program also had 450 nursery rows allocated to the AD Project, 2600 conventional nursery rows, some 4900 S1 rows and 1300 isolation rows. Matt presented the yield trial summary (grain yield, harvest moisture, & percent erect plants) for the 5 GEM lines recommended for release from the Raleigh Program. Four of the new releases were derived from the 50% tropical breeding cross, DK888:N11 and 1 new release from the DK212T:N11 breeding cross. The new release from the DK212T:N11 germplasm has 16% protein and 5% oil content.

5). General Discussion & Other Business:

Mike Blanco indicated that seed requests for the new GEM releases should be forwarded to him as seed of all new releases (Ames and Raleigh programs) would be shipped from the Ames location.

Matt Krakowsky made a few comments regarding the continued use of Ex-PVP lines in the Allelic Diversity Program.

Wenwei Xu indicated that there was very positive support for the use of U.S. GEM Program materials in China following his presentation to the Chinese Academy of Agricultural Sciences, Beijing, China in November 2008. Wenwei's presentation covered: "U.S. GEM Project and Use of Exotic Germplasm to Improve Drought Tolerance in Maize".

S. Taba mentioned that crosses of CIMMYT x GEM lines were being made in Mexico.

6). The Development of Western Corn Rootworm Resistant GEM Germplasm and its Role in Host Plant Resistance Research: **Martin Bohn** (presenter).

Martin presented a very stimulating overview of 70 years of breeding for Western Corn Rootworm (WCR) resistance as well as specific findings from his program and various other investigating programs. His outline included: tolerance vs. antibiosis, identifying antibiosis, trap crop vs. manual infestation, and germplasm. Martin indicated that developing host plant resistance to WCR is tremendously challenging as: the projects are very labor intensive, the resistance traits tend to have low heritability, and resistance to WCR larvae and adult feeding are not correlated. Some of the early developed lines (1930's, 1940's) carrying apparent resistance had large, very dense root systems and/or had quick root regeneration capabilities. Of the 12,000+ accessions that have been screened for WCR resistance, less than 1% have been utilized in germplasm development projects. Most breeding projects over the years improved tolerance to WCR but not antibiosis.

Martin indicated that recent progress has been made towards improving host plant resistance to WCR feeding due primarily to: improved high throughput screening methods & improved experimental designs, intensive collaborations (including multiple institutions & private companies), and the integration of exotic materials to broaden the genetic base for WCR resistance. The conventional screening methods for WCR resistance continue to be highly labor intensive with very slow progress primarily due to the lack of detailed knowledge concerning the actual genetic basis of the resistance mechanisms. Martin's program is utilizing the newest inbreds with improved WCR resistance to develop segregating populations and using double haploids to allow the effective mapping of quantitative loci involved in WCR resistance. Martin mentioned that the metabolic responses involved with resistance are very complex, however the integration of gene expression and metabolic profiles is of key importance. He stressed

that very diverse sets of germplasm need to continue to be screened in order to link expression patterns with the metabolic signatures associated with WCR resistance.

7). The Corn Silage and Biofeedstock Breeding Program at the University of Wisconsin: **Natalia de Leon** (presenter).

Natalia presented a very informative overview of her silage and biofeedstock breeding programs at the University of Wisconsin. Of the U.S. annual corn acreage, approximately 7% (6 million acres in 2008) are harvested for silage. Within the U.S., the University of Wisconsin has the only public plant breeding program focused on the development of corn varieties with enhanced compositional attributes and forage yield. Natalia's program is also very interested in identifying the best germplasm to use as a fermentable feedstock for energy production. Natalia reviewed the current usage of GEM germplasm within her breeding programs, noting the backgrounds of the recently released lines. She indicated that she had added some 75 new GEM families of germplasm in 2008 (including GUAT209, CUBA164, BVIR155, & AR16021, and DK888) for the silage and biofeedstocks programs.

With regard to her biofeedstock breeding program, Natalia reviewed the importance of lignocellulosic ethanol for replacing petroleum fuels in the future. A current proposal is to replace 30% of petroleum fuels with biofuels by the year 2030. She referenced an article indicating that this type of biofuel replacement would require 1 billion dry tons of biomass. In the medium to short term, lignocellulosic ethanol from corn stover could potentially represent 60% of the contribution to biofuel. Natalia presented 3 primary factors necessary to develop a successful biofeedstock breeding program focused on ethanol production: the identification of efficient / effective methods to measure the critical traits, the ability to correctly identify the most important morphological & compositional characteristics affecting biomass, and the identification of the most useful germplasm. She presented some results (biomass production, potential ethanol yield, compositional analyses, etc) from a 2 year hybrid study involving conventional grain hybrids, UW lines x testers, and commercially available silage hybrids. This study indicated that the conventional SSS x NSS heterotic patterns may not be optimal for stover yield, multi-environments will be necessary to evaluate stover yield & quality, and germplasm currently used for silage production could be very important for increasing stover and reducing lignin. The overall production of ethanol from biofeedstocks is a function of the compositional properties and their convertibility to ethanol.

9). Adjourn: **Tom Hoegemeyer** (presenter).

Tom Hoegemeyer, thanked the speakers for their informative presentations and thanked the GEM Cooperators, the TSG Members, and guests for their attendance. He wished all a productive week and safe travel back to their homes, then adjourned the meeting.