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USDA ARS Corn Breeding

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Abstract
The United States Department of AgricultureAgricultural Research Service (USDA ARS) evaluated 5,412 experimental corn research plots at the Southeast Research Farm in 2010 representing three research projects within USDA ARS:

1. Germplasm Enhancement of Maize (GEM). The objective of the GEM project is to increase the diversity of U.S. maize germplasm utilized by producers, global end-users, and consumers. The mission is accomplished though a collaborative effort between USDA-ARS and both public and private research scientists.
2. Genetic Analysis of Selection Response in Maize Populations. The objective of this project is to develop more efficient strategies to increase maize production. The primary emphasis is on understanding the genetics of adaptation to high plant density.
3. Breeding High-Quality Corn for LowInput and Organic Farming Systems. The primary objective of this project is to develop germplasm for low-input and organic farming systems through conventional breeding.

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Introduction

The United States Department of Agriculture-Agricultural Research Service (USDA ARS) evaluated 5,412 experimental corn research plots at the Southeast Research Farm in 2010 representing three research projects within USDA ARS:

1. Germplasm Enhancement of Maize (GEM). The objective of the GEM project is to increase the diversity of U.S. maize germplasm utilized by producers, global end-users, and consumers. The mission is accomplished though a collaborative effort between USDA-ARS and both public and private research scientists.
2. Genetic Analysis of Selection Response in Maize Populations. The objective of this project is to develop more efficient strategies to increase maize production. The primary emphasis is on understanding the genetics of adaptation to high plant density.
3. Breeding High-Quality Corn for Low-Input and Organic Farming Systems. The primary objective of this project is to develop germplasm for low-input and organic farming systems through conventional breeding.

Material and Methods

Experimental lines were planted in two-row plots, 18 ft long, on April 20, 2010. The number of plants/plot, number of root-lodged plants, number of stalk-lodged plants, grain yield, and grain moisture were recorded on all plots. Plots were harvested on September 20, 21, or 29. Lines planted on the Southeast Research Farm were generally replicated at a minimum of three additional locations. Wet spring conditions resulted in low plant population counts in some experiments. Despite excessive rainfall, high quality data was available from the majority of plots grown in 2010.

Results and Discussion

Results from yield trials grown at the Southeast Research Farm were combined with data from all locations where experimental lines were grown. Highlights for results of some individual projects are as follows. For project 1, Germplasm Enhancement of Maize, six new lines were recommended for release based on the 2010 trial and quality trait lab results. Two of the lines had protein content above 13 percent, and one line was a waxy inbred. All six lines will be distributed to GEM public and private cooperators for the 2011 planting season and will be used for research and breeding programs to broaden the germplasm base. For project 2, Genetic Analysis of Selection Response in Maize Populations, analyses have been conducted on the contribution of genetics to increased plant density. Data collected over the past three years have demonstrated that the most significant impact of long-term selection for grain yield in corn has been improvement in the ability of corn to withstand high plant densities. At low plant densities, selected and unselected corn hybrids have similar yields, but at high plant densities, selected hybrids have much higher yields than unselected hybrids.

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