

Corn Breeding (Field 1)

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Objective: The objectives are to select drought tolerant corn germplasm adapted to the Texas High Plains and to determine the economic and agronomic feasibility of growing drought tolerant corn as a production and rotation crop for the region.

Methodology: Each year we plant about 10,000 small plots in this field. Breeding populations are evaluated under full-irrigation and drought-stressed conditions. The timing, intensity, and duration of drought stress and uniform soil moisture across the field are important factors for field evaluation of drought tolerance. With the low rainfall and high temperatures in the West Texas, we can create different soil moisture regimes by controlling irrigation. The subsurface drip irrigation systems at this 12-acre field as well as another 7-acre field in Lubbock provide our corn-breeding program excellent field facilities for drought research. The drip tapes are buried 12 inches below soil surface in a 40-inch spacing. Corn is planted on top of each tape. Each drip irrigation field has 10 controllers for accurate control of water to create up to 10 different soil-water conditions. We routinely create three water treatments within a field: well-watered, pre-tassel drought stress and post-tassel drought stress. The plants under well-watered treatment are well watered throughout the growing season in order to evaluate yield potential and agronomic performance. Under the drought treatments, however, irrigation is withheld for a period of time to impose the drought stress at a specific growth stage. The best performing populations are selected for the next breeding cycle. In addition, we evaluated the commercial food corn hybrids for the yield performance and adaptation for the Texas High Plains.

Results: Drought tolerant germplasm has been developed. Four testcrosses made with inbred S1 and YQ-1 performed well in comparison to the commercial check hybrids. We plan to release S1 and YQ-1 lines in 2002. Testcrosses of several advanced breeding lines also yielded well under well-irrigated and drought conditions. New sources of drought tolerance and corn earworm resistance have been identified from exotic germplasm. Drought tolerant hybrids produced significantly higher yields under severe drought condition. Among the 47 commercial food corn hybrids, Asgrow RX776W, Zimmerman E8272, and Pioneer hybrid 32T17 may be the best choice for the Texas High Plains. When irrigation was reduced from 80% evapotranspiration (ET) (17.5 acre-inch irrigation plus rain) to 60% ET (12.8 acre-inch irrigation plus rain), the yield was reduced by 4.4 bu/a for every inch of water. However, yield loss rises dramatically from 60% ET to 50% ET (9.1 acre-inch irrigation plus rain), a 7.8 bu/a yield loss per every inch of irrigation.

Expectations: Breeding is a continuous process. We will continue to use this field facility to screen drought tolerance, insect resistance and yield potential. New germplasm will be released. In contrast to the Corn Belt states, there is limited industrial breeding effort in the Texas corn producers. Therefore, the germplasm developed from our breeding program can be particularly useful for the Texas. This field will also be the site for the feasibility study of drip irrigation in corn production and for the development of drought tolerance corn management.

