
Two lowland tropical maize (Zea mays L.) populations, ‘Mezcla Amarilla’ C8 (Reg. no. GP-237, PI 547100) and ‘Tuxpeño Caribe’ C8 (Reg. no. GP-238, PI547101), and two subtropical/midaltitude populations, ‘Blanco Subtropical’ C8 (Reg. no. GP-239, PI547102) and ‘AED-Tuxpeño’ C7 (Reg. no. GP-240, PI547103), have been developed by the International Maize and Wheat Improvement Center (CIMMYT). Each population underwent seven or eight cycles of modified, full-sib, intra-population recurrent selection for grain yield and specific agronomic traits. During the first two cycles 250 full-sib families were evaluated for yield and other agronomic traits in international trials conducted during the major growing season and selected families were recombined in the minor season (one yr/cycle). Subsequently, a two-yr breeding cycle was used that included the formation of 250 full-sib families, yield tests, a generation of selfing, and a half-sib recombination. Full-sib families developed in Mexico were tested in different countries and the yield and agronomic data were used to select the best 40% of families for recombination each cycle during the first five cycles and the best 20% during the last two or three cycles. Three to eight self-pollinations were made in Mexico within each selected full-sib family, and the S1 families were evaluated under disease pressure typical of the environment for which each population is targeted. Two to five agronomically superior S1 per full-sib were recombined using a bulk of pollen from the selected families, and the resulting half-sibs were used to form the next generation of full-sibs.

For each population, relative maturities are expressed in heat units to flowering according to the formula

\[ G = \sum_{i=0}^{d} \left[ 0.5(t_i + t_d) - 10 \right] \]

where \( G \) = total heat units to flowering, \( d \) = number of days elapsed from planting until 50% of plants had shed pollen, \( t_s \) = maximum daily temperature, and \( t_d \) = minimum daily temperature, both expressed in °C; \( t_s = 30^\circ C - (t_s - 30^\circ C) \) when \( t_s \geq 30^\circ C \) and \( t_d = 10^\circ C \) when \( t_d \leq 10^\circ C \). These populations are photoposed in Mexico were tested in different countries and the yield and agronomic data were used to select the best 40% of families for recombination each cycle during the first five cycles and the best 20% during the last two or three cycles. Three to eight self-pollinations were made in Mexico within each selected full-sib family, and the S1 families were evaluated under disease pressure typical of the environment for which each population is targeted. Two to five agronomically superior S1 per full-sib were recombined using a bulk of pollen from the selected families, and the resulting half-sibs were used to form the next generation of full-sibs.

'F. moniliforme' has good levels of resistance to infection with several ear rot fungi in Vietnam. The population infection averaged 31% of ears under artificial inoculation with 201 cm and 103 cm, respectively. The population accumulated 859 heat units to flowering in Poza Rica, Mexico.

Blanco Subtropical (Population 34) has white, semi-flint grain and late maturity, and is adapted to subtropical and midlatitude tropical environments. Its source materials include Cuban flints, ETO, Tuxpeño, Corn Belt dents, and germplasm from India and Nepal. The population was selected for five cycles for grain yield and broad adaptation. Starting in cycle 6, selection pressure was applied for resistance to Esoerohilum turcicum (Pass.) K.I. Leonard & E.G. Suggs and Puccinia sorghi Schwein. During the selfing and recombination generations plants were inoculated with both pathogens at the 6 to 8 leaf stage, and resistant plants were selected from the highest yielding families. The population presently has good levels of resistance to both E. turcicum and P. sorghi, which we believe are primarily due to an accumulation of minor genes. No effort was made to incorporate major gene resistance to either pathogen into the population, although some major genes may be present at low frequency. In yield trials conducted during 1989 at subtropical/mid-altitude sites in Mexico, Uganda, Malawi, and Egypt, cycle 8 of the population had mean yield of 6.2 Mg ha\(^{-1}\) at 150 g kg\(^{-1}\) grain moisture and mean plant and ear heights of 182 cm and 91 cm, respectively. It accumulated 810 heat units to flowering at Tlaltizapan, Mexico.

AED-Tuxpeño (Population 44) is a late-maturing, white dent germplasm adapted to subtropical and mid-altitude tropical environments. It is a cross of ‘American Early Dent’ (from Egypt) with cycle 7 of selection for reduced plant height in ‘Tuxpeño Crema I’ (2). The population was selected for five cycles for increased grain yield, wide adaptation, and reduced plant height. Starting in cycle 6, selection pressure was applied for resistance to E. turcicum and P. sorghi. During the selfing and recombination generations the plants were inoculated with both pathogens at the 6 to 8 leaf stage, and resistant plants were selected from the highest yielding families. The population is highly resistant to E. turcicum and P. sorghi. No effort was made to incorporate major gene resistance to either pathogen into the population, although some major genes may be present at low frequency. We believe its resistance is primarily due to an accumulation of minor genes. In yield trials conducted during 1989 at subtropical/midaltitude sites in Mexico, Egypt, and Kenya, mean yield of cycle 7 of the population was 6.8 Mg ha\(^{-1}\) at 150 g kg\(^{-1}\) grain moisture, and mean plant and ear heights were 220 cm and 112 cm, respectively. At Tlaltizapan, Mexico the population accumulated 821 heat units to flowering.

Breeder seedstocks are maintained by CIMMYT and can be obtained in germplasm quantities (500 kernels) by writing to the Director, Maize Program, CIMMYT, Apdo. Postal 6-641, 06600 Mexico, D.F., Mexico. It is requested that CIMMYT be informed about the performance and use of these materials and that appropriate recognition be made of the germplasm source if these populations contribute to the development of a new cultivar or hybrid.