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Preserve Guatemalan Teosinte, a Relict Link in Corn's Evolution

Wilkes (*1*) describes how Mexican maize depends upon a limited gene flow from its closest relative, teosinte, for variability, heterotic vigor, and yield. Because of increased grazing and other land uses in the teosinte habitats around Mexican maize fields, as well as the replacement of the native races of maize with uniform commercial varieties, this sympatric relation between the crop plant and its wild relative is threatened. Wilkes suggests that the genetic wealth represented by these sympatric partners from Mexico be preserved.

Apparently the Mexican teosintes and their maize partners have undergone a coevolution that permits a constant gene flow between them while maintaining their distinct female spikes through block inheritance of the controlling genes. This response of the Mexican teosintes to gene flow from maize, imposes two limitations upon their usefulness for maize breeding, limitations not shared by their more primitive counterpart isolated from maize in Jutiapa, Guatemala: (i) the introgression from cultivated maize in Mexico would cause some loss of teosinte's original ability to endure the rigors of a truly wild plant and (ii) some of the germplasm of Mexican teosinte has become locked up in blocks and is, thereby, less available for maize improvement. This block inheritance in crop plants is assumed to be a product of disruptive selection between man, on the one hand, and nature, on the other (*2*). The presence of four or five of these inherited blocks in segregating progenies from hybrids of maize and Mexican teosinte has been demonstrated repeatedly (*3*).

In contrast, the more primitive teosinte from Jutiapa, as shown by Rogers (*4*, p. 555), "differs from maize by genes distributed upon most of the chromosomes, while other teosintes [Mexican] represent types which differ from maize by genes of a more localized nature on a few chromosomes." Furthermore, while the hybrid of maize with the Guatemalan teosinte called "Florida" has the same amount of crossing over in the sugary glossy-3 ($SuGl_3$) region as does maize itself, the maize–Nobogamé teosinte (Mexican) hybrid has suppressed crossing over in this same region on the long arm of the definitive fourth chromosome (*5*). Thus, the Guatemalan teosintes appear to have the primitive kind of genetic architecture that would be expected in a remote common ancestor before an assemblage of block inheritance under the domestication of *Zea* spp. (maize or teosinte or both) in Mexico. In Mexico, where maize and teosinte became genetically symbiotic during domestication, the two species were able to maintain their distinct female spikes by assembling blocks of the controlling genes.

That the Guatemalan teosintes are primitive rather than just derived in isolation from the Mexican teosintes is suggested by a number of traits that are more similar to those of *Tripsacum*, a more distant and primitive relative of maize, than they are to those of Mexican teosinte and maize. Like most species of *Tripsacum*, rather than its Mexican counterparts, the Guatemalan race, the teosinte found in the region of Jutiapa, has terminal knobs on its chromosomes (*6*), elongate trapezoidal fruit cases, and large flattened staminate glumes. In addition, it tends to be a perennial (as is the tetraploid teosinte of Jalisco, Mexico), and has adapted to moist, medium elevations rather than dry, high elevations (*7*). Unlike both *Tripsacum* and Mexican teosinte, the Guatemalan teosinte has large pollen that compares favorably in size with that of present-day maize and that of the oldest known archeological remains of maize (*5*). Thus, the Guatemalan type of teosinte appears to be a primeval source of variation from which both maize and Mexican teosinte could have emerged under domestication.

The Guatemalan teosintes, as well as the Mexican teosintes, should be preserved as a reservoir of variability for maize improvement.

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