

Getting seed from the maize race Montaña

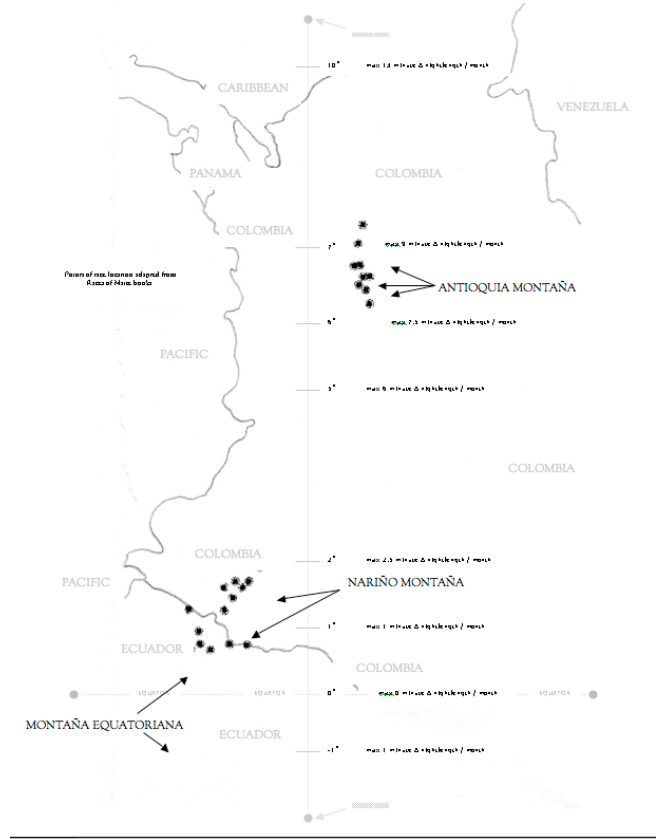
--Karl, JR

Montaña may not make seed when grown under decreasing night length.

The tallest maize types make fine seed during the winter in Florida with the exception of Montaña, an equatorial maize race. When grown in a December planting when the night length was decreasing, similar to a June planting in the southern hemisphere, Montaña made no seed. However, when planted in late September, the race makes some seed, presumably because the night length is increasing from the 12-hour autumnal equinox toward the 13.5 hours of the winter solstice.

A similar phenomenon was described in the tallest teosinte, Huehuetenango (Modena, MNL 57:38, 1983). Huehuetenango and Montaña are peerless in this sensitivity. Huehuetenango has neither male nor female flowers, while Montaña tassels but does not make ear shoots or protrude silk. It appears that Huehuetenango has an obligate, increasing night length and long-night requirement for flowering, and that Montaña has this nature just for the ears, while the tassel has the basic, photoperiodic-tropical-maize, facultative long-night nature.

Most of the Montaña race derived in a location (see accompanying map, zoomable online) that is within one or two degrees (Maps.com, <http://i.infoplease.com/images/mcolombia.gif>, 2007) (namely as much as 1.75°, 122 miles) of the equator, where the maize crops develop (2 months*) under night length that does not change by more than (at 2°) 5 minutes (Baker and Baker, <http://www.orchidculture.com/COD/daylength.html#5N>) (relatively



2.5 min per degree latitude, 15 min "annually" at 7.5 min each degree). The reproductive problem may be focused in this geographic majority of the race because of the negligible night length change there, which entailed negligible selection pressure against night length sensitivity. The discrete Antioquian (6-7° latitude) group of Montaña, in the northern half of Colombia, experiences a night length change of less than 18 minutes.

Photoperiodicity seems to be primitive, and shed by maize as it was carried by the human pole-ward. Selection pressure against photoperiodicity decreased in the southbound efflux of maize from (its creation at) the Balsas river to the equator, permitting this stretch of geography to be the semblance of a tallest maize corridor. Balsas latitude American maize had selection pressure to silk despite night length change; this pressure never existed against equatorial Montaña. That makes it a first generational selection against Montaña when it is grown under long nights that are decreasing in length.

Artificial long nights of unchanging length make good seed on equatorial Montaña in New York. The required duration of long-night treatment, of course, is likely between 11-20 days (Emerson, J. Hered. 15:41-48, 1924), beginning at the stage of 5 visible leaves (Tollenaar and Hunter, Crop Sci. 23:457-460, 1983)--when the sensitivity to night length has begun in maize--and lasting until the plants are less than 1.5', 12 leaves. 2 layers of 4-mil black plastic works, drawn over a 2 - 3', 2x2"/1x4" wood frame.

- constant night length, long night → seed
- 12-hr night September to 13.5-hr December → seed

13.5-hr December to 12-hr March → no seed

*First 5 leaves in 12 days (unpublished data) (heterotic maize);
+ 11-20 days for initiation, @ 1 leaf per 3 days; = 12 leaves and 32
days; + days from tassel initiation to ear initiation (Struik, Breeding
Strategies for Maize Production and Improvement in the Tropics,
1982); 2 months is safe parameter.

Thanks to M. Goodman's warm generosity in sharing that his
Montaña made seed in a September 7th planting in Homestead.
This inspired the idea for a resolution of the problem.