

## Propagation of the Temperate Woody Flora of Mexico

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The floristic affinities between the northeastern U.S. and northeast Asia have been known and studied by botanists for over 100 years. Less well explored is what affinities the flora of northeastern Mexico has to these two regions. Many of the temperate woody genera of Mexico are familiar, including *Cornus*, *Cercis*, and *Ostrya*. It is logical to assume that most were recent arrivals, having migrated southward during the Pleistocene glaciations. However, recent studies of fossil pollens in coal deposits in Veracruz State detected pollen of *Abies*, *Picea*, *Liquidambar*, *Fagus*, *Quercus*, *Ulmus*, *Juglans*, *Populus*, *Alnus*, and *Celtis*. As these deposits were dated to the Middle Miocene we can see that temperate elements in Mexico predate the glacial epoch by 18 million years. This indicates a more complex relationship between the floras of Mexico and other regions than previously thought. It is accurate to think of this flora not only as recent disjunctions but as a separate and distinct flora with a complex history.

Temperate flora, for the purposes of this paper, is defined as plants native to areas which consistently receive temperatures below 25° F., and which are probably cold hardy in Zones 7, 8, or 9 with a few that can survive Zone 6 or colder.

Mexican temperate flora can be found in a number of habitats: alpine zones, subalpine conifer forest, oak-pine forest, deciduous forest, and, most interesting of all, cloud forest. Due to a mountainous terrain (up to 12,000 ft), varied soil types, and rain shadow effects, the mountains of the states of Nuevo León and Tamaulipas have a wide variety of microclimates which encourages species diversity. One drawback to this supermosaic is that plants may be specifically adapted to a narrow set of conditions. The flora of these mountains warrant further testing for horticultural and landscape use and need greater representation in botanic gardens. There are also a number of research avenues which need exploring.

Many species are described briefly including propagation data. For the purposes of this paper "C" will represent a cold stratification (35°F), "W" a warm stratifica-

tion (60°F to 80°F), and the number preceding the letter indicates duration in months.

*Abies mexicana* is one of the eight firs native to Mexico and is restricted to an area on the border of Nuevo León and Coahuilla. It grows to 65 ft, is broadly conical, and was collected at 8,300 ft altitude. Only 1% germination resulted after 3C (100 seeds).

*Acer saccharum* ssp. *grandidentatum* was collected in the San Carlos Mountains at 3,400 ft with such genera as *Carpinus*, *Ilex*, *Persea*, and *Staphylea*. It was growing among ridges of granitic rock (rare in Mexico) and reached 50 ft in height. After 3C, 16% germination occurred.

*Acer skutchii* is a rare maple, related to sugar maple, found in a few locales in Mexico and Central America. Its habit of growth looks exactly like sugar maple but its new growth is bright pink, changing to red. The cloud forest area, where it is native, receives lows in the mid-twenties (F) and 99 in. of precipitation annually. The species grows rapidly, reaching 3 ft in two seasons, and has survived 4°F in Texas. Seed sprouted with no pretreatment.

*Amelanchier denticulata* is a much branched shrub which grows on dry alkaline soil. Its best ornamental features are its red to lavender fruits and thick small leaves. Ten percent germination occurred after 3C.

*Buddleia* species. Seed was collected at 9,100 ft on the slopes of Cerro Potosí. No germination resulted after 2C but 2 seedlings germinated after a second cold period.

*Carpinus* species. Seed of this plant, collected in mid-October, and placed in cold stratification began to germinate in the bag. Upon sowing 65% germination resulted. It had bronzy-pink, doubly serrate new foliage.

*Cercis canadensis* var. *mexicana* is variable, with selections having hairy or glabrous leaves known. It is found in dry arroyos as well as woodlands. High germination resulted after a hot water soak and 3C.

*Clethra pringlei* is a rare evergreen tree with long racemes of white, cinnamon-scented blooms. No seed pretreatment needed for germination.

*Cornus stolonifera*. Ten seedlings germinated after 3C.

*Cornus floccosa* was found in a mixed deciduous pine forest. Genera in this region included *Liquidambar*, *Nyssa*, *Hamamelis*, *Prunus*, *Sapindus* (130 ft), and *Carpinus*. This species has narrow, pubescent leaves and purplish-black, *C. florida*-like fruits. One seed of 25 germinated after 3C.

*Cornus florida* var. *urbiniana* possesses large white blooms, the bracts of which hold together to form an open sphere. Red fruit similar to *C. florida* occurs. This plant prefers moist woodland conditions. Seed sown immediately germinated at 48% while 3C yielded 59%. Damping-off was a problem with these seedlings.

A *Crataegus* species was collected at 8,300 ft on the slopes of Cerro Potosí. A new species presently being described, this species forms a compact spherical tree with a single leader. It holds glossy, dark green foliage and quarter-sized red or orange fruit. Lots of 50 seeds were given treatments of 3C, 5W3C, and 1 hour H<sub>2</sub>SO<sub>4</sub> followed by 3C. No seed germinated after sowing but following a second 3C lot 1 germinated 20%; lot 2., 6%; and lot 3, 38%.

*Diospyros palmeri* was a stunted plant in a wind-swept fissure in granitic rock in the San Carlos Mountains. Size of the plant was 5 ft high by 8 ft wide with fruit ripening to a blackish color. Seed sown without pretreatment germinated in 2

months at a high percentage.

*Fagus mexicana* is a rare tree to 100 ft found only in a few sites in Hidalgo and Tamaulipas States. In Hidalgo, almost pure stands are found with *Magnolia*, *Cyathaea*, *Clethra*, and *Quercus*. After 5C, germination occurred in two weeks.

*Garrya laurifolia* was given a 3W3C treatment but the seed germinated in the stratification bag during the 3W and were sown.

*Hamamelis mexicana* is one of the rarest temperate Mexican plants and is only known from a few sites. Its leaf, unlike *H. virginiana* or *H. vernalis*, is tomentose. Only a few pastel yellow flowers were seen. Cuttings collected in April and treated with 8,000 ppm IBA + 1,500 ppm NAA dip, stuck in fine pine bark : perlite medium (80 : 20, v/v), under mist rooted 60%. Seed germinated in low numbers after 5W3C.

An evergreen *Ilex* species tree growing to 75 ft in a moist protected area with *Picea*, *Abies*, and *Taxus* was collected. Four lots of 100 seed were given treatments of 3C, 3W3C, 6W3C, and 9W3C. No germination resulted after sowing. After a second 3C, lots 1 and 2 germinated at 20% and 2%.

Another *Ilex* sp., a 25-ft tree with thin, willow-like leaves, was collected at 4,600 ft in a cloud forest habitat. Germination treatments (same as for above *Ilex* sp.) resulted in the following: 9W3C yielded 1% germination after direct sowing while lots given 3C and 3W3C again germinated only after a second 3C and yielded germination of 26% and 10%, respectively.

*Ilex rubra* was found on a wind-ripped ridge in the San Carlos Mountains at 3,500 ft. It has small, toothed, green-black foliage and is judged to be one of the best collections by the authors. A treatment of 3W3C produced no germination. After an additional 3C 32% germination resulted.

*Illicium mexicanum* is a member of a primitive family, the Illiciaceae, and was collected in a swampy depression in the cloud forest. It has a beautiful magenta-rose ray flower and star shaped seed capsules along with evergreen leaves. Probably a Zone 9 plant at best. Seeds germinated at 60% after 1C.

*Juglans hindsii* germinated at 16% after 3C.

*Liquidambar styraciflua* is found as far south as Nicaragua and achieves massive proportions in northeast Mexico. One specimen measured 7 ft dbh. Seed lots of 150 were either sown directly or given 3C and yielded germination of 54% and 73%, respectively.

*Litsea* sp. sprouted in the stratification bag in the 5W phase of 5W3C.

*Lonicera pilosa* is a vine honeysuckle with beautiful tubular orange-red flowers collected at 8,500 ft. Heavy germination occurred after 3C.

*Magnolia scheidiana* can obtain massive proportions, growing to about 100 ft in the cloud forest habitat. Directly sown seed germinated at 3% while seed given 3C gave 7% germination.

*Nyssa sylvatica* is rare in Mexico and seed has not germinated after treatments of 1C and 3C.

*Osmanthus salicifolius* was collected at 7,150 ft. Treatments of direct sowing, 3C, and 5W3C yielded germination of 3%, 5%, and 7% respectively but only after another 3C was given after sowing.

*Ostrya virginiana* is a component of the moist, mixed deciduous forest. Seed lots of 100 seeds were given 3C and 5W3C. Lot 1 had 4% germination while lot 2 had no germination after sowing but following a second 3C yielded 33% germination.

*Parthenocissus quinquefolia* var. *hirsuta* was found growing in the pine-oak

forest and was notable for its felty leaf and strong red fall color. A treatment of 3C gave 40% germination.

*Picea martinezii* is one of the rarest spruces in the world and is known only from two sites in Nuevo León. Its cones are among the largest of any North American spruce measuring 6 in. long and 2.5 in. wide. From the northern population, treatments of direct sowing and 3C gave germination percentages of 31% and 32%. The southern, less-populous stand yielded germination of 19% and 13%.

*Pinus arizonica* var. *stormiae* is a 30- to 60-ft pine which grows on dry slopes up to 9,000 ft altitude. A 3C treatment gave 12% germination.

*Pinus culminicola* is a very rare and endangered pine native to three different mountains (9,750 ft to 11,400 ft) in northeast Mexico. It is a dwarf pinon pine, with a mounding dense habit. It can grow to 15 ft but is usually under 6 ft. This species forms pure dense stands in the subalpine zone but may reach the summit of Cerro Potosi. It has survived outside in Boston for 10 years but is slow growing. A 3C treatment gave a low germination percentage and damping off is a serious problem with this species.

*Pinus hartwegii* is a large pine to 90 ft with a thick rounded crown. It can be found up to 12,000 ft in elevation. We collected it on the summit of Cerro Potosí in a harsh windswept environment. Jesse Perry, in his fine book "The Pines of Mexico and Central America" suggests that this species may have applications in reforesting high mountain slopes. A 3C treatment produced 50% germination.

*Pinus strobiformis* is a relative of *P. strobus* and has a wide distribution in northern Mexico. Cones are 8 in. and resinous. It was collected at 8,000 ft. A treatment of 3C gave 50% germination.

*Pseudotsuga menziesii* var. *glauca*, blue Douglas fir, ranges from interior British Columbia to Mt. Orizaba, Mexico's highest peak. Some taxonomists split off four different species from Mexican populations but further work may be warranted. It was collected with *Abies mexicana* at 8,300 ft. A 3C treatment gave 21% germination.

*Podocarpus reichei* was collected at 4,600 ft in a cloud forest in Tamaulipas. At 23 degrees latitude it is the northernmost stand of *Podocarpus* in our hemisphere. A tree to 100 ft with leathery 6-in. leaves and a leathery seed subtended by a cherry red aril. The leathery seed coat seems to inhibit germination and once removed, seed germinates readily.

*Rosa mexicana* is an understory shrub in cool moist pine forests. After 3C no germination resulted but a second 3C produced 30% germination.

*Staphylea pringlei* was collected in the San Carlos Mountains at 3,100 ft. Twenty-five percent germination resulted after 2C.

*Styrax youngae* is an understory shrub found on slopes in moist deciduous-pine forests where it is found as a broad 6-ft shrub. It has a felty leaf more similar in shape to *S. obassia* than *S. americanum* which leads us to think there are some species in Mexico that are more closely related to their Asian counterparts than to their U.S. relations. A 20% germination resulted after 3W3C.

*Taxus globosa* is found sporadically from northeastern Mexico to El Salvador. It can be found as a multistemmed, round-headed, small tree to single-leader trees of 75 ft. Three treatments were tried: 3C, 5W3C, and a 1-hour soak in 1,000 ppm GA<sub>3</sub> followed by 3C. Germination only occurred in lot 2 at 34%. Cuttings collected from 49 plants produced an overall rooting percentage of 89.5% with 11.4 roots per cutting (10,000 ppm IBA dip; 1 sand : 1 perlite, v/v; poly tent).

*Tilia houghii* seeds (17) were given 5W3C but 5 seeds germinated in the bag during the warm stratification and were sown.

*Vaccinium confertum* is a low growing, mat-forming *Vaccinium* that reminded some of us of *Gaylussacia brachycera*. Cuttings, treated with 8,000 ppm IBA powder and stuck in sand and perlite (1 : 1, v/v), rooted 100%.

## REFERENCE

**Graham, A.** 1973. History of the aborescent temperate element in the northern Latin America biota. In: Vegetation and vegetational history of northern Latin America. Graham, A. (ed.). Elsevier Scientific Publishing Co.

## TUESDAY EVENING 1 DECEMBER 1992

The evening session was convened at 7:30 p.m. with Paul Smeal serving as Moderator.