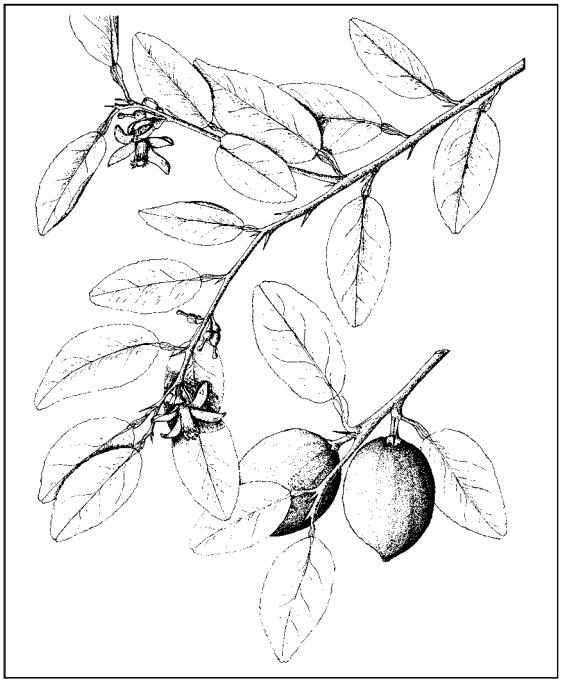
***Citrus aurantiifolia* (Christm.) Swingle** Key lime
RUTACEAE

Synonyms: *Limonia aurantifolia* Christm.
Limon spinosum Mill.
Citrus limonia Osbeck
Citrus lima Luman
Citrus spinosissima G.F.W. Meyer
Citrus acida Roxb.



General Description.—Key lime is the name used most often to refer to a primitive race of *Citrus arantiifolia* cultivated and naturalized in the West Indies. It is also referred to as Mexican lime, West Indian lime, lima, limón criollo, limón agria, limón boba, and citron (Little and Wadsworth 1964). Key lime is an evergreen, spiny shrub or small tree to 6 m in height. The plant has single or multiple stems and irregular branches covered with smoothish brown to gray bark. The twigs are quadrangular (when young), green, and bare sharp axillary spines 3 to 17 mm long. The leaves are yellow-green to dark green, with 5- to 28-mm winged petioles and elliptic to oval leathery 4- to 13-cm long blades with edges that have minute rounded teeth. The crushed foliage has a strong, distinct, spicy (citrus) odor and taste. The four- to five-petaled white flowers occur in few-flowered axillary clusters. The fruits (hesperidiums) are ellipsoidal, 3 to 5 cm in diameter, have juicy, greenish-yellow flesh, and are yellow at maturity. They contain a few white, pointed seeds about 1 cm long (Liogier 1988, Little and Wadsworth 1964).

Range.—Key lime is believed to be native of eastern Malaysia. It was introduced to the Asian mainland early in historical times and carried by Arab traders to the Middle East and eventually came to Europe during the Crusades (Burkill 1997). The species was introduced to the West Indies by Columbus during his second voyage (Ehler 2002). Key lime has been planted throughout the tropics and has naturalized in at least Puerto Rico, the Virgin Islands (Little and Wadsworth 1964), and the Florida Keys (Nelson 1996).

Ecology.—Key lime is most competitive in areas that receive from about 700 to 1000 mm of mean annual precipitation. It tolerates drought better than any of the other citrus fruit species (Morton 1987). If planted, it will grow but becomes increasingly susceptible to disease in areas that receive up to about 2000 mm of annual precipitation. Most well-drained soils are suitable, particularly those rich in calcium (Morton 1987). Elevations below 900 m are best (Secritaría del Medio Ambiente y Recursos Naturales 2002). Key lime is intolerant of shade and will not survive long under a closed forest canopy. Cattle grazing encourages it somewhat by eliminating some of the competition without damaging it. Plants are top-killed by fires and hard frosts, but will sprout and survive if the disturbance is not repeated frequently. Naturally reproduced trees may be seen on roadsides, fencerows, abandoned farms, secondary forests, and coastal hammocks.

Reproduction.—Key lime flowers in late spring and fruits in fall to spring in Florida (Nelson 1996). In Puerto Rico, it flowers in spring to early

summer and fruits in summer and fall (Little and Wadsworth 1964). The fruits ripen and fall from the trees 5 to 6 months after flowering (Morton 1987). Fruits in one collection in Puerto Rico ranged from 3.0 to 4.5 cm in diameter and weighed from 19 to 51 g. Air-dried seeds separated from them averaged 0.0702 ± 0.0037 g/seed or 14,000 seeds/kg. Placed on moist blotter paper, 84 percent germinated between 15 and 49 day after sowing. Germination is epygeal. Many of the seeds are polyembryonic. Seedlings begin to fruit in 3 to 6 years (Morton 1987). In the West Indies, the seeds are mainly dispersed by gravity and humans. There are undoubtedly animal vectors in the original native habitat. Key lime can be air-layered using indol buteric acid (IBA) with a high degree of success (Morton 1987).

Growth and Management.—Growth of Key lime is slow, less than 0.5 m/year. Plants may live for 25 years or more. Although the species is not managed in the wild, existing trees are usually protected by local inhabitants, whenever possible. Plantations are established using potted material that is set at 7.5- by 7.5-m spacing. Pruning is usually not necessary (Morton 1987).

Benefits.—Key lime has been under cultivation or semicultivation for thousands of years. Improved horticultural varieties, which have bigger, generally seedless fruits and thornless plants, now dominate the local and international fruit markets. The unimproved type is still managed commercially and is the basis for a juice and lime oil industry (Morton 1987). It is also planted for a dooryard fruit tree, and fruits are harvested from the wild. The principal use is still for food, refreshing drinks, tasty disserts, and for seasoning meats, vegetables, salads, sauces, and casseroles (Ehler 2002, Katzer 2002). The wild type is superior in flavor to the improved varieties because it has a stronger flavor and a higher acid content (Ehler 2002). The pericarp (rind) contains 7 percent essential oil with principal constituants, citral, limonene, and fenchon as well as terpineol, bisabolene, and other terpenoids (Katzer 2002). Key lime is used to treat a huge number of ailments (Burkill 1997, Liogier 1990). The author recommends a tea prepared from juice, fruit rind, or leaves as an expectorant and to relieve catarrh brought on by colds and flu. The fresh fruits and bottled juice are an excellent source of vitamin C and were once relied upon to prevent scurvy. Essential oils of Key lime and some other citrus fruits cause phytophotodermatosis in sensitive individuals (Bruneton 1999). The wood is hard and heavy, but is used for little other than fuel. It is a good honey plant. With pruning, the plant can be used for a living fence post (Little and Wadsworth 1964) and can be formed into a hedge (Burkill 1997).

References

Bruneton, J. 1999. Toxic plants dangerous to humans and animals. Lavoisier Publishing, Paris. 545 p.

Burkill, H.M. 1997. The useful plants of West Tropical Africa. Vol. 4. Royal Botanic Gardens, Kew, UK. 969 p.

Ehler, J.T. 2002. Key lime (*Citrus aurantifolia*). Food Reference, Key West, FL. http://foodreference.com/html/artkeylimes.html. 2 p.

Katzer, G. 2002. Lime [*Citrus aurantifolia* (Christm. et Panz.) Swengle]. Gernet Katzer's spice pages. http://www-ang.kfunigraz.ac.at/~katzer/engl/Citr_aur.html. 4 p.

Liogier H.A. 1988. Descriptive flora of Puerto Rico and adjacent islands, Spermatophyta. Vol. 2. Editorial de la Universidad de Puerto Rico, Río Piedras, PR. 481 p.

Liogier, H.A. 1990. Plantas medicinales de Puerto Rico y del Caribe. Iberoamericana de Ediciones, Inc., San Juan, PR 566 p.

Little, E.L., Jr. and F.L. Wadsworth. 1964. Common trees of Puerto Rico and the Virgin Islands. Agriculture Handbook 249. U.S. Department of Agriculture, Washington, DC. 548 p.

Morton, J.F. 1987. *Citrus aurantifoli*a Swingle. from: Fruits of warm climates. http://www.hort.perdue.edu/newcrop/morton/mexican_lime.html. 8 p.

Nelson, Gil. 1996. The shrubs and woody vines of Florida. Pineapple Press, Inc. Sarasota, FL. 391 p.

Secritaría del Medio Ambiente y Recursos Naturales. 2002. Especies con usos no maderables en bosques tropicales y subtropicales: *Lantana involucrata* L. http://www.semarnat.gob.mx.pfnm2.fichas/citrus_aurantifolia.htm. 2 p.

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