Rangpur ("Kona") Lime

Scientific name: *Citrus* x *limonia* Osbeck
Family: Rutaceae
Origin: Northwest India

Often called a "mandarin lime" or "local lemon" in Hawai'i, this lime is a naturally occurring hybrid between lemon and mandarin orange (tangerine). It is a medium-sized citrus tree often confused with tangerine or other citrus on first glance. The fruit is polyembryonic and thus usually reproduces true to seed. A popular rootstock in many citrus-growing areas, the tree evolved in Hawai'i as an ornamental, often when the grafted scion died off.

The spreading and drooping branches have dull green foliage with an occasional purple tint on new growth. The tree can reach a height of 20 feet. The number and size of its thorns varies from tree to tree, with some being almost thornless. The fruit rind is orange to reddish orange with minutely pitted, moderately loose skin having oil glands and a lime-like aroma. Highly acidic and very juicy, the fruit has eight to ten segments with numerous seeds and is slightly hollow in the center. Reportedly introduced to Hawai'i in the 1880s, the fruit has acclimated to Hawai'i's volcanic, well drained soils. Used for culinary purposes since the early 1920s, the trees have been maintained for their fruit rather than their use as a rootstock. The juice from the fruit has also been used for cleaning dishes and glass. India exports Rangpur lime marmalade to England, but no other commercial production is known outside of Hawai'i. However, the fruit has found a growing following on the Big Island and arguably deserves to be called "Kona lime." Further selection work to determine specific cultivars for Hawai'i is recommended.

Cultivars

There are few reported cultivars of Rangpur lime, as most trees are produced from seed. Occasional differences occur in the color and texture of the rind, number of seeds, and amount and size of thorns. Two other mandarin limes are often categorized with Rangpur: the kusaie lime, a yellow-colored, highly acidic form of the Rangpur; and the Otaheite Rangpur, an acidless form of the fruit. The 'Citrolima' cultivar has large leaves and vigorous growth and is often used in Brazil as a rootstock for Valencia oranges.

Environment

The Rangpur lime, as with most citrus, grows best in well drained soil. In the Kona district the tree is found from sea level to 3000 feet elevation. It is tolerant of colder areas and should do well at much higher elevations given sufficient rainfall and nutrition. Spacing is consistent with other citrus, usually planted 15–20 feet apart (about 100 trees per acre). Seedlings will produce fruit in 4–6 years, reaching full production in 7–10 years. The trees can be grown and will fruit in pots. When rootbound in large tubs, they become dwarfed. The tree is more tolerant of salt and high pH than many citruses. It is resistant to a number of diseases, making it the rootstock of choice in large citrus-producing areas in Brazil. The tree requires irrigation in periods of extended drought but will not tolerate being waterlogged.

Horticulture

Young trees are pruned to establish structure and shape, which facilitates harvesting and increases yields of mature trees. Annual pruning to maintain a desired height of

6–8 feet and to thin new growth and remove deadwood is advisable. Increased yield can be obtained by pruning to open the tree interior to light and air circulation. Flowering and fruiting occurs on second-year growth.

Pests and diseases

A common problem for most citrus in Hawai‘i is the citrus leaf miner, *Phyllocnistis citrella* Stainton. Damage to new growth and developing fruit can be extensive, with the insect tunneling just under the surface of the leaves or skin of the fruit. Control of the leafminer by a parasitic wasp found in Hawai‘i, *Ageniaspis citricola* Logvinovskaya, helps minimize damage. Spiders, flower bug (*Orius insidiosus*), ladybugs, fire ants, and the lacewing (*Chrysoperla rufilabris*) also help to keep the leaf miner in check. Petroleum sprays help to inhibit egg-laying but need to be repeated every two weeks when the plant flushes.

Foot rot and root rot from *Phytophthora* species can be a problem with Rangpur lime. Good soil drainage is important to prevent rot from occurring. Over-watering and wetting of the trunk will promote the spread of this pathogen.

Citrus black fly, *Aleurocanthus woglumi* Ashby, damage citrus trees by sucking the sap, removing water and nutrients. They excrete small droplets of honeydew, on which the sooty mold fungus grows. Sooty mold causes a reduction in photosynthesis that leads to a general decline in plant health and reduced fruiting. Parasitic wasps were released in 2000, and they have helped to control this pest. Neem oil and other sprays help limit infestation. Once a tree is infected, it is important to make sure it has enough water and additional fertilizer to replenish lost nutrients.

Fruit flies are not a major problem for the Rangpur lime, although it is generally advisable to follow the recommendations of the Hawai‘i Area-Wide Fruit Fly Pest Management Program (HAW-FLYPM).

Citrus tristeza virus is not a major problem for the Rangpur lime, as it has some natural resistance. Other resistant rootstocks such the mandarins ‘Heen Naran’ or ‘Cleopatra’ can be used for this lime or other citrus.

Propagation

The Rangpur lime tree is generally propagated by seed but can also be grafted. Trees with few thorns or those that are especially prolific producers can be grafted onto a Rangpur or other citrus rootstock such the rough skinned lemon, *Citrus jambhiri*, ‘Heen Naran’, or trifoliate orange, *Poncirus trifoliata* Raf. Rangpur lime can co-exist with other citrus on the same rootstock. On a single tree in South Kona, Rangpur lime, Meyer lemon, and tangelo have been grafted and all produce fruit.

Kona Rangpur lime tree at the Kona Pacific Farmers Co-op

Harvesting and yield

The fruit is harvested when orange. A mature, 7-foot, well pruned tree can produce 100 fruits or more per season and yield an average of 50 pounds of fruit. Older trees that have not been pruned can yield 300–400 fruits, but harvesting is difficult and time-consuming due the excessive height and numerous thorns.

Postharvest quality

As with most citrus, Rangpur limes can be stored at 36–39°F for up to 5 months. A wax coating will lengthen the time they can be stored, often up to 10 months. Frozen juice can be stored for future use.

Packaging, pricing, and marketing

Fresh fruit sold to markets in South Kona are boxed in 10-pound packages and wholesaled for 50 cents per pound. The markets found that consumers often confused the fruit with tangerines regardless of signage that promoted the unusual locally grown fruit. Packaging of five fruits in a vented plastic bag was then used. Hotels and restaurants order the fruit by weight, sometimes as much as 50 pounds at a time. Individual fruit, with an average weight of 7 ounces, are sold at farm stands for 50 cents each. In order to interest other hotel and restaurant chefs in the fruit, samples were sent to 10 Big Island chefs who had not previously ordered the fruit from wholesalers. Sample recipes created by students at the UH Center–West Hawai‘i culinary arts program, as well as nutritional information, was sent with the fruit. Seven of the 10 chefs continued to order the fruit after receiving the first samples.

Nutritional value per 100 g of edible portion*

Moisture	88.7–90.86 g
Energy	24–25 kcal
Protein	0.053–0.112 g
Fat	0.01–0.17 g
Fiber	0.1–0.5 g
Carbohydrate	8.33–10 g
Ash	0.25–0.40 g
Calcium	4.5–33.3 mg
Phosphorus	9–21 mg
Potassium	82 mg
Sodium	4 mg
Iron	0.11–0.33 mg
Vitamin A	0.003–0.040 mg
Thiamine	0.019–0.068 mg
Riboflavin	0.011–0.034 mg
Niacin	0.14–0.25 mg
Ascorbic Acid	25.10–48.7 mg

*Values compiled from various sources

Kona Rangpur lime cheescake

Kona Rangpur lime creme brulee

Kona Rangpur lime papaya pie

Food uses and nutrition

All citrus fruits contain healthy amounts of vitamin C, which helps to manufacture the collagen that helps the body heal cuts and wounds. The zest from limes and other citrus also contains compounds that can block cancerous cell changes. Limonene in the zest can increase the levels of liver enzymes that fight cancer-causing chemicals.

Recipes

Kona Rangpur lime papaya cheesecake
Teri Wisdom

6 egg yolks
1½ cups sugar
2 Rangpur Kona limes, juice and zest
1 teaspoon vanilla
¼ cup water
2 teaspoons unflavored gelatin
2 cups whipping cream
8 ounces cream cheese, softened
½ teaspoon salt

Procedure
Mix egg yolks, sugar, lime juice, and lime zest in double boiler to 165°F; remove from heat.

Place mixture in a bowl and beat until it thickens and starts to cool, 4–8 minutes. Set aside.

Combine water and gelatin. Let stand to hydrolyze. Heat heavy cream to a simmer and add gelatin. Stir to dissolve gelatin for one minute. Remove from heat and set aside.

Whip cream cheese and salt till light and fluffy. Scrape bowl to ensure all cream cheese is whipped.

Fold in cooled whipped cream mixture, and then fold in egg mixture. Spoon into cups and freeze overnight or until set.

For the lilikoi sauce and papaya garnish:
Mix 1 cup lilikoi puree with 1 cup sugar and 2 T lime juice in sauté pan; heat to simmer, reducing until it becomes a thin sauce. Cool.

Peel, seed, and slice papayas thinly for garnish.

To serve, loosen cups of frozen or set dessert in warm water briefly, plate upside down, garnish with papaya slices, and drizzle with lilikoi sauce. Yield: 6 servings

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Kona Rangpur lime hummus
Chef Paul Heerlein

2 cans chickpeas (garbanzo beans), drained
1 head roasted garlic
1 clove chopped garlic
Water
Olive oil
Kona Rangpur lime juice
Curry powder
Salt

Puree chickpeas and garlic to desired consistency, add remaining ingredients to taste.

Kona Rangpur lime hollandaise sauce
Vince Mott

2 lb clarified butter, warm but not too hot to the touch
12 egg yolks
2 oz cold water
3 oz Kona Rangpur lime juice
Cayenne to taste
Salt to taste

Place yolks and cold water in a stainless steel bowl and beat well. Beat in a few drops of the juice. Hold the bowl over a hot water bath and continue to beat until yolks are thickened. Draw a figure 8 in the mix to test thickness.

Remove bowl from heat. Using a ladle, slowly and gradually beat in the warm butter. Use approximately 2–2½ oz per egg yolk. Add the butter drop by drop at first then ladle by ladle. Continually beat during this process. If the sauce becomes to thick to beat before all the butter is added, beat in a little more Kona Rangpur lime juice.

When all the butter has been added, beat in the remaining lime juice. If necessary, thin sauce with a few drops of warm water.

Hold in bain marie in a warm-water bath; will hold for about 1½ hours. Yield: 1 quart.