FACT SHEET PROJECT LNE18-362

Goldenberry (*Physalis peruviana* L.)

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Synonym: *Physalis edulis* Sims

Common Names: aguaymanto, alkekengi, amor en bolsa, apelliefie, Barbados gooseberry, Bladderberry, bolsa de amor, Cape gooseberry, capuli, cereza del Peru, chuchuva, coqueret, golden berry, golden Cape gooseberry, golden husk goldenberry, gooseberry, gooseberry tomato, ground cherry, guchavo, Husk Cherry, incaberry, lobolobohan, love apple, makowi, motojobobo embolsado, Peruvian cherry, Peruvian ground cherry, Peruvian tomato, Pichuberry, Poha Berry, Poha, pompelmoes, strawberry tomato, teparee, tiparee, tomate sylvestre, topotopo, uchuba, uchuva, uvilla, vejigón, wild gooseberry, winter cherry

Related Species: Clammy Ground Cherry (*Physalis heterophylla*), Tomatillo (*P. ixocarpa*), Purple Ground Cherry (*P. philadelphica*), Strawberry Tomato (*P. pruinosa*), Ground Cherry, Husk Tomato (*P. pubescens*), Sticky Ground Cherry (*P. viscosa*). There is considerable confusion in the literature concerning the various species. Hybrids between them are also known.

Origin: The cape gooseberry is native to tropical South America.

Adaptation: Goldenberry is an annual in temperate regions and a perennial in the tropics. Plants are injured at a temperature of about 30ºF. Goldenberries have a long growing season and should be started in the greenhouse and transplanted outdoors as

soon as the threat for frost is over. They are productive anywhere tomatoes can be grown. They grow well in pots and in greenhouse culture, too.

History: Goldenberry was first described by Linnaeus in 1753 and has been cultivated for years in the Andes mountains of South America. The fruit has spread worldwide however it has not become a significant crop in most regions. Localized industries have developed in South America, South Africa, Australia, New Zealand and India but large-scale commercial production is not common.

Botany: There are over 100 species of *Physalis*, many are considered weeds, however, four are grown for their fruit (tomatillos (*P. ixocarpa*), ground cherries (*P. pruinosa*, *P. pubescens*), and goldenberries (*P. peruviana*)). Goldenberries are often confused with ground cherries (*Physalis pruinosa*, *Physalis pubescens*) however, they are easy to distinguish. Goldenberry foliage is extremely pubescent (hairy) while ground cherries are generally glabrous (smooth). In addition, the calyx (husk) of goldenberry has 10 ribs while husks of ground cherries have 5. Mature goldenberry plants are much larger (up to 5 or 6 feet) than ground cherries (at most 3 feet).

Shoots and leaves: Goldenberries are herbaceous (perennial in the tropics, annual in the temperate zone), erect, shrubs with alternate, often purplish branches with pubescent heart-shaped, pointed, randomly-toothed leaves that are 2-1/2 to 6 inches long and 1 ½ to 4 inches wide appearing nearly opposite along the ribbed stems (Morton, 1984).

Flowers: Flowers are yellow, up to ¾ inch wide, pendulous and bell-shaped with purplish spots in the throat. They appear in the leaf axils. Flowers are cupped by a purplish-green, hairy, 5-pointed calyx which expands after the flower falls following pollination and fertilization to form the husk.

Fruit: Fruit are encased in a husk (the calyx of the flower) which starts out soft and green when young but becomes tough, brown and paper-like when the fruit is mature. The husk is much larger than the fruit it encloses and it is inedible. Unlike ground cherries, goldenberries do not abscise (fall off the plant) when ripe and are harvested directly from the plant. Fruit are ½ to 1-inch-wide globe-like berries with smooth, glossy orange skin with a juicy pulp containing many very small edible seeds when fully ripe. Fruit has a pleasant tropical flavor, tasting like a mixture of pineapple,

strawberry, sour cherry and citrus. Plants generally produce 150 to 300 flowers / fruits per plant.

PRODUCTION

Seeds: Seeds should be obtained from a reliable source or extracted and saved from season to season from superior fruit (instructions on how to do this properly will be provided in the Sustainable Goldenberry Production Manual). Goldenberry are often mislabeled by seed companies, often being *P. pruinosa* or *P. pubescens* (both ground cherries) or *P. ixocarpa* (tomatillo).

Sowing seeds: Sow seed in flats of the sterile seeding mix of your choice, barely covering the seeds. Keep them moist. Seeds germinate in 14 to 21 days in a moderately warm greenhouse. Seedlings should be transplanted when they are about 1-inch-tall into 24 to 50 cell plug trays and grown in the greenhouse for at least 6 weeks in the greenhouse before they are transplanted to the production field. Plants are large enough to transplant outdoors when they are 6 to 8 inches tall and there is no chance for frost.

Goldenberries can be propagated using stem cuttings. The resulting plants are less vigorous than seedlings, however they flower and fruit earlier. We have not evaluated this potential for shorter season climates, but it is a viable option to investigate.

Soil requirements: Goldenberries produce best on well-drained 'poor' soils but they need adequate moisture as they tend to 'go dormant' during a drought.

Field planting: We recommend planting goldenberries on standard height raised beds covered with black plastic mulch with trickle irrigation, much like you would use for tomato production. Do not supply any pre-plant fertilizer or any at the time of transplanting as fertilization greatly reduces fruit production.

Spacing: Beds can be spaced according to your equipment measurements but should be at least 4 feet on center. Plants should be spaced 4 to 5 feet apart within the row.

Support: Plants tend to have a sprawling habit and are sensitive to high winds thus they should be supported with a simple 1 wire (at 3 to 4 feet) trellis with main stems clipped or tied to the wire. We use T stakes with heavy duty twine and standard

tomato clips. We will be examining the trellising and training requirements for the northeast region at our research farm, but for now, some support is recommended.

Initial pruning: Goldenberry plants grow as a single stem for 9 to 15 nodes when they then bifurcate (branch as a Y). This branching habit continues during subsequent stem growth. All axillary shoots and suckers should be removed up until the first bifurcation of the main stem. A trip through the field once every week or two should suffice. Pruning normally lasts for 3 to 4 weeks, thus labor requirements for pruning are not excessive. Once the plant has branched, minimal sucker removal is required.

Flowering: The first flower appears at the node of bifurcation (approximately a month or so after transplanting) and flowering will continue until frost in the fall. Flowers are wind and insect pollinated and are self-pollinating. The importance of cross-pollination with other goldenberry strains or related species in keeping a particular goldenberry variety true from year to year is not yet known. There is evidence in the literature that cross pollination within goldenberry is rare and cross pollination between species (i.e. goldenberry with ground cherries or tomatillos) is even rarer (Menzel, 1951).

Fruit production: Goldenberries typically produce 150 to 300 fruit per plant, beginning in late August or early September and continuing until the first fall frost.

Pests: We have seen two significant insect pests during our trials: the three lined potato beetle (*Lema daturaphila*) (particularly the larvae on young plants) and tobacco and tomato hornworms (*Manduca sexta* and *Manduca quinquemaculata*, respectively) particularly later in the season on mature plants. The tobacco hornworm is more common than the tomato hornworm and can be distinguished from the tomato hornworm by its seven diagonal white stripes and its usually red 'horn' while the tomato hornworm horn is bluish-black. We hand-picked these pests as there are no pesticides labelled specifically for goldenberry and we like to use as few chemicals (even those approved by OMRI) as possible.

Fruit harvest: Fruit are ripe when they turn a golden color which is often easily seen through the husk, which by the time of fruit ripening has faded and turned yellowish brown and translucent. Green fruit are not ripe and will not ripen once removed from the plant. Ripe fruit do not easily abscise like ground cherries and are harvested by hand. Fruit should be harvested when they are dry; if they are moist from dew or rain

they are likely to mold. Fruit is normally left in the husk for sale in pint containers, but sometimes the husk is removed and the golden berries displayed in half-pint containers for sale. Many chefs prefer fruit with the husk as it is often used for decoration. Additionally, fruit will keep at room temperature for up to 3 months if they are left in the husk.

Post-harvest storage: Fruit can be stored at room temperature for up to 3 months from harvest as long as they are kept dry with sufficient air circulation to prevent mold growth. Fruit should be inspected on a regular basis to remove fruit that have become moldy or soft. The husks should not be removed for storage.

Fruit quality: Fruit from different varieties vary in size and taste. We have selected two varieties that we prefer from many that we have trialed on our research farm over the last 4 years. We are continuing to screen new accessions as they become available.

Culinary uses: Fruit is eaten fresh or cooked. Fresh goldenberries are great plain just as they are harvested, they fit well in in mixed green or fruit salads, make a wonderful addition to salsas and make an elegant dessert when partially dipped in chocolate. The fruit makes excellent pies, jams and jellies and is naturally high in pectin. We will have a chapter of recipes in our production manual.

Medicinal qualities: The medicinal qualities of goldenberry are too numerous to list in a fact sheet. We will provide a well-researched chapter complete with references and citations on the medicinal properties of goldenberry in the forthcoming production manual.

Nutritional value: Goldenberries are highly nutritious. Detailed information will be presented in the production manual. A serving of goldenberries (100 g) provides approximately 75 calories, 0.3g protein, 0.2g fat, 19.6g carbohydrate and 4.9g fiber (National Research Council, 1989).

Toxicity: There are numerous internet reports suggesting that since goldenberries are in the nightshade family, plant tissues and green fruit are poisonous. Green tissues including unripe fruit do contain solanine (Lampe and McCann, 1985) which can cause gastroenteritis and diarrhea, thus consumption of unripe fruit should be avoided.

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