

Isoplexis canariensis

Katie Noren

Taxonomy

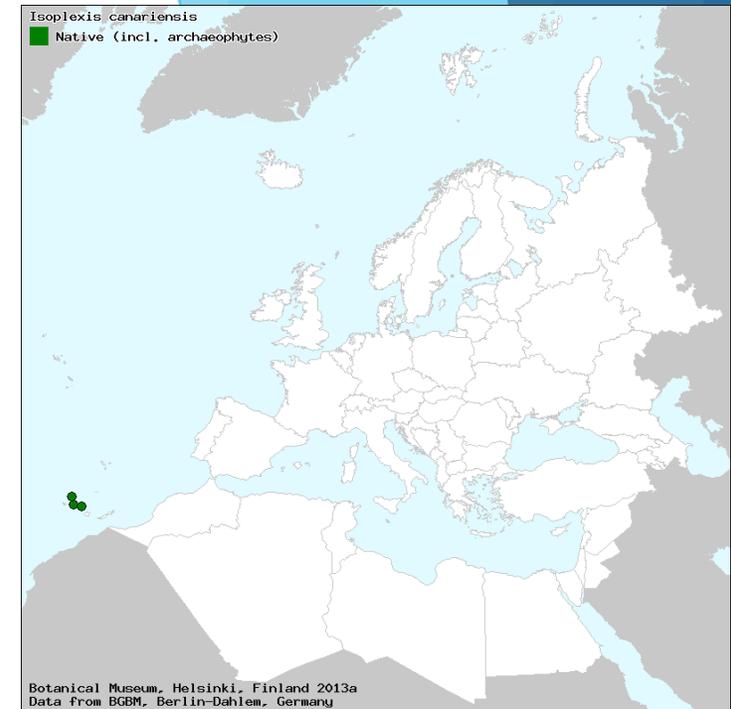
- ▶ **Scientific Name:** *Isoplexis canariensis* (L.) Loudon
- ▶ **Synonyms:** *Callianassa canariensis* (L.) Webb & Berthel, *Digitalis canariensis* L., *Digitalis lurida* Sailsb.
- ▶ **Common Name(s):** Canary Island Foxglove, Tenerife Shrub Foxglove
- ▶ **Family:** Veronicaceae ex. Scrophulariaceae



Photo: http://3.bp.blogspot.com/_sfvS6qSSxkA/TAbDFc-pW_I/AAAAAAAAAwM/Nlub45BYGUg/s1600/Digitalis+canariensis.JPG

Geographic Distribution & Native Habitat

- ▶ **Continent(s):** Africa, Europe
- ▶ **Country(-ies):** Isolated locations in Spain, Sweden, Turkey
- ▶ **State(s)/Province(s)/Region(s):** Native to the Canary Islands, specifically Gomera, La Palma, and Tenerife
- ▶ **Latitudinal Range(s):** 28° N(Canary Is.) to 60° N (Sweden)
- ▶ **Altitude:** Approx. 4000m above sea level
- ▶ **General Climactic Conditions:** The canary islands are very high in altitude and the climate there is influenced greatly by the stratocumulus sheet of clouds. The land is mostly a Laurel forest, or laurisilva which is a subtropical forest found in areas of high humidity and mild temperatures. Many of these tree and undergrowth species are endemisms which are not found elsewhere in the world, unless planted and cared for directly.
- ▶ **Tendency to naturalize or become invasive:** There is no evidence of its invasive nature and would likely not be invasive due to it being an endemism and it having such a distinct natural habitat.



Taxonomic Description

- ▶ **Overall Plant Habit/Description:** 3-4' high x 3' wide, clumping and erect shrub with terminal spikes of inflorescences (similar to that of the foxglove)
- ▶ **Root System Type:** Fibrous
- ▶ **Presence/Type of Underground Storage Organs:** None
- ▶ **Leaves:** Dark green linear, lanceolate leaves, alternate on stalk
- ▶ **Flower:** Apricot to Yellow, on spikes
- ▶ **Season of Bloom:** Dependent on location: varies from late spring to early autumn. In native habitat, late spring to early summer.
- ▶ **Use(s) by indigenous people:** None, species is very isolated and also endangered.
- ▶ **Other uses:** A source of compounds related to the *Digitalis cardenolides* and anthraquinones which can be harvested through the leaves. (Arrebola 1999)
- ▶ **Additional Items of Potential Interest:** Unlike its biennial relative, *Digitalis* - this 'foxglove' can be perennial in the right locations (wherever it is hardy)

Name and Description of Cultivars on the Market (if any):

- ▶ Sold as seed mostly on sites like ebay, and is not given a cultivar name in those cases.
- ▶ ‘Illumination Pink’ is a hybrid between *Digitalis purpurea* and *Isoplexis canariensis* available from Thompson and Morgan in the UK.
- ▶ Rare cases sell plants such as rareplants.eu, and Digging Dog Nursery (CA) but will not ship plant material outside of the country of the business. Several online companies still have minimal information up on their websites, but no longer sell the plant, such as San Marcos Growers and HayLoft Plants.



▶ Photo: http://www.newplantsandflowers.com/wp-content/uploads/Digitalis-Illumination-Pink_Michael-Perry-Paul-Hansord-Chelsea.jpg

Propagation Method(s):

- ▶ **Vegetative vs. Seed:** Both are options and neither has been proven better than the other yet.
- ▶ **Veg: plant tissue type(s):** Due to the endangered status of this species, a new micropropagation method was determined using axillary buds. Through testing for optimal micropropagation, a concentration of 0.5 μ M kinetin in Murashige and Skoog liquid basal medium was found to be the best choice. Rooting in vitro was not found to be necessary for ex vitro survival because microcuttings were able to root after being transferred to soil medium. (Arrebola 1997)
- ▶ **Seed: no. of seeds/flower:** Though it can self-pollinate, far greater seed-set is yielded through open pollination. Average seeds per flower range from 15 to 150, depending on whether they were bagged or not (bagged resulted in lower set). (Ollerton 2008)
- ▶ **Seed dormancy?** None
- ▶ **Germination temperatures/duration:** Optimal temperatures for germination are 20 deg C days and 15 deg C nights. Constant high temperatures will inhibit germination. Water from underneath using a capillary mat. Use rich, sandy soil to sow, but also free of chalk. Don't cover the seeds. Keep in a partially shaded spot.

Product Specifications



- ▶ **Crop Ideotype (the ideal phenotype that a marketable cultivar will possess):** Ideally this crop would be a part-shade specimen that that is a show-stopper. With long-lasting, bright, and big inflorescences, this crop would show height and color in a somewhat shaded garden.

Photo: <http://www.strangewonderfulthings.com/241.htm>

Market Niche—Identification and Justification

- ▶ **Target sales date(s):** Early spring - flowers will bloom in early summer.
- ▶ **Potential holiday(s) for this product:** Mother's day: whose mother wouldn't want one?
- ▶ **Programmability i.e. could this be forced year-round:** In some locations, yes. It's a long day crop but cannot tolerate cool winters. The hardiness reached so far is Zone 9. It would not be worth it in MN, but probably in locations closer to the equator.
- ▶ **Crops with which this will compete in the market:** Foxglove (*Digitalis*)
- ▶ **What kind of "story" can be told about this product?:** Help save this endangered species!
- ▶ **What will be the initial crop limitations/problems?:** Pollination. This crop is pollinated by several bird species. The nectar has very little sugar and is slightly bitter, making it not ideal for bee pollination.
- ▶ **Is this product already identifiable to the growers and consumers?:** Not really, people will likely see it as a *Digitalis* release, instead of a relative.
- ▶ **How soon would you estimate this product would be available?:** 4-5 years? Time to work out kinks and get an established crop going.

Anticipated Cultural Requirements

- ▶ **Winter Hardiness (USDA Zones):** Zone 9-11
- ▶ **Heat/Drought Tolerance (USDA Heat Zones):** Unknown heat zones. Listed as drought tolerant
- ▶ **Temperature (day/night):** unknown
- ▶ **Light quantity, quality, duration; photoperiodic response:** Full to part sun
- ▶ **Nutrition:** unknown
- ▶ **Soil:** Well-drained
- ▶ **Plant growth regulators:** unknown
- ▶ **Container size:** Gallon-sized pot or larger
- ▶ **Disease Resistance/Susceptibility:** unknown
- ▶ **Fungicides, Insecticides:** unknown



Complete Production Schedule (from seed)

- ▶ **How will this be sold?** As plugs or in a container (1-gallon+) - flowering or just before flowering.
- ▶ **Estimated no. of weeks from planting to flower bud initiation, flower development and shipping:** It would take approximately 14 weeks from sowing seed to sell these as container plants or about 4 weeks to sell as plugs.
- ▶ **Estimated time, type, and quantity of special treatment applications:** Use DIF from the 3rd week of production to finish to control height. I would also recommend testing different PGRs on a select number of crops.
- ▶ **Target sales date:** I would suggest it as a prize product for Mother's day. Target sales weeks would be weeks 18 and 19. However, since it could flower from spring through autumn, later stocks could be produced as sold for customers in late summer as well.

My Schedule:

Week	Isoplexis canariensis from seed. Start at week 4 to either sell plugs at week 8, or sell in containers at week 18.
4	Sow seed. Maintain a soil temperature of 60-65°F (16-18°C). Keep media evenly moist but not saturated. Do not cover or bury the seed. Light is required for germination, 100-400 footcandles is sufficient. Keep soil around pH 5.5-5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
5	Keep soil temps the same, but reduce soil moisture after radicle emergence. Gradually increase light to 500-1000 footcandles and begin fertilizing with 50-75 ppm N from 14-0-14 when cotyledons are fully expanded. Maintain soil pH and soluble salts as before. Alternate irrigation with clear water to help keep soluble salts down and always irrigate early to avoid pest and disease problems.
6-7	Lower soil temps to 58-62°F (14-17°C). Allow soil to dry fully between irrigations. Increase light gradually to 1000-1500 footcandles. Keep soil pH the same and soluble salts under 1.0 mmhos/cm. At this time, fertilizer can be increased to 100-150 ppm N with 20-10-20, while alternating with the previous rate of previous fertilizer. Only fertilize every 2-3 irrigations. Apply DIF during the first two hours of sunlight to control height.
8	Lower soil temperatures to 55-60°F (13-16°C) and keep allowing soil to dry thoroughly between irrigations. Gradually increase light intensity to 1500-2500 footcandles. Still maintain soil pH 5.5-5.8 and EC less than 0.75 mmhos/cm. Fertilize with 14 0 14 or calcium/potassium nitrate feed at 100 150 ppm N as needed. Plugs are now ready for transplant or shipping. If transplanting - do so directly into final containers (#1 or 2) into a well-drained, disease-free soil-less medium with a medium initial nutrient charge and a pH 5.5-6.2.
9-18	From transplant to sell: Night temps should be between 55-60°F (13-16°C), while day temps should be between 60-65°F (16-18°C). Light intensity should be maintained between 3000 to 5000 footcandles. Fertilize every other irrigation with 15-0-15 at 150-200 ppm N and maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction). To control height, plants can be allowed to wilt prior to irrigation once plants are rooted to the sides of the containers; withhold fertilizer, especially phosphorous and ammonium form of nitrogen; or use DIF as in weeks 6-7.

Needs Assessment for Genetic Improvement

- ▶ **Based on the production schedule you have assembled, assess the need for crop improvement using standard breeding methodology or genetic transformation:**

Since my schedule is based heavily on a relative of *Isoplexis*, I think before genetic improvements were made, the plant itself should be tested fully on all of the parameters of growing: light, soil, temperature, moisture, etc. before deciding it needs to or could be improved through genetics. Since the seeds I've sown have only just emerged with cotyledons at this point, all I can say for certain is that it has a high germination rate and that isn't something that needs to be focused on for improvement. The plant just needs to be grown out and tested.

Literature Cited

Arrebola, M. L. et al. "Micropropagation of *Isoplexis canariensis* (L.) G. Don." *Plant Cell Tissue and Organ Culture*. 49.2 (1997): 117-119. Web. 26 Apr. 2014.

Arrebola, M. L. et al. "Anthraquinones from *Isoplexis isabelliana* Cell Suspension Cultures." *Phytochemistry*. 52.7 (1999): 1283-1286. Web. 26 Apr. 2014.

Ollerton, Jeff, et al. "Bird Pollination of Canary Island Endemic Plants." *Naturwissenschaften*. 96.2 (2008): 221-232. Web. 26 Apr. 2014.

Other helpful websites:

<http://www.ballseed.com/Growers/advancedsearch.aspx?srch=digitalis>

http://www.rareplants.es/shop/prodtype.asp?CAT_ID=242

http://euromed.luomus.fi/euromed_map.php?taxon=309832&size=medium

<http://data.gbif.org/>

<http://eol.org/pages/5677355/maps>

http://en.wikipedia.org/wiki/Canary_Islands

<http://ww2.bgbm.org/EuroPlusMed/PTaxonDetailOccurrence.asp?NameId=48126&PTrRefK=7200000>

http://atlastenerife.es/portalweb/index.php?option=com_content&view=article&id=46&Itemid=54&lang=en

<http://theplantlist.org>

<http://theseedsite.co.uk/sdg9.html>