

# New Crop Paper: *Isoplexis canariensis*

## Taxonomy

*Isoplexis canariensis* (L.) Loudon is a name that is currently still under debate. Synonyms for this crop include *Callianassa canariensis* (L.) Webb & Berthel, *Digitalis lurida* Salisb. and more commonly seen, *Digitalis canariensis* L. The crop is native to the Canary Islands of the coast of Morocco, which are under the ownership of Spain. It's an endangered and endemic crop to that location and is therefore very rare. Common names include Canary Island Foxglove and Tenerife Shrub Foxglove. Tenerife is one of the islands belonging to the Canary Islands, and since the crop has a shrubby habit, this name is the more descriptive of the two. It belongs to the Veronicaceae family, but formerly had belonged to the Scrophulariaceae family. It is a close relative to the *Digitalis* genus and would easily be mistaken for one, if not known well.

## Geographic Distribution and Native Habitat

*I. canariensis* is native to the Canary Islands and has not been introduced to any other locations or environments except for specimens located in botanical gardens or personal collections – which is still quite minimal. Two notable examples were in Turkey and Sweden, showing the plant can survive as high of a latitude as 60°N, if cared for properly. The Canary Islands are much closer to the equator at 28°N and are situated extremely high above sea level, at about 4000m. This brings them a climate that 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. They contain mostly broadleaf tree species which

have evergreen, glossy and long leaves. Many of these tree and undergrowth species are endemisms which are not found elsewhere in the world, unless planted and cared for directly. The crop is limited to three of the islands belonging to the Canary Islands; Gomera, La Palma, and Tenerife. There is no evidence of an invasive nature and it would likely not be invasive due to it being an endemism and it having such a distinct natural habitat.

### **Taxonomic Description**

This species is described as a smallish clumping and erect shrub, approximating 3-4 feet in height with similar width with terminal spikes of inflorescences which resemble those of Foxgloves. It has a fibrous root system, with no underground storage organs. The leaves are dark green, linear and lanceolate and sit alternatively on the stalks. Flowers boast a bright apricot to yellow color and bloom season appears to be dependent on location. Timing varies from late spring to early autumn, but in their native habitat they bloom in late spring to early summer. Flowers last a long time on the plant, usually several weeks. To the best of my knowledge, there is no information about any uses of this crop by indigenous people. However, an article by Arrebola (1999) described it as a source of compounds that were related to the Digitalis cardenolides and anthraquinones, which can be harvested through the leaves. Cardenolides are steroids, which can have heart-arresting properties and anthraquinones are aromatic compounds which can have laxative properties, as well as a host of adverse side-effects. Both are being researched for medicinal uses.

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

It's sold as seed mostly on sites such as ebay, and is not given a cultivar name in such 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.

### **Propagation Method(s):**

Both seed and vegetative propagation are options and neither has been proven better than the other yet.

**Vegetative:** 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  $\mu$  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:** 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) I found the seeds lack any dormancy to overcome for germination. I had a very high germination rate when I sowed about 100 seeds and just placed them under mist (without any covering). Optimal temperatures for germination are 20° C days and 15° C nights. Constant high temperatures will inhibit germination. Plants should be watered from underneath using a capillary mat. Use rich, sandy

soil to sow, but also free of chalk. Seeds shouldn't be covered and should be kept in a partially shaded spot.

## **Product Specifications**

Ideally this crop would be a part-shade specimen that that is a show-stopper. With long-lasting, bright, big and long-lasting inflorescences, this crop would show height and color in a somewhat shaded garden. In most of the United States it would have to be sold as an annual crop, but it could grow perennially in some of the very warm states.

## **Market Niche—Identification and Justification**

The target sales date I would suggest would be during spring (around weeks 18-20), since flowers will bloom in early summer. A perfect holiday for this crop would be Mother's day – whose mother wouldn't want one? In some locations *I. canariensis* could be forced year-round. It's a long day crop but cannot tolerate cool winters. The coldest hardiness it's been successfully tested in so far is Zone 9. It would not be worth it to heat and light in MN, but probably would be in locations closer to the equator.

Another crop this could compete with would be foxglove. They're closely related, but *I. canariensis* would provide new colors and shapes not seen in *Digitalis*. An interesting marketing 'story' that could be used would be to describe the endangered nature of the species and encourage gardeners to grow it, which would stimulate more research and could 'SAVE the species from EXTINCTION!'

An initial limitation or problem to overcome for this crop would be pollination. It is naturally pollinated by several bird species. The nectar has very little sugar and is slightly bitter, making it not ideal for bee pollination. A way to pollinate the crop cheaply and efficiently would need to be found – if the grower wants to grow these from seed.

This product is not likely to be identifiable by many growers or consumers. They would likely see it as a Digitalis release, instead of a relative. This would open a market for the product however, as a comparative, a better ‘version’ of Digitalis. I would estimate 5-10 years for this to be released on the market. Enough time to breed release-able crops.

## **Anticipated Cultural Requirements**

The winter hardiness has been listed as being suitable for USDA zones 9-11. It does not appear this has been tested much at all however and the range could likely be broader. As far as I can tell, no published information exists regarding Isoplexis’ heat or drought tolerance in terms of USDA heat zones. Based on the location, I would assume it would be pretty heat tolerant. The few places I saw where it was for sale – never to the United States – it was listed as being drought tolerant. There is little information posted on the cultural requirements, because it has been untested and not sold to the United States. What little else I could find was based on the websites that sell to their respective countries or continents. Information there was very meager and likely not very well tested. No information was posted for temperatures outside of hardiness zones and certainly not day or night specific temperatures. I would assume they would both be fairly warm or with the nights being slightly cool, based on their native habitat. Light quality, quantity, duration and photoperiodic response yielded no clearer results with the only

information being, “Full to part sun.” Soil should be well drained and no information exists to my knowledge of the nutrition, plant growth regulators, container sizes (I would say gallon pots or larger), diseases or treatments. As far as I can tell, no company in the U.S. has every tried to sell this, so no information exists yet.

## Complete Production Schedule

I would recommend selling this as a container plant in late April to early May. It should be flowering by then, or close to it. Based on estimates from its relative, *Digitalis* I would think it would take approximately 4 weeks from sowing seed to ship out plugs or 14 weeks to sell flowering plants. You could produce later stocks and sell the product all summer, since it seems to flower from spring through autumn in some locations. I would suggest it as a prize product for Mother’s day as well. Use DIF from the 3<sup>rd</sup> week of production to finish to control height. I would also recommend testing different PGRs on a select number of crops. A full schedule is listed below, but is only an estimate based on the needs of *Isoplexis*’s relative, *Digitalis*. Since foxgloves are in production mostly everywhere and canary island foxgloves are not, it was much easier to find information regarding regular foxgloves. My schedule should be viewed as a starting point and not an absolute guide.

Week	<i>Isoplexis canariensis</i> 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

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

[http://euromed.luomus.fi/euromed\\_map.php?taxon=309832&size=medium](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://en.wikipedia.org/wiki/Canary_Islands)

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

[http://atlastenerife.es/portalweb/index.php?option=com\\_content&view=article&id=46&Itemid=54&lang=en](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>