



DONALD DANFORTH  
PLANT SCIENCE CENTER

# Quinoa

## General Plant Care and Pest Control

---



May 2018 by William Kezele



DONALD DANFORTH  
PLANT SCIENCE CENTER

## Introduction

Quinoa (*Chenopodium quinoa*) is a grain crop of the Amaranthaceae family originating in the Andean region of Bolivia, Peru, Ecuador, Colombia and Chile. Although considered a pseudocereal for not belonging to the Poaceae family, Quinoa has a comparable nutrient composition regarding fiber, minerals, and protein.

Quinoa is an herbaceous annual that can reach heights of 3.5' to 6.5' at maturity, and boasts a variety of fruit colors depending on the cultivar. It can tolerate a wide range of temperatures as low as 25°F/-4°C and as high as 100.4°F/38°C. However, it does not thrive above 95°F/35°C. It



also grows well within relative humidity range of 40%-88%, and ***ideal temperatures for***



DONALD DANFORTH  
PLANT SCIENCE CENTER

**cultivation are from 15°C to 20°C(FAO, 2011).** Quinoa has been cultivated in soils with a pH ranging from 4.5 - 9.5, and its life cycle can be anywhere from 90-220+ days depending on cultivar and temperature. Its day length requirements are also cultivar dependent, however, many cultivars have gone to seed here in St Louis greenhouses with 12-16 hour day lengths.

## Planting / Germination

1. Fill a small-celled plug tray (72 cell, 98 cell, etc.) with Promix FPX.
2. Water media until saturated.
3. Plant (1) quinoa seed per cell.
4. Place tray in a 4°C (39.2°F) cooler/chamber for 3-5 days. This has been shown to boost germination rates.
5. Once germination begins, place tray in a greenhouse until the first, or even second, set of true leaves emerge. Greenhouse conditions are set to a 12-14 hour day length with an average day temp of 22°C and an average night temp of 20°C. **(It's recommended a greenhouse or growth chamber be set to ideal Quinoa growth temperatures [see above] if possible.)**

## Transplanting

1. Around the two week point when the second set of true leaves emerge, it's time to transplant. (Roots should be holding the media in the plug together somewhat when scooped out at this point.)
2. Fill 4.5" pots with Berger BM7 35% media, and water thoroughly until saturated (roughly 300mL per pot).
3. Make hole in media slightly larger than the size of the plug, and insert the plug into the hole.
4. Backfill in the loose media to secure the plug, but *do not firm-in the media, or press on the transplant's roots*. This can damage the plant.
5. Water in the new transplants with tap water, and place 4.5" pots every-other slot in their respective trays.

## General Plant Care

1. Once transplanted, Quinoa should be fertilized 1x a week **when the media dries out on top** (pictured below-right) before any signs of stress show up. Fertilizer used here is 15-16-17 mixed with tap water with a pH of 6.5-7 on average. 15-5-15 fertilizer could also be used as no clear response to additional Phosphorus application has been observed (Rojas *et al.*, 2004).



Plant age: 2 weeks (Wet media on left, dry media on right)

2. Every week, these young plants should be fertilized at least 1x between Monday and Friday. On the weekends, RO (reverse osmosis) water is used to help flush the pots of any potential salt build-up.
3. When the rapid growth phase begins, apply fertilizer at least 2x per week when media dries out on top. Continue watering with RO on weekends to flush potential salt build-up.



DONALD DANFORTH  
PLANT SCIENCE CENTER



Plant age: 4+ weeks



DONALD DANFORTH  
PLANT SCIENCE CENTER



Plant age: 5.5 weeks

4. Begin fertilizing 2-3x per week at the 5-6 week point. Media will be drying out every 1-1.5 days at this point. Use tap water or RO for clear water applications.



DONALD DANFORTH  
PLANT SCIENCE CENTER

## Flowering Stage

1. Quinoa will show signs of flowering quite early in its development; some accessions more than others. Continue watering/fertilizing the same way through this growth stage. Below are a few images of flowering Quinoa:





DONALD DANFORTH  
PLANT SCIENCE CENTER



Plant Age: 6-8 weeks (cultivar dependent)

## Seed Maturation

1. When Quinoa begins to fill out its seed, it will start to draw nutrients from its leaves. Chlorophyll degradation and leaf drop (self pruning) seems to occur with most accessions during leaf senescence. Either the plant drops most-to-all of its leaves and grows new ones around the developing seeds only, or it drops most-to-all of its leaves *except* for the leaves in close proximity to the developing seeds.
2. Once the leaf numbers are greatly reduced, the pots will only dry down a few times a week. At this growth stage, cut back to fertilizing 1-2x per week. Make sure to apply a RO flush once per week if possible.
3. Quinoa fruit comes in many different colors. A few examples are shown below:





DONALD DANFORTH  
PLANT SCIENCE CENTER



Plant age: 9-12 weeks (cultivar dependent)

4. When the seeds are mature, they dry up, shrink down a bit, and turn brown (pictured below). Begin withholding irrigation at this time, allowing the pots to dry out a little more between waterings. Fertilizer should only be applied 1x a week. Clear tap water for all other waterings, and at least one RO flush per week should be applied if possible:



DONALD DANFORTH  
PLANT SCIENCE CENTER



Plant age: 13 weeks (cultivar-dependent)

5. When all seeds in the clusters are this brown and dry, you may put plants on dry down.



DONALD DANFORTH  
PLANT SCIENCE CENTER

## Harvesting

1. When all leaves have dropped, and only dried seed clusters remain, check the seeds' hardness to determine whether or not it's time to harvest. If you cannot easily push your fingernail into the seed, it's likely ready.
2. Cut off seed heads, and hold upside down over a large container. Close your hand around the stem and drag downward, scraping all the seed and chaff off of the stem.
3. Use a sieve, winnowing device, or other seed cleaner to separate the seed from the chaff.



DONALD DANFORTH  
PLANT SCIENCE CENTER



(When all leaves fall, all seeds are brown, the pot is dried out, and you cannot push your thumb nail into the seed easily, then the seed is ready to harvest.)

## Pests

In our greenhouses here at DDPSC, we've observed three insect pests that can cause persistent damage on Quinoa:

- Aphids
- Spider Mites



DONALD DANFORTH  
PLANT SCIENCE CENTER

- Thrips

Thrips and Aphids seem to arrive at any time during the plant's life cycle.

Spider mites seem to first show up when the plants begin dropping pollen, and can have the entire panicle in webs within 2 weeks. Mite presence can persist until dry down.

When pressure gets too high for any of these insects, and potential excessive damage seems unavoidable, pesticides are sprayed. Here are two pesticides that have caused phytotoxicity, and have since been removed from our pesticide chemical rotation:

- Mainspring (Cyantraniliprole)
- Pylon (Chlorfenapyr)

## References

FAO (2011) Quinoa: An Ancient Crop to Contribute to World Food Security. Food and Agriculture Organization, Rome, Italy.

Rojas, W. Soto, J.-L and Carrasco, E. (2004) *Study on the Social, Environmental and Economic Impacts of Quinoa Promotion in Bolivia*, PROINPA Foundation, La-Paz, Bolivia