

Growing *Nymphaea thermarum*

Friedman Lab, 2016

Based off of: Fischer E, Magdalena-Rodriguez C. 2010. *Nymphaea thermarum* (Nymphaeaceae). *Curtis Botanical Magazine* 27: 318–327.

Basics

Greenhouse

- Air temperature: 18°C (night) – 25°C (day)
 - Vents open at 25.5°C
- Air humidity: 70+%
- 12.5 hour day cycles, shading should be avoided
 - Supplementary lighting used for winter months
 - Lights switch on when light levels drop below 145 watts/m²

Soil

- top soil or loam, completely saturated with water (as free of floating components, such as woodchips, as possible). Can supplement with Turface or small stone particles.
 - We cover soil with water and let it soak for 2 hours to overnight and then skim floating material from the top.

Containers to hold plants + water -These need to be a few inches taller than the pots in which you are growing the plants. Which option works best will depend on your space and capacity.

- Plastic tub, shallow– good for seedlings and small plants (or plants in shorter pots); can be kept easily on greenhouse benches (a Sterilite 7-Gallon (28-Quart) Storage Box, 23.12" x 16.9" x 6.38")
- Plastic tub, deep – may be necessary if your pots are too tall for the more shallow tubs (Sterilite 66 qt Storage Box, 24-1/2" x 17-3/4" x 13-3/8")
- Fish tanks – 5 to 10 gallon tanks
- Stock tanks (Rubbermaid, structural foam, 300 gallon capacity) – great for maintaining larger populations. Can comfortably fit ~67 adult individuals in a tank.

Pots

- Small Pots for plantlets
 - ~9-10cm or 3.5in in diameter and height
- Large Pots for adult plants
 - 15cm or 6 in in diameter and height
- Smaller pots slow down the growth of plants.
- Pots larger than what we have described can be used, but tend to be unnecessarily so.
- Always placed in a watertight container filled with water to about the level of the soil contained in the pot (plant shoot apical meristem should be covered, but leaves should not be)

Seed to Seedling

1. Prepare a small flat with about 10cm (~3 in) of soil and some small, freshwater snails (e.g. *Physa* or *Planorbis*) and water fleas (*Daphnia*). Fill the flat with enough water to just barely cover the soil. This flat can be prepared a few days beforehand in the greenhouse, to allow 1) the water to come to room temperature, and 2) to allow the soil to settle before sowing.
 - a. We put the soil in an interior tray/container in order to leave some room around the edge to ease water flow during refilling to prevent disturbing the soil/seeds too much.
2. Spread seeds over the flat.
3. Gently refill flat as needed to keep the water level consistent.
4. After about 10-15 days, seedlings should have extended their primary roots into the soil and the filiform leaf should have appeared.

Seedling to Plantlet

1. Continue to refill water in the flat gently until the plantlet is about 2-3cm (~1in) in diameter. At 2-3cm, the plant should have enough root mass to be safely repotted into a small pot.
2. Dampen the soil and pack it around the plant, centering the plant as you're potting and keeping the crown of the plant at the same level as the top of the pot where the soil level should be.
 - a. The plant can be repotted by holding the plant with all the leaves facing upwards with one hand then holding the rhizome suspended over the desired location. The other hand can be used to fill the pot with soil.
3. Pots can be placed in a similarly-sized flat, as those used for the germination process, side-by-side until the plantlet is ready for repotting again. Fill the water level until it barely covers the crown of the plants and sits comfortably above the soil line.
 - a. We put the pots in trays that can be bought with the pots and easily fit into our flat. If trays do not fit, we typically cut it down to size. This leaves some room around the edge to ease water flow during refilling as to not disturb the soil/seeds too much.

Plantlet to Adult Plant

1. Continue refilling water in the flat gently until plantlets are about 5cm (~2 in) in diameter. After the plant reaches this size, it is ready for a new home.
2. Prepare a flat, or tank, with some small, freshwater snails (e.g. *Physa* or *Planorbis*) and, water fleas (*Daphnia*).
3. Pull the plant out from the soil and wash the roots gently and thoroughly.
4. Repot the plant in the same manner as was done with the plantlet, but in a larger pot. This will be the final pot size for the plant.

5. Place this larger pot in a taller tub or tank.
6. Once you have repotted all plants of interest, space them out 12cm (~5 in) apart from each other (such as alternating them within a tray).
7. Each tray should fit into a flat or tank tall enough to ensure the water level remains around the crown of the plants and the soil line.
8. Then, fill the flat, or tank, with water up to the soil level.
9. After 2-3 months, the plants should begin to flower.

Maintenance

General

- Removal of flower on the last day of blooming, if not needed for research, to avoid fruit development and potential seed dispersal
 - If seeds are allowed to germinate, they can clog up and/or overcrowd the tanks.

Water Levels

- Water evaporates slowly, but tank should be refilled as needed
- Do not allow water level to rise higher than 3cm above the soil level

Fertilizer – waterlilies tend to be greedy feeders. Under-fertilized plants will not flower.

- One pellet of sheep manure once every 7-10 days, plugged into soil 2-4 cm deep

Algae Control

- Small, freshwater snail (e.g. *Physa* or *Planorbis*)
- Water flies (e.g. *Daphnia*)

Potential Pests

- Fungus gnats – do not appear to harm plants much, but annoying and may interfere with controlled pollinations.
 - (*Bacillus thuringiensis* ssp. *Israelensis* (BTI) treatment every 30 days to kill fungus gnat larvae that may wreak havoc on plant roots. Typically, we use floating dunks of a BTI maintenance formula in our tanks. Every so often we'll use mosquito bits of BTI quick kill formula in our flats)
- Thrips (*Frankliniella* sp.) – hard to see, but infected plants will produce unhealthy-looking leaves with curled edges.
 - (Applied only when thrip infestations are detected. Active ingredients used: spinosyn & s-kinoprene)
- Aphids – rare, but possible. Clean aphids off plants and/or remove infested organs or individuals.

Repotting - Repot every 3-6 months (up to one year) for healthy growth and prolific flowering. Progressively more yellow leaves, slower flowering, poor fruit set, and emergence of shoot apical meristem from soil level are all signs that you need to repot.

- Wash rootball thoroughly, but gently
- Remove offshoots and any dying leaves (darker colour on the underside of the leaves)
- Snap off verticle rhizome as necessary