SMALL-SCALE COST-EFFECTIVE HOT WATER SEED TREATMENT

Frank Morton, Wild Garden Seed

Tom Stearns, High Mowing Seeds

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Less than $200 equipment & supplies
PLUS labor of course…!

We know this is difficult

- All of a sudden you're being required to hot water treat *Brassica* seeds in Oregon
- You are very busy
- You have lots of seed lots to deal with
- You haven't done this before & don't have the equipment
- You are concerned about seed viability and storability
- There is some regulatory uncertainty, etc., etc.

Hot water may be a useful tool for organic farms

- Many vegetable seeds are prone to seed-borne diseases
- Without proven fungicides hot water treatment can improve our defense against diseases like blackleg, light leaf spot, *Verticillium, Fusarium, Xanthomonas, Alternaria, Botrytis* and many viruses.

Key steps

1. Maintain seed identity can be time consuming with lots of lots
2. Pre-heat seeds to avoid shock – about 100-110°F for 10 minutes
3. Treat in 122°F water with temperature accurate to 0.1-1°F
4. Cool them down right away to prevent excess heat exposure
5. Dry seed immediately to avoid priming the seed
6. Keep your system clean

Seed	Water temperature		Minutes
	°F	°C	
Brussels sprouts, eggplant, spinach, cabbage, tomato	122	50	25
Broccoli, cauliflower, carrot, collard, kale, kohlrabi, rutabaga, turnip	122	50	20
Mustard, cress, radish	122	50	15
Pepper	125	51	30
Lettuce, celery, celeriac	118	47	30

From Hot Water and Chlorine Treatment of Vegetable Seeds to Eradicate Bacterial Plant Pathogens. HYG-3085-05, by Sally Miller and Melanie Lewis Ivey

1. Maintain seed identity

- Nylon stockings cut to different lengths – tight knot in one end, loose knot in the other
- Some kind of sturdy reliable clamp would be quicker
- Muslin bags or cut up pillow cases
- Label = doubled over blue masking tape w/ a Sharpy pen, plastic label with ball-point pen on the draw string…
- Water proof Sharpy's will stay on plastic plant tags

1. Maintain seed identity – more bags

1 gallon paint strainers with rubber bands to tie the top

Stapled coffee filters

From: http://vegetablemdonline.ppath.cornell.edu/NewsArticles/HotWaterSeedTreatment.html

Pour seed & label into bags

Loosely tie the top of the bag

Make sure seed is loose in the bag – good water flow is key

2. Preheat the seeds

1. About 100-110°F for 10 minutes
2. Check temperature with a thermometer
3. Precision isn't critical – easy enough with warm tap water
4. This could be a big area of re-infection if not cleaned – it's a dirty step

3. Hot water step

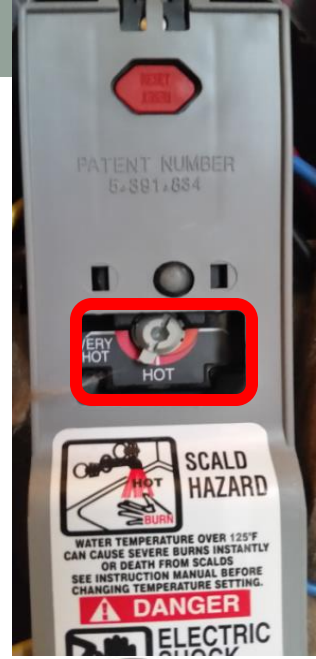
- Accuracy ensures seed-borne pathogens are killed and seed is still viable and stores well.
- Good thermometers ~$50
  - Mercury
  - Water proof digital – Thomas Scientific two probe waterproof. Updates 2x per second with 0.1°F accuracy
- Redundancy is good - >1 thermometer

3. Hot water step

- Use a relatively large container. Lots of water maintains more even temperature during the 15-30 minutes when seeds are treated.
- Frank uses camping coolers Tom uses stainless sinks
- Circulate water with a stirring rod
  or $20 fishtank circulator

3. Hot water step

- Set your hot water heater to about 125°F (the water cools off a bit in the lines)
- Fill your container with the hot water
- Monitor the temperature and maintain within about 0.5-1°F if you're planting right away. We think 0.1°F accuracy is important if you plan to store seed.
- When water starts to cool add a squirt of boiling water from the kettle
- Avoid seed contact, and circulate quickly
- Sous Vide hot water heater and circulator costs ≥$200 but is nice – used for cooking.



3. Hot water step

- Tom can run about 20lbs of seed per batch through the sinks
- Frank uses a larger cooler to run larger batches
- Only seeds with same time and temperature requirements in the same batch
- Set an alarm so you can do other things, but check the temperature at least a few times during the process unless you have confidence in your Sous Vide.

3. Hot water step

- Sometimes you can find used “circulating hot water baths” online.
- This bath was for sale on eBay for $99 and is the type often used in labs. It could work for small seed lots.

4. Cool the seed

- Cool tap water
- Get the seed down to ambient temperature right away

5. Pre-dry the seed

- Frank pre-dries small lots in the bags on a terry cloth towel
- He pours out larger lots (i.e. >1 lb) on the towel to pre-dry them more quickly
- Tom uses a spin dryer with no heat (1,600rpm for 3 minutes)

5. Dry the seed

- Air dry the seed at 85°F overnight especially if you are storing the seed
- Small lots (i.e. a few ounces) can stay in the bags
- Larger lots should be spread thinly on a screen
- Some counter-top food dryers can be set as low as 85°F
- You may be able to dry seeds on trays in a warm room or over a heating vent
- During warmer weather, gentle air flow may sufficient

6. Clean your set-up

- Avoid re-infection from infected lots and less than 100% effective treatment
- Frank and Tom scrub everything down and replace the water between lots
- Tom is considering an ozone treatment to keep the water sterile. Then they would only have to replace the water when it has too much debris

Start small

- Try treating some extra seed at a small scale
- Test germination of treated and untreated seed from the same batch
- Consider storing some seed and testing later to gain confidence in the accuracy of your system for future years
- Start small again whenever you try a new type of seed
- Hot water treatment exacerbates problems with poor quality seed, i.e old, harvested immature, damaged seed coat, diseased, etc.. Not always a bad thing – maybe that wouldn’t have been a profitable plant anyway.

THANKS
FRANK & TOM!!!

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