

Hot Water Seed Treatment

Some plant pathogens, including specific fungal, oomycete, and viral pathogens, can be carried on seed; some can only infest the seed surface, but others are able to penetrate the seed coat and survive within the seed. In both cases, the pathogen can then grow with the seed when it is planted, resulting in an infected plant. Therefore, starting with disease-free seed is an important step towards growing disease-free crops. Seeds can be treated with chlorine or pesticides to eliminate pathogens that are associated with the surface of seeds. However, these treatments cannot penetrate the seed coat, and therefore leave internal pathogens untouched. Hot water *can* penetrate the seed coat and can also kill pathogens, making it a useful tool for managing seed-borne pathogens.

Treating your seeds with hot water can help prevent the establishment of seed-borne diseases on your farm, or prevent their reintroduction year after year. However, it's important to note that while hot water seed treatment will kill pathogens on and within your seeds, it does not protect crops from disease and does not guarantee disease-free crops. Crop rotation and field sanitation are key for preventing diseases that overwinter on crop debris, and crops need to be scouted regularly for wind-, water-, and insect-borne diseases.

Hot water seed treatment has the beneficial effect of priming seeds, resulting in faster germination than untreated seed.

When deciding whether to use hot water treatment and which seeds to treat:

1. **Determine the likelihood that seed-borne pathogens could be present based on the crop** (see Table 1 for reference). Tomato, pepper, and brassicas are good candidates for hot water seed treatment because there are common bacterial and fungal diseases of these small-seeded crops that can be easily killed through treatment.
2. **Ask your seed supplier if the seed was already treated with hot water or if it has been primed** (pre-soaked to promote earlier and more uniform germination). Treating again could adversely affect the seed. Also ask the supplier about the growing conditions to determine the likelihood that the seeds are carrying pathogens: were the seeds produced in a way to minimize exposure to seed-borne pathogens? Was the seed tested for the presence of any pathogens? Only a few companies routinely hot-water treat seeds—many are reluctant because there is a risk that germination rate will drop if the water is too hot or if the seeds were already exposed to stressful environmental conditions.
3. **Don't treat seed that has a fungicide or insecticide treatment coating**, as it will wash off during treatment.
4. **Only treat seed that will be used in the following year.** Treated seed does not remain viable for as long as untreated seed.
5. **Large-seeded crops (beans, cucurbits, peas, corn etc.) are usually not effectively disinfested with hot water treatment** because the temperature required to heat the whole seed would kill the outer seed tissue and the seed will not germinate. In some cases, hot water has been used to disinfect just the surface of larger seeds, for example, treating anthracnose on beans.
6. **Hot water seed treatment can decrease germination rates**, especially of older seed (more than 1 year old) or seeds that were grown under stressful environmental conditions.

Table 1. Vegetable crops and seed borne pathogens control by hot water treatment.

Crop	Diseases Controlled
Brassicas	Alternaria leaf spot, Bacterial leaf spot, Black leg, Black rot
Beet / Swiss Chard	Phoma/Canker, Downy Mildew, Cercospora leaf spot
Carrot	Alternaria leaf blight, Bacterial leaf blight, Cercospora leaf spot, Crater rot/foliar blight
Celery / Celeriac	Bacterial leaf spot, Cercospora leaf spot, Septoria leaf spot, Phoma crown and root rot
Eggplant	Anthracnose, Early blight, Phomopsis, Verticillium wilt
Lettuce	Anthracnose, Bacterial leaf spot, Lettuce mosaic virus, Septoria leaf spot, Verticillium wilt
Onion	Purple blotch, Stemphylium leaf blight, Basal Rot, Botrytis blight, Smudge, Black mold
Pepper	Anthracnose, Bacterial leaf spot, Cucumber mosaic virus, Pepper mild mosaic virus, Tobacco mosaic virus, Tomato mosaic virus
Parsley / Cilantro	Bacterial leaf blight, Alternaria leaf blight, Black rot, Cercosporoid leaf blight, Septoria blight
Spinach	Anthracnose, Cladosporium leaf spot, Cucumber mosaic virus, Downy mildew, Fusarium wilt, Stemphylium leaf spot, Verticillium wilt
Tomato	Alfalfa mosaic virus, Anthracnose, Bacterial canker, Bacterial speck, Bacterial spot, Cucumber mosaic virus, Early blight, Fusarium wilt, Leaf mold, Septoria leaf spot, Tomato mosaic virus, Verticillium wilt, Double virus streak

Hot Water Seed Treatment Liability Waiver

The UMass Vegetable Program follows established and tested protocols for hot water treating each species and cultivar of vegetable seed to ensure the highest quality. Seed undergoes a pre-warming process in a controlled water bath at 100°F then is subjected to treatment in another aerated warming bath at 118-125°F for 15 to 30 minutes depending on the species. Seed is immediately air dried, carefully packaged and shipped back to the grower within 10 days. These protocols are proven to maintain or enhance seed germination if the appropriate seed (see page 1) is used, but we cannot guarantee that there will not be negative effects.

As a condition of submitting seed to the University of Massachusetts Extension Vegetable Program for hot water seed treatment, the undersigned acknowledges that he/she has been informed of the risks associated with the potential, possible loss of seed viability and hereby waives any and all rights to assert any claim against the University of Massachusetts Extension, for negligence or otherwise. The University of Massachusetts Extension shall not be liable for incidental or consequential damages or crop failure as a result of the use of this treated seed.

I hereby release from liability and agree to indemnify and hold harmless the University of Massachusetts, its Board of Trustees, employees, agents, and/or volunteers, for any liability in connection with the use of this hot water treated seed. This release is for any and all liability property losses or damage occasioned by, or in connection with the use of this hot water treated seed.

I have read this entire Document (pages 1-4), including the release portion (page 2), and I fully understand it and agree to be legally bound by this Document.

Signature: _____ Date: _____

Print Name: _____

Hot Water Seed Treatment Submission Form

UMass Vegetable Program staff will treat seeds and return to the grower within **10 days** (longer if you are treating more than 13 oz. of seed). Contact us with any questions before mailing in your seed.

Contact Info: (include return address where the seed will be mailed)	
Name:	
Business Name:	
Street or PO Box:	
City, State, Zip:	
Phone:	
Email:	

Fees: Each variety or cultivar will cost **\$6 for each 0.1 -1oz¹**. For example, 0.5oz of cherry tomato seed will cost \$6 and 1.6oz of plum tomato seed will cost \$12. An additional **\$5 for each 0.1 – 13oz of seed is charged for shipping.**

Mailing Instructions: Clearly label each variety or cultivar of seed to be treated in separate containers (e.g., seed packets, plastic jars, etc.) and enclose in a water resistant container such as a resealable plastic bag. Label the seed packets the same as you do on this form. Carefully place the seed in a **padded envelope** (or box if treating large amounts of seed) and mail to the address above along with the Hot Water Treatment Submission Form, signed liability waiver, and check made out to **“UMass”** for the total treatment amount and shipping cost.

Lab use only	
Received:	Due:
Check#:	Cash:

Lab ID (leave blank)	Crop	Variety/Cultivar	Ounces	\$6 for every 0.1 – 1 oz
Subtotal			oz	\$
Total (including \$5 shipping for each 0.1-13oz)				\$