



Extension FactSheet

Plant Pathology, 2021 Coffey Road, Columbus, Ohio 43210

Hot Water and Chlorine Treatment of Vegetable Seeds to Eradicate Bacterial Plant Pathogens

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One of the ways plant pathogens are introduced into a crop is on seeds. Bacterial pathogens are particularly notorious for this means of dissemination. In general, the earlier a pathogen comes in contact with the crop, the greater the potential for a serious disease problem to develop. This is why it is very important to start with “clean” seed. Clean seed can be obtained by applying one of the treatments described below to kill bacterial pathogens on and/or within the seed.

When treating vegetable seeds it is critical to follow the instructions exactly, as seeds may be damaged by the treatment and/or the pathogen may not be completely eliminated. In addition, old or poor quality seed can be injured by seed treatments. **Therefore, it is recommended that a small sample be treated and tested for germination (see method below) prior to treating the entire seed lot.** Treatments should be done on raw seed only, since the treatment will destroy any seed pelleting and will wash off any fungicide that may have been applied to the seed. If fungicide treated seeds are used, the fungicide washed off must be disposed of properly. After the treatment, seed may be treated with Thiram to prevent damping-off caused by various soilborne fungi.

Hot Water Treatment

Properly used, hot water treatment kills most bacterial disease-causing organisms on or within seed. This treatment is suggested for seeds of eggplant, pepper, tomato, carrot, spinach, lettuce, celery, cabbage, turnip, radish, and other crucifers. **Seeds of cucurbits (squash, gourds, pumpkins, watermelons, etc.) can be damaged by hot water and thus should not be treated.**

Instructions

A. The following equipment and supplies are needed to hot water treat vegetable seed.

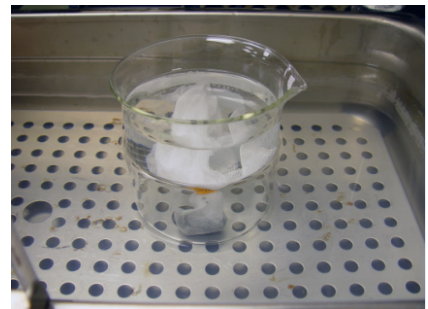
- Water bath (preferably two: one for pre-warming and one for treatment; Sources: Fisher Scientific Co., Thomas Scientific, VWR Scientific)
- Thermometer
- Cotton cloth, cotton bags, or nylon bags
- Screen for seed drying

B. How to Hot Water Treat Seed.

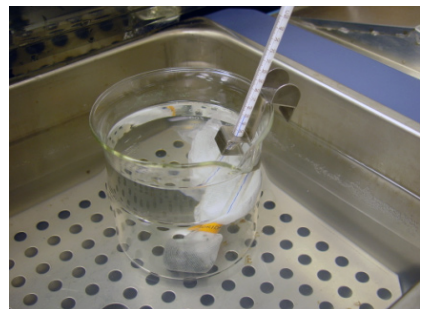
Step 1: Wrap seeds loosely in a woven cotton bag (such as cheesecloth) or nylon bag.



Step 2: Pre-warm seed for 10 minutes in 100°F (37°C) water.



Step 3: Place pre-warmed seed in a water bath that will constantly hold the water at the recommended temperature (see table that follows). **Length of treatment and temperature of water must be exactly as prescribed.**



Step 4: After treatment, place bags in cold tap water for 5 minutes to stop heating action.



Step 5: Spread seed in a single, uniform layer on screen to dry. Do not dry seed in area where fungicides, pesticides, or other chemicals are located.



Step 6: Dust seed with Thiram 75WP (1 tsp/1 lb seed) once the seed is completely dry.



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

Chlorine Treatment

Chlorine treatment effectively removes bacterial pathogens on the seed surface. Unlike hot water treatment it does not eliminate pathogens within the seed. Chlorine treatment is recommended for both large- and small-seeded vegetables if the seeds have not been treated by any other method and the possibility of pathogens being carried inside the seeds is not a concern.

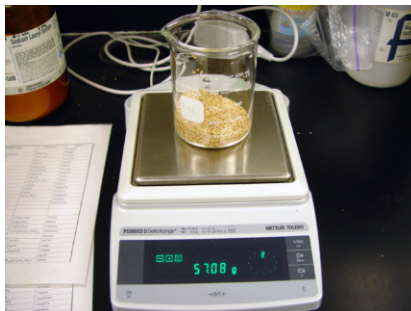
Instructions

A. The following equipment and supplies are needed to chlorine treat vegetable seed.

- Chlorox (5.25% hypochlorite)
- Surfactant (e.g., Activator 90 or Silwet)
- Glass beakers or jars
- Stirring stick
- Screen for seed drying

B. How to Chlorine Treat Seed.

Step 1: Agitate seed in a solution of 25 oz Clorox plus 100 oz water with one teaspoon surfactant for 1 minute. Use 1 gallon of disinfectant solution per pound of seed (conversions provided below) and prepare a fresh solution for each batch.



Step 2: Rinse seed thoroughly in cold running tap water for 5 minutes.



Step 3: Spread seed in a single, uniform layer on screen to dry. Do not dry seed in area where fungicides, pesticides, or other chemicals are located.



Step 4: Dust seed with Thiram 75WP (1 tsp/1 lb seed) once the seed is completely dry.



How to Test for Seed Germination After Hot Water or Chlorine Treatment

1. Mix seeds in each seed lot and count out 100 seeds per seed lot.
2. Treat 50 of the seeds exactly as described in the fact sheet.
3. After treated seeds have dried, plant the two groups of seeds separately in flats containing planting mix according to standard practice. Label each group as “treated” or “untreated.”
4. Allow the seeds to germinate and grow until the first true leaf appears (to allow for differences in germination rates to be observed).
5. Count seedlings in each group separately.
6. Determine the % germination in each group:

$$\frac{\text{\# seedlings emerged}}{\text{\# seeds planted}} \times 100$$

7. Compare % germination in each group: they should be within 5% of each other.

Conversions:

8 oz = 1 cup

16 oz = 1 pint

32 oz = 1 quart

128 oz = 1 gallon

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