Hot water treatment of vegetable seed to prevent bacterial diseases.

Bacterial disease of vegetable crops, such as bacterial leaf spot of peppers caused by *Xanthomonas campestris pv. vesicatoria*, bacterial canker of tomatoes (*Clavibacter michiganensis pv. michiganensis*) and black rot on cole crops (*Xanthomonas campestris pv. capestris*), can cause serious losses. When present, these diseases can cause extensive crop destruction, due to the speed with which they spread and because chemical control often provides disappointing results. These three disease-causing organisms can arrive on farms in infected seed and transplants or survive one or two winters on crop residues or for longer periods on weeds in the same botanical families as the host crop.

Companies that produce seed take many steps, from inspecting seed production fields to testing seed in lots of 10 to 30,000, to try to ensure that it is free of bacterium. Many companies use chemical treatment such as sodium hypochlorite, which sterilize the surface of the seed. However, chemicals do not reach infections within the seed. Research has shown that hot-water treatment can penetrate the seed sufficiently to eradicate bacterial infections inside the seed.

There are only a few seed companies that routinely hot-water treat Brassica and tomato seed (not peppers, which are considered more fragile) or may do so on request. Their reluctance is understandable, since there is risk that germination will be reduced if the water gets too hot or if the seed crop was grown under stressful environmental conditions. Thus, some varieties or seed lots are more vulnerable to heat treatment than others. One seed company reports, however, that they often see an "increase" in germination rates after hot-water treatment, because other microbes that attack the seed during germination are killed.

If the varieties you prefer are not available from a company that offers this service or you suspect that some of your seed might be infected, you can treat the seed yourself. Hot-water treatment is easier, cheaper and more effective than trying to combat bacterial diseases in the field with chemicals. Once you hot-water treat, the seed company's liability and guarantees are null and void, therefore the following precautions and recommendations should be observed.

Recommended times and temperatures:

Treat pepper, cabbage or Brussels sprouts at 122 F for 25 minutes.
Treat cauliflower and broccoli at 122 F (50 C) for 20 minutes.
Treat tomato seed at 122 for 25 minutes or 125 F (51.7 C) for 20 minutes.

Steps for hot water treatment:

1. Given the high cost of hybrid seed, treat a 50 or 100-seed sample and conduct a germination test in the greenhouse before exposing the whole seed lot to the high temperature bath. Seed lots vary in susceptibility, so ideally treat a sample of each lot number and variety. Plant it alongside an equal number of untreated seed in the same growing media that you plan to use for your transplant production. You could also use moist paper towels for a germination test.

2. Use an accurate laboratory thermometer. It is important that the water be maintained at a uniform temperature throughout the vessel, that the recommended temperature not be exceeded and that the seed be treated no longer than the time interval specified. A stirring hot plate helps to provide continuous agitation and uniform water temperature, though it can be done with continuous, consistent manual agitation. Bring the bath up to the recommended temperature for the crop seed you are treating (122 F = 50 C or 125 F = 51.7C). Wrap the seed loosely in a cloth or in cheesecloth, add a metal bolt or sinker to keep the seed submerged and proceed to soak it for the recommended interval. Check the temperature constantly. It helps to have a separate container of room temperature water close by to add, if necessary, to prevent overheating. Remove the seed after 20 to 25 minutes, cool the seed under tap water and air dry at 70 to 75 F by spreading the seed on paper towels.
3. If the test treatment gives acceptable germination rates, treat as much seed as you expect to plant this year, carefully using the same procedure. It is advisable that the treated seed be used in the same year.

You can order the necessary equipment from Fisher Scientific, 711 Forbes Avenue, Pittsburgh, PA 15219, 1-800-766-7000, or another laboratory supplier. They are not expensive. For example, Fisher offers a laboratory thermometer in Celsius (cat # 14-983-10B) or Farenheit (cat # #14-983-15B) for about $15. Stirring hot plates run $300 to $450.

Adapted from fact sheet, 'Bacterial Diseases of Vegetable Crops' by Jude Boucher and Gianna Nixon, University of Connecticut Cooperative Extension System and Ruth Hazzard and Robert Wick,
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