Tips for beautiful vegetable transplants

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Attention to detail during transplant production will reward you with quality transplants and optimal results in the field.

Seeds

Pathogens -There are numerous diseases that can impact your crop, and a good number of these can be seedborne. A first line of defense is to ensure you are planting clean seed. Buy disease indexed seeds when available. To reduce bacterial seedborne diseases in crops such as tomatoes, peppers, and brassicas, seeds can be hot water treated. Chlorine treatment can also be useful on some seeds as a surface treatment but will not kill pathogens inside the seed.

Go to this factsheet for more details:
http://vegetablemdonline.ppath.cornell.edu/NewsArticles/HotWaterSeedTreatment.html

Storage – The optimal temperature for seed storage is 34-40 °F with a relative humidity of less than 40%. A refrigerator can be a good storage place. Viability of seed will decrease over time; and after 1 year germination may not be as uniform. Pelleted seed may be primed for quick, uniform germination, but shortens storage life.

Leftover seeds—Do a germination test if using seed from last year. You can do this yourself by placing a specific number of seeds on a moistened paper towel, folding the towel over the seeds and placing it in a plastic bag in a warm place. Inspect seeds twice a day and spray with water as needed to maintain moisture. Count how many seeds have germinated after the usual days to germination for that variety.

There are commercial labs offering germination and other seed tests, including:

New York State Seed Testing Laboratory
6 Harriman Campus Road
Albany, NY 12206

https://agriculture.ny.gov/seed-testing-laboratory

Greenhouse Clean Up

The greenhouse can be another point source of disease in transplant production. Bacterial spot, bacterial speck, bacterial canker, gummy stem blight, and tomato spotted wilt virus, are just a few that can start in the greenhouse and be carried to the field. Bacteria, fungal spores and viruses from previous crops can persist on bench surfaces, pots, trays, and equipment. Plant residues from previous crops and weeds in the greenhouse can also carry over disease. Overwintering insects such as thrips can spread virus to transplants. Pull weeds and remove from greenhouse; weeds harbor disease and insects. Sweep and vacuum debris from greenhouse surfaces and containers before sanitizing. Organic matter will decrease the sanitizing power of products such as sodium hypochlorite (bleach).

Sanitize benches, floors, and tools. If you reuse any plant containers (not recommended) they should be disinfected. Repeated use of chlorine solutions may be harmful to plastics or metals.

There are several different types of disinfectants that are currently used in the greenhouse for plant pathogen and algae control. They are quaternary ammonium compounds (Green-Shield®, Physan 20®, and KleenGrow™), hydrogen dioxide (ZeroTol® 2.0, Oxidate® 2.0), hydrogen peroxide & peroxyacetic acid (Sanidate®), hydrogen peroxide, peroxyacetic acid and octanoic acid (X™-3), sodium carbonate peroxyhydrate (GreenClean Pro Granular Algicide) and chlorine bleach. Bleach contains sodium and chloride. Excess chlorine can be toxic to some plants. Objects to be sanitized with chlorine require 30 minutes of soaking and then should be rinsed with water.

For more detailed information on greenhouse clean up and disinfectants see:

http://ag.umass.edu/greenhouse-floriculture/fact-sheets/cleaning-disinfecting-greenhouse

Media

Start with clean fresh media free of of insects, pathogens, nematodes and weed seeds. Old media, 8 months or older, can be difficult to wet. Keep growing media in a clean area and covered. Select media that is appropriate for germination. It should have finer shredded peat particles, as well as smaller grade vermiculite and perlite. Media should drain well and provide good aeration but still have moderate water-holding capacity, and an appropriate nutrient starter charge for seedlings. The electro-conductivity (EC) reading measuring nutrient salts should be between 0.26 to 0.75 mS/cm using the 1:2 extraction method.

The root tips of these pepper plants are damaged due to fertilizer salts accumulating in media at the bottom of the flat cells. Fertilizer levels in media can be monitored with an EC meter using a simple

extraction method. Leaching salts through the media and out the bottom of the container during irrigations will help avoid this problem.

Fertilizer

Nutrient starter charge in media (if there is any) can be depleted anywhere between 2- 6 weeks after seeding. Monitor soil EC and initiate a fertility program before plants show signs of deficiency.

As a guideline, a dilute fertilizer program ~25 ppm nitrogen (N) is normally started at the opening of the cotyledons and the rate of application is gradually increased as the seedlings grow larger and approach transplanting. For seedlings with two true leaves, provide constant fertilization at 50 ppm N or 100 ppm N 2-3 times per week. Adjust your fertility program to the nutrient starter charge in media and crop demands. Tomato, pepper and cole crops tend to be heavier feeders, cucurbits crops and basil are lighter feeders.

Cool, wet conditions typical in early spring can lead to ammonium toxicity. Use fertilizers with low or no ammonium nitrogen. Media should not be waterlogged. Media with compost tends to be heavier and hold more water.

Avoid high phosphorus fertilizers during transplant production. Phosphorus promotes stretch as do ammonium forms of N. Do not over fertilize and check that your proportioner /injector is properly functioning.

Checking the EC of the water coming out of the hose after the proportioner is a simple way to determine if you are mixing fertilizer correctly and that your proportioner is functioning as it should. Check the fertilizer bag or container for a table of EC readings for target ppm of N at various proportioner settings. The meter in the photo on the right can be used to monitor pH and EC of water and media.

Water Quality

Test irrigation water. Highly alkaline water sources (greater than 200 ppm $CaCO_3$) will raise media pH and result in iron deficiencies, especially in peppers. If you have highly alkaline water you should consider treating water with sulfuric acid or citric acid for organic production. If your alkalinity is moderate (between 120- 200 ppm $CaCO_3$), use an acidifying fertilizer. Fertilizers with a higher proportion of ammonium and urea N cause an acidifying reaction while fertilizers with high nitrate forms of nitrogen cause a basic reaction. Purchase pH and EC meters to monitor media.

The yellowing of the new growth in the tomato transplants is due to iron deficiency induced by the high pH of the soilless media it is growing in. This one measured around 7.2.

Temperature

Reducing the day-night temperature difference, or reversing it, can greatly reduce stem elongation. In most heating programs, a greenhouse will be much warmer in the daytime than nighttime. The greater this difference, the more potential for stretch.

Light

Most vegetable seeds germinate in light or dark conditions (although lettuce needs light). To avoid stretching of seedlings and "leggy" transplants, provide higher intensity light right after germination. After germination, stretching can occur if seeds are left in dark or low intensity light. Be careful if moving seedlings from germination chambers to high intensity light situations. You may need to provide some shading for a few days while seedlings adjust.

Other resources on transplant production

There are excellent detailed fact sheets on many of the topics covered in this article on the Cornell Greenhouse Horticulture website.

The UGA extension publication "Commercial Production of Vegetable Transplants (B 1144)" contains lots of useful information especially for those who are relatively new to transplant production.