

Sanitation Practices:

- **Greenhouse:**
- Hand remove all weeds prior to seeding
- Remove any debris that may contribute to a habitat for insects
- Do not use herbicides in the greenhouse!!
- **Trays:**
- Thoroughly remove all soilless media and plant debris from each tray
- Steam at 160 to 175° F for 30 minutes
- **Mower:**
- Thoroughly rinse with 50% household bleach solution prior to each clipping and when transitioning between greenhouses

Source Water Solution Analysis:

- NCDA&CS analyzes water for a nominal fee. A water analysis is useful in monitoring pH, bicarbonates, and trace elements. A well rinsed regular drink bottle (16 fl. oz.) is sufficient for sampling. Allow water to run from source for several minutes prior to sampling. A water sample will provide information for correcting bicarbonates (Fig. 1).

Germination Temperature:

- Optimum daytime: 86° F
- Optimum nighttime: 68° F
- It is important to fluctuate day and night temperature to break seed dormancy
- Nighttime temperature can be reduced to 55-60° after stand establishment
- Seed trays when the five day forecast predicts bright, sunny days
- Seedlings exhibiting cold injury (Fig. 2) will recover with the addition of warm air

Fertilizer Management:

- 2-1-2 or 3-1-3 ratio fertilizers are recommended
- 20-10-20 and 16-5-16 fertilizer sources are examples of both

Nitrogen (N):

- Add 100-150 ppm seven to 10 days **AFTER** seeding. This will reduce soluble salts injury to seedlings and can reduce the presence of spiral roots (Fig. 3). Add an additional 100-125 ppm four weeks after seeding
- If using an injector, maintain 125 ppm N

Phosphorus (P) and Potassium (K):

- 2-1-2 or 3-1-3 ratio fertilizers provide sufficient amounts of both P and K, when targeted N rate is achieved, excessive P can result in “leggy/spindly” transplants
- P deficiency (Fig. 4) is rarely observed when recommended fertilizers are used

Calcium (Ca):

- Sufficient Ca should be included in the media; if not, 5 oz. Gypsum/100 gal float water prior to seeding is sufficient.
- If a deficiency is confirmed (Fig. 5), 3.51 oz of Calcium Nitrate/100 gallons of water can be applied overhead. Application to the float water is acceptable as well. Both application methods will provide 50 ppm Ca and 40 ppm N.

Magnesium (Mg) and Sulfur (S):

- Sufficient Mg and S are typically obtained from standard fertilizers. If deficiency is a concern, add Epsom salts at a rate of 4 oz./100 gallons of float water.

Boron (B):

- To ensure that a trace amount of B is present, choose a fertilizer that has 0.02% B. Float bed concentration should range from 1-2 ppm, less than 0.5 ppm is considered low. If correction is needed, add no more than 0.2 oz. Borax/100 gallons of float water. This will supply 1.5 ppm B. Collect a water sample prior to seeding to determine B levels. **REMEMBER B is toxic to plants when concentration exceeds 2 ppm (Fig. 6)! Total source water B content should be added to fertilizer B to determine total B concentration in the float bed. A diagnostic float water sample collected after fertilizer addition will provide insight to B concentration.**

Calculation for Gallons of Water in a Float Bed:

- length (ft) x width (ft) x depth (ft) x 7.48 gallons per cubic foot = gallons of water per bed

Fertilizer Calculation:

- desired ppm of nutrient / (% concentration in fertilizer x 0.75) = oz. of fertilizer per 100 gallons



Figure 1. Bicarbonate issue



Figure 2. Cold injury



Figure 3. Spiral root & salt injury

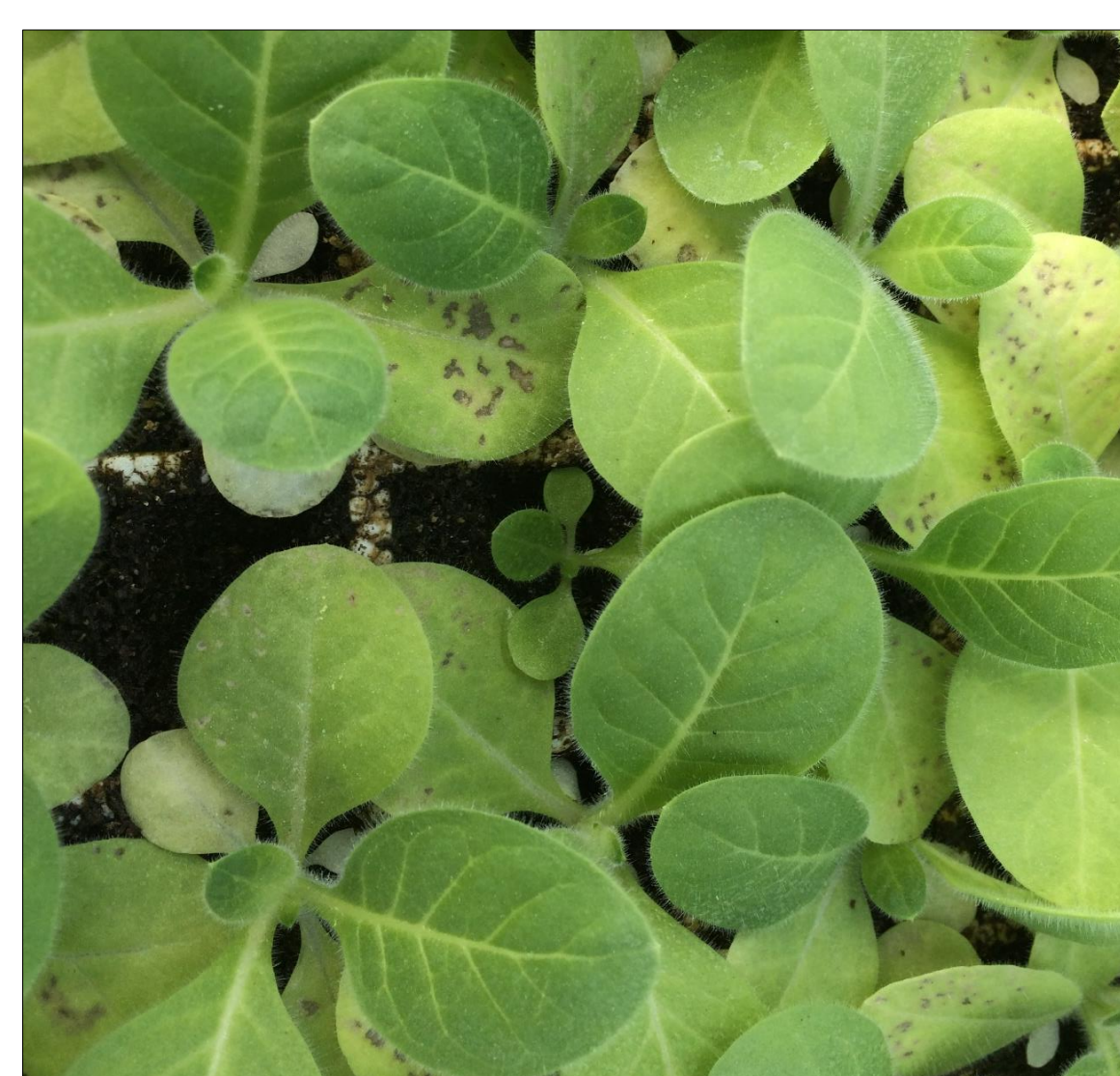


Figure 4. P deficiency



Figure 5. Ca deficiency



Figure 6. B toxicity

Disease Control:

- Sanitation and ventilation are essential to successful disease control
- Dispose of diseased trays
- **Pythium Root Rot:** Terramaster 4EC
 - Preventative rate = 1.0 fl. oz./100 gallons of float water
 - Curative rate = 1.4 fl. oz./100 gallons of float water
 - Ensure that Terramaster is mixed well throughout the float bed. Root pruning is expected. Apply no earlier than 3 weeks after seeding and no later than 8 weeks after seeding. Maximum use of Terramaster is 3.8 fl. oz. per season.
- **Target Spot (Fig. 7):** Quadris F
 - 0.14 fl. oz./1,000 square feet. Use at least 5 gallons of water per 1,000 square feet. Coverage is critical! Make only one application prior to transplanting.
- **Black Root Rot/Tobacco Mosaic Virus/Collar Rot (Figs. 8 & 9):**
 - No chemical control, infected trays and seedlings must be discarded

Seedling Growth Management:

- Clipping properly ensures plant uniformity, hardiness, and number of usable seedlings.
- Begin clipping when plant height is 2 to 2.5 inches above the tray or 1.5 inches above the bud.
- Clipping 5 times increases usable plants by increasing stem diameter and reducing stem elongation. After the 5th clipping, seedlings are only being “held” until transplanting.
- Discard plant clippings at least 100 yards from the greenhouse for sanitation purposes

Insect Control:

- **Aphids, Flea Beetles, and Thrips:**
 - Orthene = 0.375 oz. in 3 gallons of water per 1,000 square feet during seedling production
 - Admire Pro = 0.6-0.8 fl. oz. per 1,000 plants (check formulation) for field protection
 - Platinum = 0.8 fl. oz. per 1,000 plants (check formulation) for field protection
 - Admire Pro and Platinum should be applied overtop of transplants and then rinsed off immediately to ensure media wash-in
 - Admire Pro and Platinum treated seedlings should be transplanted within 3 to 5 days following treatment

Estimated EC Meter Reading Examples

	100 ppm N	150 ppm N
Ultrasol 16-5-16	0.80 mS/cm	1.20 mS/cm
Ultrasol 20-10-20	0.65 mS/cm	0.975 mS/cm

* If acid is utilized to correct bicarbonates, EC reading will be elevated

* Many greenhouse fertilizer labels contain estimated EC readings



Figure 7. Target Spot



Figure 8. Black Root Rot



Figure 9. Collar Rot

Prepared by:

-Tyler Whaley, Extension Agent-Wayne County, Agriculture & Natural Resources
-Matthew Vann, Extension Tobacco Specialist, Department of Crop & Soil Sciences
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Recommendations for the use of chemicals are included in this article as a convenience to the reader. The use of brand names and any mention or listing of commercial products or services does not imply endorsement by the North Carolina Cooperative Extension Service nor discriminated against similar products or services not mentioned. Individuals who use chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Be sure to obtain current information about usage and examine a current product label before applying any chemical. For assistance, contact an agent from North Carolina Cooperative Extension Service