Vegetable Transplant Production in Greenhouses

Krishna Nemali, Ph.D.
Asst. Professor, Controlled Environment Agriculture
(765) 494-8179, knemali@purdue.edu
Purdue University

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Commercial Transplant Production in Florida
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Vegetable Transplant Production
Dan Drost, Extension Vegetable Specialist

Commercial Production of Vegetable Transplants
W. Terry Kelley, Extension Horticulturist, George E. Boyhan, Extension Horticulturist, Darbie M. Granberry (retired), Extension Horticulturist, Stormy Sparks, Extension Entomologist, David Langston, Extension Plant Pathologist, Stanley Culpepper, Extension Weed Scientist, Paul E. Sumner, Extension Engineer, Greg Fonsah, Extension Economist

Growing Vegetable Transplants
By Lewis W. Jett, WVU Extension Service commercial horticulture specialist

Outline

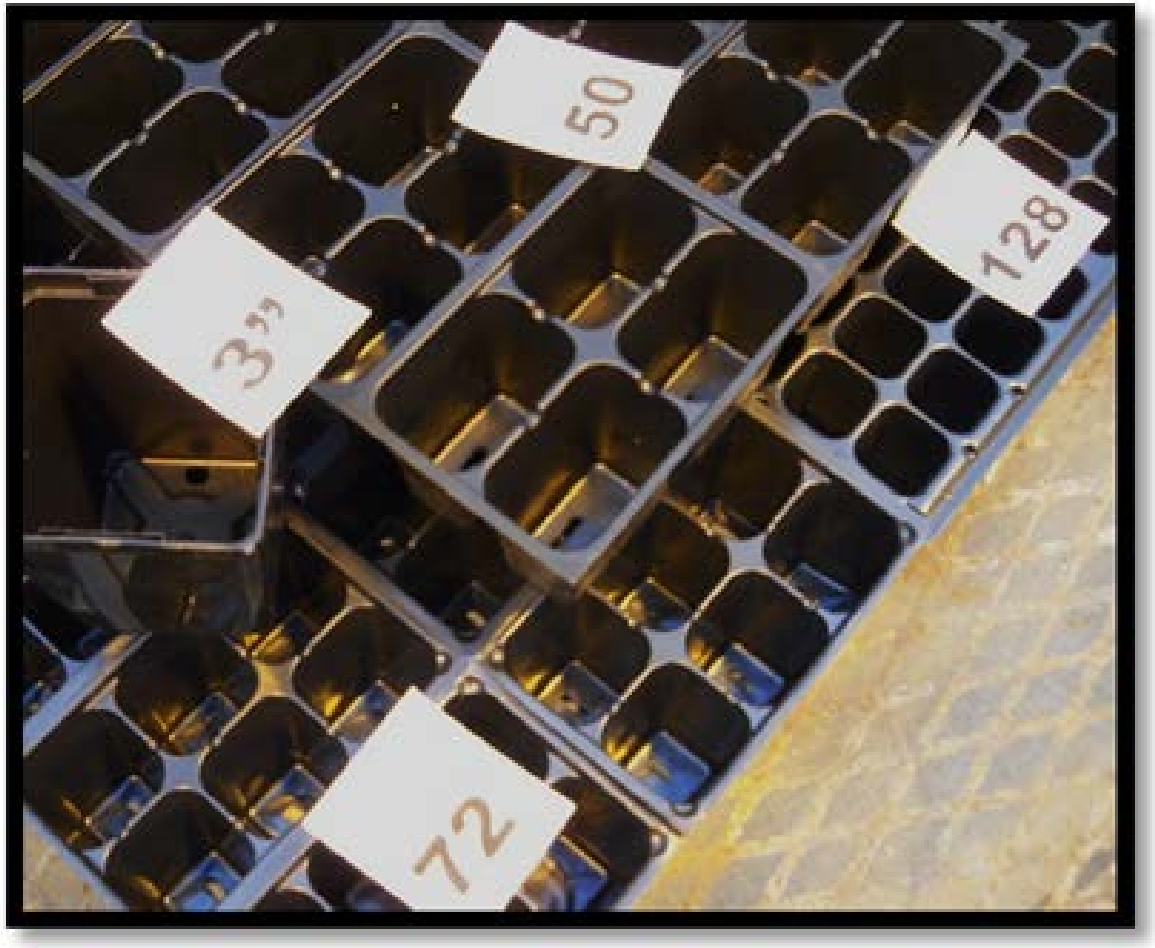
- Containers and media
- Seeding and scheduling
- Growth systems, irrigation and fertilizer
- Growth control
- Hardening

Advantages of greenhouse transplants

- Transplants can be produced earlier
- Transplants are uniform and stocky
- Growth can be controlled easily
- Protection from harsh environment
- Less shock at transplanting due to root ball

Containers for transplants

Polystyrene tray



Plastic tray

Containers for transplants

- Cell shape has no relation to crop growth whereas volume or height can affect growth
- 1-inch cells: cabbage, cauliflower, kale, broccoli and lettuce
- 2-inch cells: tomato, pepper, water melon, musk melon, cucumber
- Inserts available for older polystyrene trays that have cracks
- More water available to plants in plastic trays than polystyrene trays, this results in increased transplant growth under plastic trays
- Sanitize trays with chlorine bleach when reusing; properly aerate after sanitization

Media for transplants

Peat
(organic, ~70%)

Moisture/nutrients

Vermiculite
(inorganic, ~20%)

Moisture/nutrients

Perlite
(inorganic, ~10%)

Drainage

+ Wetting agent

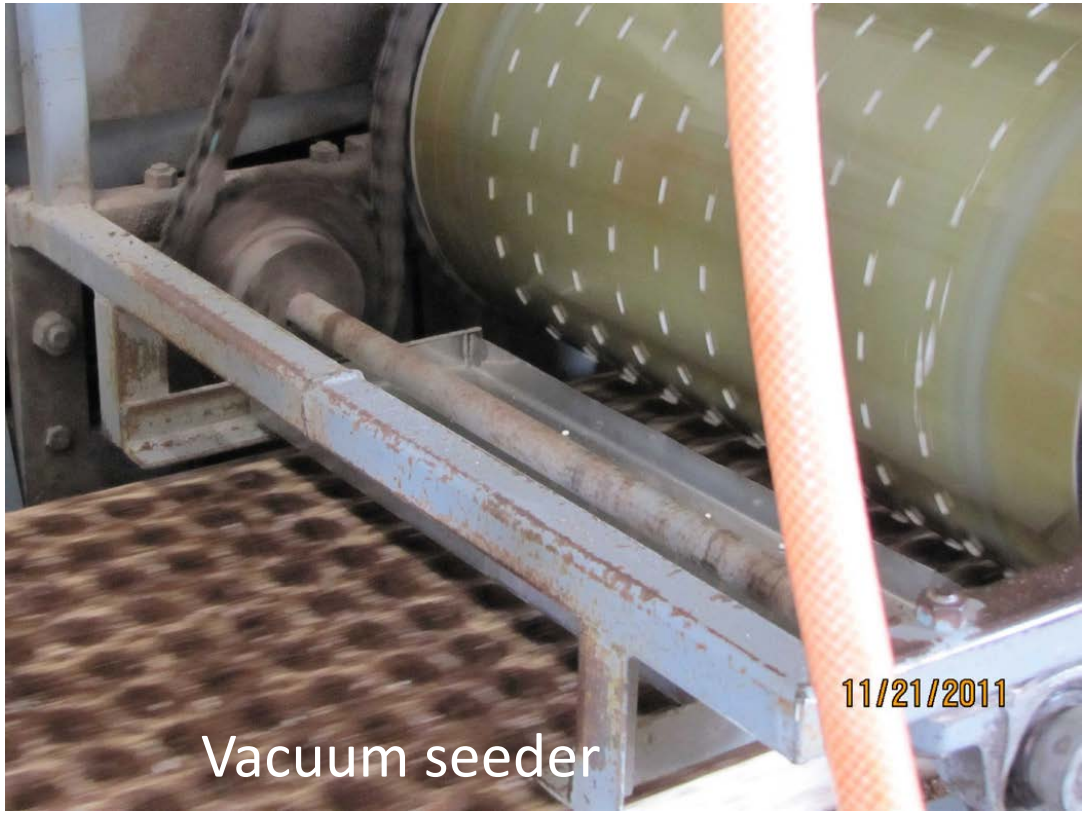
Media for transplants

- Avoid using field soil due to poor drainage, weeds and pest infestation
- Usually commercial mixes are more uniform than custom mixes
- Media should be fine, avoid media for bedding plants or large containers
- If using compost, ensure that it is pasteurized, decomposed properly and you are aware of nutrient status
- Organic producers: ATTRA publications on *Potting Mixes for Certified Organic Production* and *Plug and Transplant Production for Organic Systems*.

Mechanical tray filling equipment

Seeding transplants

- Buy high quality seeds with high germination rates
- Moisten media before dribbling
- Apply a layer of vermiculite at the top of tray after seeding
- Pelleted seeds are better
- Water seeds with warm water (70 F) after seeding if possible



Vacuum seeder

Temperature is key for germination (along with water)

Crop	Germination Temp (F)
Asparagus	75-85
Brassica Crops (broccoli, cabbage, kale)	70-80
Cucurbits (cucumber, melons, squash)	75-95
Greens (chard, lettuce, spinach)	60-70
Bulb Crops (leeks, onions)	65-80
Solanaceous Crops (eggplant, pepper, tomato)	75-85

Accelerate seed germination

Heat mats

Cold frames

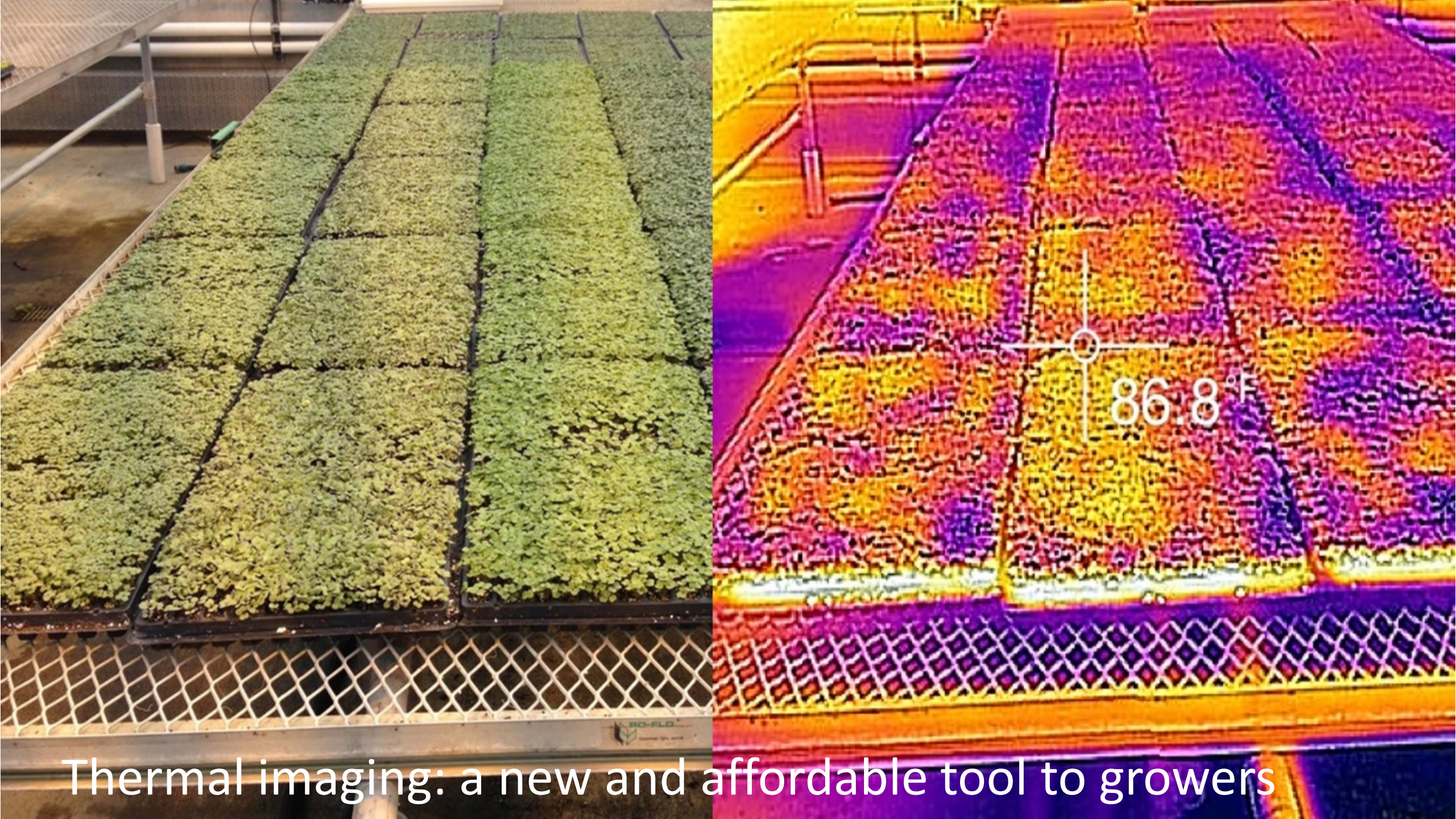
Scheduling transplant production

Crop	Weeks from Seed to Transplant in Field
Cabbage	4 to 6
Cauliflower	4 to 6
Broccoli	4 to 6
Lettuce	3 to 4
Eggplant	6 to 8
Peppers	6 to 8
Tomatoes	5 to 8
Squash/ Pumpkin	2 to 3
Cucumber	3
Watermelon	3 to 4
Melons	2 to 3
Onions	10 to 12

Growing systems (based on irrigation)

Rail/bench system

Float system

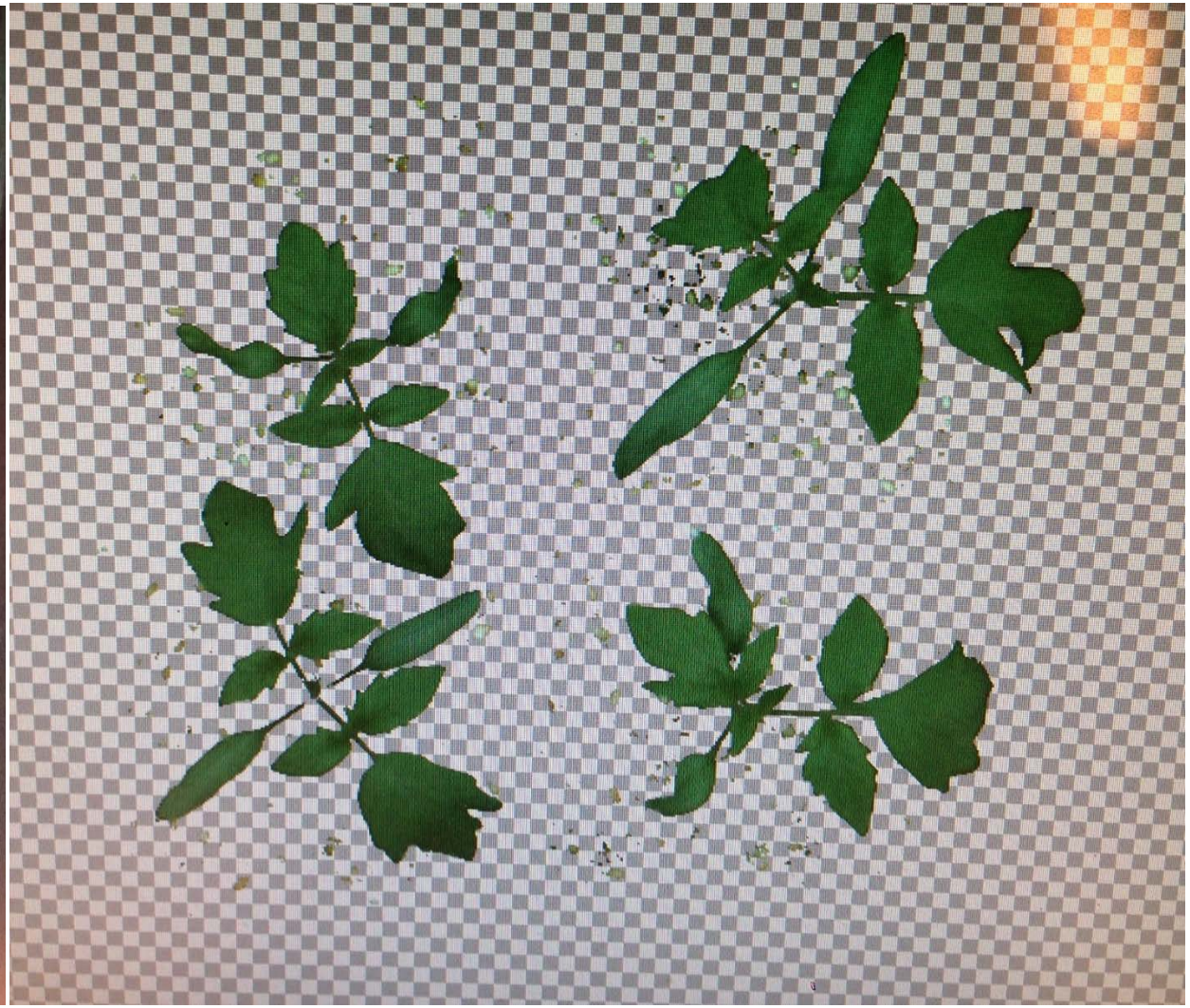


Thermal imaging: a new and affordable tool to growers

General fertilizer guidelines

- Check if the media contains starter charge; if yes, delay fertilization for a couple of weeks
- Apply fertilizer solution until it drains out
- Apply a balanced fertilizer solution with an EC of ~ 1.5 mS/cm
- In terms of N, apply at 50-100 ppm depending on the crop.
- Solanaceous and cole crops get more N while cucurbits get less N
- Fertilizer rates are usually 30-50% lower under subirrigation. Why?
- Managing media pH is crucial to avoid nutrient deficiency/toxicity symptoms. Best pH is ~6.

Supplying fertilizers based on crop growth rate



Transplant Growth Control

- Goal is to produce study and stocky plants not big plants
- Elongated transplants are susceptible for stresses after transplanting in the field
- Plant growth regulators, except for sumagic, are not allowed
- Supplemental light, lowering fertilizer and mild drought can aid in reducing seedling elongation

Growth control using negative DIF

- DIF stands for difference in night and day temperature
- Negative DIF indicates that night temperature is greater than day temperature (ex: night 60, day 55 F)
- Negative DIF for 2-3 h during the morning can reduce plant height
- This is possible during cooler months by allowing outside air in the greenhouse

Mechanical Stress for growth control

Using mechanical stress (ex: brushing plants gently), we can control plant height, improve plant strength, stress tolerance, insect resistance

Crop and cultivar	Stem length (cm)	
	Untreated	Brushed
Tomato		
Sunny	20.4	9.6*
Celebrity	19.0	9.5*
Eggplant		
Black Beauty	14.6	9.2*
Ping Tung Long	9.4	6.2*
Cucumber		
Suyo Long	23.0	16.0*
Sweet Success	26.6	20.5*
Squash		
Dixie	9.6	8.0*
All Seasons	7.0	6.0*
Cream of the Crop	7.3	5.5*
Broccoli		
Early Dawn	8.0	6.9*
Green Duke	7.8	7.3*
Symphony	6.4	6.2
Premium Crop	5.6	5.8
Green Comet	4.9	4.8
Cabbage		
Conquest	5.6	5.0*
A&C #5	4.3	4.0
Rio Verde	4.1	4.1
Gourmet	4.9	4.9
Market Prize	4.3	3.9*

*Significantly different from respective untreated control; $P < 0.05$.

(Latimer, 1998)

Hardening transplants

- Hardening store carbohydrates in stems and develop waxy coatings on leaves
- Goal of hardening is to reduce growth so reserves are stored in plants
- Ventilation by cool air, exposure to sun light, mild drought or lowering fertilizer can harden transplants
- Harden transplants a week prior to moving to field