

Vegetable Transplant Production

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Why Transplant ?

1. High seed cost (seedless watermelons)
2. Earliness (tomato, pepper, other warm season crops)
3. Uniform stand and harvest
4. Reduces amount of time the plant is in the field
5. Eliminates the need for thinning

Why Not Transplant ?

1. Not cost effective (lettuce)
2. Some crops not adapted (sweet corn, some cucurbits).
 - Roots are destroyed by the process and roots do not regenerate easily
 - Not efficient in water uptake

Success =

- Temperature control
 - 80F for rapid, uniform germination
 - grow out @ 75°F day/65°F night
- Water
 - harden off by withholding
- Nutrition
 - do not cut back

Keys to Success

1. Start with excellent seed
 - high germination %
 - excellent vigor
2. Practice good greenhouse sanitation
 - bacteria and fungi can survive in plant debris for years
 - clean flats, benches, pipes, tools with a 1% solution of bleach

Keys to Success (cont.)

3. Water
 - test for: pH, alkalinity, Ec (salts)
 - use 68°F water for young seedlings
4. Understand how the fertilizer injector works – know dilution of stock
5. Watch for pests
 - rodents
 - thrips, whitefly, mites

Growing Structures

- Coldframes, hotbeds
- Small greenhouse – 1 layer poly
- Greenhouse – 2 layer poly
- Wagons



**Coldframe,
Hotbed**

**Small, single
layer plastic –
note vent**



2-layer poly, fans

**375 flats of standard
No. 1020's**



Short season bedding plants as:



**Cukes
Melons
Squash,
summer**



Old hay mulch

**Wood burner
in center**

Ethylene Damage Most Common

- Long term exposure (chronic)
- 0.01 – 1 ppm
- Acute (short exposure)
- 1 ppm for 3 hours



Symptoms

- yellowing of lower leaves
- leaves drooping
- flowers drop off



Bedding plants hit by frost



Cold Injury (prior to flower appearance)



Common Problems

- High temperature
 - Over water
 - Low light
- = spindly, soft transplant resulting in field death



Crowding – 1/2 inch

High light
vs
Low light



Common Problems (cont.)

- Low germination temperature, < 70°F
- Sow too soon in the spring
- Excess fertility (soluble salts)
- P deficiency
- Poorly drained media (using soil)



Seedlings showing **short** stem growth caused by:
 1. Controlled watering
 2. Temperatures at 75°F or below.



Seedlings showing **elongated** stem growth caused by:
 1. Over-watering
 2. Temperatures above 75°F.



Bell pepper

Hot – Jalapeno

Need heating pad for hot peppers, eggplant

Pepper Transplants



Too large, flat bound

K deficiency



Nutrition Example Weekly Feed

Tomato 200N – 30P – 250K

Muskmelon 250N – 25P – 250K

Artificial media assumed

A good fertilizer analysis = Poinsettia mix

17 – 5 – 19 (Johnsons Whsle)

25 – 5 – 15 (Peters or Jacks)

Growing Conditions

Crop	Temperature, °F			Time, wks	Plts/sq.ft
	Germ.	Day	Night		
Broccoli, caul.	70-85	65-70	60	5-6	48
Cucurbits	85-95	70-75	65	3	24
Pepper	70-85	70-75	60	5-7	36
Tomato	70-85	75	60	4-6	24
Eggplant	75-85	70-85	65	5-7	36

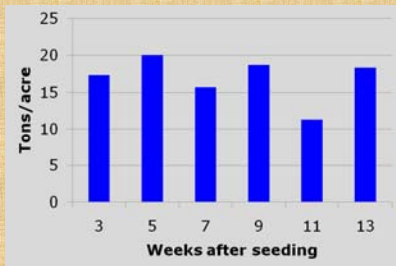
Does Transplant Age Make a Difference ?

Answer = Yes. Exception = watermelons

- tomatoes, peppers = 4-5 week old out performed 6-8 week old plants in earliness, yield, and fruit size

- Cabbage = highly variable depending on variety

Transplant Age - Watermelon



Florida, 1993 data, 2-inch cell size,
Crimson Sweet (Dr. Varina, Univ. Florida)

Leave the Cotyledons Intact

No. Cotyledons Removed	Tomato Delay in Cluster Appearance		
	1st	2nd	3rd
1	4	4	3
1.5	7	6	5
2	10	11	8

Plant Physiol. 48: 482-489. 1973.

Ideal Transplant



Stocky – as tall as wide



Mixes and Containers

- Jiffy pots, jiffy 7's are not used commercially
- Cell trays - specific sizes for specific purposes and crops
- Artificial mixes = 100%. Soil introduces pathogens and weed seed

Prepare your own mix?



Problems if you use soil as a portion of the mix



Herbicide carryover



Soil pathogens

Soil Mixes

Choose as coarse a mix as possible for the tray chosen. (Examples are: Metro-Mix 360, Fafard Professional No 2, Sunshine L2, Pro-Mix BX)



Do not use a plug mix!

- Plug mixes are too fine.
- A fine mix holds too much water resulting in less oxygen available to the roots



Use square cells when ever possible

Round cells cause root girdling

Hardening Off

Why? To reduce transplanting shock or stress

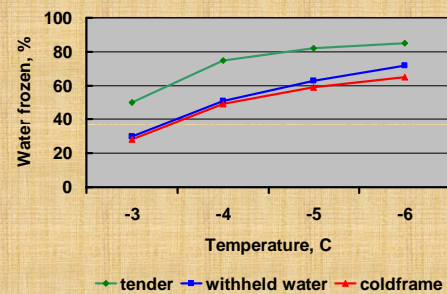
How? Reduce optimum growing conditions

Options

- Reduce temperature
- Increase ventilation
- Withhold water
- Reduce fertilizer application

Above only if not in plasticulture system

The most practical, without injurious consequences, is to withhold water.



Cabbage leaves. Rosa, Missouri Res. Bul. 48, 1921.

Plugs ? (cells > 128)

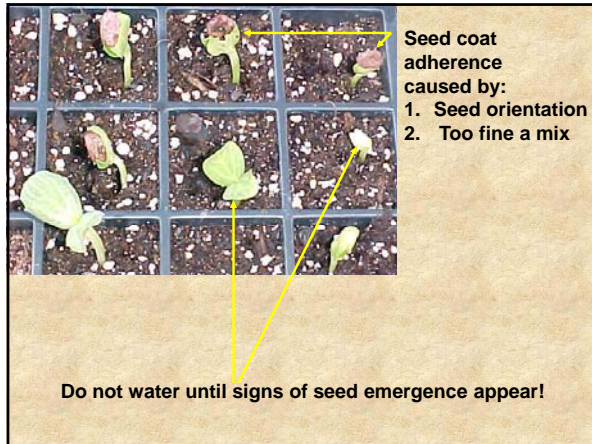
- Root volume is too small to practically withhold fertilizer and water
- Poor plugs =
 - tall, spindly
 - thin stems
 - very sensitive to transplant shock
- Bring in cooler night air - use fans
- Move out into full sunlight



Radicle end pointed up if possible

Watermelon seeding

Place seeds at least one inch deep



Success in the Field

1. Use young, vigorous plants
 - minimize root breakage
 - keep seed leaves sound
 - do not over-harden
2. Transplant under favorable conditions
 - cloudy, high RH days
 - wind at low mph
3. Immediate watering

4. Use a 'starter fertilizer' solution
 - contains high P fertilizer
 - may not be needed if transplant late spring into high fertility soil

Monitor temp daily if clear row cover used

Remove cover when max air > 83°F

Earliness is the key

First cluster missing

First cluster set

Need Irrigation

Wind Damage



Windbreaks Needed



Ease of Transplanting

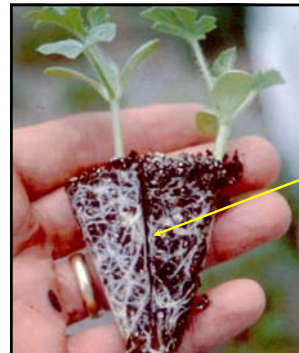
Easy = cole crops, tomato. Efficient in water absorption and form new roots rapidly

Moderate = celery, eggplant, onion, pepper. Do not absorb water as efficiently, but quickly form new roots

Hard (special care and containers) = cucurbits, sweet corn.

- Roots are easily injured during transplanting. Develops 'suberin' a compound that prevents root initiation.

- Cannot be held, plant becomes too large during transplant development.



Well formed root systems of watermelon transplants.

Correct transplanting stage



Irrigation a Must !!



Sweet Corn cell size and type



Wind damage –
cannot harden
off sweet corn

Need a row
tunnel

Is Depth of Planting Important?

- Plant deep to avoid wind breakage?
 - Tomatoes will generate roots along the stem, but not peppers
 - Smother growing point results in growth distortion – corn, lettuce
- Head lettuce – deep planting results in a long skinny head. Height does not vary, but width varies greatly. Leaf pressure on the growing point causes change.

	<u>width, inches</u>
Shallow	4.88
Medium	4.65
Deep	3.69

Stem Scalded from Black Plastic



90°F temperature day
after transplanting



Heat stress on
stem of the plant



For Further Information

In-depth California guide can be found at:

<http://anrcatalog.ucdavis.edu/pdf/8013.pdf>

Midwest veg production guides:

<http://ohioline.osu.edu/b672/pdf/Transplants.pdf>

<http://www.btny.purdue.edu/pubs/ID/ID-56/>