Crop production methods for hydroponic vegetables

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Propagation

- Seed propagation
  - Most common
  - Cost of seed varies across crops
  - Typically started in rockwool, phenolic foam, or stabilized organic substrates
- Cutting propagation
- Grafting

Seed propagation

- Use diluted fertilizer solution
  - 50 to 150 ppm N or ¼ to ½ the EC of nutrient solution used for finishing.
- Temperature and light intensity need to be gradually adjusted.
- Time to produce transplantable seedlings varies with species, culture, and goal.

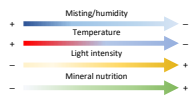


Cuttings and runners

- Can be purchased or grown from stock plants.
- Substrate choice depends on crop and production system to be used.
- Rooting hormone may help with uniformity.

Cutting propagation

- Mist and shade are initially applied.
- Temperature should be warm at the beginning.
  - Bottom heat can help.



- Light intensity and fertilizer concentration should increase as cuttings grow to promote root growth and reduce the time to transplanting.
  - DLIs between ~10 to 16 $mol \cdot m^{-2} \cdot d^{-1}$

Grafting

Popular for high-wire tomato production.

Lettuce

- Typically grown in DWC or NFT systems.
- Growth is often proportional to the amount of light received (≥12 mol·m^{-2}·d^{-1}).
  - Head lettuce varieties cannot be pushed too quickly with DLI.
  - Responds well to CO_2 enrichment.
- Day/night temperatures and RH are maintained at 68-75/60-66° F and 50 to 70%.

Culinary herbs

- Wide variety of crops:
  - Annual: basil, parsley, dill, and cilantro
  - Perennial: rosemary, mint, thyme, and oregano
- Typically grown in NFT or DWC systems.
- Most grow well at moderate day temperatures (72 to 75° F) and moderate to high DLIs of ≥12 to 15 mol·m^{-2}·d^{-1}.

High-wire (vine) crops

- Indeterminate cultivars, typically grown in double rows using slabs or Dutch buckets.
- Nutrient solution is adjusted as plants transition from vegetative to fruit production.
- Most grow well at moderate to warm day temperatures (70 to 85° F) and high DLIs of ≥20 mol·m^{-2}·d^{-1}.
- CO_2 is often maintained at 1000 ppm.
- Brix can sometimes be enhanced by managing the nutrient solution.

Pruning and training is needed!

Strawberry

- Typically produced using soilless culture (substrate-based system).
- Cultivar selection will depend on geographic location and market.
  - June-bearing cultivars flower in response to short days.
  - Ever-bearing cultivars can flower under a range of day lengths.
- Day/night temperatures are maintained at 75/60° F.
- Considered high-light plants (DLIs of ≥17 mol·m^{-2}·d^{-1}).
- Constant harvests are necessary.
  - Fruit should be at least 50% ripe.

Harvesting lettuce




Whole plant vs. leaves

Harvesting herbs

Whole plant vs. leaves


Harvesting fruit


Postharvest care

- Shelf life varies with species and product.
- Most leafy greens and herbs are cold tolerant and should be stored just above freezing temperatures.
  - Basil is an exception (>50 °F), as it is prone to develop chilling injury.



Fruit storage

- Fruit temperature should be reduced after harvest.
- Shelf life greatly depends on ripeness, storage temperature, humidity, and gases.
  - ~40 to 50° F and high relative humidities (>85%) are commonly used.
- Care should be placed when storing different produce in the same cooler.




Thank you!

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