BASICS OF MICROGREENS

John Roberts, PhD
(partly adapted “Growing Microgreens can be for Everyone” by Terry DelValle)
What are “microgreens”?

- Origin…

- Cotyledon…
Sprouts vs. Microgreens

- **Needs**
  - Growth medium
  - Ventilation requirements
  - Light requirements

- **Harvest period**
- **Size**
- **Maturation of physiology**
- **Nutrition**
- **Culinary uses**
Microgreens vs. Baby Greens

• Microgreens: ~2” tall
• Baby Greens: ~3-4” tall

• No legal definition…. 
Advantages

• Require very little room
• Time of year and climate do not impact microgreen growth
• Concentrated nutrition and taste
• Fast harvest
• Typically low-cost

Disadvantages

• Relatively short shelf life
• Short harvest windows
• Seeds price varies (some are expensive)
Plants

• Fast - Brassicas (Mustard family) and radishes tend to be fast growing (~3-10 days)

• Intermediate – amaranth, beets, carrots, chards, a few brassicas (‘red giant’ mustard, ‘red pac’ pac choi) (~10-20 days)

• Slow (16-25 days) – carrots, most herbs, marigold
Common to Semi-Common Plants

- Amaranth
- Basil
- Cilantro/Coriander
- Celery
Common Plants

- **Brassicaceae** (mustard family / cruciferous plants)
  - Broccoli
  - Kale
  - Bok Choy / Pak Choi
  - Tokyo Bekana
  - Mustard
  - Arugula
  - Cabbage
  - Garden Cress
Other Common Plants

- Endive
- Peas
- Radish
- Beet family
  - Beets
  - Chards
Many others

- Sunflower
- Buckwheat
- Onion
- Beans

Herbs
- Basil
- Cilantro
- Chive
- Dill
- Fennel
- Lemon balm
- Lemongrass
Plants unsuited for microgreens

- Lettuce (i.e., many within *Asteraceae*)

- *Solanaceae* (tomato, pepper, potato, eggplant, etc.)
Equipment

• 10” x 20” tray is standard….
• But, there are many options that can work (e.g., pie pans, food containers, event plates…)
Where to get soil and supplies?

• Local garden stores (hydroponics / greenhouse)
• Online
Containers

- Any container will work that is sterile and is 2” to 3 ½” deep; drainage a plus
- Food grade only
- Examples: flats, plastic or peat pots; commercial growers use 20-row seed flats
- To sterilize old pots: clean and disinfect with Clorox/water 1:9 dilution
Where to get seeds?

- Mountain Valley Seed Catalog
- Online is usually easy
  - Johnny’s
  - Burpee’s
  - True Leaf Market
  - Other online retailer’s…”

Price for Seed

- Varies with crop
- Sango Purple Radish
  1 oz = $5.00
- Amaranth, Red Garnet
  - 1 oz conventional = $6.27
  - 1 oz organic = $8.20

- Basils
  - 1 oz dark opal = $11.70
  - 1 oz red ruby = $13.60
  - 1 oz lemon basil = $6.80
- Gem Marigold 1 oz = $24.20
- Red Veined Sorrel 1 oz = $23.20

Prices taken from Johnny’s Selected Seeds & Mountain Valley Seed Co. (2017 catalogues)
Seed Germination

- 65 to 75°F ideal for most
- Germination Medium
  - Sterile
  - Oxygen
  - Moisture
  - No fertilizer
  - Holds water but drains freely
  - Particle size in direct proportion to seed size; fine textured for small seeds
Soaking Helps with Some

- Beets (24 hours)
- Cilantro (2 hours)
- Buckwheat (12 hours)
  - Rinse & drain seeds twice daily for 2 days
- Peas (8-12 hours)
- Sunflower (8 hours)
- Nasturtium (8 hours)
- Popcorn (8 hours)
- Winter wheat (8 hours)
**Media vs. Fabric/Mats**

**Pros**
- More easily available
- Typically more flexible for different types of containers

**Cons**
- Potential for contamination (i.e., so use growing mix)
- Typically requires more clean-up

**Pros**
- Less messy
- Easier harvest
- Can be easier due to ‘hydroponics’

**Cons**
- Typically requires more set-up and forethought
Germination Media

- Peat Moss (holds water)
- Coconut fiber (holds water)
- Shredded Sphagnum (holds water)
- Vermiculite (light weight material, holds water)
- Perlite (light material for air/drainage)
- Jiffy Mix: equal parts sphagnum, peat, vermiculite & some nutrients
- Any combination of above products

Another option: Mat or lining in bottom of tray; very fibrous

- Seed density
  - ~10 seeds per square inch
Fabric Materials

Burlap (left) must be organic

BioStrate Felt (bottom)
Micro Mats

- For hydroponic culture
- Made from wood fiber
- When wet 5” x 5”
- Can be composted
- Once germinated, water from below
- Falls apart if lifted unless plant roots hold it together
Media is Best for Some Seeds

- Beet
- Buckwheat
- Cilantro
- Chard
- Nasturtium
- Peas
- Sunflower
- Check seed packet or catalogues for instructions
Mucilaginous Seeds

- Jelly-like coating on seed once wet
- Make sure to keep moist so germination and establishment occurs
- Examples: basil, chia, cress
Water Quality

- Some seed sensitive to chlorine
- Some references suggest water with pH of 6.0 is best
- To make H2O more acidic add lemon juice to water and stir thoroughly

Vinegar also used by some growers
Maintenance

- Remove cover and mist twice a day
- Keep covered (dark) for ~ 4-5 days
- Remove cover 1 day after cotyledon leaves emerge & place in light; 4 hours/day

You want seedlings to stretch
Easier to harvest 1 ½” stem
<table>
<thead>
<tr>
<th>No Cover</th>
<th>Light Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broccoli</td>
<td>Amaranth</td>
</tr>
<tr>
<td>Cabbage</td>
<td>Arugula</td>
</tr>
<tr>
<td>Lemon balm</td>
<td>Basil</td>
</tr>
<tr>
<td>Mint</td>
<td>Beet</td>
</tr>
<tr>
<td>Oregano</td>
<td>Chervil</td>
</tr>
<tr>
<td>Thyme</td>
<td>Dill</td>
</tr>
<tr>
<td></td>
<td>Fennel</td>
</tr>
<tr>
<td></td>
<td>Kale</td>
</tr>
<tr>
<td></td>
<td>Mustard</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Light Cover</th>
<th>Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pea</td>
<td>Carrot</td>
</tr>
<tr>
<td>Sage</td>
<td>Celery</td>
</tr>
<tr>
<td>Shiso</td>
<td>Swiss chard</td>
</tr>
<tr>
<td>Sorrel</td>
<td>Chive</td>
</tr>
<tr>
<td>Tatsoi</td>
<td>Cilantro</td>
</tr>
<tr>
<td>Wasabi</td>
<td>Parsley</td>
</tr>
<tr>
<td></td>
<td>Radish</td>
</tr>
<tr>
<td></td>
<td>Sunflower</td>
</tr>
<tr>
<td></td>
<td>Watercress</td>
</tr>
</tbody>
</table>

Information provided by Aparna Gazula and Wanda Laughlin UF/IFAS
Mat Grown Seed after 9 Hours in Light on Right
Soil vs. Mat - Day 6

Back row: tatsoi, cressida cress, garnet red amaranth, cilantro

Front row: kohlrabi, garnet mustard, carrot, dark opal basil
Using Media

- Fill containers with moist growing medium
- Seed density
  - 10-12 per square inch for smaller seed
  - 6-8 per square inch for larger seed
- Broadcast or plant in rows

Covering seed lightly with media or fine vermiculite is optional; more important for larger seeds
• Gently press seeds onto surface
• Mist & cover
• Seed may need warmth (refrigerator top, heating cables)
• Check specifics for temperature needs, etc.
Spread seed evenly on top of media.
Gently press seed into media or cover lightly with media.
Moisten the seed & place in plastic bag; can keep in dark.
Mist lightly ~ twice a day
Keep covered during root development
Once cotyledons emerge, remove cover & place in light
Place on sunny window sill

Turn 180° each day
Potential problems

- Seed concentration
- Not enough light
- Temperature (too warm or too cold)
- Irrigation (too dry or too wet)
- Inconsistent conditions
Excess seed concentration + excess water
In Light for 9 Hours on Right

Media - Day 5 after seeding

Place in south facing window
Growing Seedlings

- Most do not need fertilizer but for longer growing microgreens, can use weak fertilizer solution
- Water as needed but do not overwater; keep moist but not wet (damping-off); best to water from bottom
- Keep peas on the dry side
General Growing Conditions

• Irrigation
  • Moist (not flooded)
  • Mist or lightly water twice per day

• Light
  • Required after germination (>6 hrs)
  • Put in a South-facing window
  • Rotate 180 degrees every day

• Temperature
  • 70-75°F is ideal

• Humidity
  • >50% humidity
Harvesting

- At desired height ~ 2”-3” tall
- Best at night or morning when cool & in shade
- Cut with scissors or electric knife just above soil line
- Wash and spin dry with salad spinner or on paper towels
- Refrigerate in plastic container or use fresh

Harvest at appropriate stage, time varies
Keeps for 5-6 days in fridge
Harvest

• Cut just above the soil line
• Consumption of roots is not advisable
Options

- Leaving greens on substrate, can be stored in cooler for 2-3 weeks
- Cut as needed
- No soil/media allowed in restaurants
Uses & Attributes

- Soups
- Stews
- Salads
- Sandwiches
- Main dishes
- Garnishes

- Spicy, mild or sweet
- Adds color & texture
- Flavor more intense than mature plants
- Sometimes more nutritious than mature plants; the more intense the color, the more nutritious
Are Microgreens Healthier?
(Univ. of Maryland)

• “4 to 40 times (X) more concentrated with nutrients”
• Red cabbage 40X more Vit. E & 6X more Vit. C
• Cilantro 3X more beta carotene (Vit. A)

• Highest Vit. C, K & E
  o Red cabbage, Garnet amaranth, green daikon radish

• Buckwheat – same protein as oats
  o Plus high in antioxidants, flavonoids, carotenoids & alpha-tocopherol
  o Doesn't keep as well once harvested
Harvest at cotyledon stage in 5-10 days for best flavor
What now?

• Personal trials
• Good record keeping
• Repetition (*Repetitio est mater studiorum*)

• Timing production cycles
• Estimating yields
Resources


- https://gardeningsolutions.ifas.ufl.edu/plants/edibles/vegetables/microgreens.html

- http://edis.ifas.ufl.edu/hs1164

- https://conference.ifas.ufl.edu/gardener17/presentations/1%201100%20DELVALLE%20grow%20your%20own%20microgreens.pdf
Image sources:

- https://draxe.com/nutrition/microgreens/
- https://montecristomagazine.com/magazine/summer-2016/sky-harvest
- https://montecristomagazine.com/magazine/summer-2016/sky-harvest
- https://www.betterlivingfarm.com/microgreens/swiss-chard
- https://www.amazon.com/Radish-Sprouting-Seed-Heirloom-Microgreens/dp/B06XRLNSV2
- https://sproutpeople.org/celery-micro-greens/
- https://sproutpeople.org/cilantro-micro-greens/
- https://www.amazon.com/Genovese-Basil-Microgreens-Seeds-Gardening/dp/B00YDE8YAW
- https://www.longislandmicrogreens.com/products/arugula-microgreens
- https://www.longislandmicrogreens.com/products/kale-microgreens
- https://www.hamama.com/
- https://www.microveggy.com/sprouts-vs-microgreens/