

BASICS OF MICROGREENS

John Roberts, PhD

(partly adapted “Growing Microgreens can be for Everyone” by Terry DeValle)



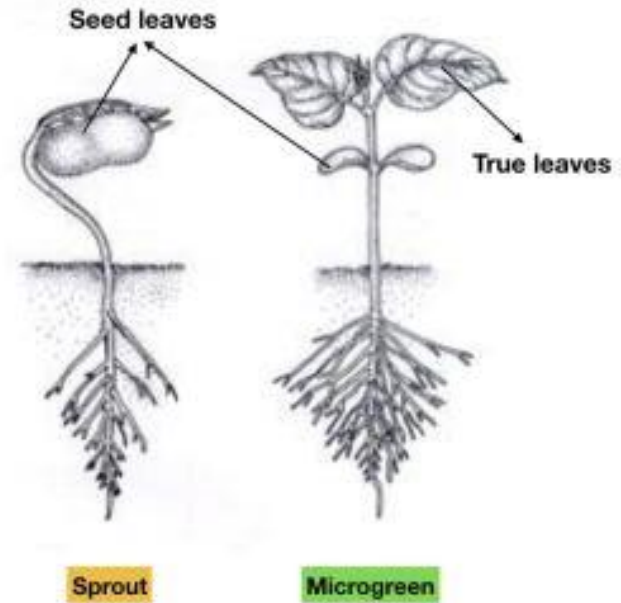
What are “microgreens”?

- 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....



SPROUTS



MICROGREENS

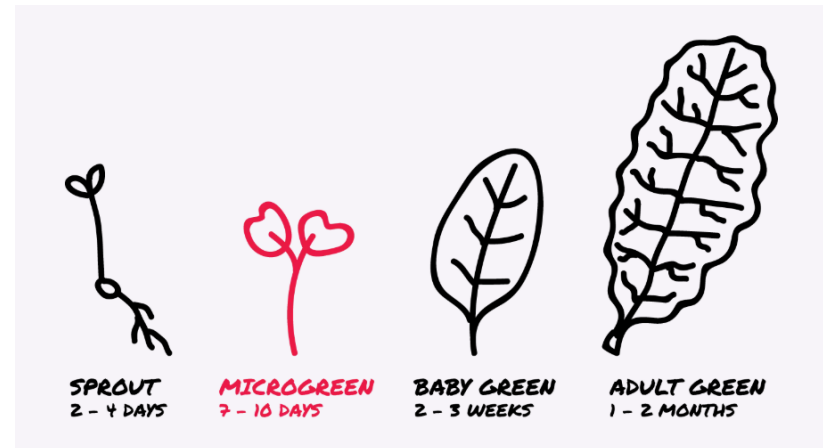


BABY GREENS

Advantages

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

General maturity timeline:



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 →

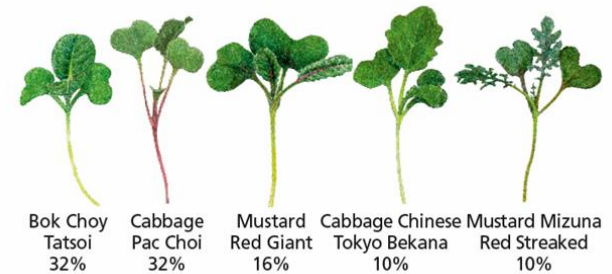


- Celery →



Common Plants

- Brassicaceae (mustard family / cruciferous plants)



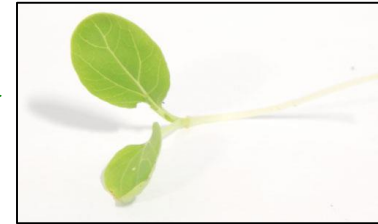
- Broccoli

- 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

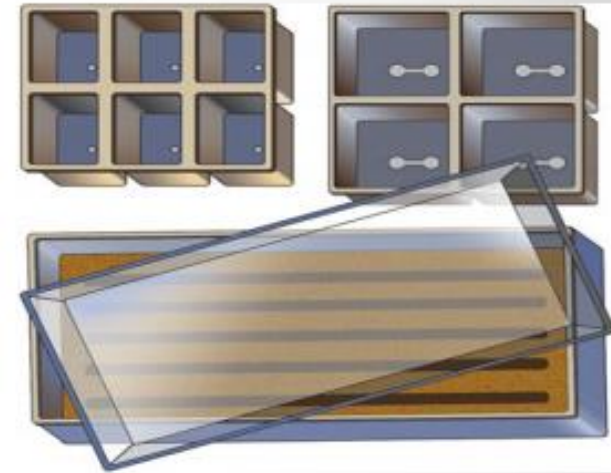
- 10" x 20" tray is standard....
- But, there are many options that can work (e.g., pie pans, food containers, event plates...)

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...

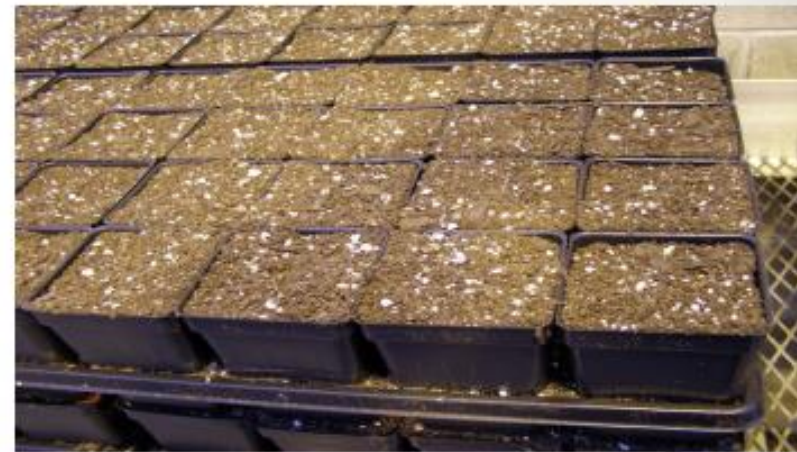
Price for Seed

- 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 rubin = \$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



CropKing.com

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

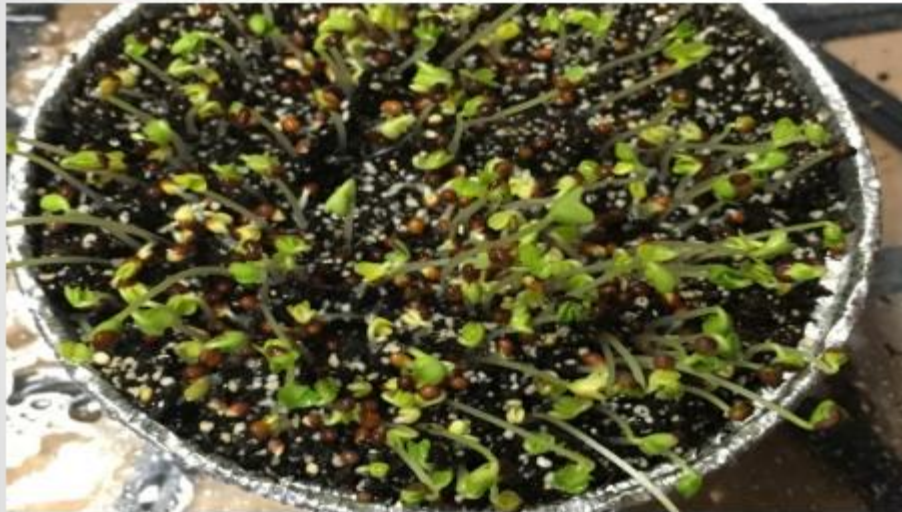
Water Quality

- 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



You want seedlings to stretch
Easier to harvest 1 ½" stem

- 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

No Cover	Light Cover
Broccoli	Amaranth
Cabbage	Arugula
Lemon balm	Basil
Mint	Beet
Oregano	Chervil
Thyme	Dill
	Fennel
	Kale
	Mustard

Light Cover	Cover
Pea	Carrot
Sage	Celery
Shiso	Swiss chard
Sorrel	Chive
Tatsoi	Cilantro
Wasabi	Parsley
	Radish
	Sunflower
	Watercress

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

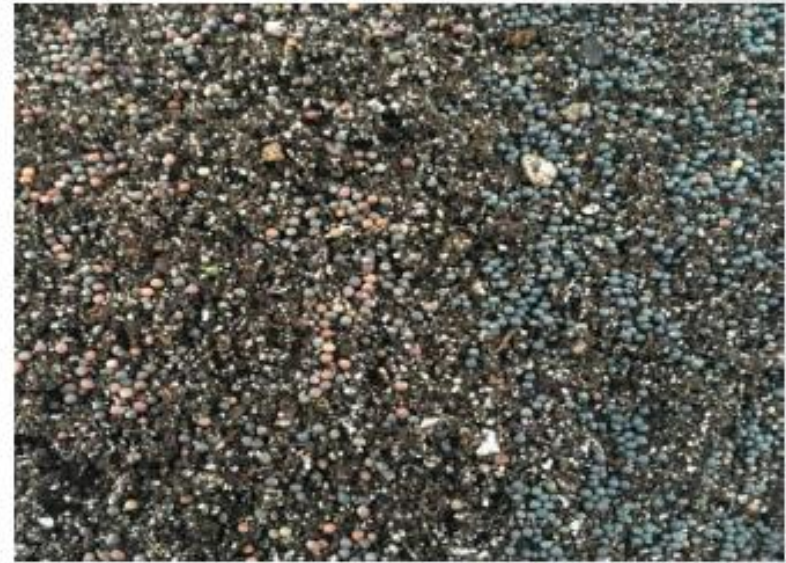


Back row: tatsoi, cressida cress, garnet red amaranth, cilantro

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



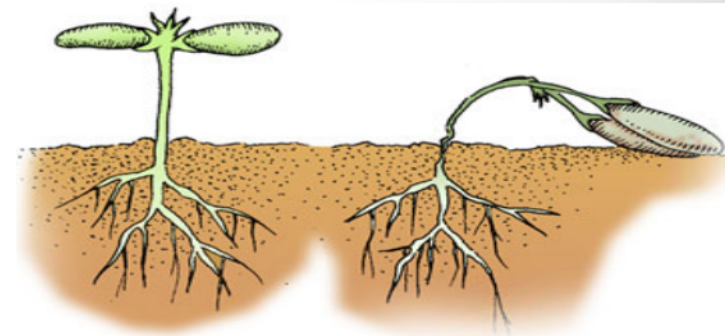
Media - Day 5 after seeding



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



Problem with Garnett
Amaranth

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
 - Red cabbage. Garnet amaranth, green daikon radish
- Buckwheat – same protein as oats
 - Plus high in antioxidants, flavonoids, carotenoids & alpha-tocopherol
 - 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://www.johnnyseeds.com/growers-library/vegetables/year-round-micro-greens-production.html>
- <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>

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