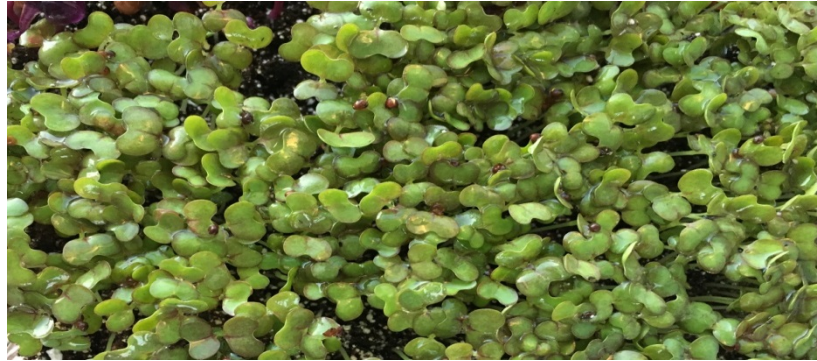


# Growing Microgreens Can Be For Everyone



By Terry DelValle

Duval County Extension

# BYOM

- Birth your own microgreens
- Started in 1980s in San Francisco



# What are Microgreens?

- Young, tender greens used to enhance color, texture or flavor of salads or to garnish main dishes
- Harvested at cotyledon or 1st true leaf stage; used with stem and leaves attached
- Vegetable confetti



# Sprouts, Microgreens, Baby Greens

- Sprouts: youngest and smallest;
  - germinated seeds without true leaves; eat entire plant
  - Highest risk microbial contamination; heavily regulated
- Microgreens: ~2" tall
- Baby Greens: ~3-4" tall; oldest and largest
- Microgreens and Baby Greens: no legal definition; marketing terms; not eating roots

# Shoots

- Like microgreens, harvested with stems and leaves when they reach desired size (3" to 5" tall)
- Sunflower, buckwheat, field pea, tendrill pea, hard red winter wheat, nasturtium, popcorn



# 80-100 Crops/Crop Varieties

- Cabbage
- Beet\*
- Kale
- Kohlrabi
- Mizuna
- Mustard
- Radish
- Swiss chard
- Amaranth
- Tatsoi
- Carrot
- Cress
- Arugula
- Basil
- Onion
- Chive
- Broccoli
- Buckwheat
- Cilantro
- Lemongrass

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# Fast Growing Microgreens

- Red cabbage
- Chinese cabbage, Kogane
- Collard, Champion
- Cress, Cressida
- Cress, Persian
- Hon Tsai Tai
- Kale, Red Russian & Tuscano
- Kohlrabi
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- Mizuna
- Mustards except red giant
- Pac Choi, Rosie
- Radish
- Tatsoi



# Slow-Growing Microgreens

- Amaranth, Garnet Red
- Arugula
- Beets
- Carrot
- Chards
- Komatsuna
- Magenta Spreen
- Mustard, Red Giant



- Orach, Ruby Red
- Pac Choi, Red Pac
- Purslane, Red Gruner
- Scallion, Evergreen Hardy White
- Shungiku



# Slow Growing Microgreen Herbs

- Anise
- Anise Hyssop
- Basils
- Chervil
- Cilantro
- Cutting Celery
- Dill
- Fennel
- Lemon Balm
- Marigold, Gem
- Parsley
- Salad Burnet
- Saltwort
- Shiso, Britton





Basils



Cressida Cress



• Tatsoi



Red Garnet Amaranth •



• Nasturtium

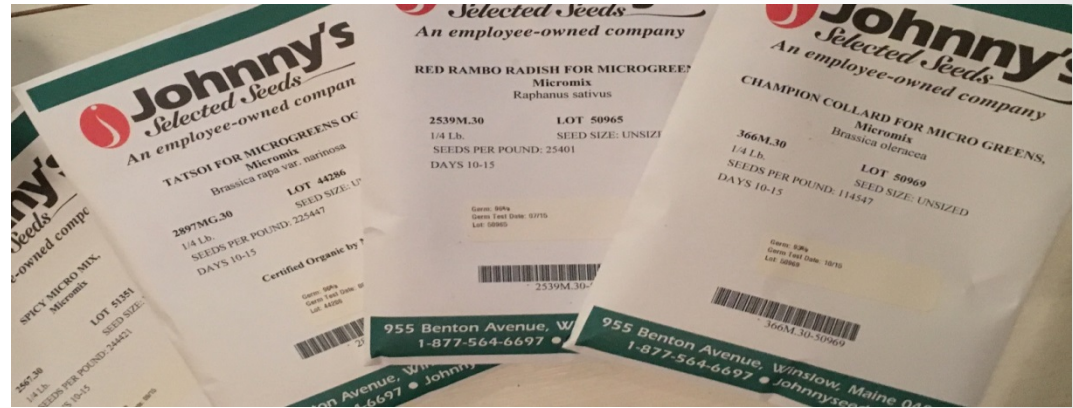


Sunflower



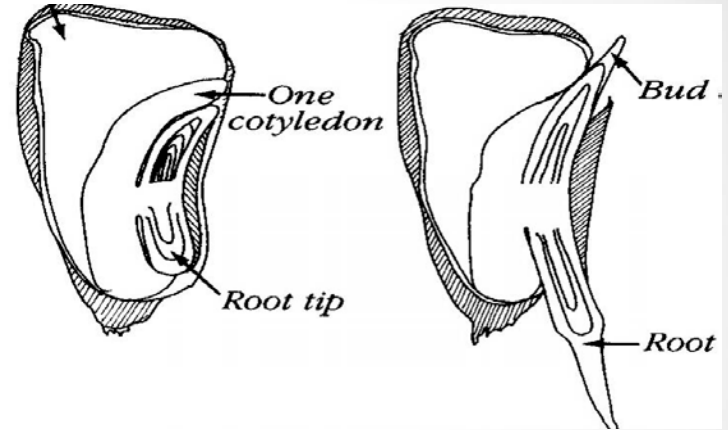
# Sexual Propagation

- Start with healthy seed
- Some organic
- Do not use treated seeds
- Extra can be stored in fridge in zip lock bag



# Steps In Seed Germination

- Activation: Water penetrates seed coat, endosperm swells and splits seed coat
- Digestion: Water dissolves nutrients in endosperm for embryo
- Growth begins – cell division and elongation



# How many days till germination?

- Varies with crop
- Many will germinate in ~ 2 days
- Others like beets, carrots and Swiss chard take longer
- Depends on temperature: heating mats and lights may be needed
- If mixing seeds in trays, need to match with similar germination rates\*\*

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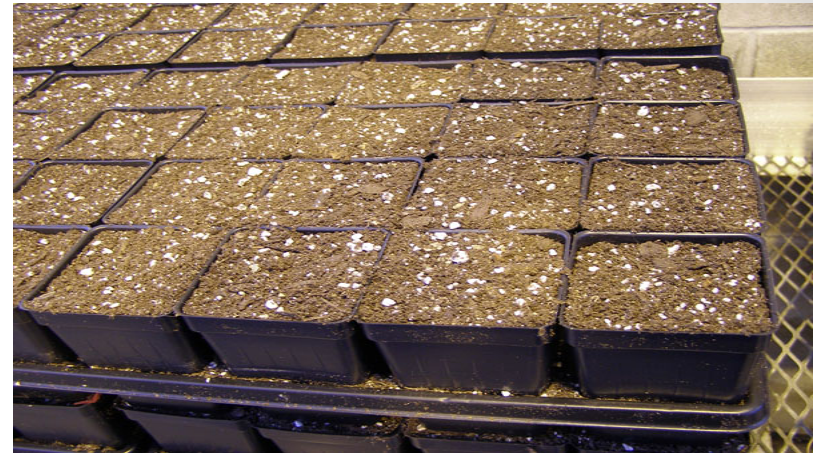
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Plant	Days to germination
Amaranth	3-4
Arugula	5-7
Basil	3-7
Beet	5-7
Broccoli	3-7
Swiss Chard	5-7
Chive	7-10
Cilantro	7-14
Dill & Fennel	7-21
Kale	5-7
Lemon Balm	5-7

Plant	Days to germination
Mint	14-21
Mustard	5-10
Oregano	14-21
Parsley	10-21
Pea	7-14
Radish	3-7
Sage	10-21
Sunflower	3-7
Tatsoi	7-10
Thyme	14-28
Watercress	3-7

# 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)



# Mountain Valley Seed Co. Catalogue

- H=Heirloom
- O=Organic
- A=AAS Winner
- M=Micro green
- S=Sprout
- N=New
- F=Staff favorites

## Anise <sup>H M</sup>

**Micro** Anise as a MicroGreen? Yes please! Not as easy as other Micros but hey, YumYum. Seed at the rate of 1 light teaspoon (about 1 gram) per 5 inch square. Harvest in 14 to 21 days.

33,000 seeds/oz. Annual. 75 days. Use licorice flavored leaves in salads, and the seeds to flavor applesauce, cakes, confections and liquors. Grows to about 18 inches tall with finely serrated leaves, topped by umbels of white blossoms. Wonderfully fragrant.

1 oz	4 oz	1 lb
\$5.19	\$8.75	\$20.10

## Arugula, Slow Bolt <sup>H O M</sup>

**Micro** Arugula is a staff and visitor favorite. The tender heart shaped leaves pack a peppery punch that you can't ignore. Fantastic on sandwiches or right out of the growing tray. Arugula has a tender structure, which can be damaged during harvest. We find it best to sow directly on the surface to keep soil off the leaves. Seed at the rate of 1/2 teaspoon (2 grams) per 5 inch square. Cool condition tolerant. Harvest within 7 to 12 days.

14,000 seeds/oz. 43 days. An easily grown green that adds a tangy, peppery flavor to salads. Plant in the spring and again in the fall.

	pkg	1 oz	4 oz	1 lb	5 lb
Conventional	\$1.89	\$5.00	\$7.09	\$21.38	\$52.75
Organic	\$2.49	\$6.68	\$15.71	\$45.05	\$182.32

## Genovese <sup>H M</sup>

20,000 seeds/oz. Annual. An intensely scented basil with slightly hairy leaves and purple flowers. Growing in popularity.

1 oz	4 oz	1 lb	5lb	2
\$5.50	\$6.76	\$16.13	\$57.60	\$

## Italian Large Leaf <sup>H M</sup>

20,000 seeds/oz. Annual. Traditional herb used in anything containing tomatoes or tomatoes and fish and vegetables. Easy to grow. Ht. 24 in.

	pkg	1 oz	4 oz	1 lb
Conv.	\$1.89	\$5.00	\$7.00	\$18.6
Organic	\$2.49	\$11.40	\$19.26	\$39.7

## Lemon <sup>H M</sup>

17,000 seeds/oz. Annual. Compact basil plant. Wonderful in salad dressings and any other use. Ideal for potpourri. Height 24 inches.

pkg	1 oz	4 oz	1 lb
\$1.89	\$8.24	\$16.28	\$47.50

## Licorice <sup>H M</sup>

Annual. Also known as Anise basil or Persian a spicy, licorice smell.

1 oz	4 oz	1 lb
\$9.82	\$19.61	\$59.14

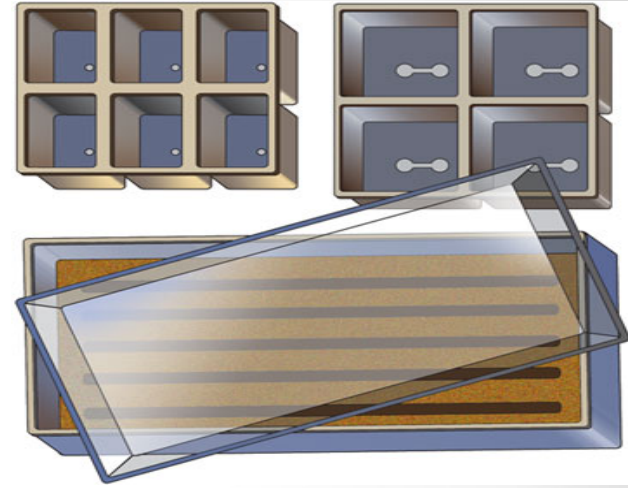
# Price for Seed

- Varies with crop
- Sango Purple Radish  
1oz = \$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)

# 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





# 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



# 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

# Differences in micro mats & media



# 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 H<sub>2</sub>O more acidic add lemon juice to water and stir thoroughly



Vinegar also used by  
some growers

# Check Water pH

- City tap water is ~ 7.0
- Use pH meter or litmus paper to check pH



# Adjust to pH 5.5 to 6.5



# 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.





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

# Seeding with Pads

- Pour 2 cups of water in tray filling channels
- Add pad and tilt tray to wet pad
- Once saturated, flip pad
- Mist to ensure pad is evenly moist
- Sprinkle seed evenly on pad & mist 10-12 times
- Spray inside of another tray, invert and cover



# Inverted Tray Method

- Leave inverted tray on flat until the seedlings lift the tray up an inch or two – **recommended more for shoots**
- Sunflower, popcorn, nasturtium, peas, winter wheat, buckwheat



# 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

# In Light for 9 Hours on Right



Media - Day 5 after seeding

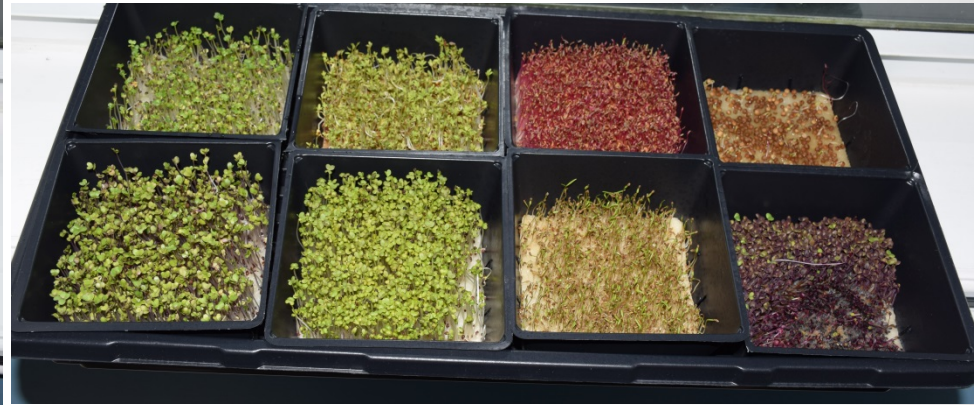


Place in south facing window

# 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

# Provide Artificial Light if Needed



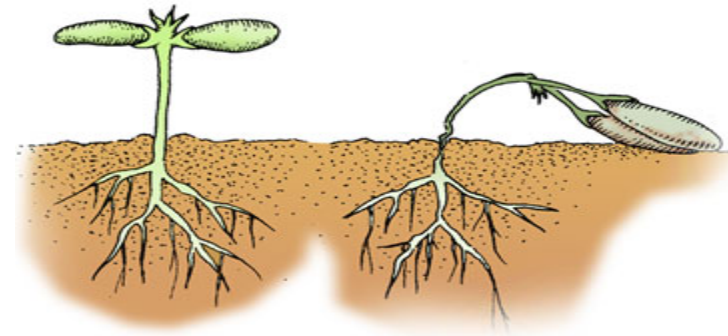
Inexpensive, collapsible grow-light frame using PVC pipe: Use a regular shop lamp, with two 40-watt fluorescent light bulbs or other light source.

Need cooler lights for microgreens & lights are not as close to seedlings.



# 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



# 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

# Options



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

# Harvest to Grocery Store



Keeps better if it has oxygen –  
air exchange



# 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

# Will I get more than 1 harvest?

- It depends on crop
- Initial harvest definitely the best





# What to do with Media or Mat?

- Mix into vegetable planting area
- Compost



Take home project....  
Fill tin with moist media.  
Spread seed evenly on top of media.



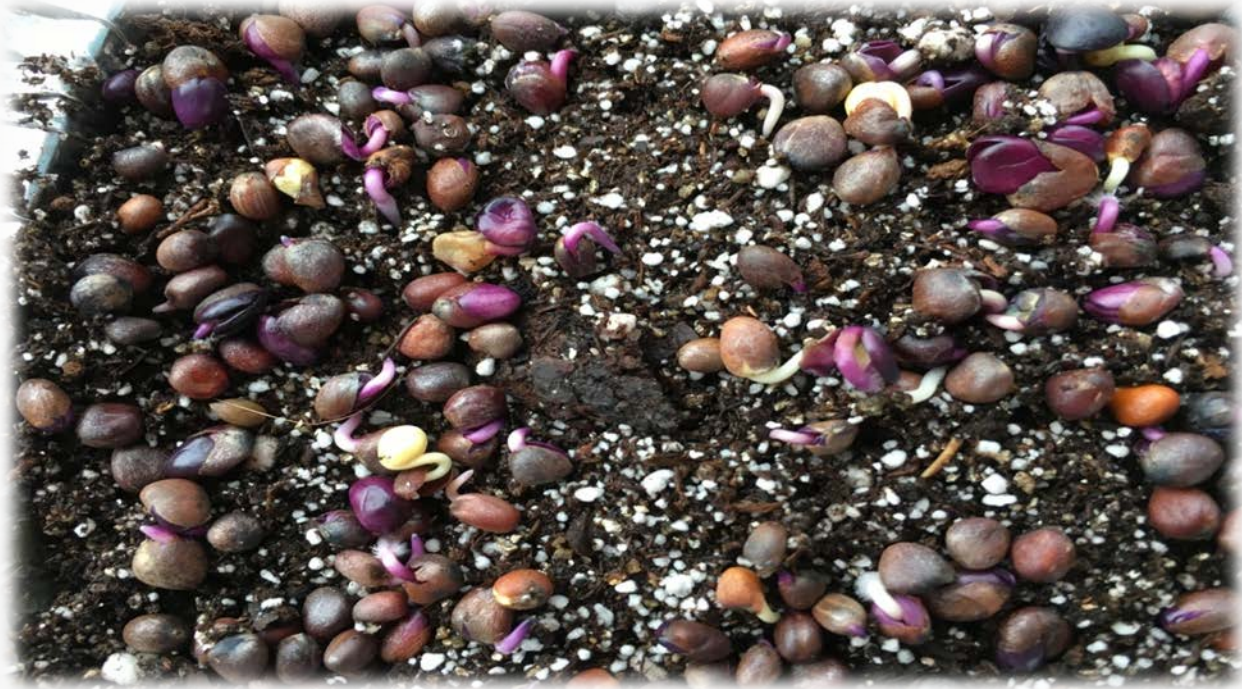
Gently press seed into media or  
cover lightly with media.



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





# Maintenance

- Continue to water twice each day
- Small ketchup bottle to add water or mist heavily



# Harvest at cotyledon stage in 5-10 days for best flavor



# References

- Microgreens: A New Specialty Crop  
<https://edis.ifas.ufl.edu/hs1164>
- <http://www.johnnyseeds.com/c-48-micro-greens.aspx>
- <https://trueleafmarket.com/>
- <https://agresearchmag.ars.usda.gov/2014/jan/greens/> Specialty greens pack a nutritional punch

# Donation from trueleafmarket.com



- 6 - [21"x10" Growing Trays](#)
- 9 - [21"x10" Hydroponic Grow Pads](#)
- [pH Test Strip](#)
- [Spray Bottle](#)
- Assortment of MG Seeds. **Seeds** in reseal bags for 12 to 18 plantings: [Basic Salad Mix](#), [Spicy Sprouting Mix](#), [Sango Radish](#), [Red Acre Cabbage](#), [Purple Vienna Kohlrabi](#)