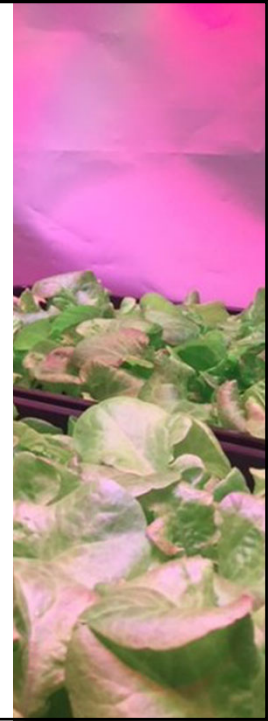




Baby Greens; The Tender Leafies!

**Fatemeh Sheibani, Michael Gildersleeve, and
Cary Mitchell**

Department of Horticulture & Landscape
Architecture
Purdue University



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“Baby greens” is a term used to describe young and tender salad greens that are harvested before they reach full maturity.
Google



Common species: lettuce, arugula, kale, mizuna, mustard, Pak choi, spinach, beet, etc.

2

What are baby greens?

General :

- ✓ Small, immature seedlings with few true leaves
- ✓ Developmental stage after micro-greens



Production sites

- ✓ Outdoor if weather conditions allow
- ✓ Controlled-environment sectors
 - low tunnels, high tunnels, greenhouses, vertical farms, shipping containers
- ✓ Mini units of vertical farms in restaurants, schools, and homes



Uses:

- ✓ Salad bowl
- ✓ Salad kit
- ✓ Topping
- ✓ Wrap



Popular attributes:

- ✓ Ready-to-use
- ✓ Local
- ✓ Nutritious

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Baby-Green Definitions

Academic

Lack of literature on the baby green definition, unlike microgreens

Broad definition:

“Young leaves and petioles of any crop”

15-40 days cropping cycle

Eight-true leaf stage



Mattson et al., 2023
Greenhouse Product News

Industry

“Baby greens take a month to harvest”, outdoor production

“Baby greens are young, tender leaves that are harvested before plants reach maturity”

The focus of this presentation:

- ✓ **Indoor leafy green production, with 15-18 days cropping cycle**

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Different Stages of Development, Focus on Indoor Production

Mitchell lab definition of various stages of development:

- Sprouts: harvested after several days of exposure to darkness
- Microgreens: 10-11 days cropping cycle
- Baby greens: 15-18 days cropping cycle
- Teen greens 21-23 days cropping cycle
- Leafy greens 28-30 days cropping cycle



Sprouts
ourplantbasedworld.com



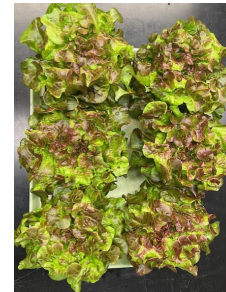
Microgreens
integrisk.com



Baby greens



Teen greens



Leafy greens

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Baby-Green Products

Grocery Store Packaging

- Clam Shells
- Plastic Bags



Commonly Marketed as

- Salad Mixes
- Homogenous Mixes

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Baby-Green Production at Commercial Scale

❖ Small plugs

Individual plants in each plug
Expensive



www.phorticulture.com



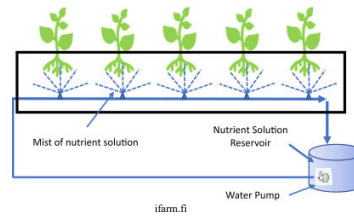
❖ Hydroponic soilless medium

Water holder (peat moss/coco coir)
Aerator (perlite/vermiculite)

Media-based hydroponic culture of baby green “lawns” is typically bottom fertigated

❖ Aeroponic

Porous support film, “blanket”
Fine mist delivers nutrient solution to roots



ifarm.fi

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Seeds, The Initial Input

The same seeds as mature plants

New seeds bred for baby-green production

Better leaf shape

Better color and texture

Post-harvest attributes (thicker leaves)



BOTTAS RZ (84-BB8485)

Babyleaf | Oak-leaf

HR: BI:29-40EU/Fol:4/Nr:0

IR: LMV:1



LIDIVIA RZ (84-90)

Babyleaf | Leaf

HR: BI:29-40EU/Fol:4/Nr:0



BOURDAIS RZ (84-35)

Babyleaf | Oak-leaf

HR: BI:29-40EU/Nr:0

IR: Fol:4

www.rijkzwaanusa.com

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Environmental Inputs for Baby-Green Production

- Sole-source lighting with light-emitting diodes (LEDs) in a warehouse
 - PPFD: 200-300 $\mu\text{mol m}^{-2} \text{s}^{-1}$
 - Photoperiod: 16/8(h), light/dark
 - Spectral composition: warm white LEDs +red LED supplementation (overall red +blue + green+ far-red)
- Temperature
 - Constant or light-dark cycle
 - Range: 20-25 ° C
- CO₂ concentration
 - Enrichment is essential
 - 800-1000 ppm ($\mu\text{mol mol}^{-1}$)
- Relative humidity
 - 70-80%
 - Tip burn is typically not a concern for baby-green stage



www.VerticalFarmDaily.com

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Is Baby-Green Production Energy Efficient?

- ✓ Short cropping cycle requires less energy
- ✓ Less distance between plants results in improved canopy photon capture efficiency
- ✓ Limiting light conditions is suitable for the early stage of baby-green production
- ✓ Modifying spectral composition is an effective energy-saving strategy



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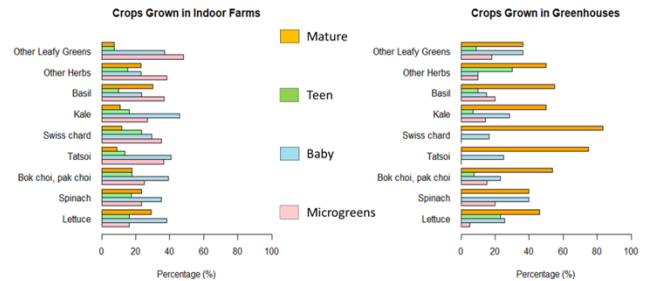
Baby Greens Indoor : Popular Among Producers & Consumers

Producers' point of view :

- ✓ Short production cycle
- ✓ High harvestable yield
- ✓ Short stature
- ✓ Year-round demand
- ✓ Lower seed density compared to micro greens
- ✓ Possibility of “cut and come again”

Consumers' point of view:

- ✓ Diversity in color, taste, texture, and leaf shape
- ✓ Nutritious
- ✓ Fresh, local
- ✓ Convenient



“Labor Efficiency” by Simone Valle de Souza and Chris Peterson.
OptimIA University, September, 2023



Courtesy of Planted Detroit

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Economic Aspects of Baby-Green Production

Limited data on economic aspects of indoor baby-greens production
Requires more input from commercial-scale producers

The retail price of baby greens varies, depending on
Market demographics (income, location, life-style)
Proximity of production to consumption
Competition with seasonal outdoor/year-round greenhouse production



- ✓ **“On average, wholesale prices of leafy greens sold in small packages (including baby greens) carry a premium of 433% compared to common iceberg and romaine lettuce.”**

(Valle de Souza et al., 2023. Emerging economics and profitability of PFALs)

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Challenges of Indoor Baby-Green Production

- Labor is one of the most expensive operational costs
- Automation requires higher capital expenses
- Packaging is another expensive operational cost



Courtesy of Planted Detroit



Courtesy of Planted Detroit

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For more lectures from OptimIA University,
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For questions about this lecture, please contact :

Fatemeh Sheibani, Fsheiban@purdue.edu

Michael Gildersleeve, mgilder@purdue.edu

Cary Mitchell, cmitchel@purdue.edu



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