

Successfully Rooting Vegetative Cuttings




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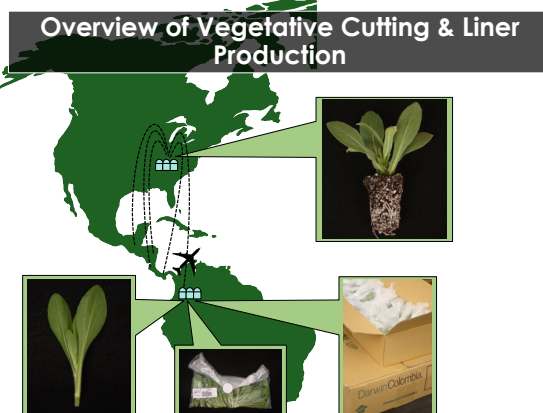
MICHIGAN STATE UNIVERSITY

Outline

- I. Why?
- II. Getting Started
- III. Cultural Practices
 - 1. Rooting hormone
 - 2. Fertility
- IV. Environmental Practices & Management
 - 1. Light
 - 2. Temperature




Overview of Vegetative Cutting & Liner Production



The diagram shows a map of the United States with callouts to various stages of production: a cutting, a rooted cutting, a liner in a box, and a liner in a bag.

Developmental Phases

- Horticultural Stages of Rooting Cuttings
 - **Stages 0 – 1: Harvesting/sticking**
 - Harvest cuttings from stock plants
 - **Stage 2: Callusing**
 - Callus formation
 - **Stage 3: Root development**
 - Initiation & development of roots
 - **Stage 4: Toning**
 - Continuous root formation & shoot development resulting in "pullable" liners



(Dole and Gibson, 2006)

I. Why propagate your own cuttings?

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- Shorter production time

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Crop	128-Tray	
	Seed	Vegetative Cuttings
Coleus	7 – 8 wks	3 wks
Dahlia	7 – 8 wks	3 wks
Geranium	7 wks	4 – 5 wks
Petunia	7 – 8 wks	3 – 4 wks

(Styer and Koranski, 1997) (Dole and Gibson, 2006)

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- Production of sterile or seedless cultivars

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YOU have CONTROL

I. Why propagate your own cuttings?

- Shorter production time
- Production of sterile or seedless cultivars
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YOU have CONTROL
YOU know the history of the crop

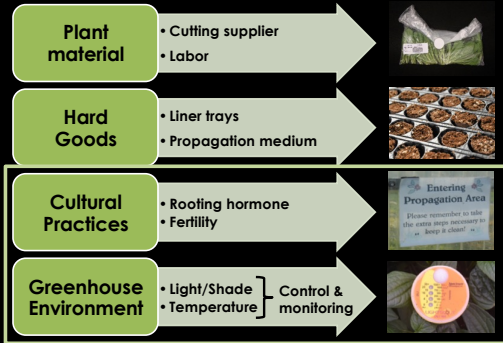
II. What do I need to start propagating my own cuttings?

II. Getting Started

- You do not have to:
 - Buy or have top-of-the-line equipment



II. Getting Started



III. Cultural Practices Rooting Hormone Applications

III. Cultural Practices Rooting Hormone Applications

- Commercially available rooting compounds

Liquid	Powder
Dip' N Grow	Hormodin
IBA Water Soluble Salts	Rhizopon
C-mon	Hormex
C-mone K	
C-mone K+	

*List of examples. For a complete list, refer to Dale and Gibson (2006).

III. Cultural Practices Rooting Hormone Applications

- Do I need to apply to all unrooted cuttings?

III. Cultural Practices Rooting Hormone Applications

- Do I need to apply to all unrooted cuttings?
 - Not required by all bedding plants
 - Essential for economical rooting of difficult-to-root plants
 - Accelerate root initiation
 - Increase rooting uniformity and quality

III. Cultural Practices Rooting Hormone Applications

- Rooting hormone requirements

Low	May Benefit	High
Angelonia	Argyranthemum	Coral bells
Coleus	Bacopa	Dahlia
Gaillardia	Calibrachoa	Hydrangea
Impatiens	Coreopsis	Osteospermum
Ipomoea	Fuchsia	Poinsettia
Lamium	Geranium	Scaevola
Petunia	Lavender	Thunbergia

*List of examples. For an expanded list, refer to Dole and Gibson (2006).
**Supplemented with information supplied by Dr. Royal Heins.

III. Cultural Practices Rooting Hormone Applications

Labor intensive Time consuming

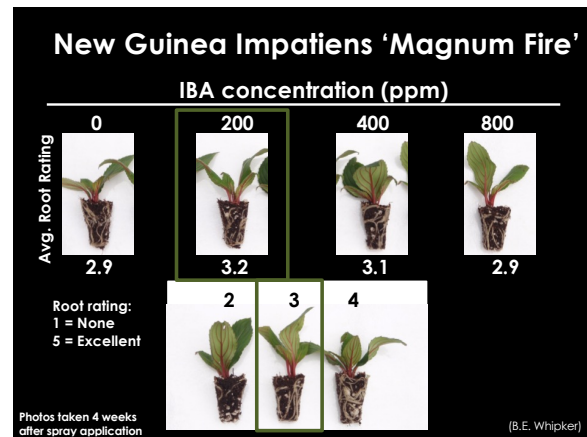
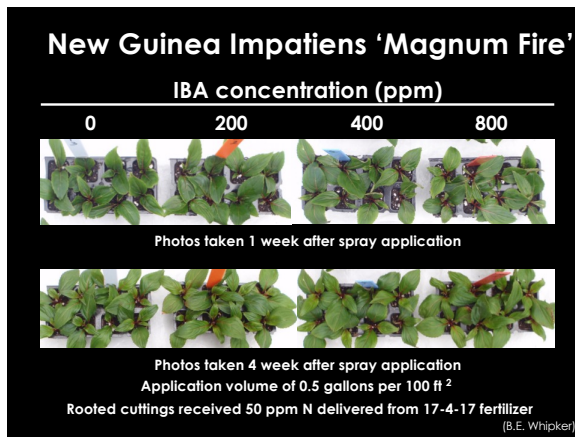
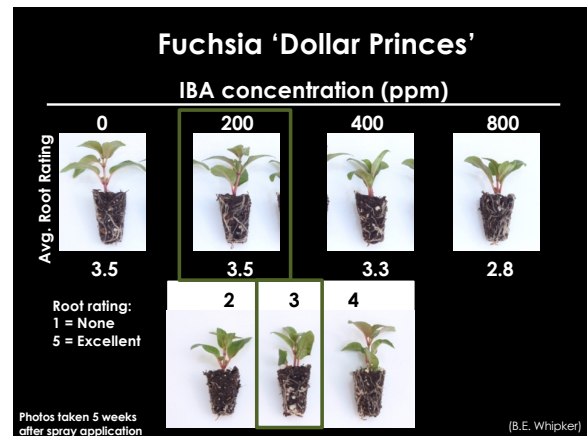
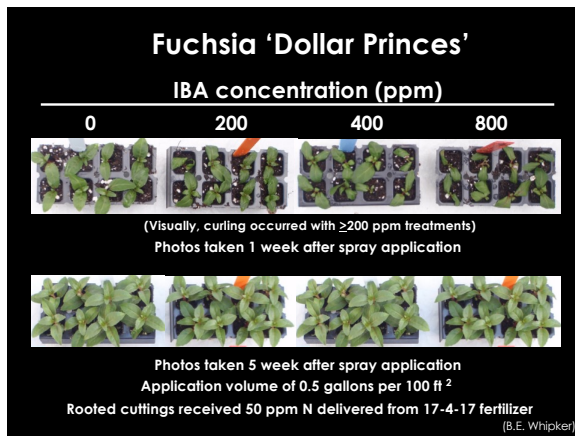
An Alternative Option!

III. Cultural Practices Rooting Hormone Applications

- IBA Foliar Spray – An alternative option!

III. Cultural Practices Rooting Hormone Applications

- IBA Foliar Spray – An alternative option!
 - Apply after sticking
 - To the point of runoff
 - IBA concentration lower than recommended rate for cutting dips
 - Rates and concentrations for specific crops
 - **Conduct a small in-house trial**



III. Cultural Practices

Rooting Hormone Applications

- In general, rooting was less at higher IBA concentration rates
 - Distorted growth occurred
- Optimal IBA concentration for foliar sprays is considered to be around 200 ppm

III. Cultural Practices

Fertility

III. Cultural Practices Fertility

- Do I need to provide cuttings with nutrition during propagation?

III. Cultural Practices Fertility

- Do I need to provide cuttings with nutrition during propagation?
 - Low nutrition at stick and throughout propagation
 - Slow to root and non-uniform rooting
 - Cuttings will become nutrient deficient
 - Greater susceptibility to diseases



III. Cultural Practices Fertility

- Do I need to provide cuttings with nutrition during propagation?
- When do I start?

III. Cultural Practices Fertility

- When do I start?
 - Tissue nutrient concentrations often drop
 - After cutting harvest (Stage 0) to just after sticking (Stage 1)
 - Increase at root formation (Stage 3)

III. Cultural Practices Fertility

- Do I need to provide cuttings with nutrition during propagation?
- When do I start?
- How do I provide cuttings nutrition?

III. Cultural Practices Fertility

- How do I provide cuttings nutrition?
 - Water-soluble
 - Mist
 - Hand irrigated (daily)

III. Cultural Practices Fertility

- How do I provide cuttings nutrition?
 - Water-soluble
 - Mist
 - Hand irrigated (daily)
- Up to 13 lbs./1000 ft² N may be applied during propagation
 - 24% of N being leached (Santos et al., 2009)

III. Cultural Practices Controlled-release Fertilizers

- Application
 - Incorporated
- Types
 - Urea-Formaldehyde
 - Sulfur-Coated
 - Polymer-Coated
- Release rate

III. Cultural Practices Controlled-release Fertilizers

- Blended formulations control release

New Guinea Impatiens 'Celebrette Rose Hot'

15-9-12 CRF (lbs./yd ³)					WSF
0	5	10	20	40	
52.9 a	50.2 ab	45.0 ab	45.8 b	32.3 b	36.0 b

Root dry mas: (mg)

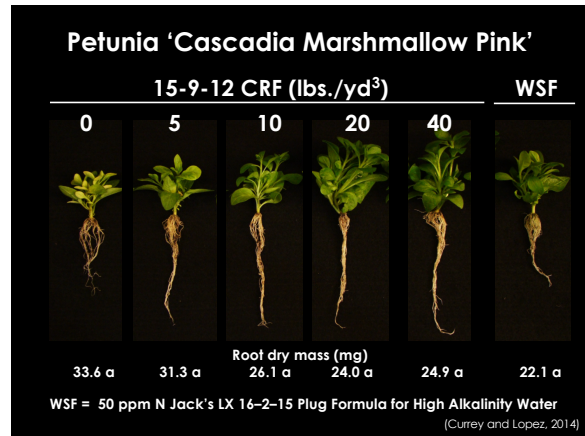
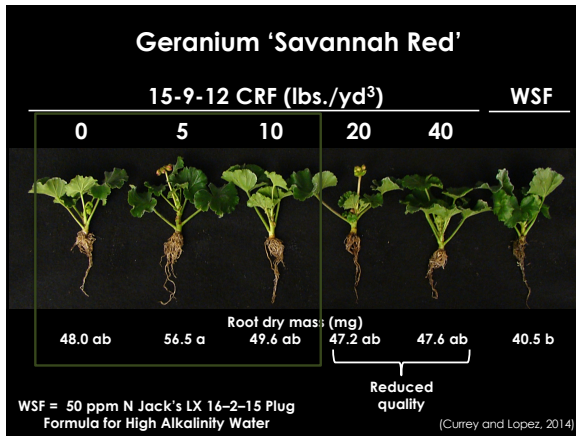
WSF = 50 ppm N Jack's LX 16-2-15 Plug Formula for High Alkalinity Water
(Currey and Lopez, 2014)

Angelonia 'Sundancer Pink'

15-9-12 CRF (lbs./yd ³)					WSF
0	5	10	20	40	
67.9 a	55.7 ab	55.5 ab	46.3 b	43.9 b	47.4 b

Root dry mas: (mg)

WSF = 50 ppm N Jack's LX 16-2-15 Plug Formula for High Alkalinity Water
(Currey and Lopez, 2014)



III. Cultural Practices Controlled-release Fertilizers

Controlled-release fertilizer (lbs./yd ³)	Cost per 105-cell tray
5	\$0.04
10	\$0.07
20	\$0.15
40	\$0.30

(Currey and Lopez, 2014)



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MICHIGAN STATE UNIVERSITY
EXTENSION
FLORICULTURE TEAM

Name:
Team Members

Production Information:
Controlled-Release Fertilizers
(Online College of Knowledge)

Environmental Assistance:
Program LMA/AP
Floriculture News from MSU Extension

MSU Trial Gardens

Programs and Meetings:
Michigan Greenhouse Growers Expo
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Other Information:
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Light Management in Controlled Environments
The book, written by Roberts Lopez and Erik Benitez, contains 18 chapters on the subject of light in horticulture. It is updated and substantially expanded from the "Lighting Up" primer book published in 2004. It presents the underlying biology of how light influences plant growth and development of specialty crops, especially those grown in greenhouses and controlled-environment growth rooms. Over 20 leading plant scientists from 16 different universities/extension service agencies discuss technology options for shade and lighting, including the latest developments in greenhouse and site-source lighting. Published in April, 2017 and available in print and digital versions.