University of New Hampshire

Extension

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Research interest

- Plant physiology and biochemistry
- Nutrient and water management
- Abiotic stress management
- Nanotechnology
- Light quality
- Hydroponic and aeroponic systems

Research Plans

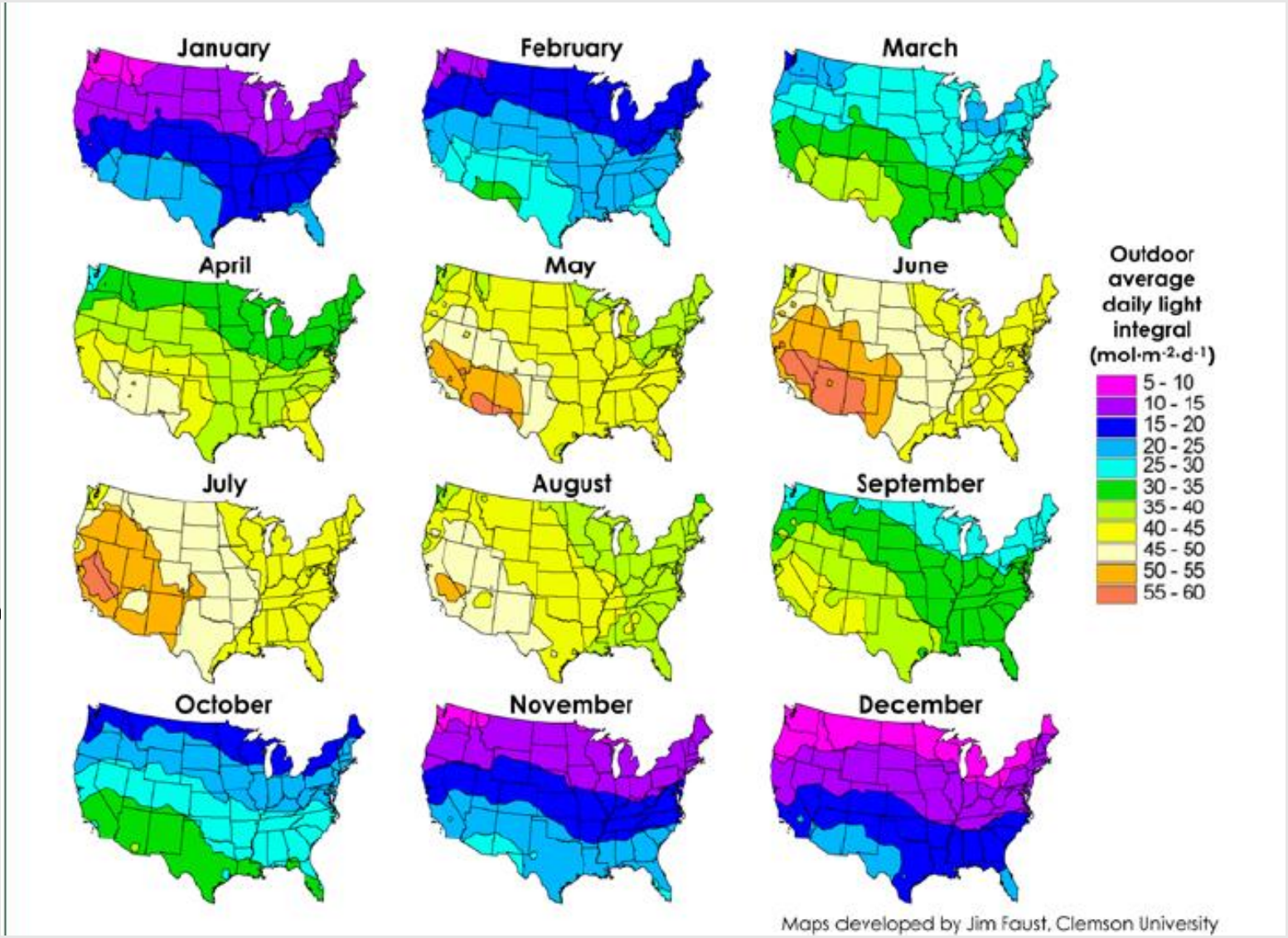
- Supplemental LED lightening
- Silicon application to improve plant health
- Nanoparticles/Nanofertilizers
- Substrate amendments
- Biotic and abiotic stress management
- Grower-researcher joint research projects

Supplemental LED lightening

- **Light Quality**
  - Different light spectrum
  - Combinations of different spectrum

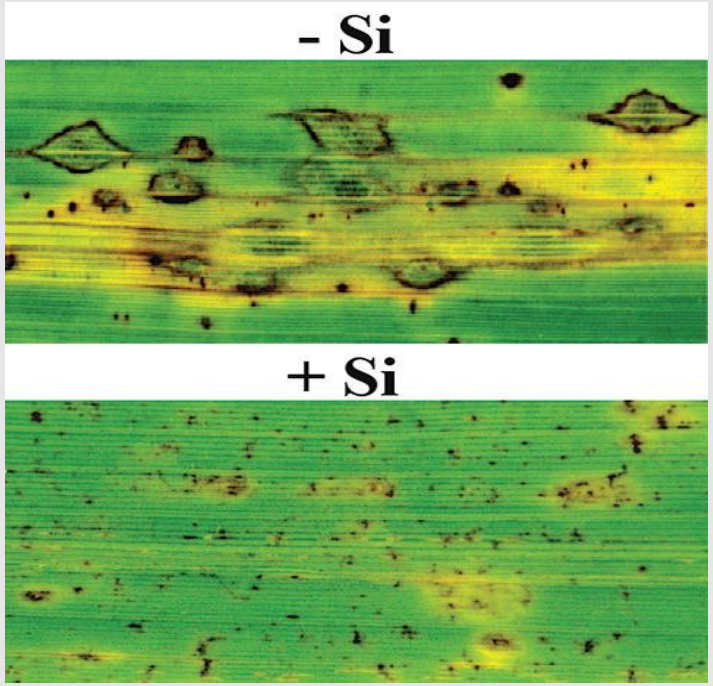
Why Light Quantity???

- DLI: Daily light integral
- Lights meters measure DLI
- DLI Varies from 5-30 mol/m2/d1 in northern latitude
- Further 40-70% reduction by glazing, lights, baskets etc.
- DLI directly impacts root and shoot growth in seedlings, and finish quality like branching, uniform flower size, compactness etc.
- Work on crop-wise DLI requirement particularly in NE is required???



Silicon Application in Greenhouse Production

- Second most abundant element
- Approved by Association of American Plant Food Control Officials (AAPFCO)
- Improve growth, yield and quality of produce
- Resistance to bacterial and fungal diseases
- Resistance to insect-pests
- Resistance to different abiotic stresses like salinity, drought, heat, cold
- Improve nutrient uptake and nutrient use efficiency
- Strengthen the root architecture, stronger and thicker the stem, shorter the internodes, larger and thicker the leaves



Leaf blast PC: Lawrence Datnoff, LSU

Post harvest life: Neil Mattson, Cornell University

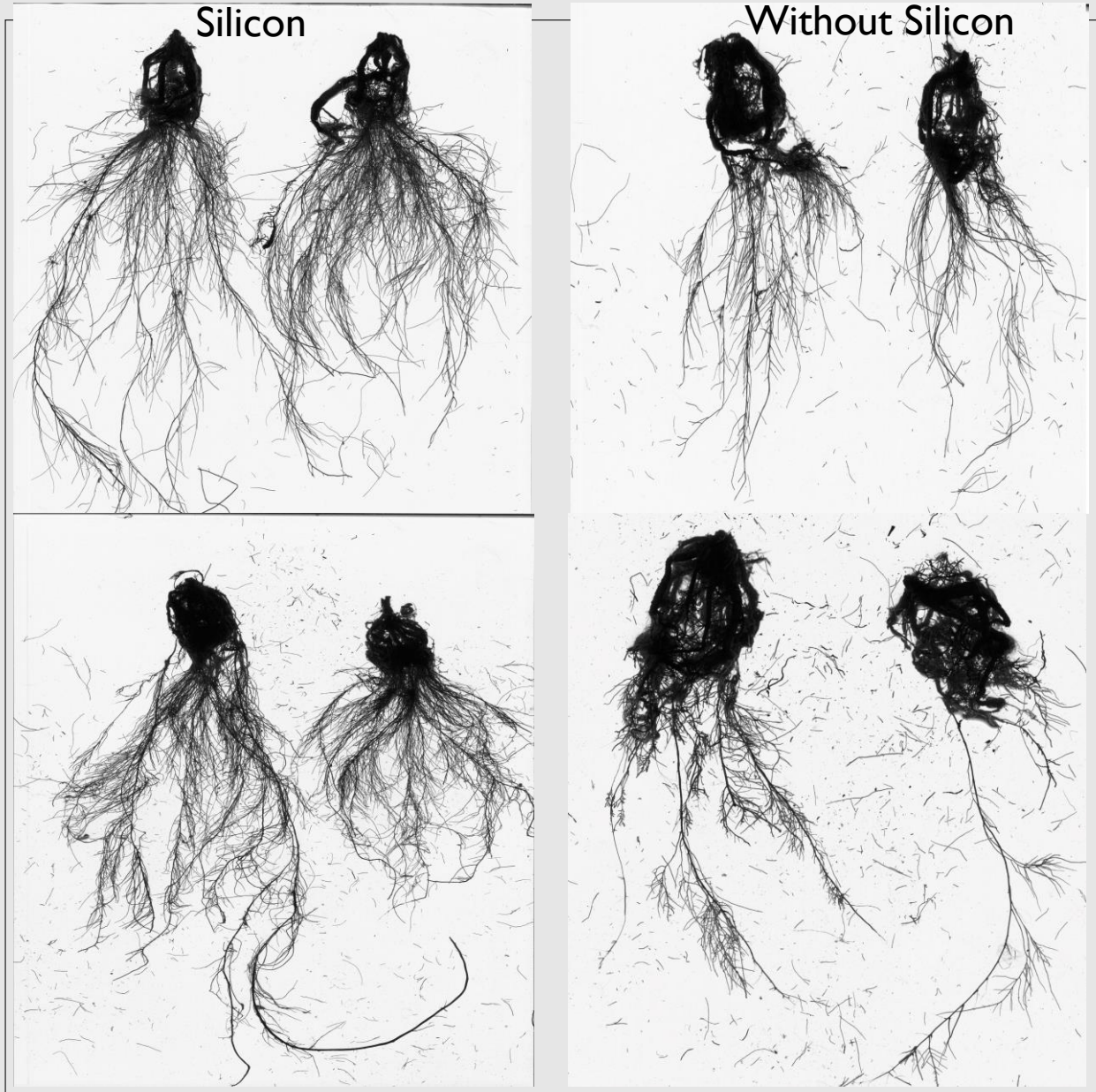
Stem diameter: Steve Marek, Oklahoma State University

Blueberry seedlings under hypoxia stress

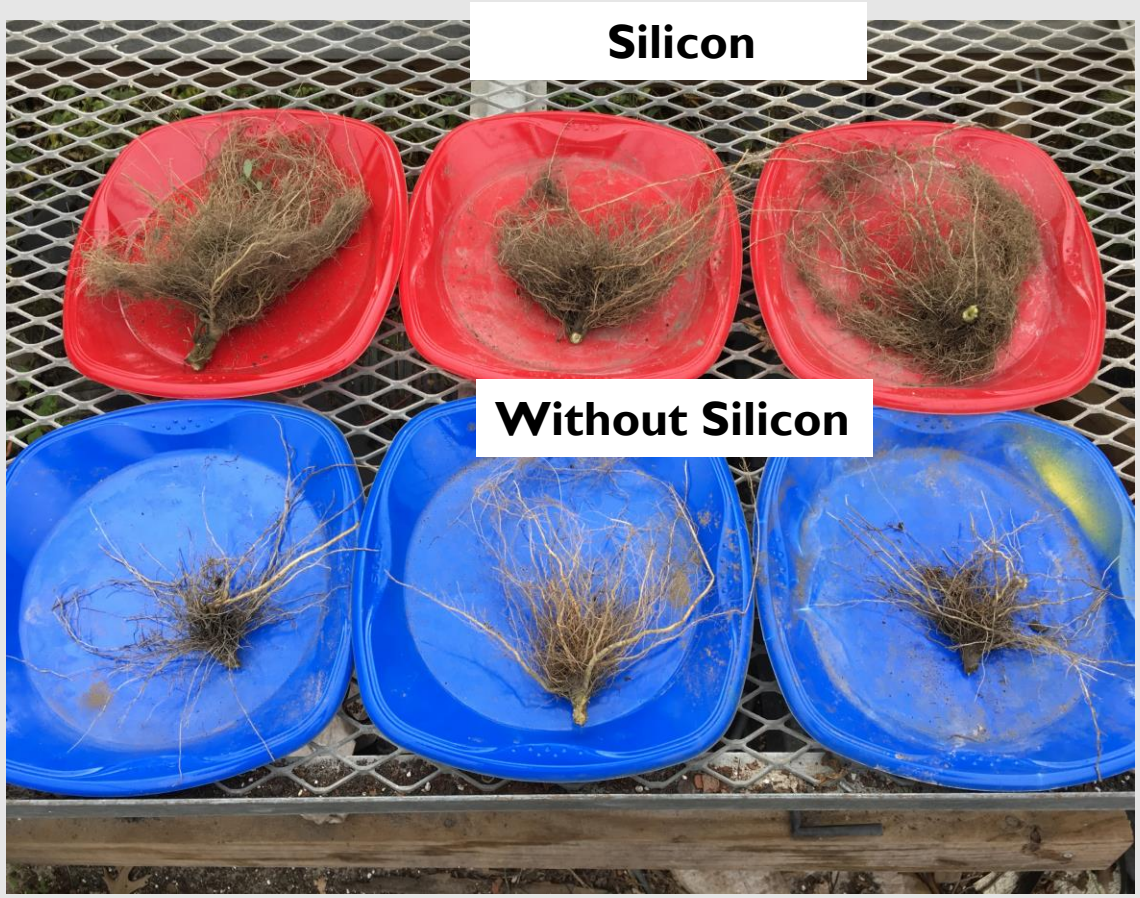
Citrus rootstocks under hypoxia stress

PC: Muhammad Shahid

Silicon improved shelf life in grapes, peach and mango (PC: Ali Sarkhosh)



Grape



Tomato

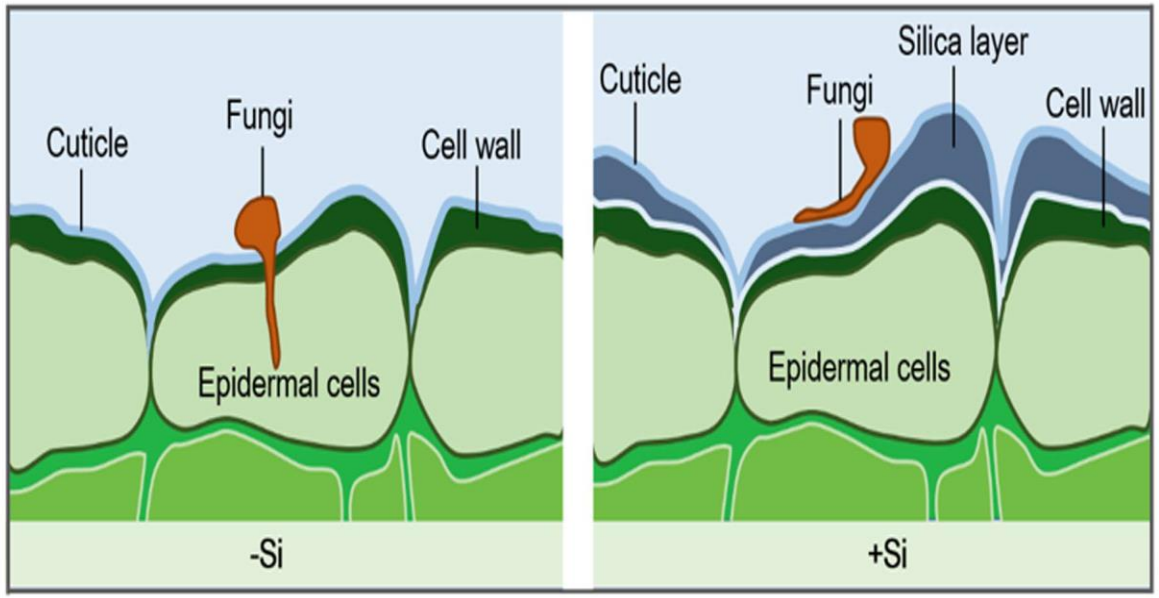
Effect of silicon on root formation in aeroponically grown grape cuttings (PC: Muhammad)

Mode of action of Si

- Physical barrier
- Biochemical action
- Molecular mechanism

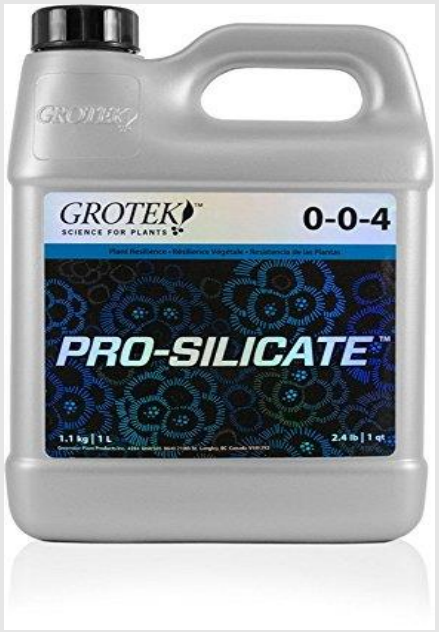
A

B



Silicon Fertilizers

- Available liquid and powder
  - Biacsil
  - Silifert
  - Nitrosil
  - Agsil 16
  - Agsil 22
  - Silica Balast
  - Sil-guard
  - SiGuard
  - SiMag58



Biochar: Substrate Amendment

- Charcoal produced by burning of plant materials at high temperature in the absence of oxygen
- Improve fertility
- Improve nutrient and water holding capacity
- Mitigate micronutrient deficiencies
- Reduces input cost by limiting nutrient leaching

Biochar Source Material	Soil/Substrate	Effect on Plant Growth	Crop
Citrus wood	Coconut fiber: tuff substrate	Increase	Pepper (*Capsicum annuum* L.) and Tomato (*Solanum lycopersicum* L.)
Gasified rice hulls	Peat	Decrease Increase	Geranium (*Pelargonium ×hortorum* 'Maverick Red') Tomato (*Solanum lycopersicum* 'Megabite')
Hardwood	Soil	Increase	Maize (*Zea mays* L.)
Hardwood pellets and pelletized wheat straw	Peat moss	Little or no effect	Tomato (*Solanum lycopersicum* L.) and Marigold (*Tagetes erecta* L.)
Mixed hardwood	Pine bark	Increase	*Hydrangea paniculata* 'Silver Dollar'

- Hatch: Effect of different biochar on nutrient availability and water holding capacity

Table: Jahromi


Use of biochar in grape production in south Florida

Project Overview

Impact of Biochar on Moisture and Nutrient Retention in Long Island Nurseries

LNE19-384R
Project Type: Research Only
Funds awarded in 2019: $83,949.00
Projected End Date: 04/30/2022
Grant Recipient: Cornell Cooperative Extension of Suffolk County
Region: Northeast
State: New York

Commodities

- **Additional Plants:** ornamentals

Practices

- **Crop Production:** application rate management, crop improvement and selection, nurseries, tissue analysis
- **Education and Training:** demonstration, extension, on-farm/ranch research, workshop
- **Soil Management:** organic matter, soil analysis, soil quality/health

Nanotechnology

- Particle size 1-100nm
- Improve nutrient use efficiency
- Improve nutrient uptake
- Herbicidal, insecticidal, antifungal and bacteriostatic action
- Highly reactive due to more surface to volume ratio
- Low environmental impacts
- Low leaching and volatilization

- **Types**
  - Silver based NP
  - Zinc based NP
  - Chitosan based NP
  - Copper based NP
  - Urea coated-zeolite chips

  - Hatch:
    - Evaluate the nanoparticles for disease incidence particularly for downy and powdery mildew
    - Evaluate the nanoparticles against abiotic stresses

Abiotic Stress Management

- Screening
- Supplemental lightening
- Growth regulators
- Nutrient management

Joint-Venture Research

- Silicon application in basil production *(DS Cole)*
- Red/Blue light spectrum in Basil production *(DS Cole)*
- Impact of LED lighting on lettuce production *(Moulton Farm)*
- Induction of flowering through LED light spectrum in annuals *(Pleasant View Gardens)*
- Reducing seed germination time in leafy greens by supplemental LED lightening *(LEF Farm)*

Contact

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THANKS