e-GRO Research
Webinar

Plant Nutrition Research Update

Silicon Fertilizer Enhances Stress Tolerance of Bedding and Potted Plants

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Webinar online at:
https://www.youtube.com/watch?v=dzez3yIvARI

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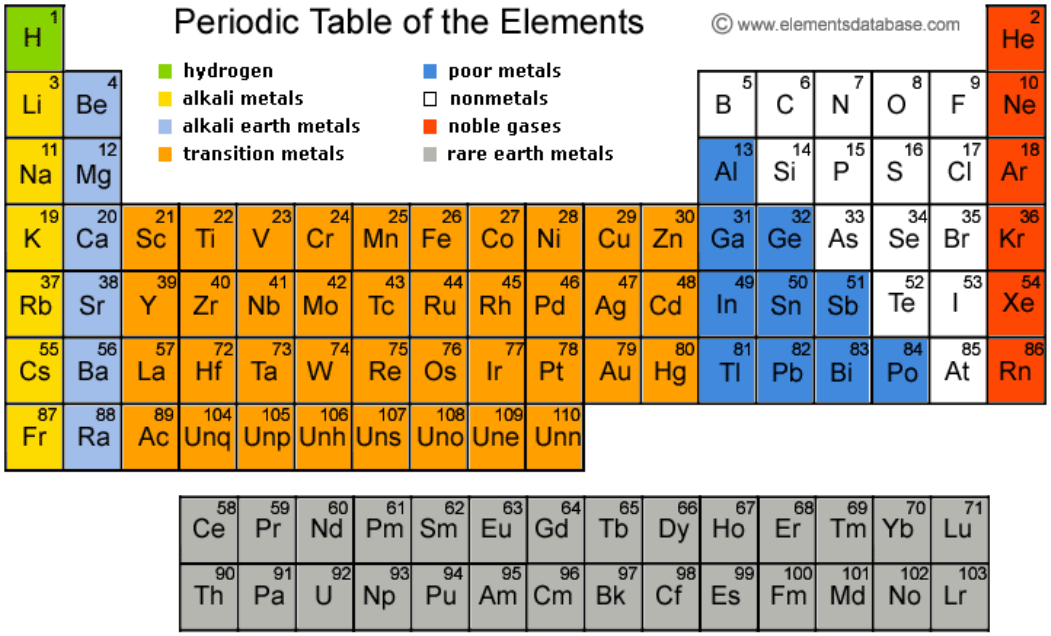
What is silicon?

What is silicon?

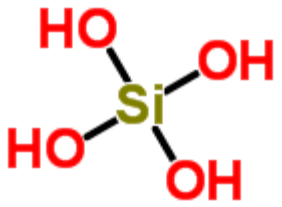
- Si, the 14th element on the periodic table
- Second largest constituent of soils
  - Oxygen 47% (by weight)
  - Silicon 27%
  - Aluminum 8%



Silicon **not** Silicone

Silicon:

- Orthosilicic acid: H_4SiO_4
  - Form absorbed by plants
- Silica, SiO_2, Quartz, amorphous glass
  - Form deposited into plant tissue



Silicone:

- polymer of Si, C, H, and O
- Rubber-like consistency
- Commonly used in cookware, sealants, adhesives, lubricants

Do floriculture species in a soilless substrate take up Si?

Soilless substrate: 2 ppm Si

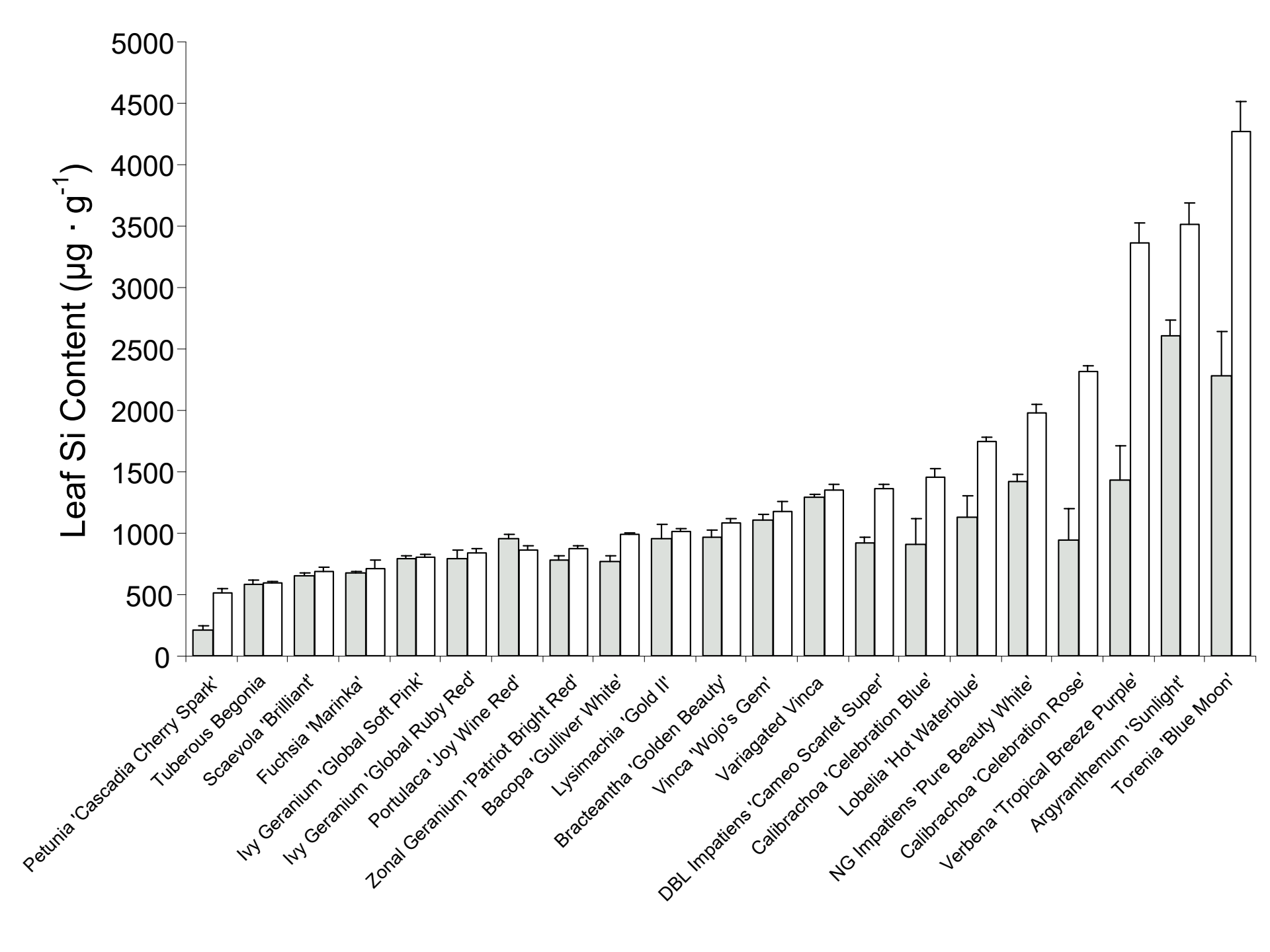
(Soils: 3-30 ppm Si)

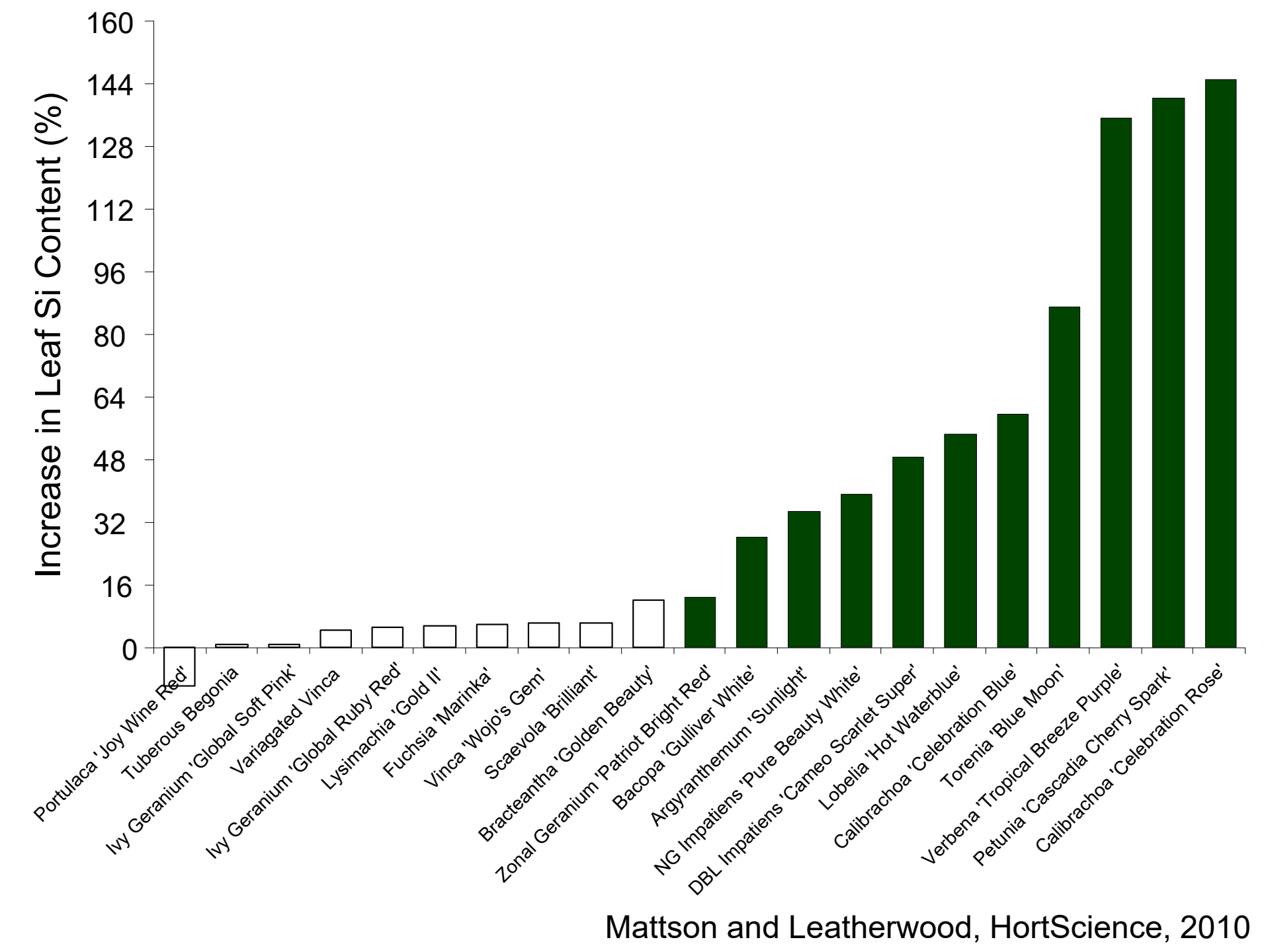
Cornell water: 0.8 ppm Si

Objective: Screen 21 floriculture species to determine if supplemental Si enhances leaf tissue Si

Bedding plants grown for 10 weeks with weekly drenches of 0 or 112 ppm Si (potassium silicate, Dyna Gro ProTeKt)

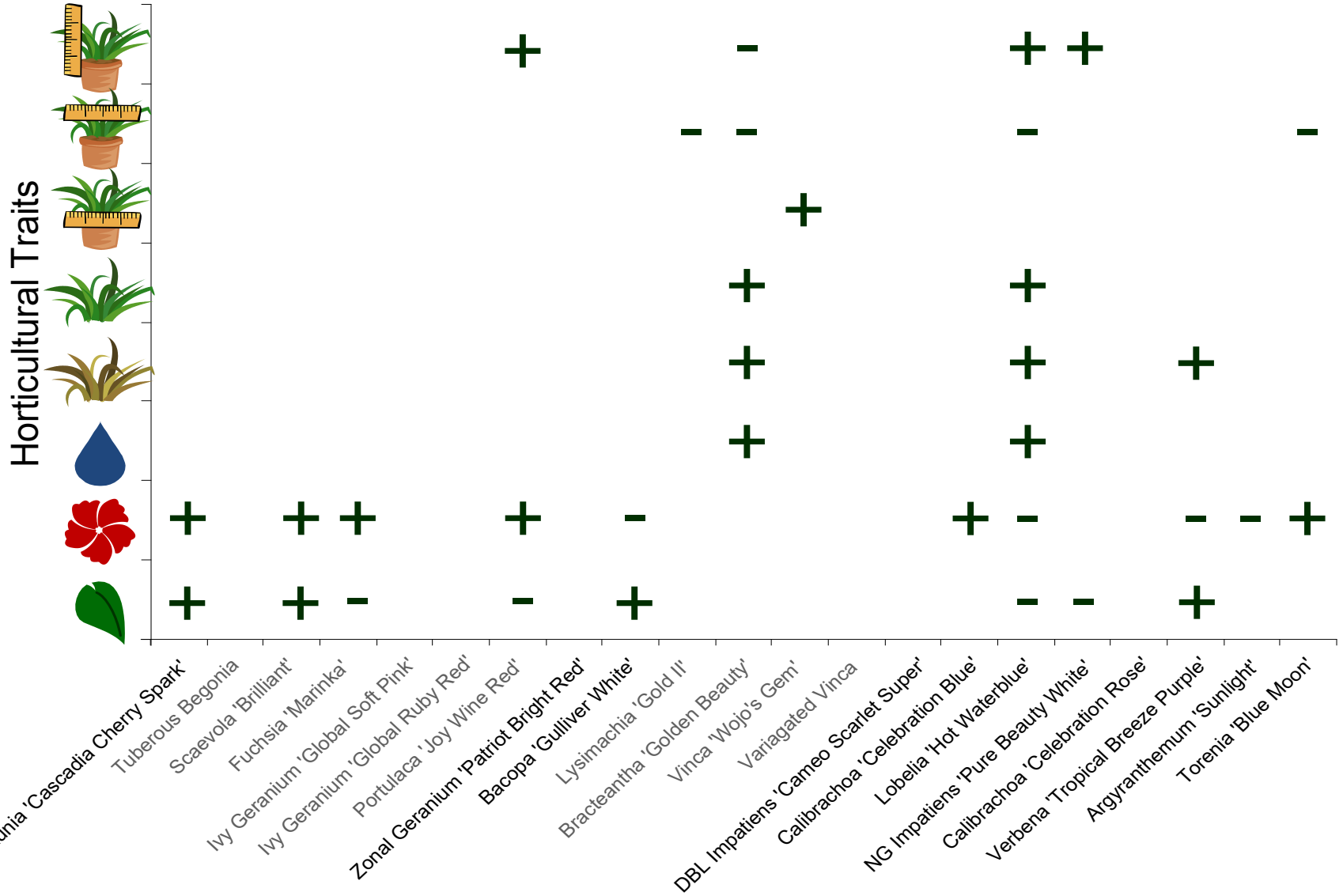
Mattson and Leatherwood, HortScience, 2010


Leaf Si Content (µg · g-1)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Petunia 'Cascadia Cherry Spark'
Tuberous Begonia
Scaevola 'Brilliant'
Fuchsia 'Marinka'
Ivy Geranium 'Global Soft Pink'
Ivy Geranium 'Global Ruby Red'
Portulaca 'Joy Wine Red'
Zonal Geranium 'Patriot Bright Red'
Bacopa 'Gulliver White'
Lysimachia 'Gold II'
Bracteantha 'Golden Beauty'
Vinca 'Wojo's Gem'
Variagated Vinca
DBL Impatiens 'Cameo Scarlet Super'
Calibrachoa 'Celebration Blue'
Lobelia 'Hot Waterblue'
NG Impatiens 'Pure Beauty White'
Calibrachoa 'Celebration Rose'
Verbena 'Tropical Breeze Purple'
Argyranthemum 'Sunlight'
Torenia 'Blue Moon'



Mattson and Leatherwood, HortScience, 2010

Horticultural Traits



Conclusions – Si Screening

- Weekly Si supplementation increased leaf Si concenctration for ½ of species studied
- Cultivars within a species can vary in Si accumulating ability; and Si growth effects
- Differential Si accumulation not required to see a growth affect
  - continual supply of plant available Si may be more important
- In absence of (a)biotic stresses, Si did not have any dramatic effects on plant growth

Does Si enhance salt tolerance of floriculture species?

- 28 species
- Seedlings transplanted into a soilless substrate
- Fertilized daily
- Treated 5 weeks, then harvested

Treatments

1. -NaCl -Si (Control)
2. -NaCl +Si
3. +NaCl -Si
4. +NaCl +Si

920 ppm Na + 1416 ppm Cl, 56 ppm Si
Cost of Si application 2 cents / pot

Dr. Jinrong Liu

Si benefits

- For 8 species, salt stressed plants +Si were significantly larger than -Si
  - Of these +Si increased DW by 47% to 152%
- +Si did not reduce growth of unstressed plants
- 4 additional species showed some benefit
  - +Salt +Si not sig. diff. from control

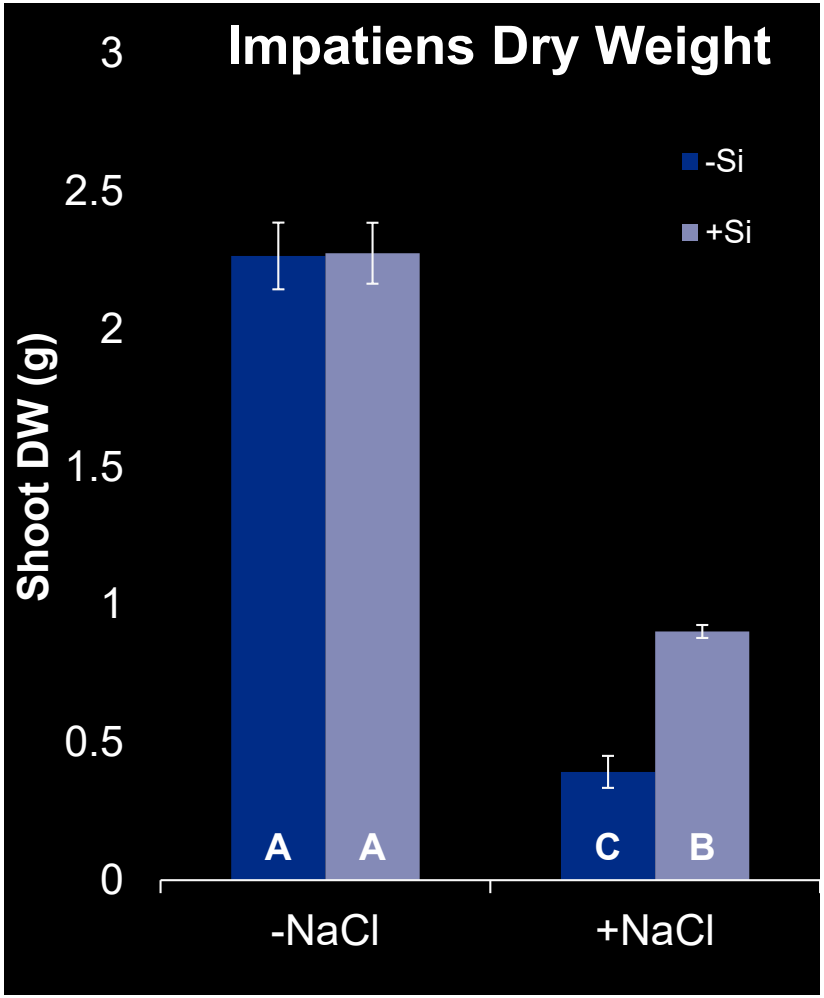
Si → DW of salt stressed plants

- Bacopa
- Begonia (Fibrous)
- Calibrachoa
- Cuphea
- Dahlia
- Impatiens
- Pansy
- Snapdragon

Letters represent Tukey's HSD separation comparison, alpha=0.05

Si benefits

- For 12 species, salt stressed plants +Si were significantly larger than -Si
  - Of these +Si increased DW by 47% to 152%
- +Si did not reduce growth of unstressed plants
- 4 additional species showed some benefit
  - +Salt +Si not sig. diff. from control



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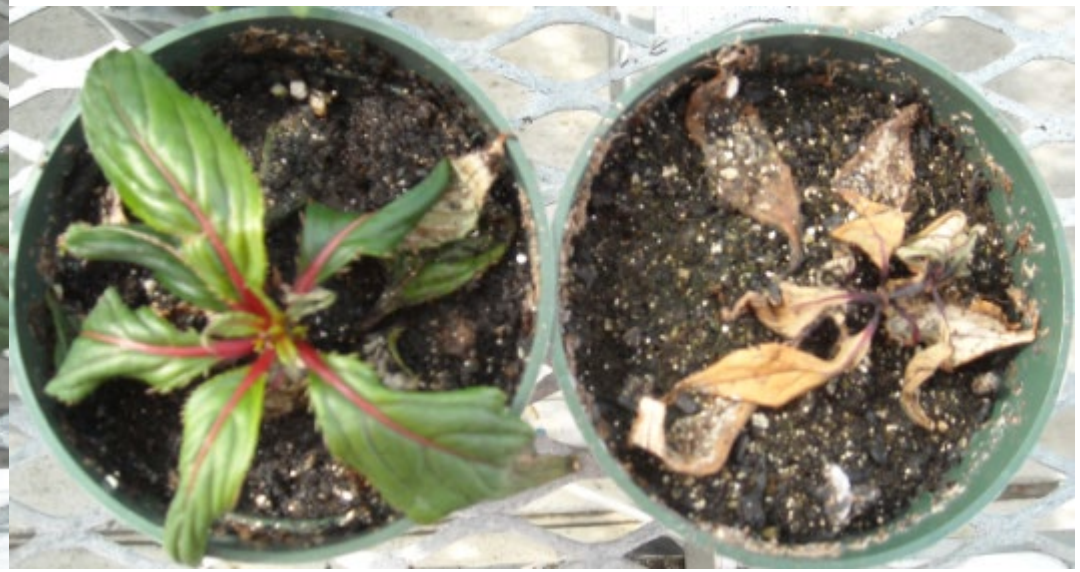
New Guinea Impatiens ‘Sonic Deep Purple’



-NaCl
-Si

+NaCl
+Si

+NaCl
-Si

‘Peterstar Red’ 100% Irrigation

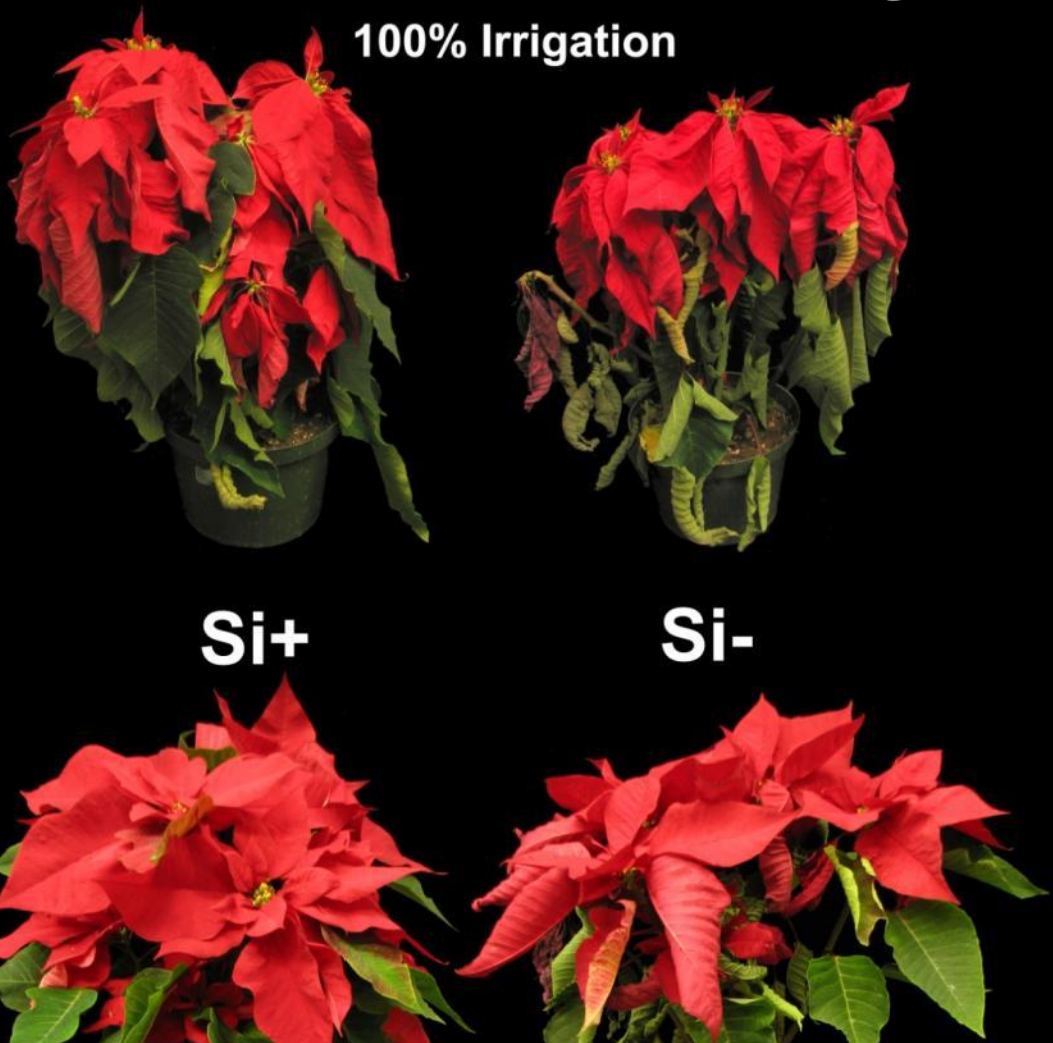
12 Days Postharvest

+Si

-Si

Peterstar Wilt Recovery

100% Irrigation



Si+ Si-

Petunia heat stress, 1 day exposure
Plants had received 0 or 100ppm Si weekly for several weeks

102° F

95° F

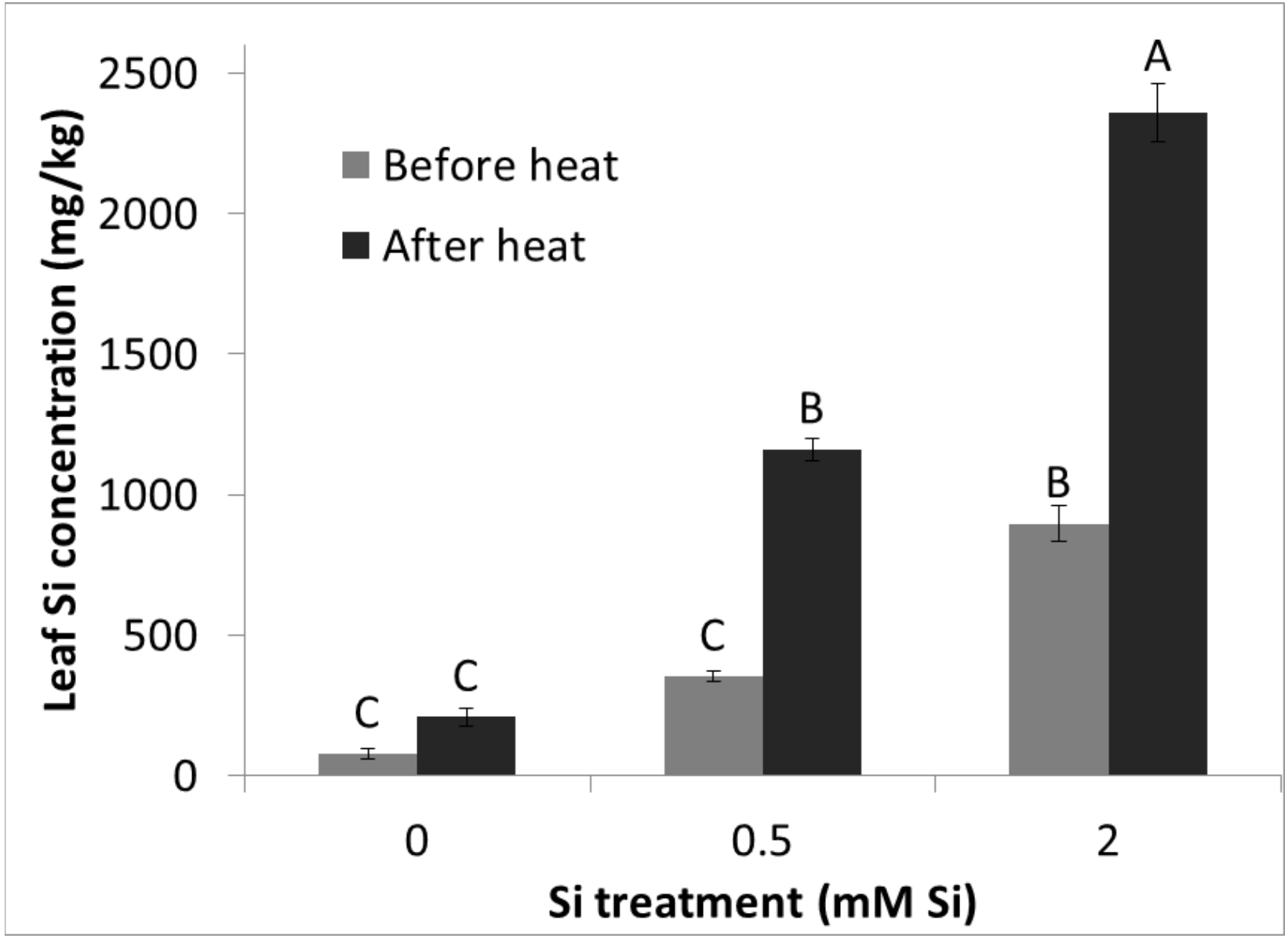
-Si +Si -Si +Si

3 days at 102 °F

- Silicon

+ Silicon

Stress Induced Silicon Accumulation



Using Potassium Silicate

- Liquid potassium-silicate (ex: Dyna Gro Pro-TeKt) cannot be mixed in the same stock tank as your standard fertilizer, solutions:
  - Second injector in series
  - 1x weekly drench when not fertilizing

Using Potassium Silicate

- Suggested Trial Rate
  - 50 ppm silicon if Constant Liquid Feed
  - 100 ppm silicon for weekly drench
- Raises pH slightly (ex: 0.3 pH units)

Neil's thought on silicon…

The addition of Si to greenhouse plants growing in soilless substrates appears to be beneficial for certain plants under certain conditions

1) A stress is present (heat, salt, biotic)
2) Tap water, fertilizer, or substrate does not continually supply enough Si as a contaminant
3) Not a miracle cure for every stress

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