Developing a fertilizer program for bedding plants

Neil Mattson

nsm47@cornell.edu

CornellCALS
College of Agriculture and Life Sciences

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Constant Liquid Feed

Ounces of Peters EXCEL 21-5-20 Per Gallon of Concentrate						
Nitrogen	Injector Ratios*					E.C.**
ppm N	1:15	1:100	1:128	1:200	1:300	mmhos/cm
25	0.24	1.61	2.06	3.22	4.83	0.16
50	0.48	3.22	4.12	6.43	9.65	0.32
75	0.72	4.82	6.17	9.65	14.48	0.48
100	0.96	6.43	8.23	12.86	19.29	0.64
150	1.45	9.65	12.35	19.29	28.94	0.96
200	1.93	12.86	16.46	25.72	38.58	1.28
300	2.89	19.30	24.69	38.58	57.90	1.92
400	3.86	25.72	32.92	51.44	77.16	2.56

A one-size fits all fertilizer solution is hard to do

- Different fertilizer requirements
  - Low, moderate, and heavy feeders
- Different pH requirements

Snapdragon 'Rocket Light Pink'

Low fertility affects plant marketability

High fertility combined with lack of leaching causes salt burn

Dahlia (L) and Cuphea (R) showed leaf burn at 500 ppm N

Grouping crops by fertilizer requirements

Light feeders 100 ppm Nitrogen CLF

- 1:2 dilution of 0.26 to 0.75 mS/cm
- SME of 0.76 to 2.0 mS/cm
- PourThru of 1.0 to 2.6 mS/cm

Ex: fibrous begonia, marigold, New Guinea impatiens, pansy, many bedding plants in packs

http://www.ces.ncsu.edu/depts/hort/floriculture/hils/HIL590.pdf

Grouping crops by fertilizer requirements

Moderate feeders 150 ppm Nitrogen CLF

- 1:2 dilution of 0.5 to 1.25 mS/cm
- SME of 1.5 to 3.0 mS/cm
- PourThru of 2.0 to 3.5 mS/cm

Ex: calibrachoa, dianthus, lantana, zonal geranium (vegetative), petunia

http://www.ces.ncsu.edu/depts/hort/floriculture/hils/HIL590.pdf

Grouping crops by fertilizer requirements

Heavy feeders 200-300 ppm Nitrogen
CLF

- 1:2 dilution of 0.75 to 1.5 mS/cm
- SME of 2.0 to 3.5 mS/cm
- PourThru of 2.6 to 4.6 mS/cm

Ex: garden mums, poinsettias, wave petunias (during the vegetative stage)

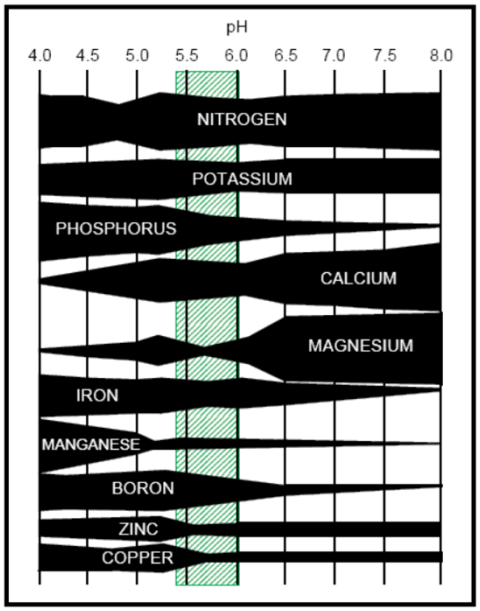
http://www.ces.ncsu.edu/depts/hort/floriculture/hils/HIL590.pdf

Example crops

Crop	Fertility	Suggested ppm N
Fibrous begonia	Light	100
NG Impatiens	Light-moderate	100-150
Pansy	Light-moderate	100-150
Petunia	Moderate	150-200+
Zonal Ger. (V)	Moderate	200+

Can you find a one size fits all fertilizer rate?

Effect of pH on nutrient availability



Group your crops according to pH requirements

Low pH Group

- Media pH between 5.5 – 5.8
- Plants are prone to Iron, Manganese, and other micronutrient DEFICIENCIES.

- •Bacopa
- •Begonias
- •Bratheantha
- •Calibrachoa
- •Diascia
- •Nemesia
- •Pansy
- •Petunia
- •Snapdragon
- •Tiarella
- •Sutera
- •Verbena
- •Vinca
- •Zinna

Information from Cari Peters, J.R. Peters Inc.

Symptoms of Iron Deficiency

- Leaves develop interveinal chlorosis
- Young leaves can develop uniform chlorosis
- If symptoms advance – the entire leaf can lose chlorophyll pigment and become light yellow/white
- Finally leaves can become necrotic

Group your crops according to pH requirements

Moderate pH Group

- Media pH between 5.5-6.5
- General group- plants not particularly prone to micronutrient deficiencies or toxicities

•Angelonia	•Dahlia	•Oxalis
•Ageratum	•Euphorbia	•Poinsettia
•Bracteantha	•Fushia	•Primula
•Chrysanthemum	•Impatiens	•Torenia
•Coleus	•Lobelia	•Osteospermum

Information from Cari Peters, J.R. Peters Inc.

Group your crops according to pH requirements

High pH Group

- Media pH between 6.2 – 6.5
- Plants can be prone to Iron, Manganese and other micronutrient TOXICITIES.

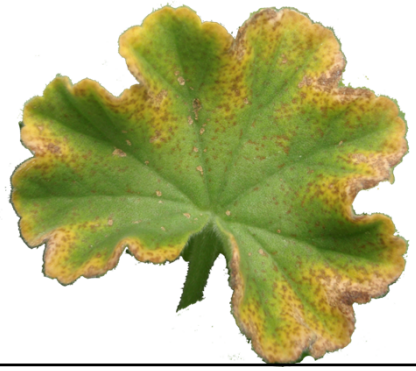
•Begonia- Rex	•Pentas	•New Guinea Impatiens
•Calendula	•Perilla	•Marigold
•Cyclamen	•Portulaca	•Dianthus
•Zonal& Seed Geranium	•Aloe	•Cleome
•Heliotrope	•Alocasia	

Information from Cari Peters, J.R. Peters Inc.

What is Optimal pH?

Iron-efficient group

- pH 6.2-6.5
- Iron/Manganese toxicity at low pH



Example crops

Crop	pH
Fibrous begonia	5.5-6.2
NG Impatiens	5.8-6.2
Pansy	5.5-6.0
Petunia	5.5-6.0
Zonal Ger. (V)	6.2-6.5

Can you find a one size fits all pH?

Ways to Lower pH

- Gradual methods:
  - Use an ammonium or urea based fertilizer
  - Continual acid injection to decrease water alkalinity to 80 ppm $CaCO_3$
- Quick methods:
  - One-time phosphoric acid drench (3.5 ounces 75-85% phosphoric acid / 100 gallons of water) or
  - One-time sulfuric acid drench (2 ounces sulfuric acid / 100 gallons of water)

Ways to Raise pH

- Gradual methods:
  - Stop acidifying water if acid is being injected
  - Use a nitrate based
- Quick methods:
  - Application of flowable lime or potassium bicarbonate drench

Selecting fertilizer based on your water source alkalinity

Alkalinity (in ppm CaCO3)	CCE (lbs/ton)	% Acidic Nitrogen	Examples
250-300	>500 acidic	>50%	20-20-20 21-7-7
150-250	200-450 acidic	40%	20-10-20 21-5-20
60-150	150 acidic - 150 basic	20%-30%	17-5-17 20-0-20
30-60	>200 basic	<10%	13-2-13 15-0-15

Adapted from: Paul Fisher and Bill Argo

Commercial testing labs

- Dairy One / Agro-One http://www.dairyone.com/AgroOne/
  - $24 tissue testing (Service Package 180, results only)
  - $12 soil testing (Service Package 855, commercial vegetables), includes: pH, buffer pH (lime requirement), organic matter, Modified Morgan phosphorus, potassium, calcium, magnesium, aluminum, iron, zinc, and manganese
- A&L Eastern Laboratories http://www.aleastern.com/
  - $24-30 ($2 extra for tissue recommendation using NutriScription®)
- JR Peters Laboratory http://www.jrpeters.com/
  - $36 for tissue, media, or water analysis (soil does not include OM)
- Macro Micro Laboratory http://www.mmilabs.com/
  - $45 for tissue, media, soil, or water analysis
- Everris Testing Laboratory http://protestinglab.everris.us.com/
  - $34 for tissue, media, soil or water analysis

Fertilizer Effects on Aphid Population Growth and Biocontrol

John Sanderson, Entomology
Neil Mattson, Horticulture
Elizabeth Lamb, NYS IPM
Brian Eshenaur, NYS IPM
Cornell University, Ithaca, NY

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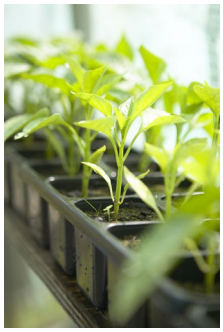
Two Plants

Pepper



Pansy

Seven Fertilizer Treatments

1 - Unfertilized control (water only)
2 - Water soluble fertilizer (WSF) (21-5-20)
low rate - 50 ppm N constant liquid feed
3 - Water soluble fertilizer (WSF)
high rate - 150 ppm N constant liquid feed
4 - Controlled release fertilizer (CRF) (Osmocote Bloom 12-7-18)
low rate (1.75 pounds per cubic yard)
5 - Controlled release fertilizer (CRF)
high rate - (3.5 pounds per cubic yard)
6 - Organic granular fertilizer (OGF) (Verdanta EcoVita 7-5-10)
low rate - (3 pounds per cubic yard)
7 - Organic granular fertilizer (OGF)
high rate - (6 pounds per cubic yard)

Methods

- Plants grown from seed for 4-6 weeks, all fertilized the same (WSF)
- Transplanted into 4 inch pots; grown under one of the seven fertilizer treatments for 2 weeks

Water Low High Low High Low High

WSF CRF OGF

Two Aphids

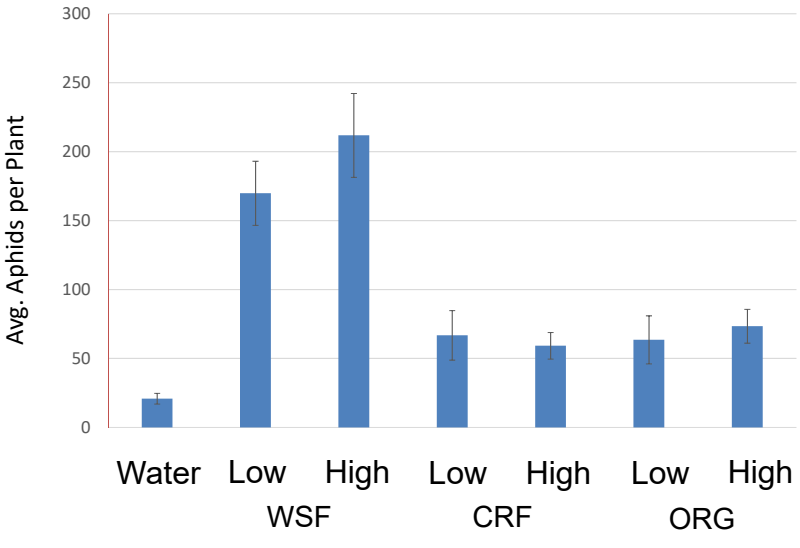
Green peach aphid,
Myzus persicae

Foxglove aphid,
Aulacorthum solani

Methods

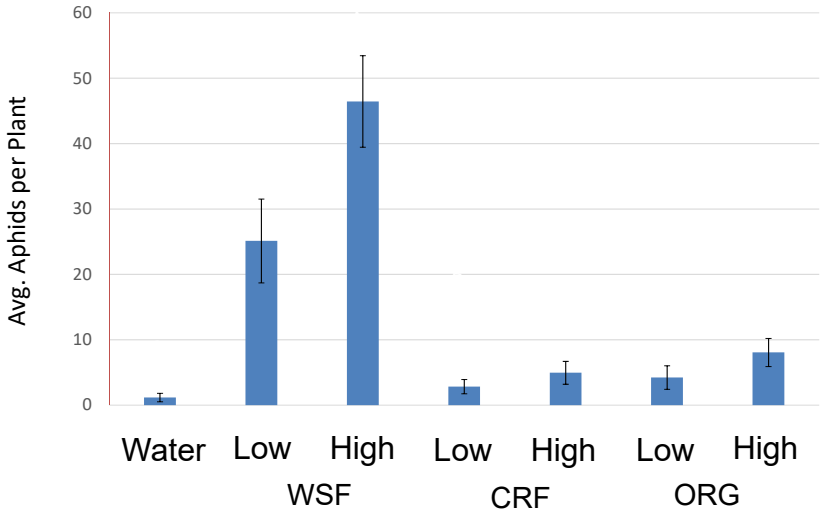
- 3 adult female aphids of either foxglove aphid or green peach aphid added to each plant; allowed to reproduce for 2 weeks
- Continued the specific fertilizer treatments
- All aphids on all plants counted at end of 2 weeks

Avg. No. Green Peach Aphid on Pepper



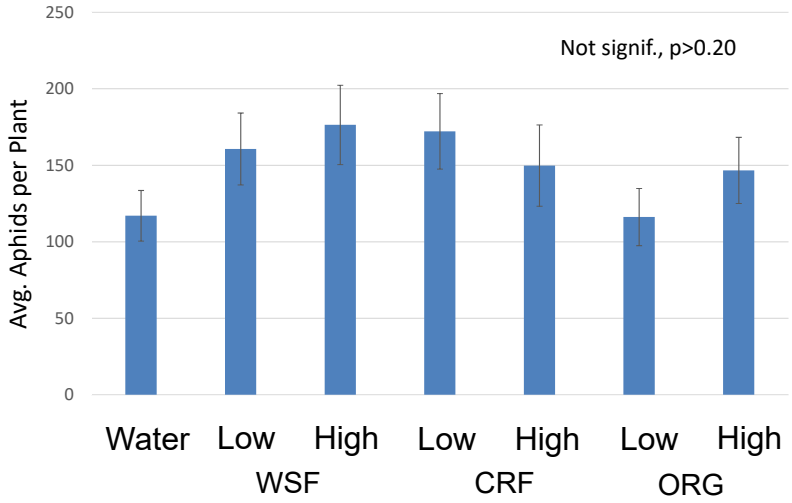
Note number of aphids

Avg. No. Foxglove Aphid on Pepper

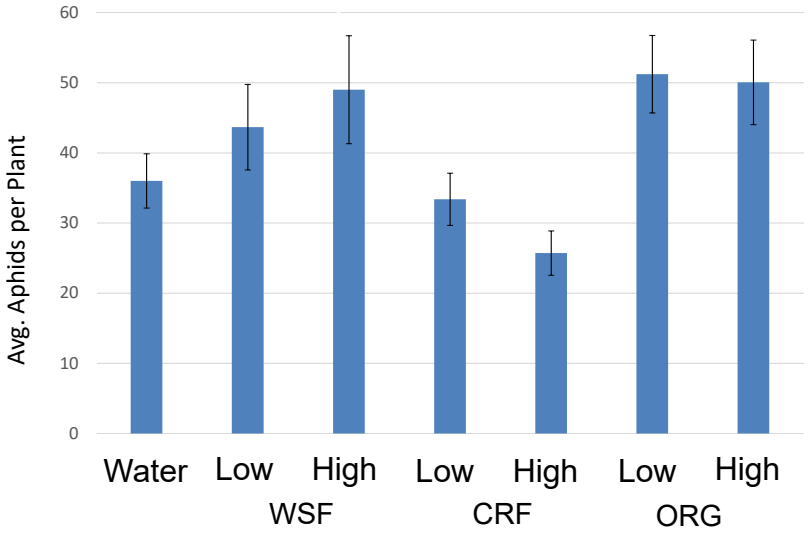


Note number of aphids

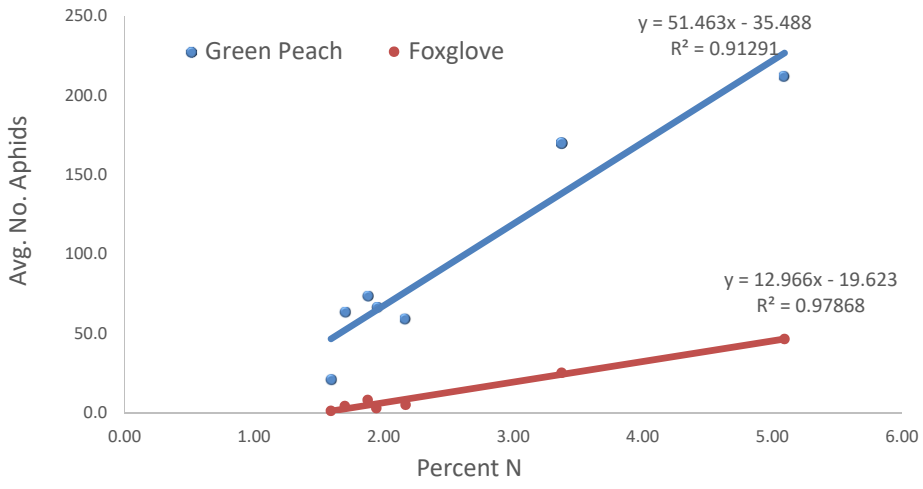
Avg. No. Green Peach Aphid on Pansy

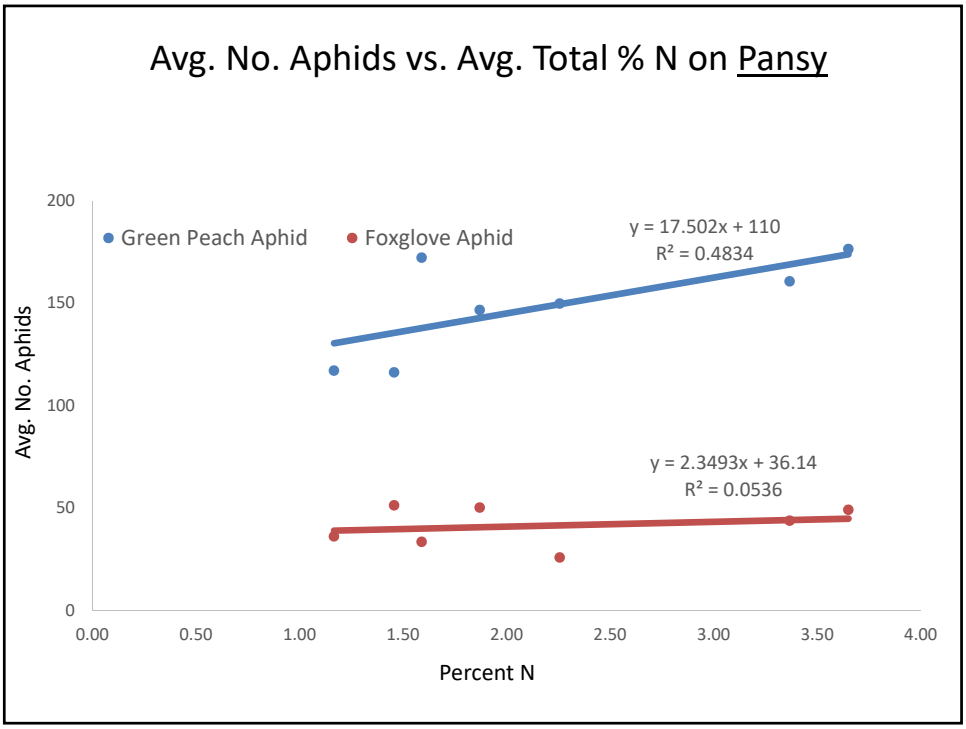


Avg. No. Foxglove Aphid on Pansy



Avg. No. Aphids vs. Avg. Total % N on Pepper





Conclusions: Aphid Response

- Fertilizer treatment significantly affected aphid population growth in the same manner that it affected plant growth in pepper but not in pansy
- Regardless of fertilizer treatment, GPA populations grew much larger than FGA
- *More fertilizer or higher N level doesn't necessarily lead to more aphids*
  - Plant specific – but why?
  - Not plant size?

QUESTIONS?

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