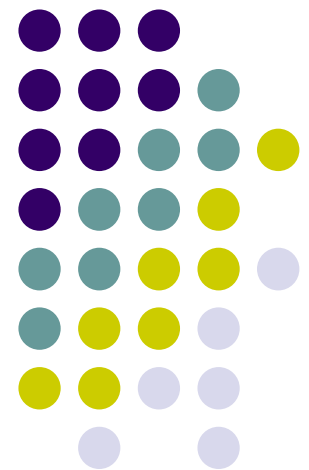


# The Secrets of Zinnias Revealed

Alexa Wright, Julia Kornegay,  
Travis Hootman, John Dole

NC STATE UNIVERSITY



# Zinnia Production and Postharvest

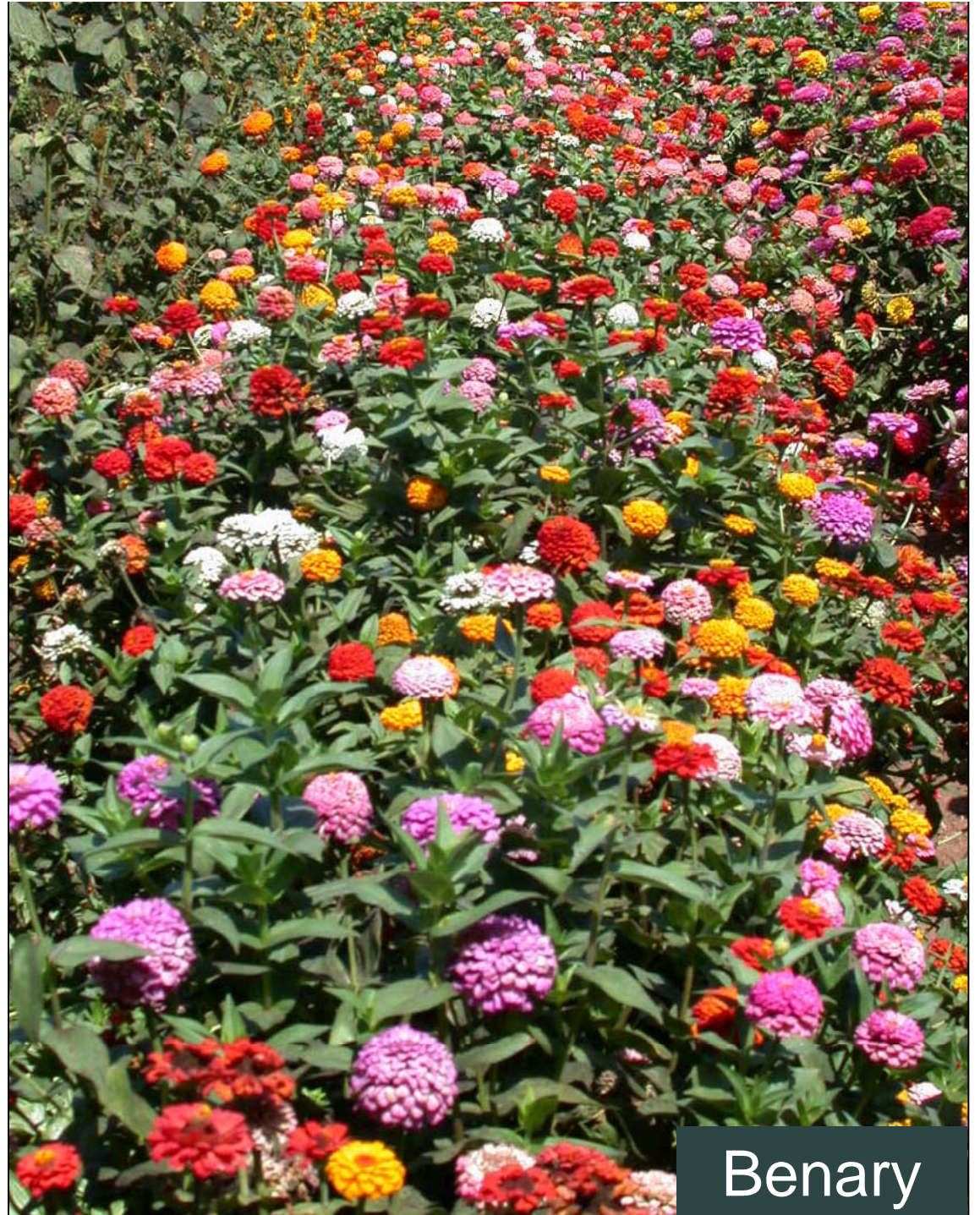


- Cultivars
- Production
- Postharvest
- Future – Breeding of new zinnias

# Zinnia: Cultivars

Benary Giants – most individual colors:

- Bright Pink
- Carmine Rose
- Coral
- Deep Red
- Deep Rose
- Golden Yellow
- Lime
- Orange
- Purple
- Salmon Rose
- Scarlet
- White
- Wine



Benary

15-16 day

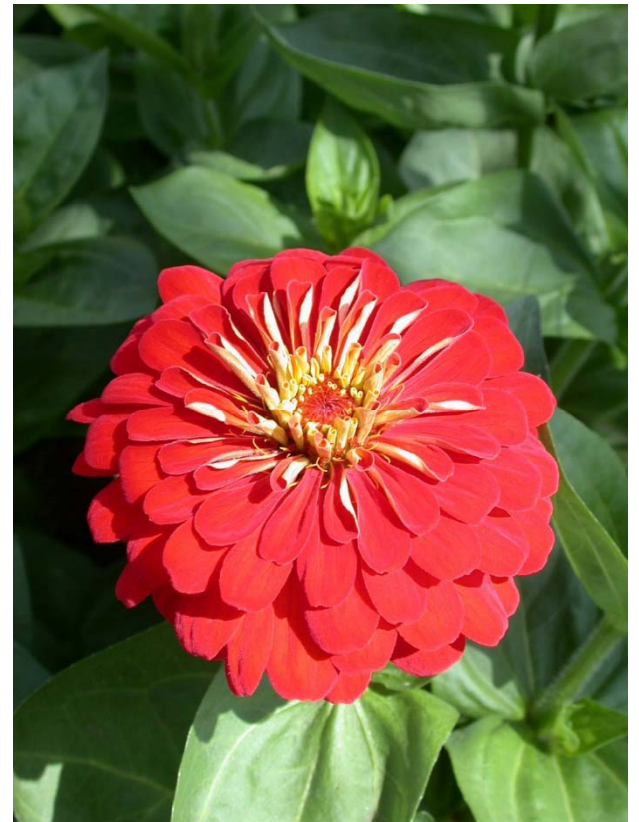
9 day minimum

Syngenta



Zinnia 'Uproar Rose'

# 'Sun Cherry', 'Gold', 'Red'



American Takii

# Zinnia Queen Red Lime



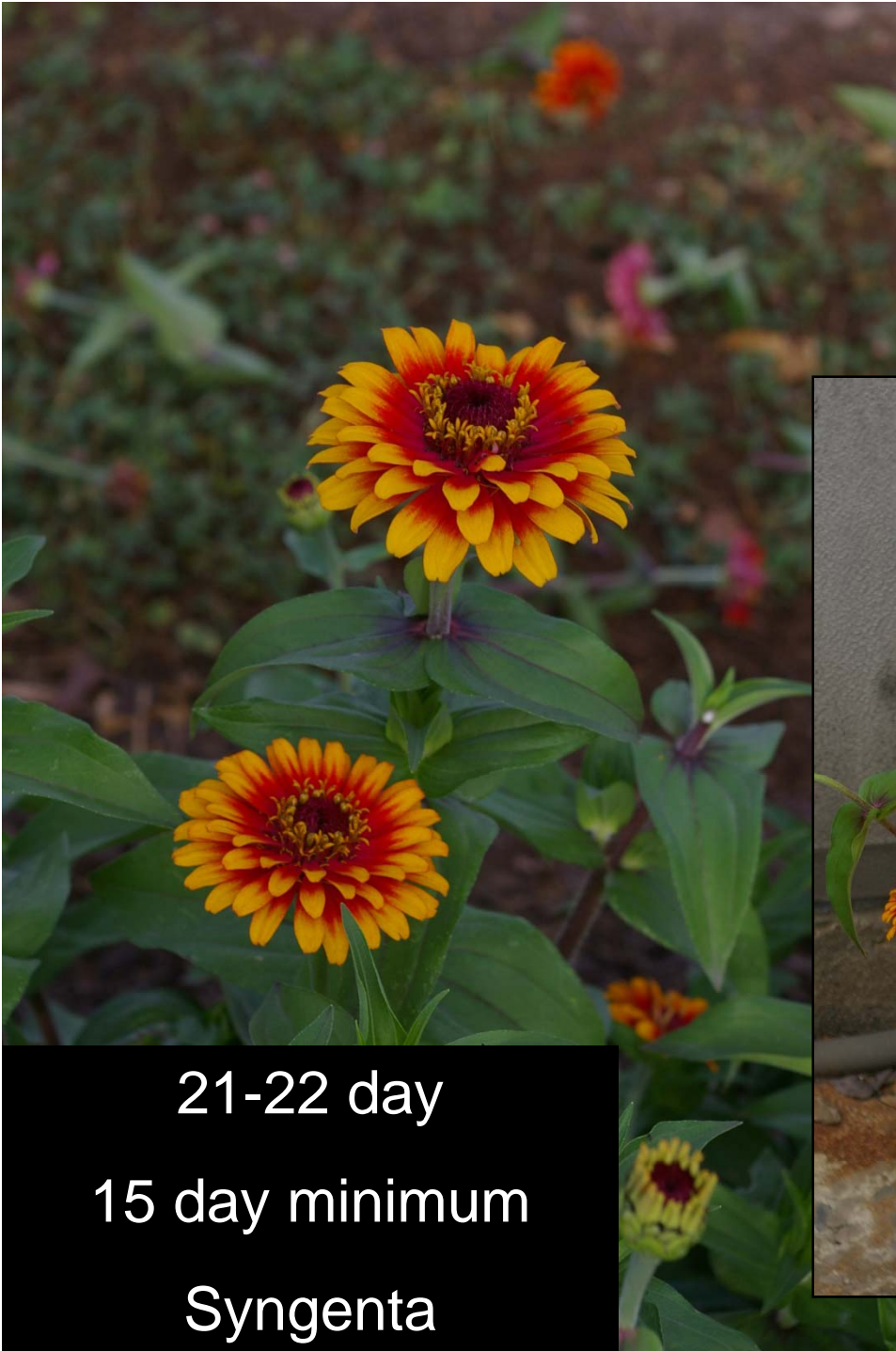
Holding 8-9 days  
Water 6 days  
4 day minimum  
Benary

# Zinnia Red Beauty



Genesis Seed

# Zinnia 'Zowie! Yellow Flame'



21-22 day

15 day minimum

Syngenta



# *Zinnia* 'Oklahoma'

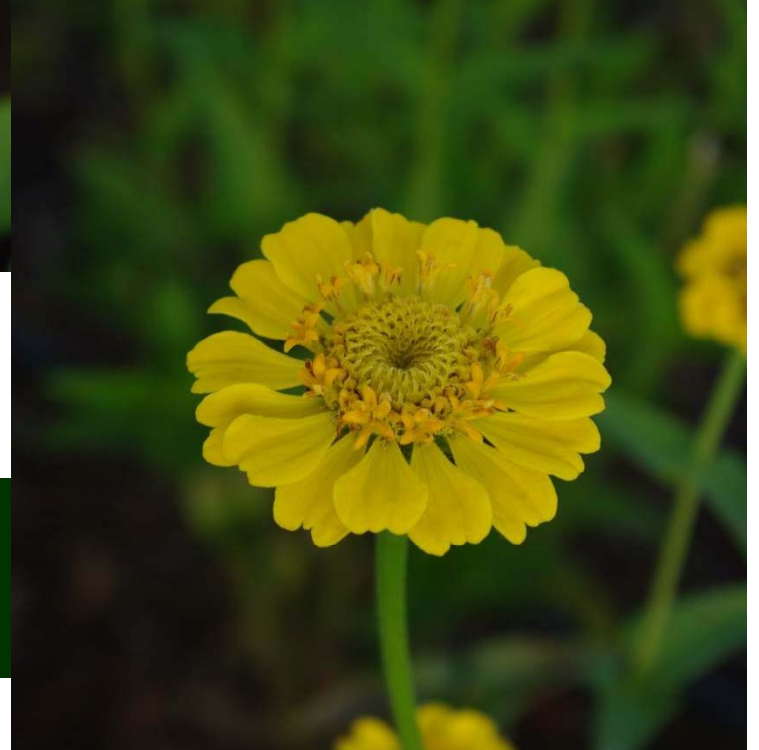


14+ day vase life, Benary

# Zinnia 'Cupcake Red'

Gro N' Sell/Floragran





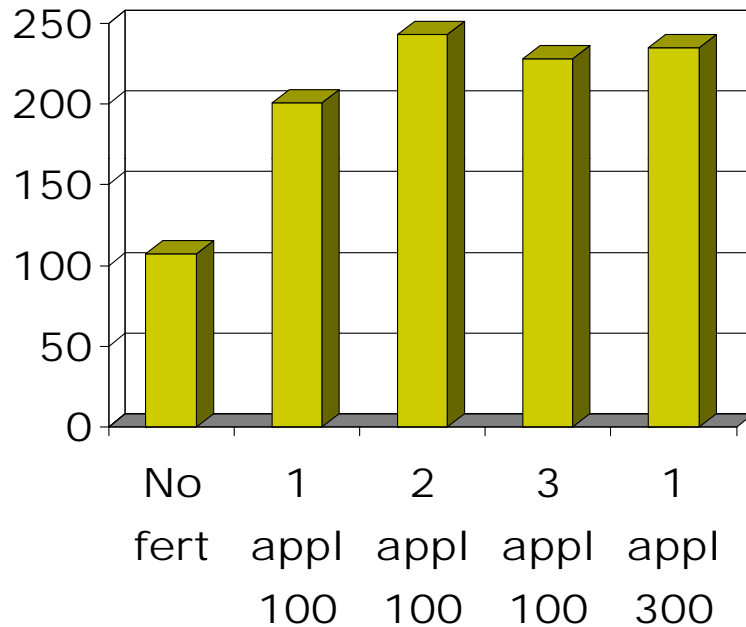
‘Cupcake Orange’ / ‘Yellow’

Vaselife: 9-10 days

# Production: Fertilization

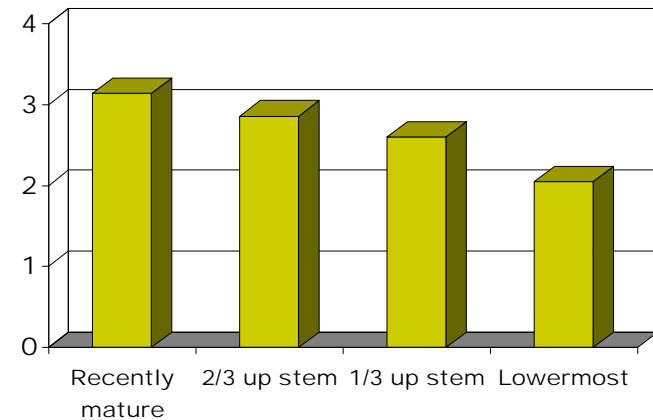
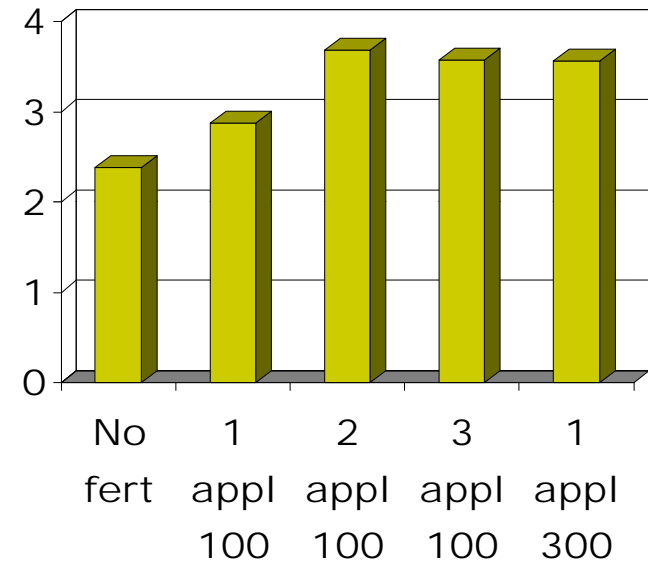


**Harvested stems (no.)**



appl = application  
 100 = 100 lb/acre nitrogen  
 300 = 300 lb/acre nitrogen

**Tissue N level (%)**



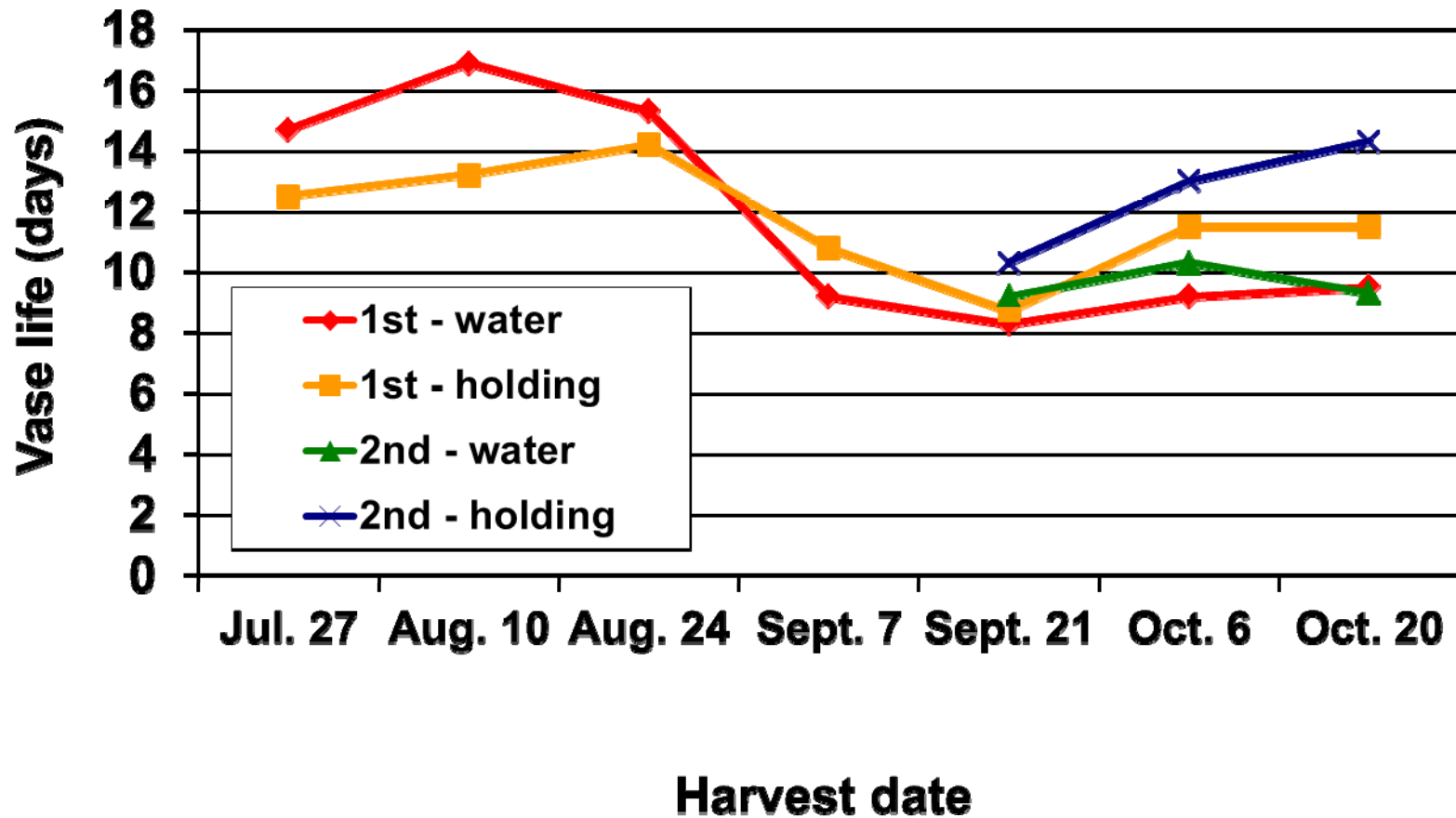
# Postharvest: Cultivars



	Water		Hydrator (4 hrs)		Holding duration
	Water	Holding	Water	Holding	
Benary's Giant Wine	8	10	8	9	2 days
Queen Red Lime	6	8	6	9	2 days
Red Beauty	8	9	8	9	2 days
Benary's Giant Lime	24	16	20	1	Continuous
Oklahoma Carmine	19	17	20	18	Continuous
Oklahoma Yellow	22	22	24	22	Continuous
Sun Cherry	12	7	13	7	Continuous
Sun Gold	11	9	12	8	Continuous
Uproar Rose	23	16	25	15	Continuous
Zowie Yellow Flame	33	22	31	21	Continuous

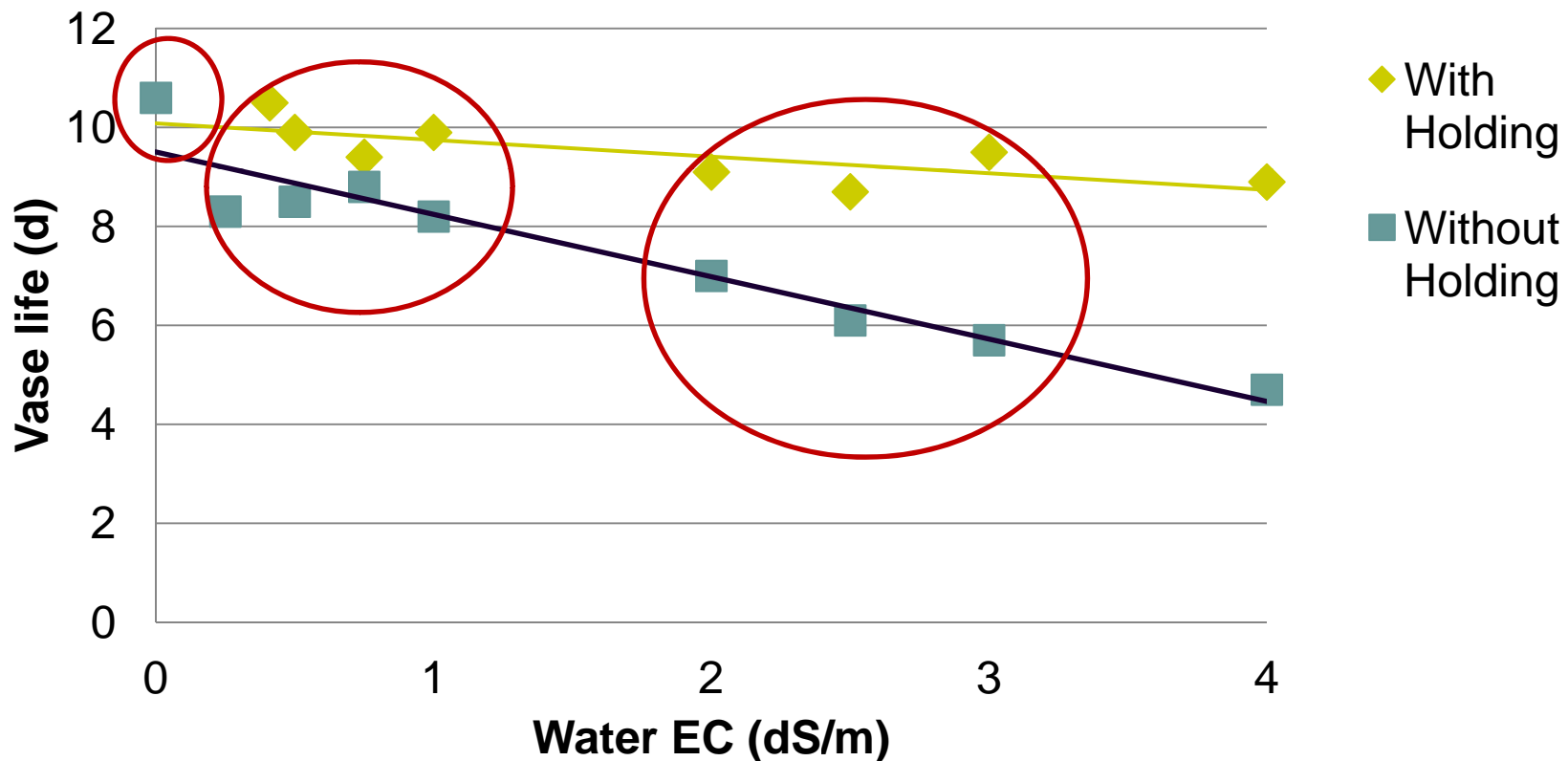


# Postharvest: Seasonality





# Postharvest: Water EC

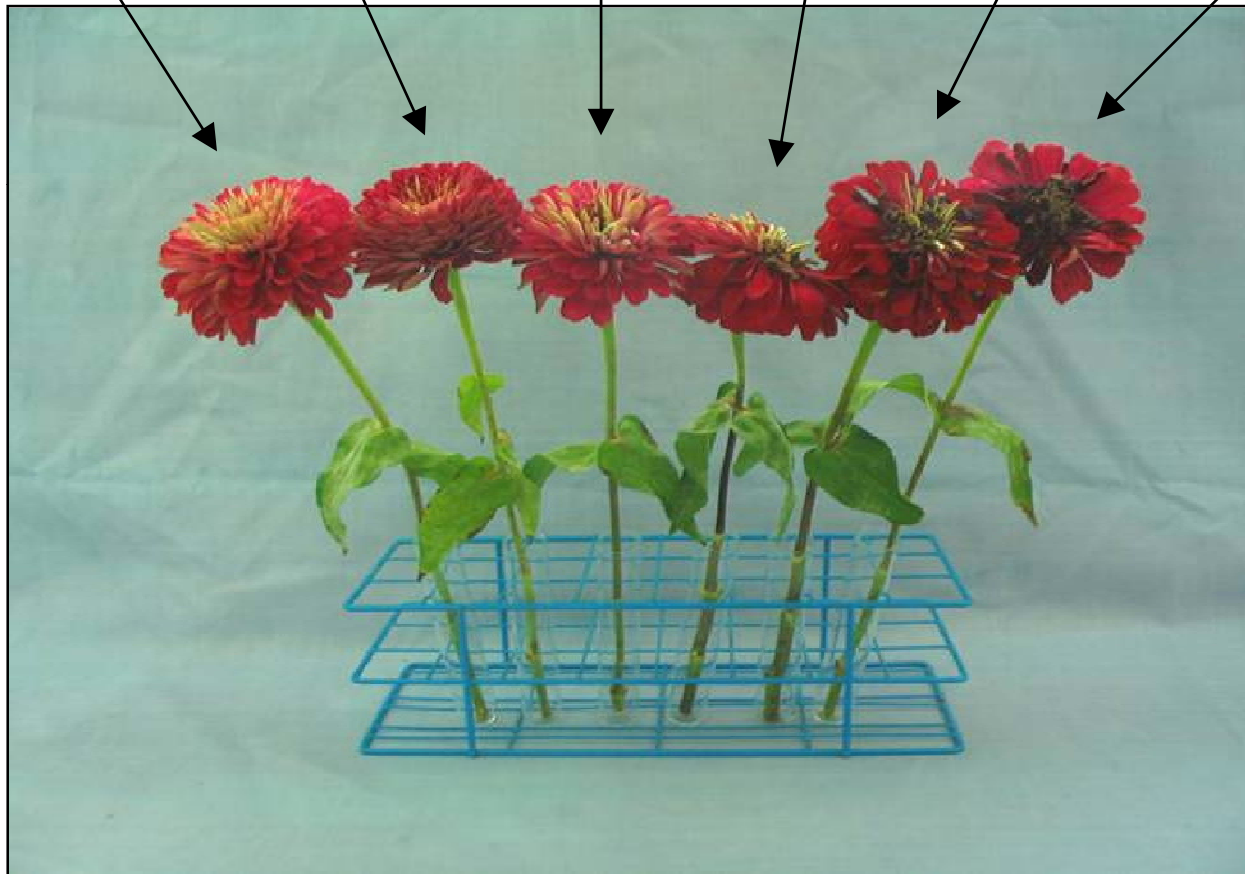


- Increasing EC reduced vase life
- Holding solution helped to mediate the negative effects of high EC on vase life

# Postharvest: Drying Time After Recutting



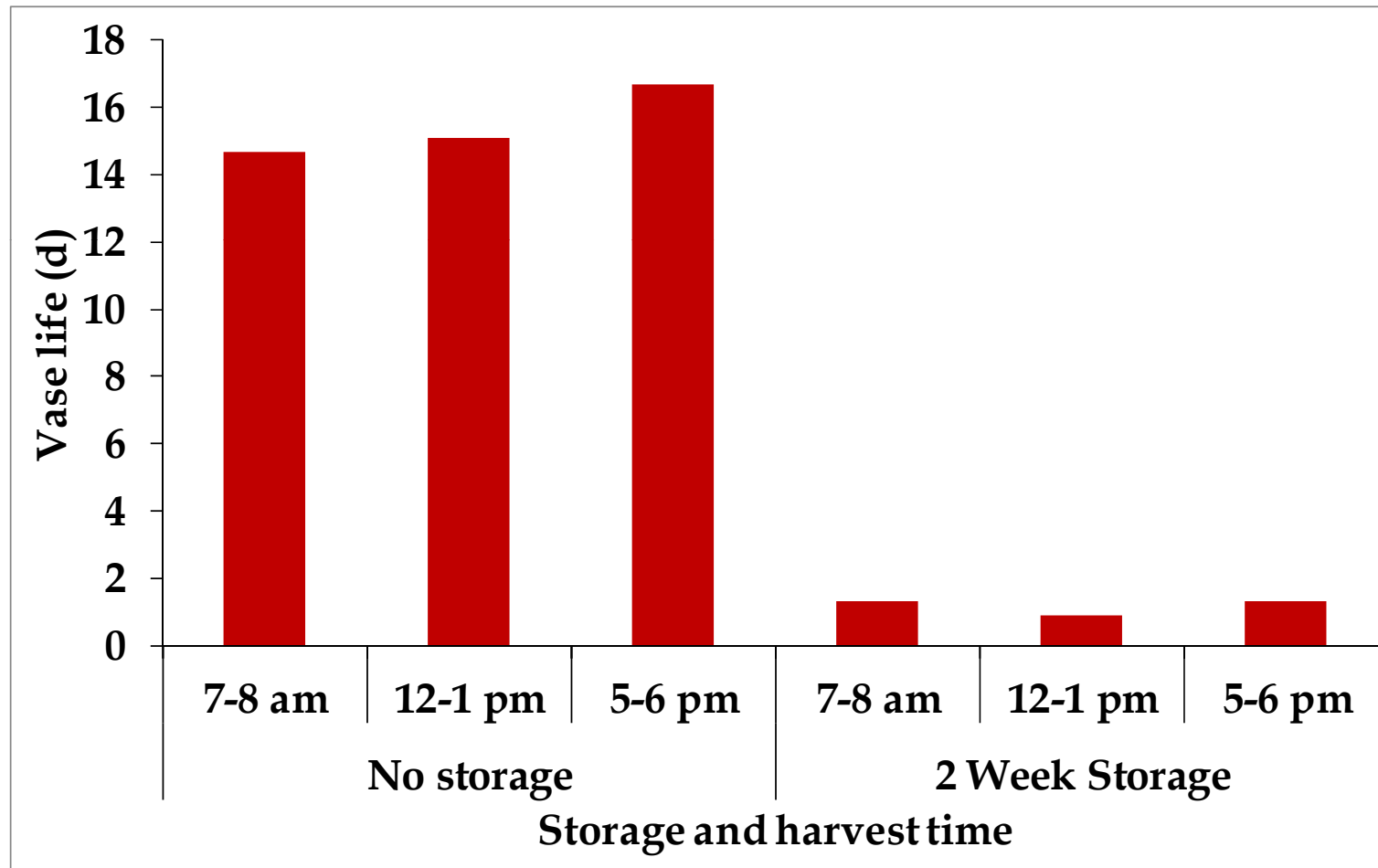
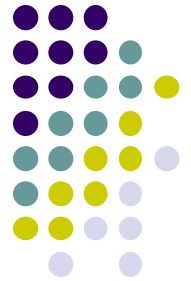
0 min      10 min      60 min      120 min      240 min      480 min



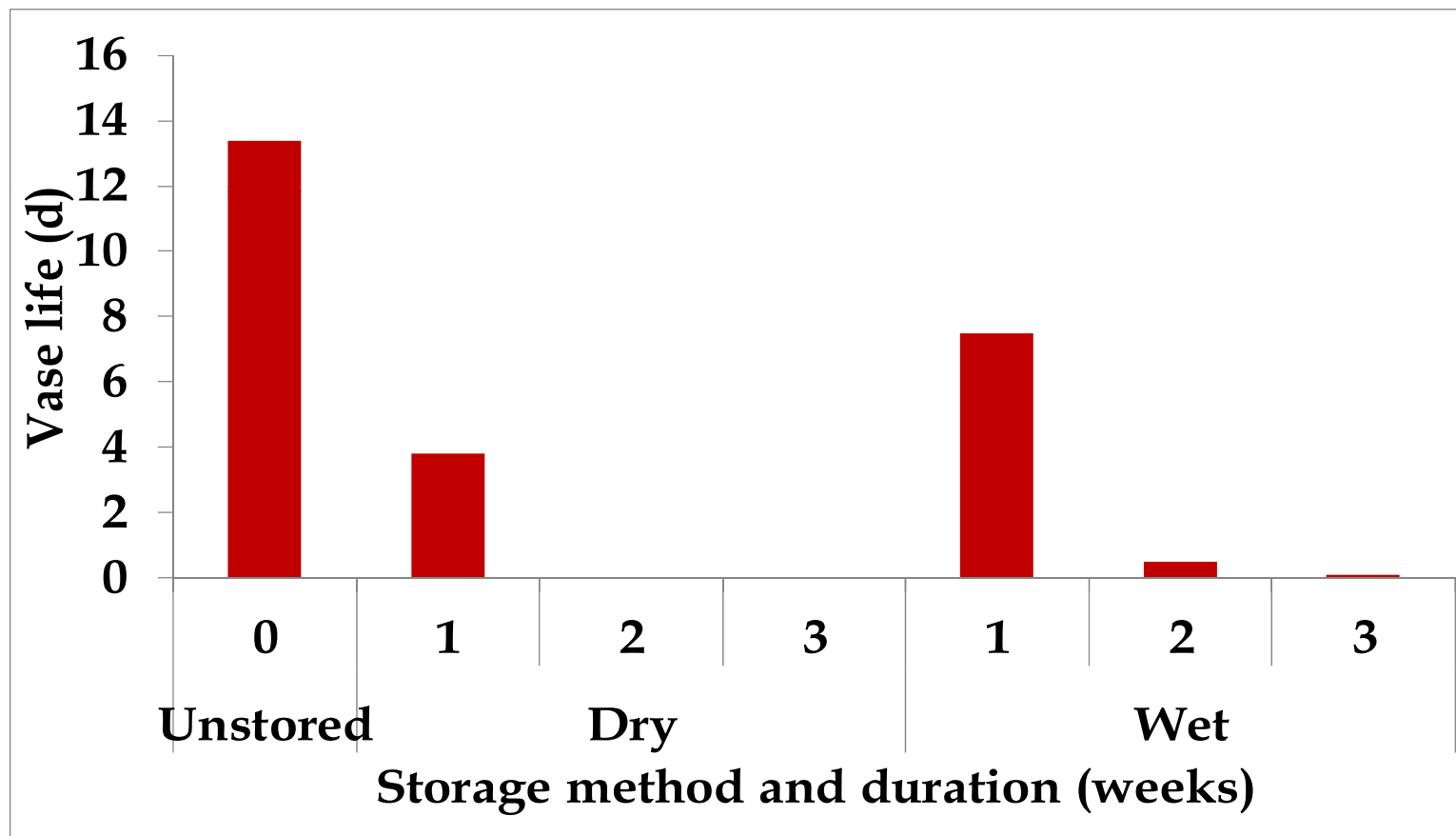
Day 11



# Postharvest: Harvest Time and Storage



# Postharvest: Storage Method and Duration





# Postharvest: Summary

- Erratic results
- Cold damage
  - Yes, if stored at 36F for one week
  - No, if stored for 1 to 3 days at 34 to 36F
- Flower foods
  - 2-day pulse of holding solution improved vase life
  - Shorter vase life and petal damage sometimes occurs when stems are kept in holding solution too long or when a hydrator is followed by a holding solution
- Water
  - Low EC
  - pH doesn't matter



# Postharvest: Summary

- Harvest and Storage
  - Afternoon harvests slightly lengthens vase life
  - Zinnia doesn't store well, regardless of wet or dry storage
- Handling
  - Can tolerate being out of the water for as long as 2 hours
  - Recut if dry, don't recut if stems are not out of the water
- “Dirty” flower that is sensitive to bacteria – cleanliness is very important



# **Future of Zinnia Breeding**

# Germplasm Resources



- Tolerate
  - Summer heat
  - Drought
- Vary in height
- Flowers
  - High diversity in form
  - Wide range of solid and bicolors
  - Attract butterflies, bees, and hummingbirds
- Disease resistance



# Zinnia Systematics



## Subgenus *Diplothrix* (20)

- *Z. juniperifolia*
- *Z. citrea*
- *Z. acerosa*
- *Z. oligantha*
- *Z. grandifolia*
- *Z. anomala*

## Subgenus *Zinnia*

### **Section *Mendezia* (22)**

- Z. angustifolia*
- Z. maritima*
- Z. greggii*
- Z. bicolor*
- Z. purpusii*
- Z. tenella*
- Z. leucoglossa*
- Z. littoralis*

### **Section *Zinnia* (24)**

- Z. violacea*
- Z. haageana*
- Z. peruviana*
- Z. tenuifolia*

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# Powdery Mildew



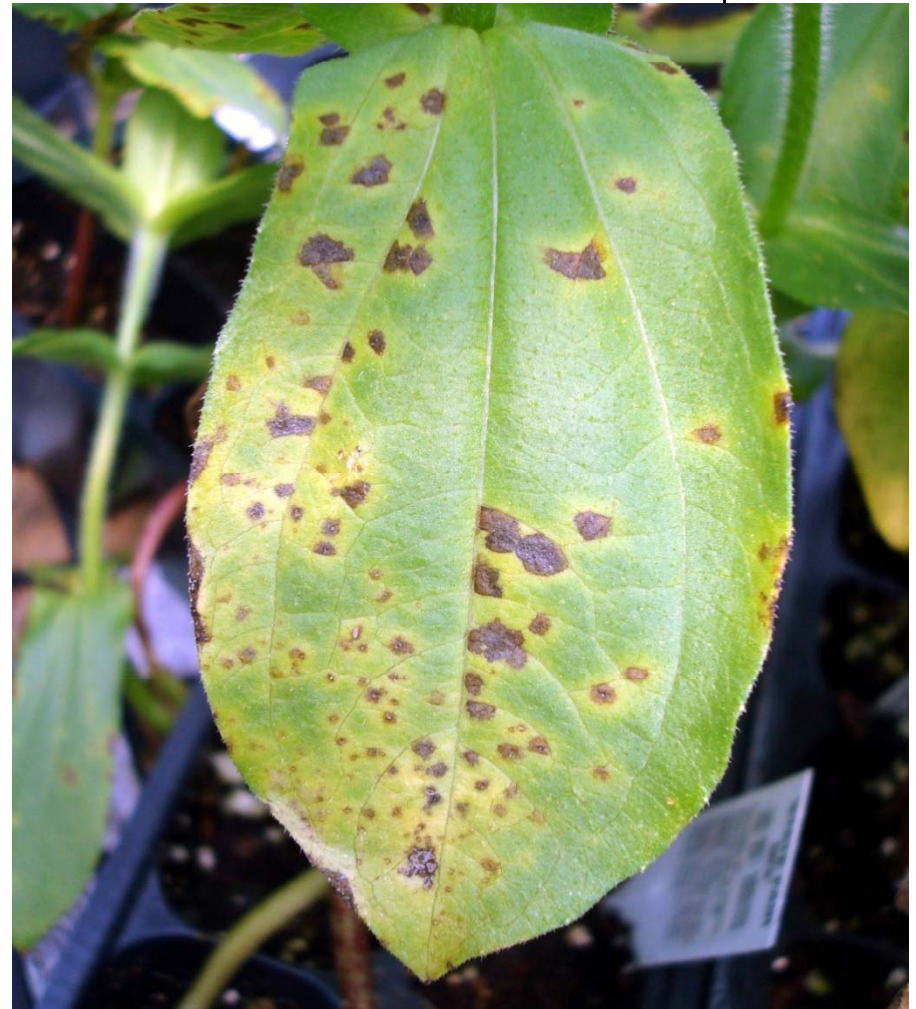
- Fungal disease
- First appears in August or September
- Scattered circular white powdery-looking spots on the leaves
- Ruins or even kills the plant



# Bacterial Leaf and Flower Spot



- Can develop at anytime
- Characterized by angular red brown leaf spots
- Often affects newly transplanted or emerged seedlings
- Heavily spotted tissues wither and die



# Alternaria Blight



- Late summer early fall fungal disease
- Circular in shape with reddish brown to purple margins and grey-white centers
- Heavily spotted tissues wither and die



# Germplasm Disease Ratings



Zinnia species	Cultivar	Powdery mildew	Bacterial leaf and flower spot
violacea	Benary Giant Lime	S	S
violacea	Benary Giant Scarlet	S	I/S
violacea	Zowie Yellow Flame	S	S
violacea	State Fair Mix	S	I
haageana	Aztec Sunset	I	R/I
haageana	Jazzy Mix	I/S	R/I
haageana	Chippendale	I	R
tenuifolia	Red Spider	I/S	R/I
peruviana	PI410405	I/S	R
angustifolia	Cascade Beauties Yellow	HR	HR
angustifolia	Crystal White	HR	HR
angustifolia	Starbright	HR	HR

S= susceptible, I= intermediate, R= resistant, HR= highly resistant

# Example of *Z. marylandica*



- Hybrid of *Z. angustifolia* and *Z. violacea*
- Highly disease resistant
- Compact bedding plants
  - Too short for cut flower use
- Flower all season
- Moderate heat and drought tolerance



# Drought Tolerance



- Many cultivars advertised as drought and heat tolerant
- Few studies on drought and heat tolerance

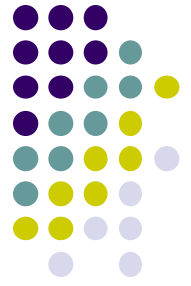
# Breeding Goals



- Utilization of the germplasm
- Interspecific hybridization
- Disease resistant cut flower types
- Drought and heat tolerant cut flower types



# Breeding Challenges



- Much of the genetic diversity is not well known
- Interspecific incompatibility and infertile hybrids



# Support



- ASCFG Research Fund
- American Floral Endowment
- Hill Foundation
  
- Numerous plant material suppliers
- Pokon Chrysal
- Floralife
- Coor Farm Supply
- Dillon Plastics, Fafard, Berger, Scotts

# The Cut Flower Crew (CFC)



- Ingram McCall
- Diane Mays
- Iftikhar Ahmad
- Alicain Carlson
- Brigitte Crawford



**Questions/Comments**