Postharvest Handling Techniques and Research

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Outline

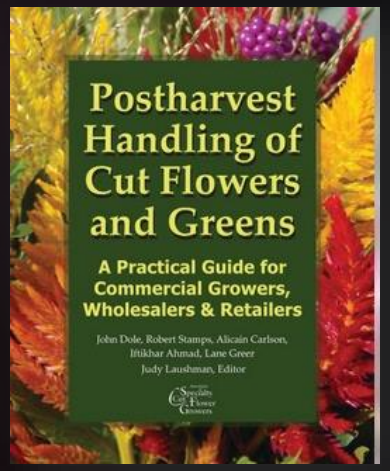
- General and current postharvest practices
- Postharvest issues
- NC State Research
  - Heat effect on storage
  - Long-term storage
  - Preservative pulses

Postharvest handling considerations

Variety | Bud stage | Market | Temperature | Moisture | Disease | Preservatives

Postharvest practices

1. Harvest at correct bud stage for target market
2. Remove surface moisture
3. Cool to 34 °F (1 °C) within 2 hours
4. Grade and bunch
5. Hydrate before storage?
6. Dry store between 32 and 34 °F (0 to 1 °C)
7. Cut and rehydrate with a commercial hydrating solution
8. Sucrose (20%) pulse improves flower opening and vase water improves vase life

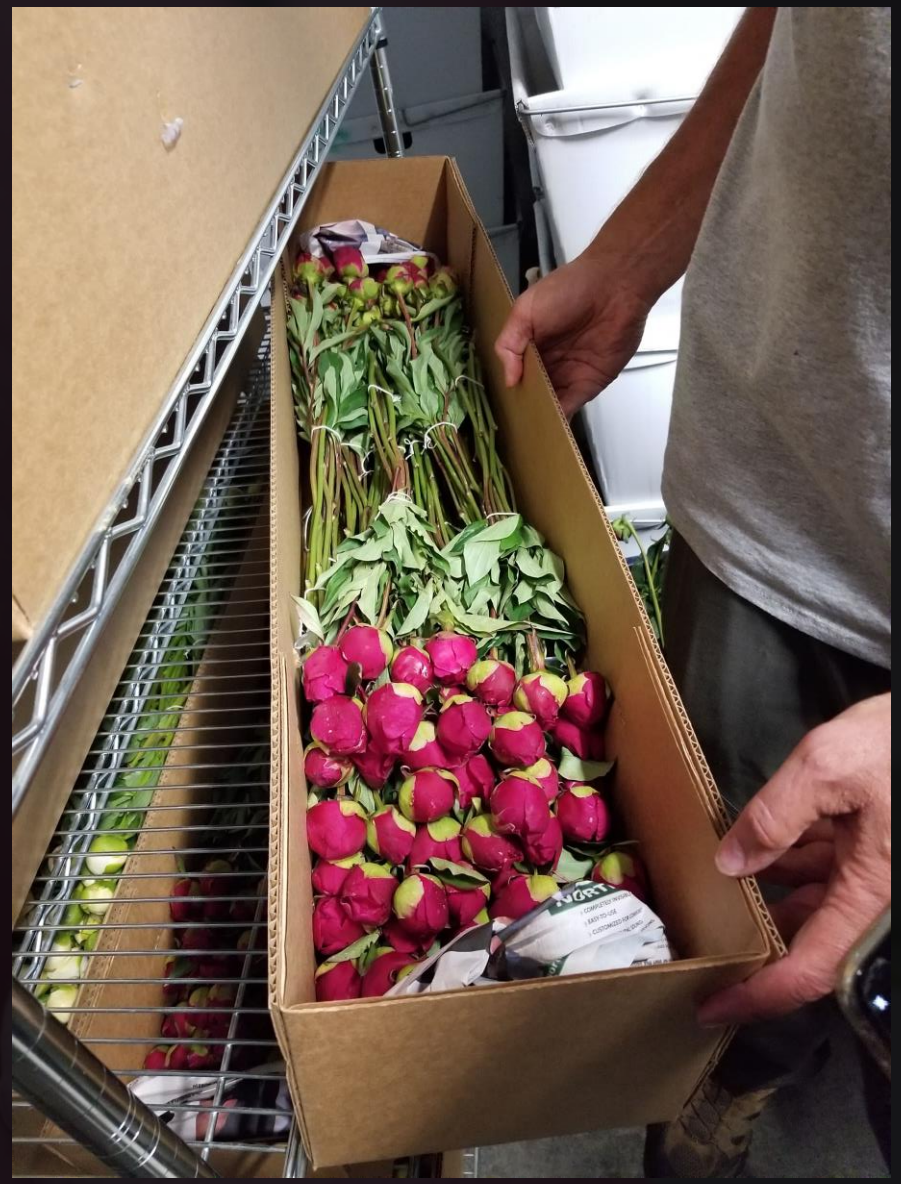


Storage temperature and humidity

- Industry standard = 33 °F (0.6 °C)
- High relative humidity >80%
- Plastic lined boxes with dry stems and leaves
- Limit 4 weeks
- Modified Atmosphere Packaging (MAP)
  - Increase humidity
  - Lower oxygen concentrations

Storage type

- Dry (horizontal)
  - Slows bud development
  - Approximately 4 weeks
  - Wilting and desiccation
- Wet (upright)
  - Prevents wilting
  - Buds develop
  - Less than 1 week



NC State Research

- Objectives
  - Improve storage life
  - Preserve vase life
  - Evaluate sub-zero temperatures

Total vase life = time as an unopened bud + time as an open flower

Funded by the NC Specialty Block Grant Program

Short-term heat effect

Objective: Determine short-term dry storage effect on cut peony vase life and quality

- Storage duration: 0, 2, 4, 6, 8 d
- Temperatures:

°F	°C
71.6	22.0
50.0	10.0
39.3	4.1
33.0	0.6

Festiva Maxima

Karl Rosenfield

Sarah Bernhardt

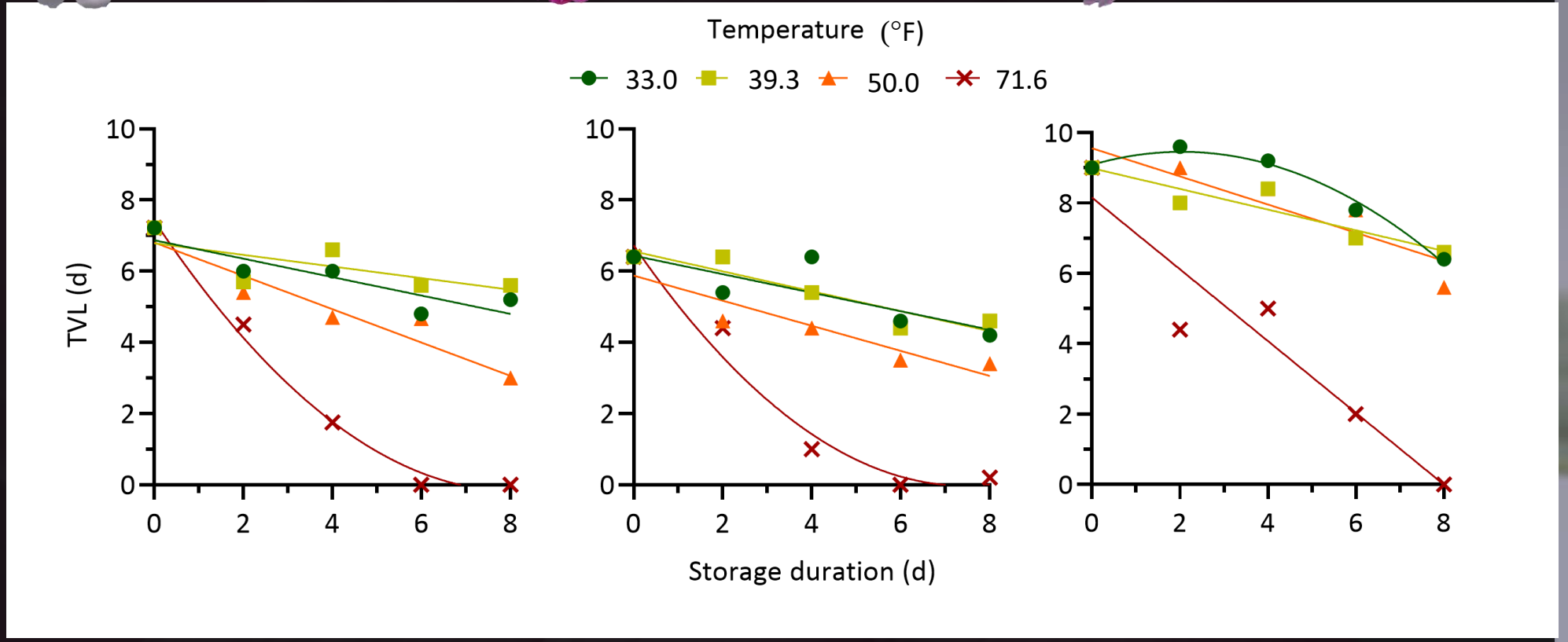
Short-term heat effect


Festiva Maxima


Karl Rosenfield


Sarah Bernhardt

- Short-term (<8 days) best at 33 or 39 F
- 2 days at room temperature quickly reduces vase life



Short-term heat effect

- Bud opening
  - Slower at 39.3 and 33.0 °F
  - Faster at 72 and 50 °F (1 to 2 d)
- Diameter
  - 0.4 in to 0.8 in (1 to 2 cm) loss over 8 d
  - Best preserved at 33 and 40 °F
- Necrotic petals
  - No development at 33 °F
  - Highest at 50 then 72 °F

Long-term storage year 1

- Objective: Evaluate storage duration and freezing temperature effect on peony quality and vase life
- Storage duration: every week for 12 weeks
- Temperatures:

°F	°C
38	3.5
33	0.6
26	-3.1

Festiva Maxima

Monsiuer Jules Elie

Sarah Bernhardt

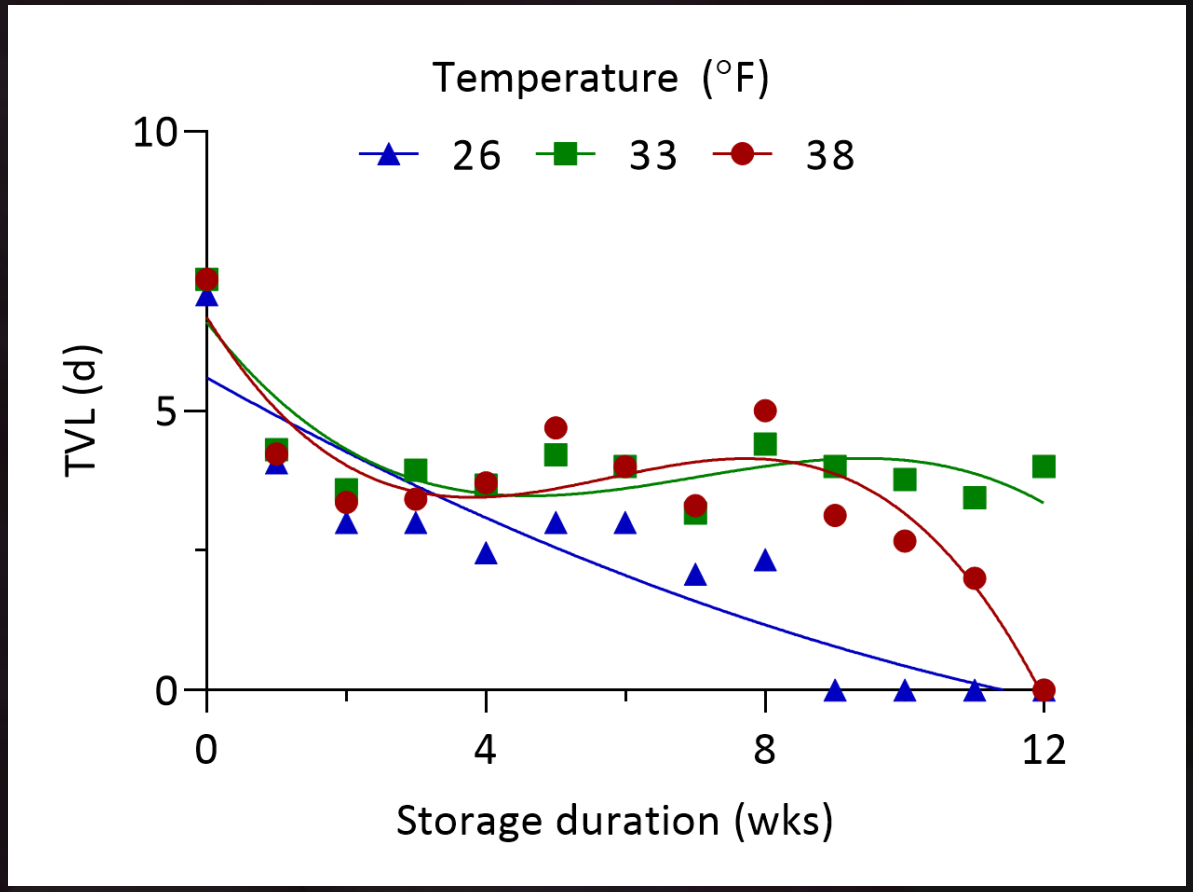
Vase life

- Warm = 38 °F (3.5 °C)
- Industry standard = 33 °F (0.6 °C)
- Sub-zero = 26 °F (-3.1 °C)

No storage

7 weeks of storage

Festiva Maxima



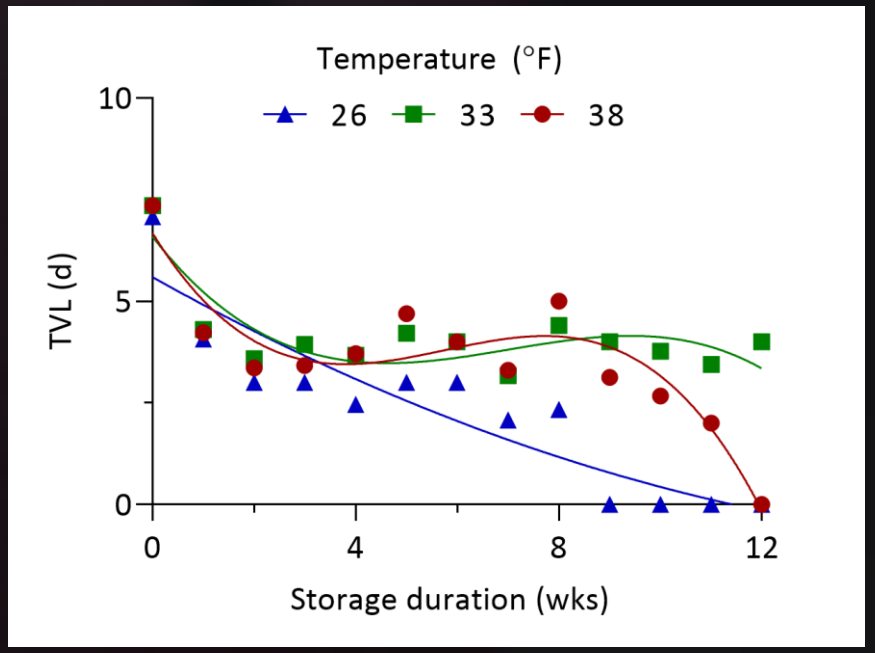
Vase life

- Warm = 38 °F (3.5 °C)
- Industry standard = 33 °F (0.6 °C)
- Sub-zero = 26 °F (-3.1 °C)

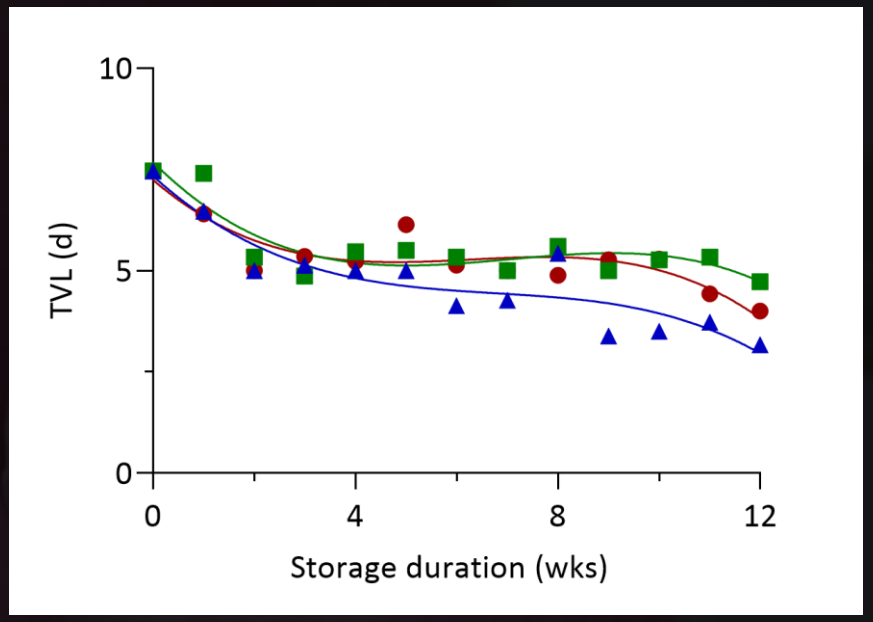
No storage

10 weeks of storage

Festiva Maxima



Monsieur Jules Elie



Vase life

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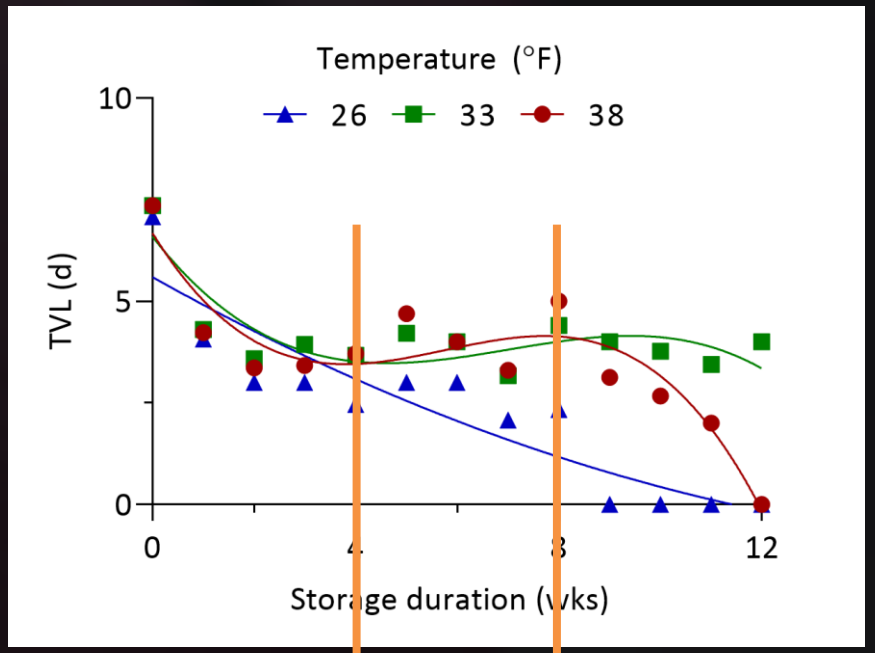
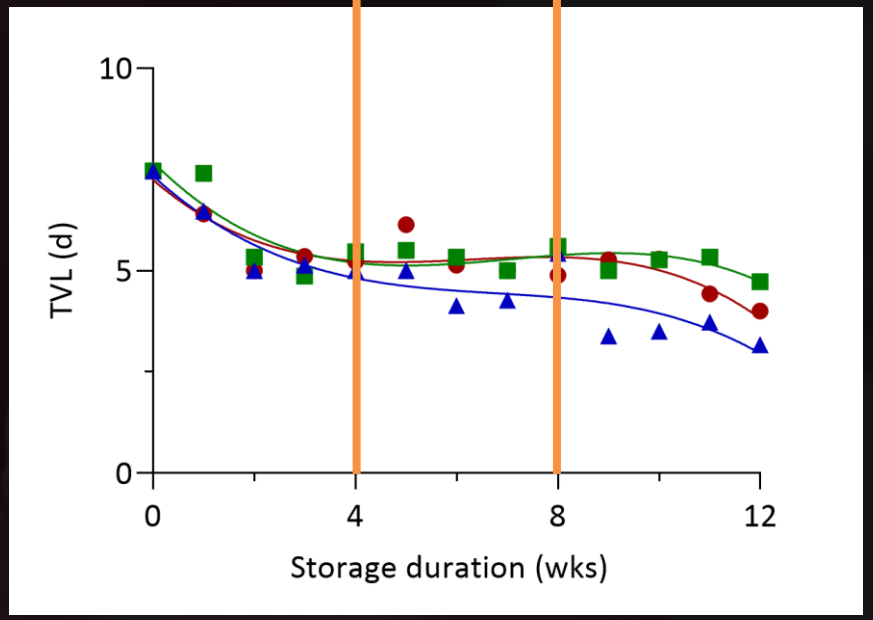
10 weeks of storage

Festiva Maxima



Monsieur Jules Elie



Storage issues

- Unopened flowers
- Diameter loss
- Flower deformity
- Petal loss
- Desiccation and stem collapse
- Disease

Storage issue: Unopened flowers

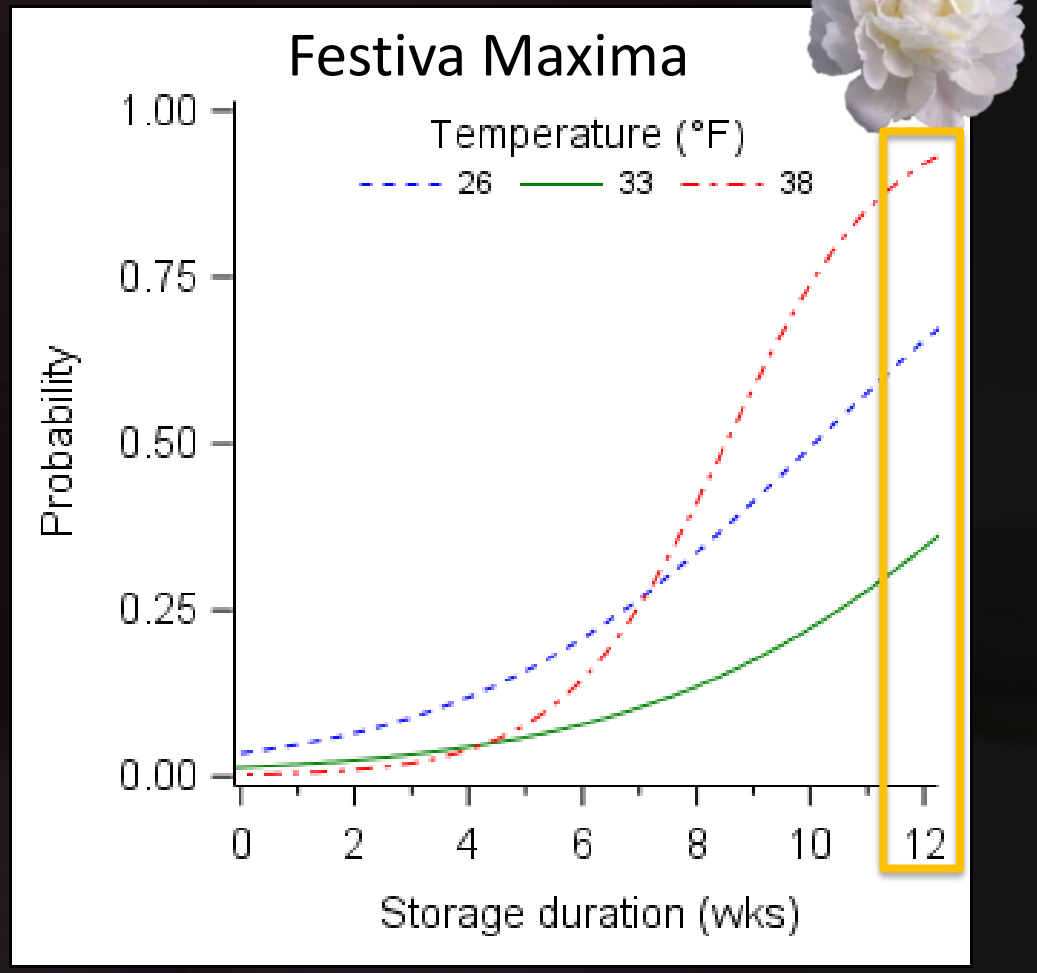
Fully open

Partially open

Failed to open

Storage issue: Unopened flowers

38 °F	≈0%	≈100%
33 °F	70%	30%
26 °F	30%	70%



Storage issue: Flower deformities

Monsieur Jules Elie

Festiva Maxima

Sarah Bernhardt

Storage issue: Flower deformities

Storage issue: Flower deformities

Long-term storage year 1

- Objective: Evaluate storage duration and freezing temperature effect on peony quality and vase life
- Storage duration: every week for 12 weeks
- Temperatures:

°F	°C
38	3.5
33	0.6
26	-3.1

Festiva Maxima

Monsiuer Jules Elie

Sarah Bernhardt

Long-term storage year 2

- Objective: Evaluate storage duration and freezing temperature effect on peony quality and vase life
- Pre-storage pulses (2 h at 40 °F): commercial hydrator, 20% sucrose solution, or no-pulse
- Storage duration: every 2 weeks for 16 weeks
- Temperatures:

°F	°C
~~38~~	~~3.5~~
33	0.7
31	-0.6

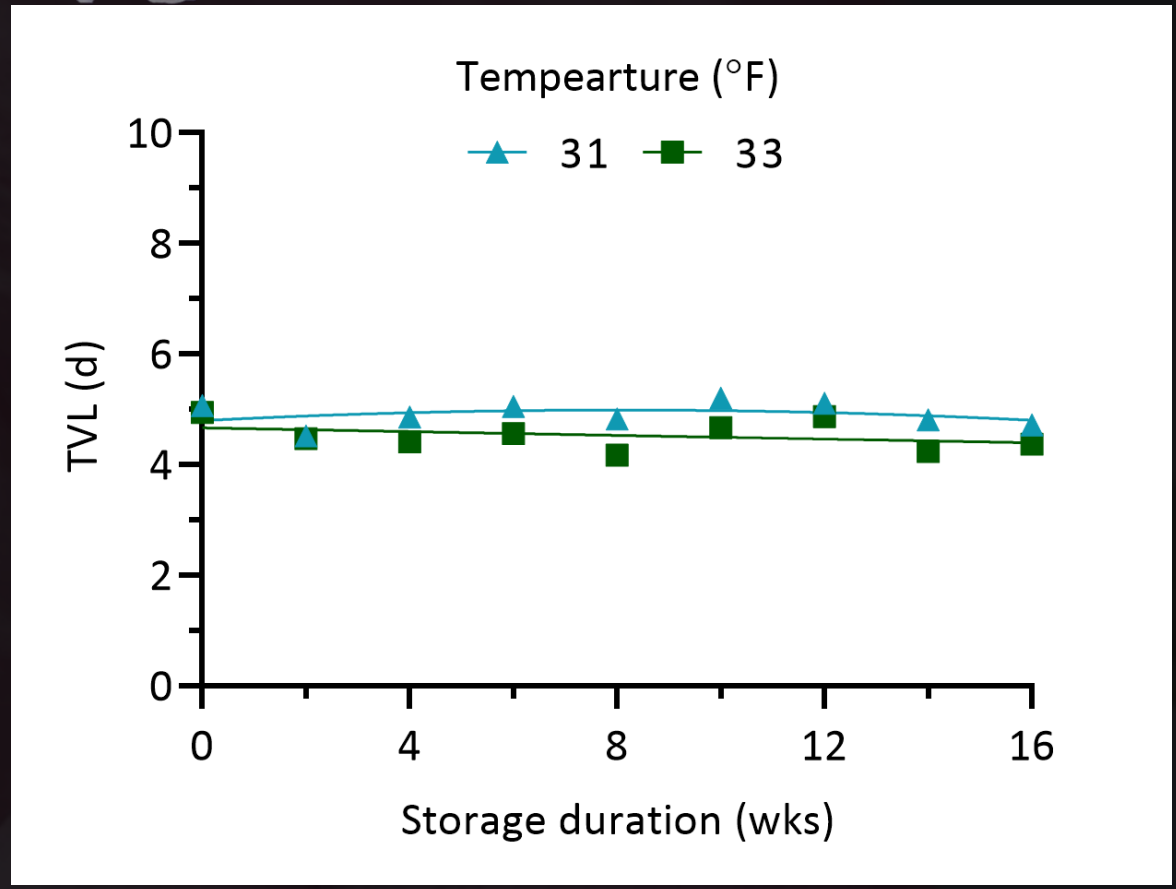
Festiva Maxima

Monsieur Jules Elie

Sarah Bernhardt

Vase life

- Temperature - slightly higher total vase life at 31 ºF
  - Festiva Maxima (0.2 d)
  - Mons. Jules Elie (0.6 d)
  - Sarah Bernhardt (0.3d)
- Pre-storage pulses – slight improvement with hydration solution
  - Festiva Maxima and Mons. Jules Elie (0.3 d)
  - Sarah Bernhardt no improvement over dry, control

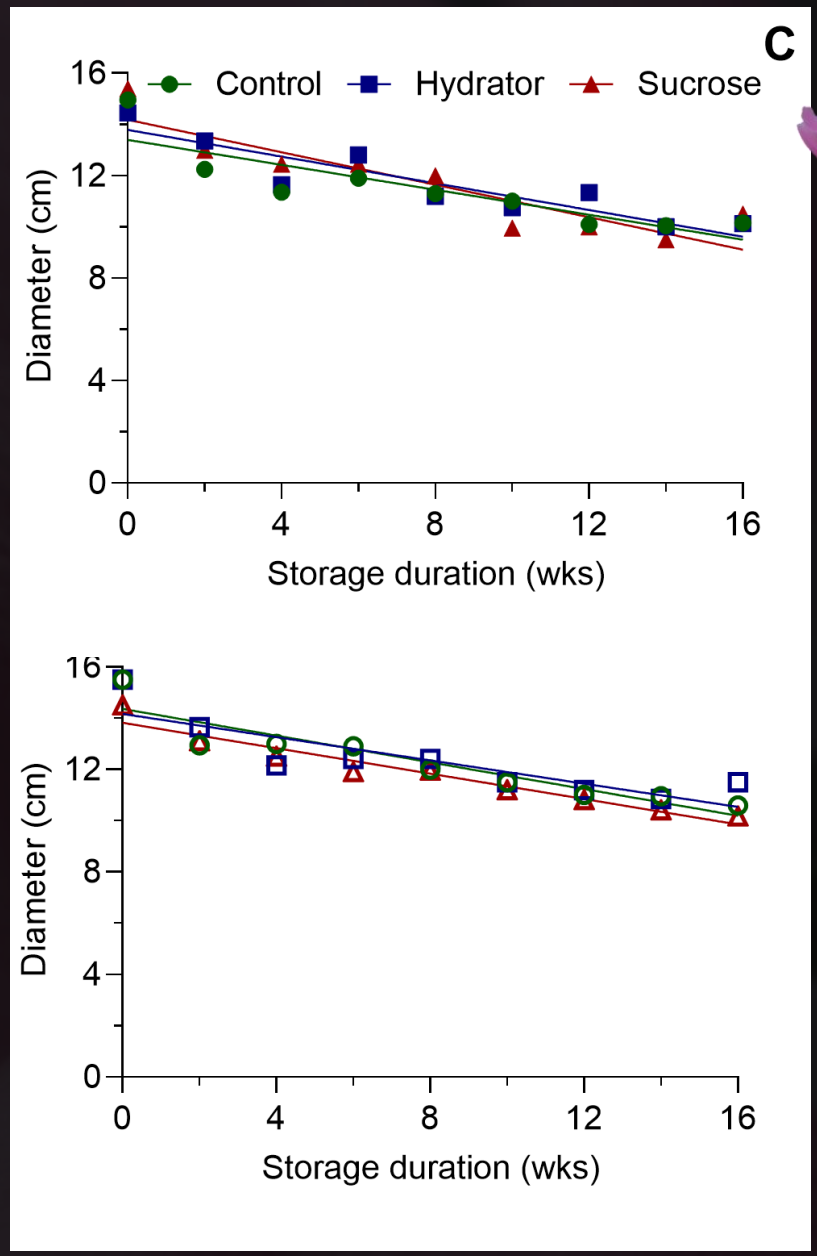


Diameter

- Slightly higher at 31 °F
- Little to no influence by pulse treatments
- Lost 1 to 1.5 in (3 to 4 cm) over 16 wks

33 °F
(0.7 C)

31 °F
(-0.6 C)



Quality benefits of 31 ºF

- Flower deformities lower by 10 to 25%

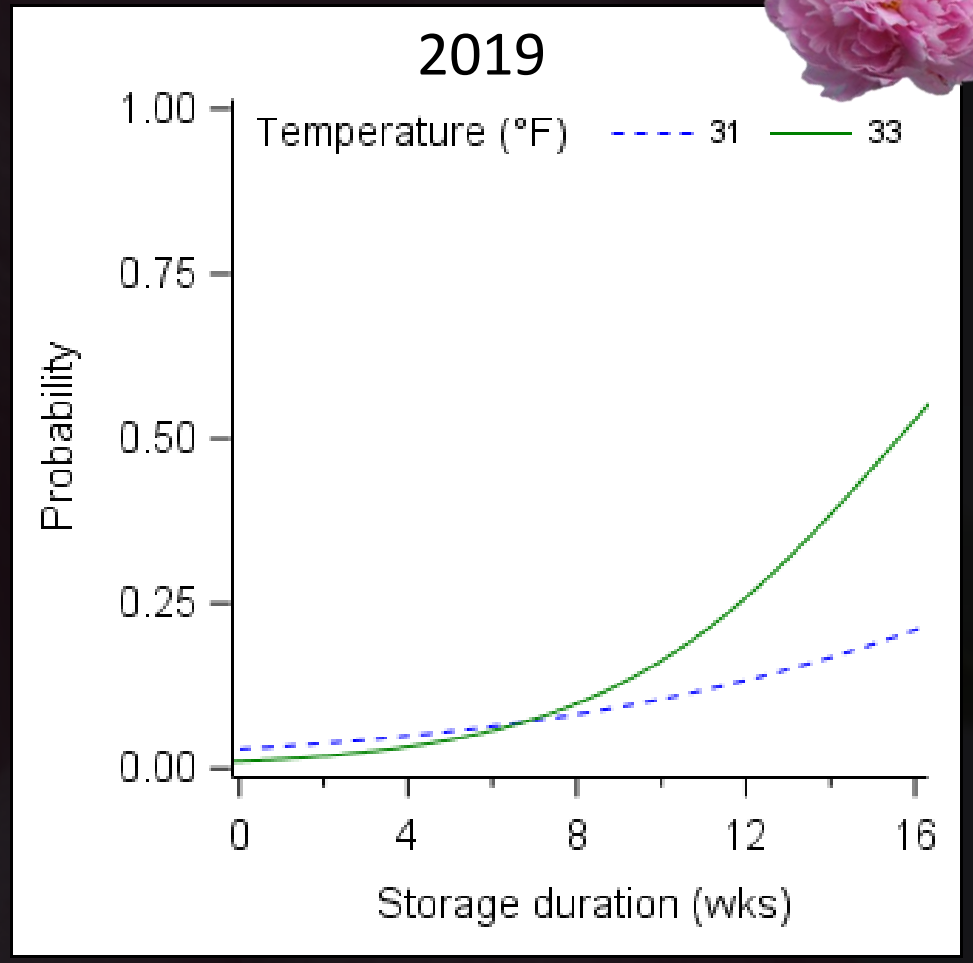
No storage

14 weeks

16 weeks

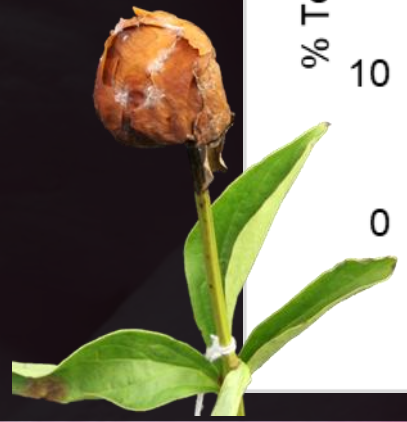
Quality benefits of 31 ºF

- Flower deformities lower by 10 to 25%
- Failure to open lower by 10 to 25%



Quality benefits of 31 ºF

- Flower deformities lower by 10 to 25%
- Failure to open lower by 10 to 25%
- Disease incidence was lower



Pre-storage preservative pulses

General effect after 16 weeks of storage (8 h pulses at 4 C)

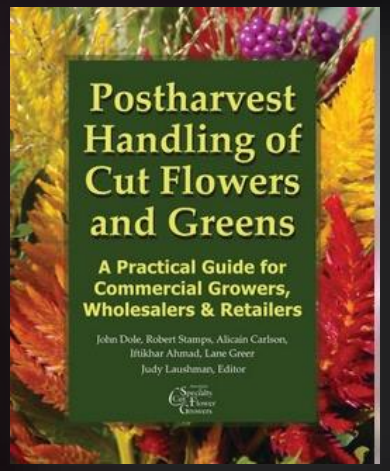
Change in relation to no pulse control			+ higher	- similar	x lower
Pulse treatment	**Vase life**	**Weight loss during storage**	**Failure to open**	**Diameter**	**Deformity**
Sucrose (20%)	-	↑	-	↓	-
Commercial hydrator	-	↑	↓	-	-

Conclusions

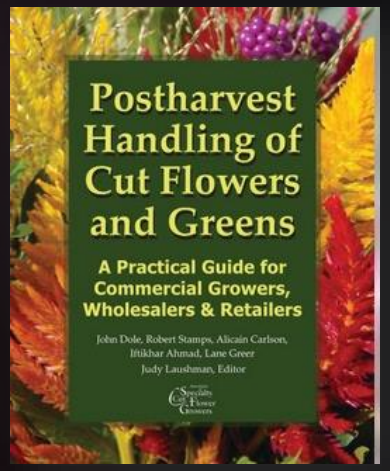
- Short-term storage (<8 d)
  - Similar vase life when storing at 33 and 40 °F up to 8 d of storage
  - Quality (bud maturity preservation, diameter, necrosis) best preserved at 33 °F
- Long-term storage
  - Extended vase life to 16 wks in three cultivars with minimal loss
  - 31 °F slightly higher vase life
  - 31 °F better quality (fewer unopened buds, larger diameter)
- Pre-storage preservative pulses
  - Relatively not beneficial

Postharvest practices

1. Harvest at correct bud stage for target market
2. Remove surface moisture
3. Cool to 34 °F (1 °C) within 2 hours
4. Grade and bunch
5. Hydrate?
6. Dry store between 32 and 34 °F (0 to 1 °C) for ≈4 weeks
7. Cut and rehydrate with a commercial hydrating solution
8. Sucrose (20%) pulse improves flower opening and a constant vase solution containing carbohydrates improves vase life



Postharvest practices



1. Harvest at correct bud stage for target market
2. Remove surface moisture
3. Cool to 34 °F (1 °C) within 2 hours
4. Grade and bunch
5. Optional: Hydrate before short-term, not for long-term
6. Dry store between 31 and 34 °F (0 to 1 °C) for ≈16 weeks at 31 °F
7. Cut and rehydrate with a commercial hydrating solution
8. Sucrose (20%) pulse improves flower opening and a constant vase solution containing carbohydrates improves vase life

Thank you

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