Research Update powered by FloraLife

Dot.Com Shipping: Effects of Cold Chain Breakdown on Rose Bouquet Quality

September 2021

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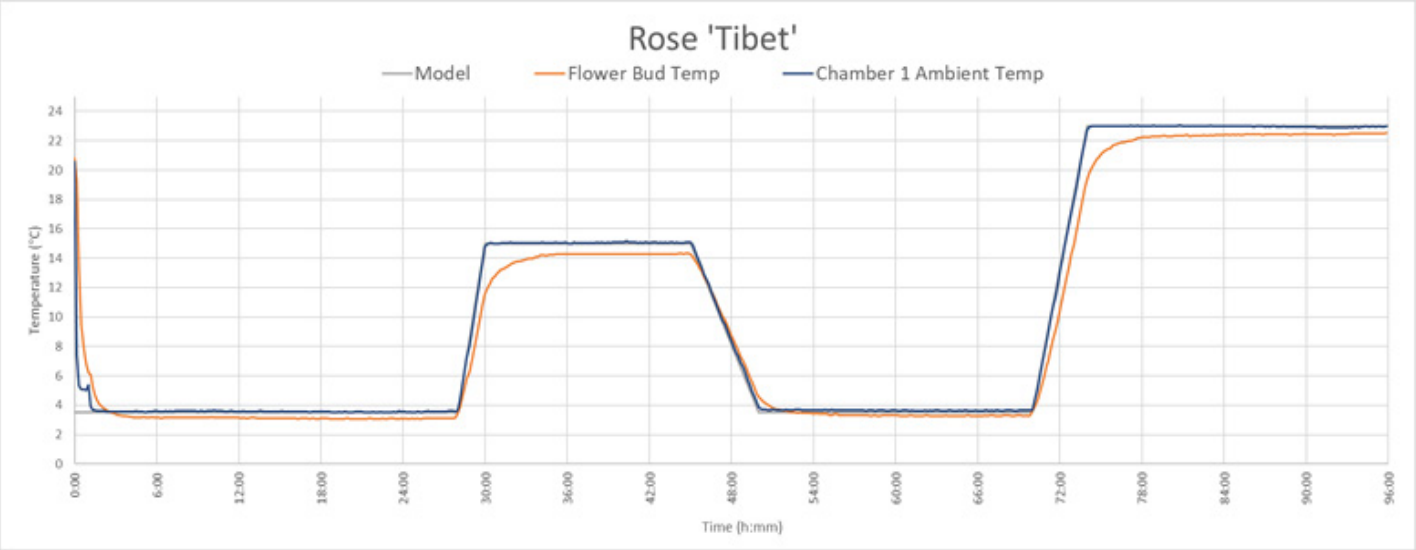
Introduction:
Shipping of bouquets directly from the farm to the consumer is becoming more and more common. Providing a quality bouquet presents many logistical challenges, one of them being maintaining some semblance of the cold chain which normally breaks down during air shipment and courier delivery in a non-refrigerated vehicle. At FloraLife we are beginning to collect data to determine what level of quality is being sacrificed during the breakdown in the cold chain in the farm to consumer Dot.com channel.

FloraLife purchased three individual bouquets from a farm to consumer Dot. Com provider. GPS trackable temperature data-loggers were included in each of the three shipments providing specific temperature and location data during the bouquet's journey from the farm to consumer (our lab in Kent, Ohio. From these data we were able to model a real-life temperature profile that could be used as a model for simulated shipping experiments using a programable environmental chamber. The 96-hour profile included staging of the bouquet at the farm, air freight from Colombia to Miami, subsequent precooling in Miami, and finally courier air freight and vehicle shipment to Kent OH.

Methods:
Proper single bouquet shipping boxes were obtained from the Dot. Com provider. 'Freedom' and 'Tibet' Roses were obtained in boxed shipments of 200 stems directly from a farm in Colombia (air freighted to Miami and shipped to a local wholesaler via refrigerated truck). Flowers were approximately seven days old when received at the lab. Roses were assembled into bouquets of 12 stems including plastic bouquet sleeves and were hydrated overnight in the flower cooler at 2 °C/35.6 °F in a solution of FloraLife® Express 200. The next morning, single bouquets were weighed then boxed and placed in the environmental chambers for the 96-hour temperature profile to simulate farm to consumer delivery. Temperatures the flower heads were monitored using a thermocouple. A boxed bouquet remained in the flower cooler (2 °C/35.6 °F) for 96 hours as a control. At the end of the temperature cycle, bouquets were removed from boxes, re-weighed, re-cut, and placed in vases of FloraLife® Express 300 Flower Food solution for consumer vase-life evaluation. Data included fresh weight loss (g) over the 96 hours, vase life (days), and flower diameter (cm) on day 7.

Results:
Figure 1 & 2. Treatment temperatures over the 96 hours



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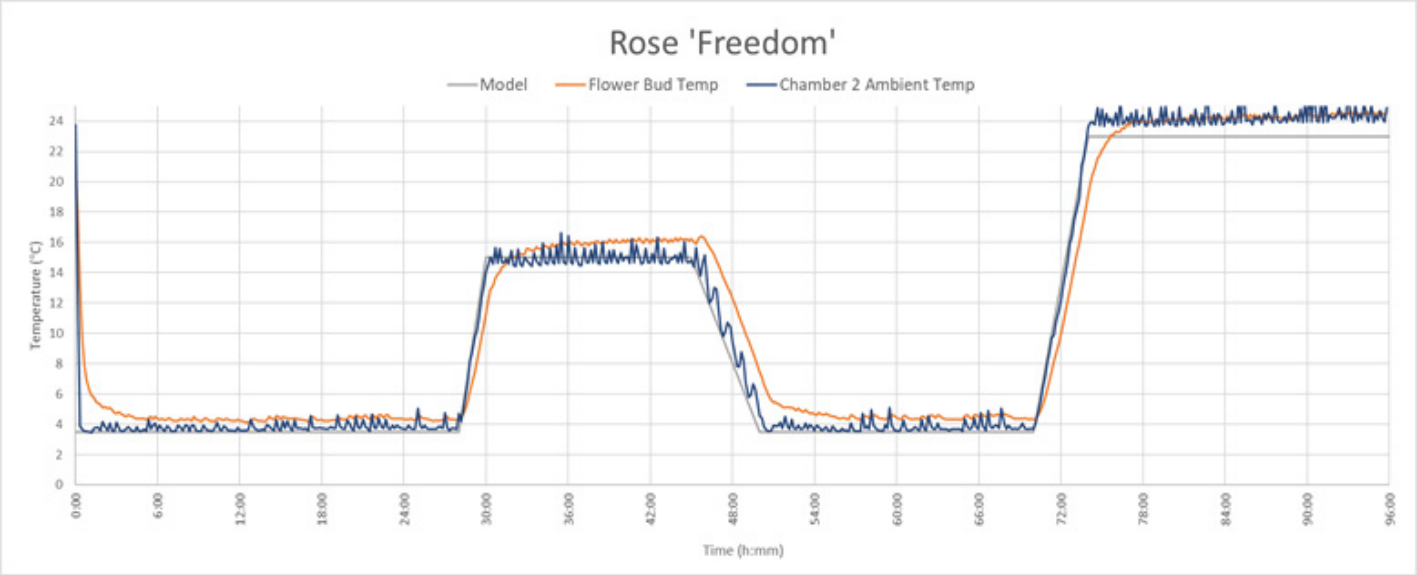
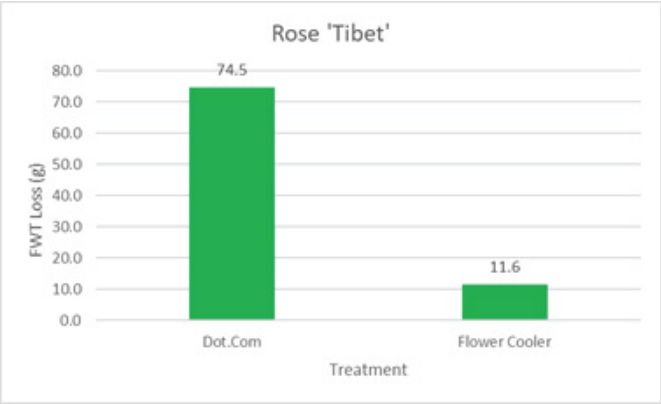


Table 1 & 2: Bouquet fresh weight loss from farm to consumer



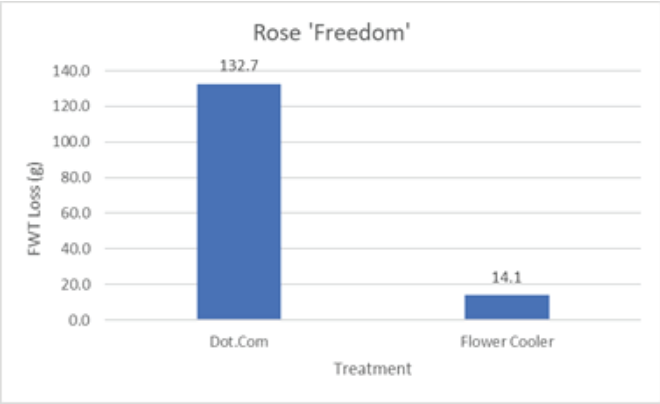
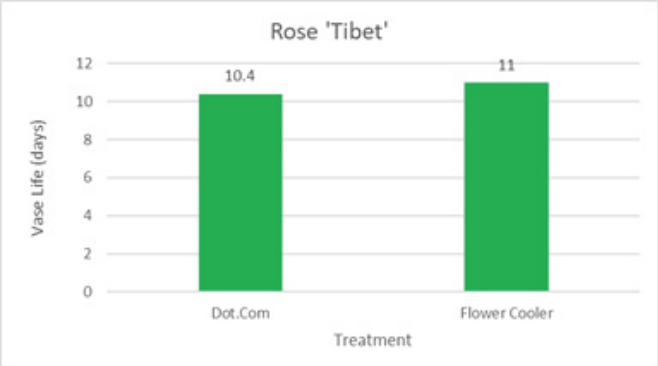


Table 3 & 4: Bouquet vase life (days)



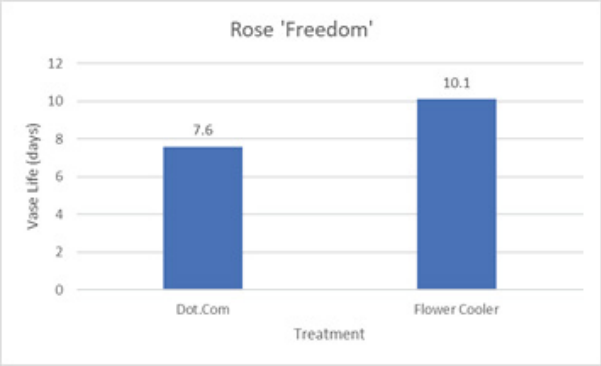


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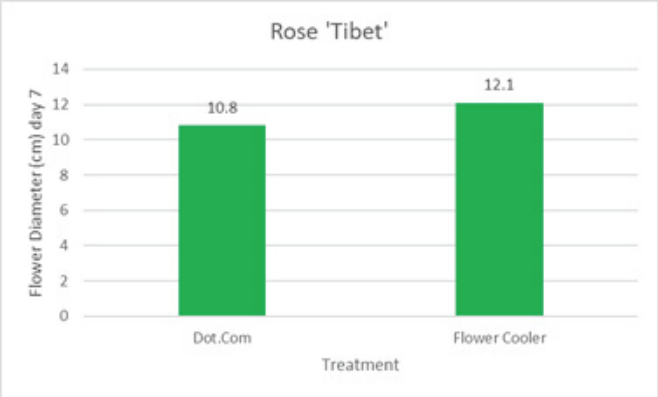
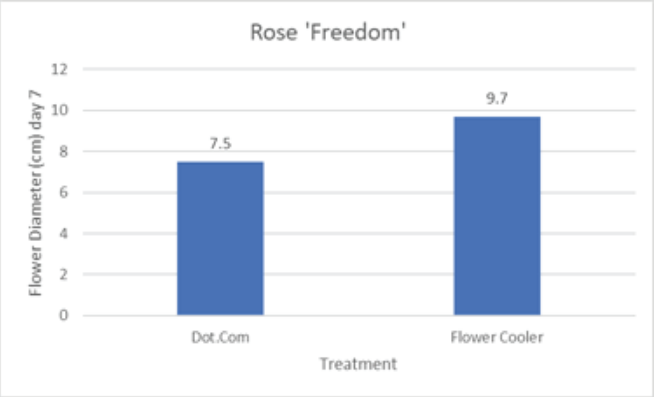
Table 5 & 6: Flower Diameter (cm) day 7





- 'Tibet' flower bud temperatures remained just below ambient box temperatures whereas 'Freedom' flower bud temperatures were consistently at or above the ambient chamber temperature. This may be due to greater bouquet FWT of 'Freedom' and possibly higher heat generation from respiration.
- Flower cooler treatment significantly reduced bouquet FWT loss, demonstrating the effects of low temperatures on transpiration.
- Interestingly, cooler treatment significantly increased vase life of 'Freedom' (2.5 days) but had a minimal effect on 'Tibet' (0.6 day), indicating that cultivar selection may be critical for Dot.Com success.
- Cooler treatment significantly increased flower diameter compared to Dot.Com treatment in both 'Tibet' (1.3 cm / 0.51 in) and 'Freedom' (2.2 cm / 0.87 in).

Conclusion:

- Data indicates that the cold chain breakdown in Dot.Com flower delivery from farm to consumer can reduce rose bouquet quality due to increased water loss, reduced vase life, and reduce flower diameter.
- Data indicates that the degree of quality loss is likely cultivar dependent, meaning that variety selection may be key to success.
- If an effective shipping system could be developed that maintains cooler ambient temperatures in the shipping box it will likely improve consumer performance; however, the degree of quality increase would have to be weighed against packaging costs.

Photos: From Left to Right: Dot.Com and Cooler Control

Photo 1 & 2: Day 0

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Photo 3 & 4: Day 3

Photo 5 & 6: Day 7