ASCFG Research Update – Quantifying the Influence of Vernalization Duration and Temperature and Photoperiod on Ranunculus Cut flower Production

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Specialty cut flowers are largely produced outdoors in open fields or high tunnels. However, in northern latitudes production in these systems is limited to late spring, summer, and early fall. Due to a rising demand for year-round availability of locally produced cut flowers, growers in northern latitudes are interested in transitioning to year-round greenhouse production. The utilization of greenhouses allows growers to control environmental parameters such as temperature and light for uniform and consistent successive plantings, hastened flowering, and the production of high-quality stems throughout the year.

Many Persian buttercup (*Ranunculus*) cut flower growers report inconsistent flowering and stem quality between successive plantings. Therefore, the concept of developing vernalization and photoperiod protocols to hasten flowering and improve uniformity between plantings is of great importance. Though some research has been conducted, the literature has inconsistent and contradictory vernalization and photoperiod recommendations (Carillo, et al., 2020; De Hertogh, 1996). We proposed to determine the most effective vernalization temperature and duration of commercially relevant Persian buttercup cultivars to hasten and stimulate flowering as well as the most effective photoperiod to force sprouted plants.

Ranunculus Vernalization and Photoperiod Study

'Butterfly Artemis', 'La Belle White', and 'Tecolote Salmon' Persian buttercup corms (*Ranunculus asiaticus* L.) were received from a commercial bulb supplier (Ednie Flower Bulb, Newton, NJ) and stored at 50 °F. In the research greenhouses at Michigan State University, corms were rehydrated in running water that was kept at 68 °F (20 °C) for 8 hours before planting. The rehydrated corms were planted into 18- or 72-cell trays filled with 50:50 (v/v) commercial soilless medium composed of 70% peat moss, 21% perlite, and 9% vermiculite and 50% coarse perlite. Trays were then placed into walk-in coolers for a pre-sprout period where environmental conditions consisted of a temperature of 40 °F (5 °C) and under ~200 $\mu mol \cdot m^{-2} \cdot s^{-1}$ of light for $12\text{-}h \cdot d^{-1}$. After four weeks of pre-sprouting, the trays were placed into vernalization treatments of 3.5, 5, or 7.5 °C for 0, 2 or 3 weeks. and under the same light intensity and duration as previously described. Treatment durations were staggered so that all plants were removed from vernalization treatments on the same day. Young plants were transplanted into bulb crates and placed into greenhouses compartments and under 12-, 14-, or 16-h photoperiods (Fig. 1). The average daily temperature in the greenhouse was 55 °F (13 °C), with day temperatures of 64 °F (18 °C) and night temperatures of 46 °F (8 °C).

Data collection consisted of recording time to first visible bud, open flower, and harvest for each stem on each plant. Stems were considered 'marketable' and harvested when the terminal flower bud was 50% open. Additionally, we measured stem length, stem caliper, the number of branches, and the total number of stems harvested from each plant.

Our results indicate that vernalization duration and temperature and sometimes photoperiod during finishing stages influenced time to visible bud and harvest. For example, time to first visible bud and harvest of non-vernalized ‘La Belle White’ forced under a 16-h photoperiod was 43 d and 70 d and 32 and 53 d for plants receiving 3 weeks of vernalization at 7.5 °C, respectively. However, stem length and caliper and the number of stems harvested were not different between these treatments. The greatest number of stems per plant (7 stems) were harvested from ‘La Belle White’ plants not receiving vernalization and forced under a 12-h photoperiod. Plants forced under a 16-h photoperiod were harvested on average 4 days earlier than those under a 12-h photoperiod. However, stems under a 16-h photoperiod were on average 1.6 in. (4-cm) shorter than those harvested under a 12-h photoperiod (Fig. 2).

For non-vernalized ‘Tecolote Salmon’ forced under a 16-h photoperiod time to visible bud and harvest was 42 d and 72 d and 33 and 61 d for plants receiving 3 weeks of vernalization at 7.5 °C and forced under a 16-h photoperiod, respectively. The number of stems per plant was not influenced by vernalization temperature and duration or photoperiod (Fig. 3). On average, plants forced under a 16-h photoperiod were harvested 11 days earlier than those under a 12-h photoperiod.

Time to first visible bud and harvest was hastened by 11 to 13 days and 13 to 15 days, respectively, when ‘Butterfly Artemis’ was vernalized at 7.5 or 5 °C for 3 weeks compared to non-vernalized plants. Time to visible bud and harvest of non-vernalized plants occurred on average between 40 to 45 days and 61 to 66 days, respectively, and was not influenced by forcing photoperiod. Vernalization had no impact on stem length and caliper, and stems per plant.

Our results collectively indicate that time to visible bud and harvest of the Persian buttercup cultivars we tested was hastened by vernalization. However, 3 weeks of vernalization added approximately 1 week of production time and did not result in increased stem length, stem caliper or harvestable stems. Persian buttercup should not be immediately forced under a 16-h photoperiod as it negatively affects stem length and yield. Instead, they should be allowed to grow vegetative under a short day (≤12-h) and then placed under a 16-h photoperiod to hasten flowering.

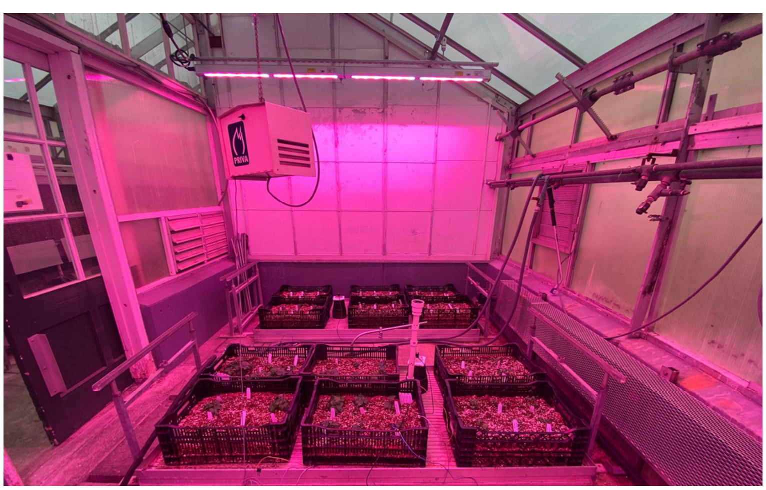

Figure 1. Ranunculus cultivars after transplant into bulb crates for photoperiod finishing treatment.

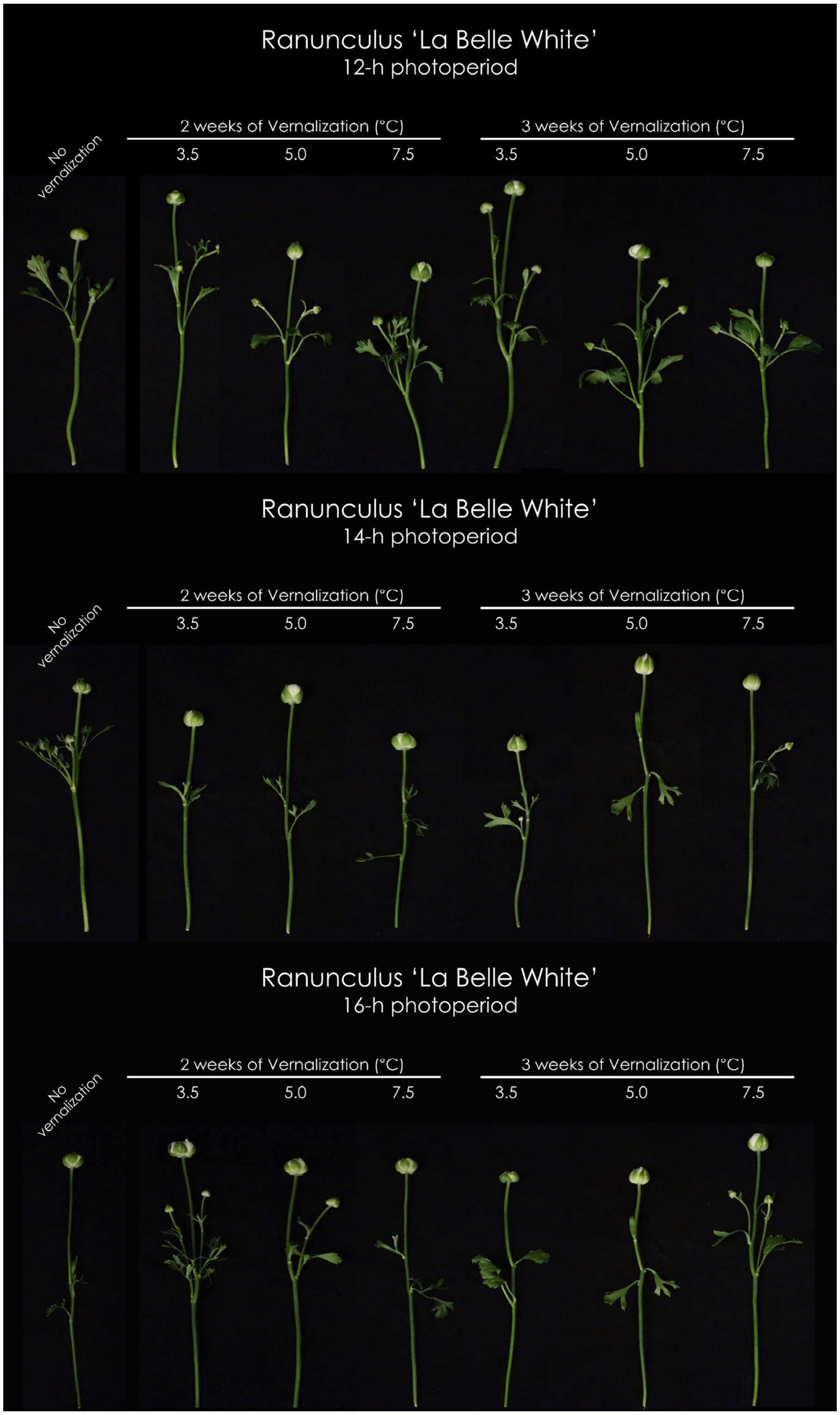

Figure 2. Potted ranunculus 'La Belle White' corms were vernalized at 38, 41, or 46 °F (3.5, 5.0, or 7.5 °C) for 0, 2, or 3 weeks and forced under 12, 14, or 16-h photoperiods.

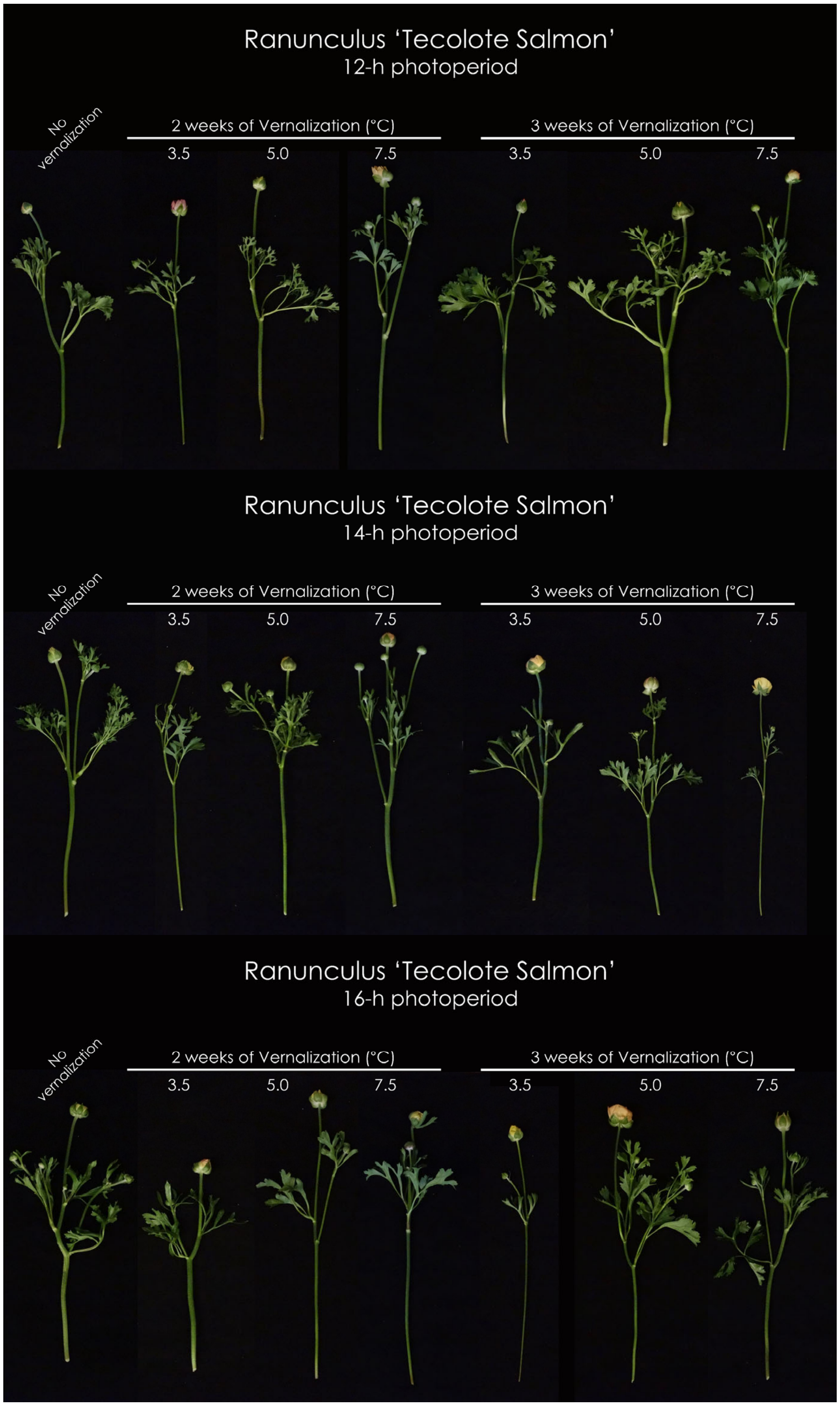

Figure 3. Potted ranunculus 'Tecolote' corms were vernalized at 38, 41, or 46 °F (3.5, 5.0, or 7.5 °C) for 0, 2, or 3 weeks and forced under 12, 14, or 16-h photoperiods.

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