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Geranium Cutting Propagation – Reducing lower-leaf yellowing

Research shows PGRs can reduce this all-too-common problem.

In my recent visits to greenhouses, I have seen the all- too-common lower leaf yellowing of geranium cuttings during propagation (Figure 1a and b). Geranium cuttings (un-rooted) have a short postharvest life and low tolerance to high temperatures during shipping or prolonged shipping or storage. Undesirable postharvest conditions can increase cutting respiration (reducing carbohydrates) and increase ethylene generation in the shipping package or box, which can cause lower-leaf yellowing and senescence during propagation. Is this leaf yellowing a problem? In severe cases, cuttings can lose several leaves and rooting can be delayed. Additionally, abscised leaves can host botrytis and cause significant losses during propagation. Therefore, fungicides are often applied during propagation and infected leaves are removed manually to reduce pathogen problems.

Applications of plant growth regulators (PGRs) such

Figure 1a and b. Geranium cuttings with lower-leaf yellowing are a common sight during propagation.

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Figure 2. Geraniums in propagation with no sprays (top) and geraniums propagated at the same greenhouse four years later with a 2.5 ppm GA^{4+7} and BA (Fascination).

as benzyladenine (BA; a cytokinin) and/or gibberellic acid (GA) may suppress lower-leaf yellowing and senescence. Growers producing Easter lilies are already familiar with applying a BA and GA, known commercially as Fascination or Fresco, to keep the older, lower leaves green. In the past few years, some propagators of zonal geraniums have also been utilizing BA and GA during propagation to reduce lower-leaf yellowing of geranium cuttings (Figure 2).

Research objectives and experiments

Our objectives were to quantify the effects of BA + GA applications on suppressing lower leaf yellowing of several geranium cultivars. Un-rotted cuttings of 'Designer Salmon', 'Fantasia Purple Sizzle', 'Fantasia Pink Shell', and 'Presto Dark Red' zonal geraniums were received from a commercial propagator. Upon removal from the shipping container, the end of each cutting was either briefly dipped in a rooting hormone containing 1,000 ppm IBA + 500 ppm NAA (Dip'N Grow Liquid Rooting Concentrate) or received no rooting hormone. Cuttings were then placed in 72-cell propagation trays in the propagation greenhouse. Sprays at a volume of 2 quarts per 100 ft^2 containing a surfactant and 0, 1, 2, 3, or 4 ppm each of BA + GA^{4+7} (Fresco; Fine Americas, Walnut Creek, CA) were applied immediately before placement under mist. The "greenness"

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of lower leaves was measured 7 days after the beginning of propagation with a SPAD relative chlorophyll meter, and the number of senesced leaves was recorded 28 days after cuttings were treated and placed in the greenhouse. Shoot and root dry weights were measured following harvest.

Our Findings

Cuttings of 'Fantasia Pink Shell' and 'Presto Dark Red' geranium did not exhibit any leaf yellowing indicating that not all cultivars are susceptible to lower leaf yellowing. However, both 'Designer Salmon' and 'Fantasia Purple Sizzle' displayed leaf yellowing once propagation began.

Seven days after PGR applications, the "greenness" of 'Fantasia Purple Sizzle' and 'Designer Salmon' increased as the concentration of BA + GA^{4+7} increased from 0 to 4 ppm. After 28 days in propagation, the total number of senesced leaves decreased with increasing PGR concentration for 'Fantasia Purple Sizzle', though only cuttings treated with 4 ppm BA + GA^{4+7} had fewer senesced leaves (Figure 3). 'Designer Salmon' cuttings treated with at least 1 ppm BA + GA^{4+7} had fewer senesced leaves than untreated cuttings. Shoot and root dry weights were not affected by PGR applications.

The take-home message

Products containing BA + GA^{4+7} are most likely the best for commercial use in geranium propagation. Our

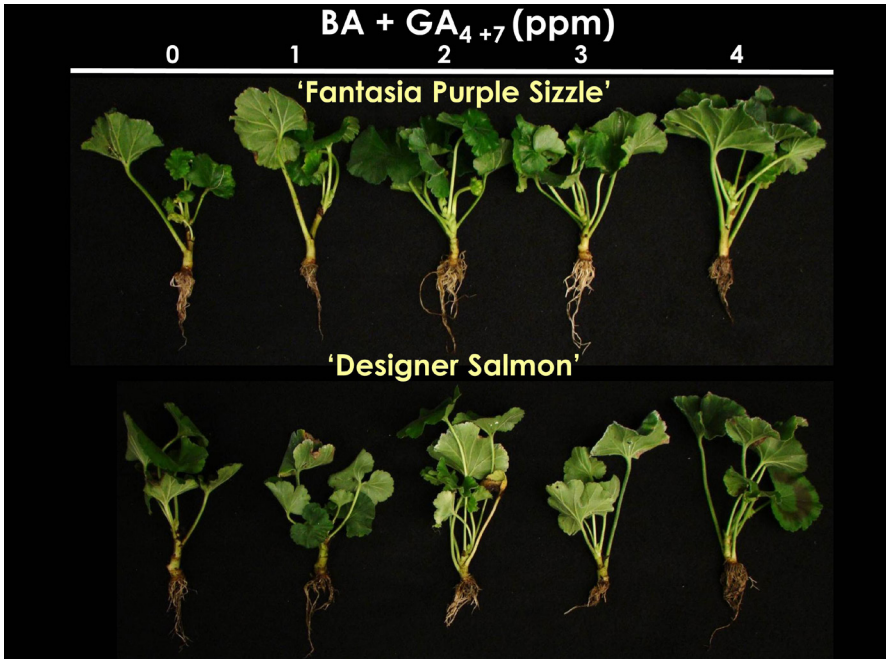

Figure 3. Fantasia Purple Sizzle and Designer Salmon geranium cuttings 28 days after being treated with 0 to 4 ppm BA + GA^{4+7}.

overall results indicate that applying PGR solutions after shipping were more effective than the same PGR applications made before shipping. BA and GA can inhibit rooting; however dipping cuttings in a rooting hormone can partially overcome that suppression. Finally, we have observed in our research and with growers that geranium cultivars vary in their susceptibility to lower-leaf yellowing and senescence. Cultivars with white, pink, salmon and purple flowers tend to be the most susceptible. We found no negative effect of BA + GA^{4+7} applications on the cultivars that did not exhibit leaf yellowing. This could allow commercial growers to apply BA + GA^{4+7} to all geranium cultivars in propagation, thus simplifying management decisions.

Using PGRCALC, we estimated the PGR spray cost for a foliar application of solution containing 2.5 to 5 ppm BA + GA^{4+7} at a rate of 2 quarts per 100 ft2to be $0.44 to $0.88 per 1,000 ft2 of bench space. Based on this calculation, we believe that the costs for PGR and application labor to prevent lower-leaf senescence are minimal when compared to the potential labor costs to manually remove leaves plus any losses from botrytis-infected cuttings.