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Improving the Rooting Success of Challenging Petunia Cultivars

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Each year, as greenhouse growers you are challenged with propagating and growing hundreds of new cultivars released by plant breeders. Over the past several years, growers across the U.S. have experienced challenges propagating and finishing a number of vegetatively propagated petunia cultivars, specifically cultivars with yellow flowers. Cuttings of these cultivars often root well during Stages 1 and 2, but toward the end of rooting Stage 3 they lose vigor, turn yellow, develop necrotic (brown) shoot tips, and/or die (Photo 1 and 2). Furthermore, during the finish stage (transplant) a small percentage (5 to 10%, sometimes more) of the plants appear stunted, have low vigor, and most often have to be removed from the combination planters or cell packs (Photo 3). These unexpected problems pose significant losses for both greenhouse growers and breeding companies.

Observations in commercial greenhouses strongly suggested nutrition during liner production could play a significant role in reducing the yellowing, necrosis and loss of vigor of these cultivars during propagation. In order to investigate if this was indeed the case, research was conducted at Ball Horticulture Company in West Chicago, Illinois and

Photo 1. Growers have found that cuttings of some yellow petunia cultivars often root well, but toward the end of liner rooting stage 3, they can lose vigor, turn yellow, develop necrotic (brown) shoot tips, and/or die (top) compared to other cultivars (bottom).

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Photo 2. Trays of yellow petunia cultivars exhibiting extreme symptoms.

Photo 3. Growers have also found that after transplant some rooted yellow petunia cultivars can appear stunted, have low vigor, and most often have to be removed from the combination planters or cell packs.

In cooperation with our local and state greenhouse organizations

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Research Summary

Within the first couple of days after sticking, tissue nutrient content of un-rooted petunia cuttings (cultivars with yellow flowers) quickly decreased. For example, nutrients such as iron and manganese and calcium fell drastically from stick (day 0) to day 2 in both mature leaves and shoot tips. After the cuttings had callused and begin to form roots (day 6), they were now able to take up nutrients from the substrate that is provided either from water soluble fertilizers (WSF) or controlled release fertilizers (CRFs). In this case, it took 8 to 13 days to match or exceed the nutrition content of cuttings before sticking. Although many nutrients are necessary for successful rooting and plant development, we will focus on those that are essential for successful petunia liner production. First, iron and manganese are important in growing petunias. High substrate pH will limit availability of these nutrients and iron or manganese deficiency can cause chlorosis. It has often been thought that iron deficiency is the cause of yellowing, however we found the ratio between iron and manganese is critical. We found cuttings appeared healthy with an iron to manganese ratio of 1:1. We also found that manganese was generally deficient more frequently than iron.

Additionally, boron and calcium are essential for shoot tip and leaf development. Boron and calcium are only mobile in water and can be indicators of problems related to water uptake and transpiration. It is not uncommon for liner production areas to maintain warm temperatures and high humidity while outdoor light levels are low (i.e. during the winter and early spring). In order to promote transpiration and uptake of mineral nutrients, HAF fans should be used in these areas while maintaining high humidity or low vapor pressure deficits to maintain cutting turgor and avoid wilting.

Our studies show that as fertility during liner production increased either from WSF provided through the mist or CRFs incorporated in the substrate, the visual quality of rooted yellow-flowered petunia cultivars increased from severe necrosis or death for unfertilized to green with little or no yellowing or necrosis for cuttings fertilized at moderate to high rates (Photo 4). While shoot dry mass (growth) increased with fertilization, root dry mass either remained the same or decreased slightly with increasing fertility during liner production- however roots of fertilized cuttings were still considered well-developed. One of the main effects of increasing the amount of CRF in the propagation substrate was the enhanced development of side shots when or if the stem tip had

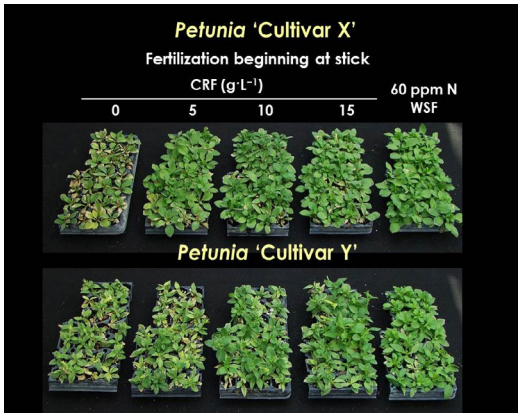
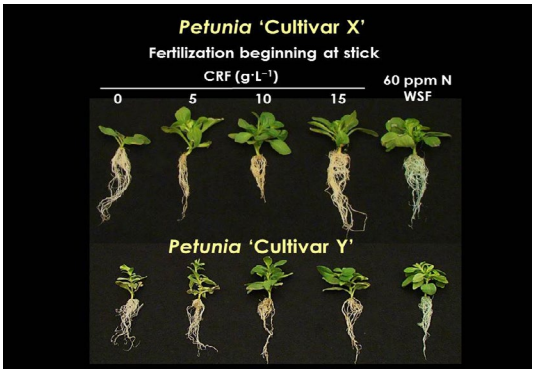


Photo 4a & b. As substrate incorporated with controlled release fertilizer (CRF) increased from 0 to 15 g·L^{-1} or 60 ppm water soluble fertilizer (WSF), the visual quality of rooted yellow petunia increased from severe necrosis or death to green, little or no yellowing or necrosis. Phot taken three weeks after sticking.



died or aborted. Yellow-flowered petunia cultivars propagated with high rates of CRF either maintained the growth of the main growing point or greatly enhanced the development of side shoots to compensate for an aborted stem tip.

Take Home Message

The research at Ball and Purdue highlight the apparently challenging nutritional requirement of yellow-flowered petunia cultivars during liner production. We can conclude that petunias, especially challenging cultivars should have ample nutrition available in the substrate between days 4 to 6 when roots are beginning to form in order to avoid the problems we have illustrated. Therefore, cuttings of yellow petunia cultivars should be rooted using an aggressive fertilizer program that supply not only higher levels of nitrogen, but micronutrients as well.

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