Scientists Explore Ways to Encourage Root Formation in Pecans, Legumes

The Noble Research Institute Plant Cell Biology Laboratory conducts basic research on plants. We ask why and how plants do what they do. Research efforts are directed toward understanding how the plant root system grows and survives under conditions of low water and nutrient levels and a range of other stresses that could lower crop yields.

Recently, we embarked on a new project that seeks ways to improve root production in pecan stem cuttings. This project was initiated because we discovered a set of small synthetic chemicals that triggered extensive formation of roots in stems of Arabidopsis thaliana, a model plant related to the mustard family.

Most plant aficionados are familiar with roots that form on the stems and even on the leaves. Roots that form

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Story continues on next page
from any part of a mature plant other than the root itself are called “adventitious roots,” which is the basics for propagating a range of horticultural plant species. This ensures that the resulting plants remain genetically identical to the parent plant.

The ability of plants to form adventitious roots is under the tight control of many factors including:

- Humidity
- Age of the plant stem used for propagation
- Soil water content
- Plant species

With regard to the latter, some plant species are more difficult to root than others. What ties these adventitious root-inducing conditions together is the participation of a plant hormone called auxin.

Auxins are commonly used in agriculture. For example, they are used as herbicides, the most common of which is 2,4-D. Some auxins like indole butyric acid (IBA) are also the major active ingredients in commercially available root-inducing products.

For auxin and auxin-like chemicals to trigger adventitious root formation in plants, cells within the plant have a way to sense the presence of auxin and to transport it to other cells. The sensing and transport of auxin is regulated by the plant’s genetics but can also be modified by externally applied chemicals.

Armed with this knowledge, we are conducting experiments with small chemicals that can improve how auxins are absorbed by plant cells and those that help auxins move to the cells in which they are most effective. Some of the chemicals that are being currently tested have auxin-like activity themselves.

Together, with Charles Rohla, Ph.D., pecan and agricultural systems manager, and Charlie Graham, Ph.D., senior pecan specialist, we are asking if any of these adventitious root-inducing chemicals can be part of a strategy for delivering genetically identical elite pecan cultivars and rootstocks to growers.

Recently, we initiated collaborative work with Noble’s legume breeding group, led by Suresh Bhamidimarri, Ph.D., to test the effectiveness of these small chemicals on rooting of perennial legume stem cuttings.