

# 'Smart' flower bulbs pull themselves to deeper ground

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Mature mother bulb before and after root development. Note a bulblet formed on a scale of the middle bulb. On the right is a single bulblet with a contractile root. Credit: A. Carl Leopold

Confused about the right planting depth for flower bulbs? Trust the bulbs! Researchers have discovered that some flower bulbs are actually "smart" enough to adjust themselves to the right planting depth. A recent study published in the *Journal of the American Society for Horticultural Science* proved that bulbs can adjust their planting position by moving deeper into the ground, apparently in search of moister, more conducive

growing conditions.

According to Dr. A. Carl Leopold, William H. Crocker Scientist Emeritus at The Boyce Thompson Institute for Plant Research at Cornell University, when gardeners plant tulips or lilies too shallowly in their gardens, the bulbs will respond to the shallow conditions by literally "pulling" themselves down into deeper ground. "One doesn't think of plants moving, and especially moving down into the ground, but our research proved that this movement occurs.", explained Leopold.

Leopold and the late Dr. Modecai Jaffe had studied plants for decades, but had never focused on bulb movement in soil. The duo was interested in working on the physiology of "contractile roots", or those roots that are responsible for bulbs' movement. Explained Leopold, "Negative growth is very rare in plants, and the sort of contractile proteins that are so well known to drive contraction in animal muscles do not occur in plants. We selected this work as a divergence from the usual studies of growth, and introduced the idea of contraction." He added that hundreds of books have been written about plant root growth, but none mention this phenomenon of negative growth.

The study focused on the "Nelly White" variety of Easter lily. Contractile roots were found to respond to light signals perceived by the bulb. Exposure to certain types of blue light forced new contractile roots to be formed on the bulbs and helped initiate the remarkable bulb movement.

Further explaining the study, Leopold noted that "contraction is evidenced by a formation of epidermal wrinkles, starting at the base of the root and advancing toward the root tip. The movement function occurs in shallowly planted materials, is lessened at deeper locations, and ceases at a vermiculite depth of 15 centimeters. Movement of the bulb in the soil is achieved by a hydraulic shift in cortical cells. Root contraction

is stimulated by light."

The research team documented that perception of the light stimulus occurred in the bulblet or the subtending leaf. They also found that responsiveness to light faded as the roots aged. Experiments with light of different wavelengths indicated that the contraction response was triggered most often by blue light, and that blue light was the most effective in stimulating movement, suggesting the presence of a blue-absorbing pigment in the lily bulbs. The signal for contraction moved from the bulbs down into the roots, but the roots themselves did not respond to the light. The deeper the bulbs were planted, the less they formed contractile roots.

Summarizing the team's research, Leopold said that many plants have the ability to move down into soil—either to establish a more protected or stable location as in the case of many bulbs and tubers, or to provide stability for the plant. Bulbs "know" how to move down where environmental conditions are more constant.

Leopold mused, "I have some lily bulbs that were in the ground for nearly a decade, and I was astonished to find the bulbs moved themselves over a foot into the ground!". The research findings may help commercial and amateur gardeners in their quest for more effective bulb planting and growing techniques.

Source: American Society for Horticultural Science

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