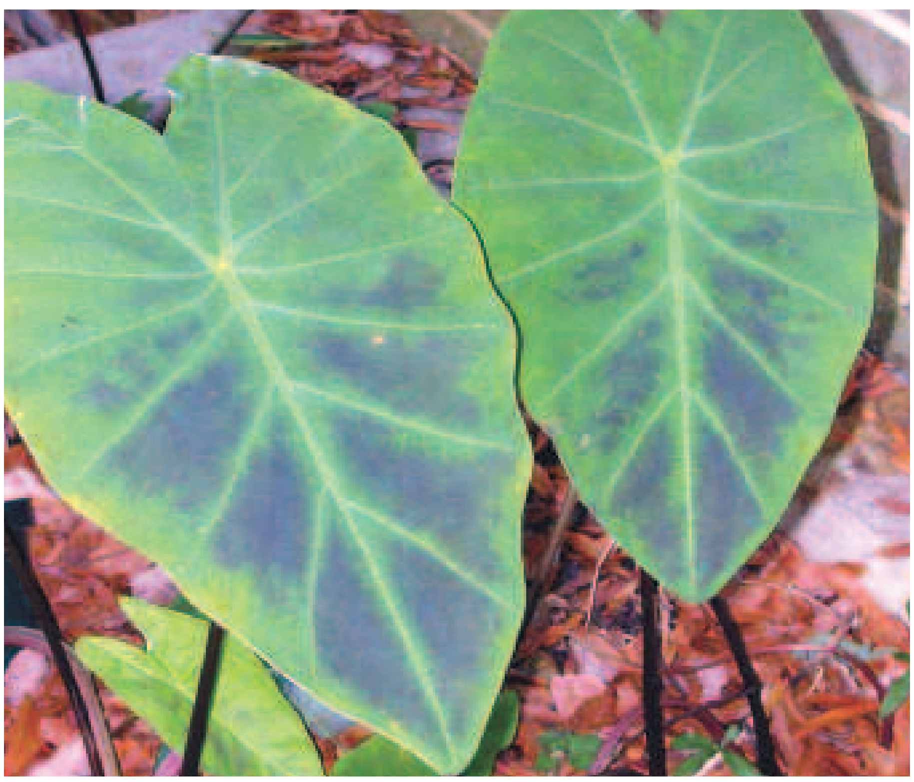
Cold Storage of Colocasia

What temperatures are suitable for storing colocasia? Clemson University research answers this question.

By Jim Faust, Kelly Lewis and Jeff Adelberg



Top right: Colocasia antiquorum *'Illustris'.* ***Bottom:*** *Elephant ear with leaves cut at 1½ inches above soil line prior to storage.*

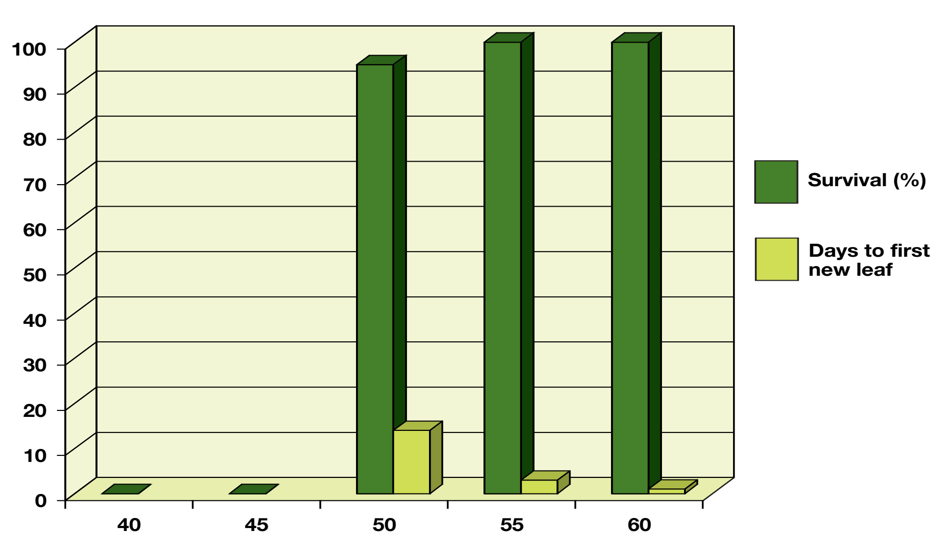
Elephant ear or taro (colocasia) has been increasing in popularity because of both the wider range of color choices and improved cold hardiness. The species, *Colocasia esculenta*, produces 5- to 7-foot-tall plants that have very large (3 feet), nodding, green leaves and a very large (5-inch diameter) thickened stem. It is commonly sold as a corm in garden centers and is a food crop (taro) in the tropics (Note: the stem must be boiled or fermented before it is edible). *C. esculenta* is considered an invasive exotic in peninsular Florida.

Many cultivars of *C. esculenta* and *C. antiquorum* have been introduced in recent years. These cultivars have partially or entirely black leaves and/or petioles or have different leaf shapes and sizes. Many cultivars have also been selected for reliable cold-hardiness as far north as Zone 7. In colder climates, elephant ears can be grown as annuals. They are typically used in aquatic gardens, as accent plants in containers or as textural plants in the landscape. Most cultivars produce a relatively small thickened stem (about the size of a golf ball) and numerous thickened roots (rhizomes) or above-ground runners (stolons). The rhizomes or stolons produce new shoots that allow the plant to colonize. As a result, most cultivars are propagated by division and can be purchased as bareroot plants. Elephant ears are also readily propagated by tissue culture.

WHY STORE?

We conducted a series of experiments to identify the best methods for overwintering or storing elephant ears. Storage creates more flexibility with production schedules. For example, if plants are propagated over a period of time, they can be placed into

Figure 1. The effect of storage temperature and shoot preparation on the performance of elephant ears following seven weeks in storage.



storage over several weeks, then brought out of storage simultaneously for uniform forcing. In contrast, one could place many plants in storage at one time, then bring the plants out of storage at staggered dates in order to force them for specific market dates or to ship via mail order. Since elephant ears grow rapidly, targeting markets with precise forcing schedules can allow for fast crop times. Finally, storage can be a more efficient use of space than simply over-wintering in a minimally heated greenhouse, since the containers can be placed on shelves or racks in the storage facility.

We used *Colocasia antiquorum* 'Illustris' in this study. Plantlets were received from a commercial tissue culture propagator and placed on a mist propagation bench until rooted, which took about three weeks at 74° F. Plants were then transplanted into 6-inch pots containing Fafard 3B Mix and placed into a heated greenhouse (70° F). The plants were grown until thickened roots with new shoot-tips were observed (8-16 weeks). Then, plants were moved into refrigerated coolers that maintained 40, 45, 50, 55 or 60° F to determine the ideal storage temperature. The plants were left in storage for seven weeks then returned to the heated greenhouse.

LEAF REMOVAL

One of the initial questions was whether it was harmful to remove the leaves before storage. Removing the leaves makes handling and storage much easier, but there was a possibility that the leaves could be a source of carbohydrates during storage. To test this theory, we removed the leaves off half of the plants immediately prior to storage. We observed that leaf removal prior to storage had no effect on plant survival, made handling easier and allowed for more plants to fit in the cooler. Furthermore, leaf removal did not increase labor, since the intact plants required the removal of the unsightly leaves following storage.

STORAGE TEMPERATURE

All plants stored at 40 or 45° F were completely dead within a couple weeks of storage (see Figure 1, page 64). Plants stored at 50° F had a high survival rate (95 percent), while those stored at 55 and 60° F had a 100-percent survival rate. The time of emergence (first newly unfolded leaf) following storage was delayed at 50° F compared to the warmer storage temperatures. For example, the plants stored at 50° F emerged in 14 days, while the plants stored at 55 and 60° F emerged in 3-5 days.

At 50° F, the petiole tissue slowly decayed

Top and bottom: *Botrytis infection was severe at 50° F. New shoots typically emerged from the stem tissue below the media surface; however, shoot emergence was slow compared to warmer storage temperatures.*

Top: *Appearance of elephant ears during storage at 55° F, which was the optimal temperature in this study.* ***Bottom:*** *Cut elephant ear stored at 60° F. Note emergence of yellow leaves that occurred during storage.*

during storage, resulting in a severe Botrytis infection after four weeks in storage. The longer the plants were stored at 50° F, the deeper the rot penetrated the petiole tissue. In many cases the petiole tissue was completely dead down to the stem tissue after seven weeks in storage. As a result, when these plants were removed from storage, a longer period of time was required before a new leaf emerged from the meristem atop the stem tissue. In a few cases, the stem tissue also rotted, resulting in less than 100-percent survival at 50° F. Fungicides applied prior to storage slightly delayed the rate of Botrytis infection but did not result in an overall improvement in survival.

Plants stored at 55° F did not rot during storage and thus achieved 100-percent survival. Since the immature leaves located within the petiole sheath were not damaged, emergence of new leaves occurred within a few days of the plant being removed from storage.

Plants stored at 60° F also achieved 100-percent survival after seven weeks of storage; however, leaf growth occurred during storage. These leaves were chlorotic due to the lack of light. Since growth during storage was detrimental, 60° F was considered to be too warm for *C. antiquorum* Illustris storage.

THE BOTTOM LINE

Temperature is a critical factor affecting the storage of elephant ears. In our experiments the optimal storage temperature for *C. antiquorum* Illustris was 55° F, since survival was 100 percent, and yet no growth occurred during storage. We expect that storage duration greater than seven weeks could be achieved at 55° F; however, experimentation is required to identify the potential storage longevity. Leaf removal prior to storage had no effect on plant survival and made handling easier; therefore, it is highly recommended. Following storage at 55° F, shoot growth was rapid, so the plants were marketable in 3-4 weeks. GPN

Jim Faust is an assistant professor of floriculture; Kelly Lewis is research specialist; and Jeff Adelberg is assistant professor at Clemson University. They can be reached by E-mail at jfaust@clemson.edu.

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