GROWING AND BREEDING *DIEFFENBACHIA*

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At the Agricultural Research Center - Apopka we have been studying the breeding potential within the genus *Dieffenbachia.* One goal of this program is the development of new and better varieties of *Dieffenbachia* for commercial production in Florida. Another important objective is to study the reproductive mechanisms of *Dieffenbachia* and learn more of their biology and how it relates to all tropical plants in general and other aroids in particular. Such studies include research into factors affecting plant growth, flowering, pollen and seed production and storage and inheritance of various plant characteristics (leaf and petiole variegation, growth habit, etc.).

An important part of plant breeding involves collecting and maintaining stock plants in good condition until flowering. We grow all of our stock plants in a medium consisting of: 2 parts Florida peat moss, 1 part cypress shavings and 1 part pine bark by volume. This basic medium is amended with 7 lbs dolomite, 3 lbs perk (a micronutrient source) and 10 lbs osmocote (14-14-14) per cubic yard. In addition plants also receive 200 ppm of 20-20-20 liquid Peter's fertilizer biweekly and they are grown either in greenhouses or slat sheds with light intensities at 2500-3500 footcandles. Temperatures are kept within the limits of 65-95°F throughout the year with the exception of the slat shed which is allowed to cool to 45°F during the winter. No apparent damage has been observed on plants at 45°F. All of the 50-60 cultivars and species of *Dieffenbachia* we have collected and grown have responded well to these growing conditions.

Under our conditions in central Florida, *Dieffenbachia* tends to have an annual flowering habit. There exists a spring "flush" of blooms during April, May and June at which time 95% of our crosses are performed. Unfortunately some *Dieffenbachia* species such as *D. amoena* flower later in July and August while *D. oerstedii* flowers in the fall. Attempts to hybridize the plants with the earlier flowering cultivars is severely limited. In contrast, *D. maculata* var.*angustior*, seems to flower more or less continuously. These observations have been made over a 3-year period and may differ from what occurs in other parts of this state or other countries. Because little is known about flowering in tropical plants, we have initiated research in this area as part of our breeding program.

Dieffenbachias have a unique floral structure and the remainder of this paper is intended to serve as a guide for anyone planning to do breeding work with them. The *Dieffenbachia* inflorescence is made up of a spadix and a spathe (Figure 1A-C). The spadix consists of an upright central axis covered with several minute petalless flowers. Dieffenbachias have separate male (staminate) and female (pistillate) flowers clustered about the spadix. Female flowers consist of a stigma,

Figure 1. *Dieffenbachia maculata* 'Perfection' inflorescences. A. Bud stage; B. at anthesis (the day of flowering opening); C. with spathe cut away to show basal female flowers with staminodia.

Figure 2. (left) Male (staminate) portion of *Dieffenbachia maculata* 'Perfection' inflorescence with pollen visible. Figure 3. (right) Camel hair brush used to pollinate female (pistillate) flowers of *D. maculata* 'Perfection.' The white structures (→) are staminodia and are not involved in pollination.

style and ovary while the male flowers are made of the anther and filament and produce pollen. A pollination involves the transfer of pollen from selected male flowers to the stigmas of the selected female

In a *Dieffenbachia* inflorescence male flowers are grouped on the upper half of the spadix and female flowers on the basal half (Figure 1C). The spathe covers the spadix until anthesis (the day of flower opening) when it unfurls and exposes the male portion of the spadix (Figure 1B). Whenever possible the inflorescence should be pollinated the same day as the spathe unfurls. Usually the spathe unfurls during the night, so flowering plants should be checked each

morning for newly opened inflorescences.

The first step in pollinating *Dieffenbachia* is finding a source of pollen. The male flowers of *Dieffenbachia* do not produce pollen until 2-3 days after the spathe unfurls (Figure 1B). This means that it is necessary to collect pollen from a 2-3 day old inflorescence for use in pollinating a newly opened one. The female flowers are receptive of pollen the same day the spathe unfurls and possibly the next. In nature this prevents self pollination, or inbreeding, and the mechanism is referred to as dichogamy.

Dieffenbachia pollen is easy to observe once it is produced (Figure 2); The portion of the inflorescence bearing pollen (Male or staminate portion) can be cut off with a razor blade and placed in a dish or container for easy access. A camel hair brush may be used to pick up the pollen and transfer it to the stigmatic surface of the female flowers (Figure 3). The brush will pick up pollen easier if it is first brushed lightly across the moist, sticky surface of the stigma. The stigmatic surfaces of the female flowers may be identified by their golden yellow color and there may be 40-80 female flowers per inflorescence depending on the cultivar. The female flowers are surrounded by white appendages termed staminoidia which often extend higher than the stigmatic surface. Staminoidia are sterile and serve no function during pollination.

In 3-4 weeks following a successful pollination, the female flowers (now technically a fruit) will turn green and begin to enlarge. During this period the stigmas and the staminoidia will have deteriorated and disappeared. As the fruits enlarge they change color from green to cream colored to orange to bright red when mature, approximately 4-5 months after pollination. The fruits will not immediately fall off the spadix, once they have turned red, although it is best to harvest them as soon as possible.

Mature fruit should be harvested and planted as soon as it is ripe. Each *Dieffenbachia* fruit generally contains 1 large seed and it is very important not to let the seeds dry out or they will lose viability rapidly. We clean off the fleshy outer covering from the fruit before planting the seed to help prevent development of bacteria or fungi in the seed bed. After cleaning the seeds are soaked in a 10% Chlorox solution for 5-10 minutes, followed by a dip in a benlate (fungicide) solution. Seeds are then placed on top of shallow depressions made in a moistened medium consisting of 1 part German peat and 1 part perlite by volume, in small plastic trays. Each container is sealed with a plastic bag to maintain high relative humidity around the seeds. The trays are placed under florescent lights which are on 12 hours daily in growth rooms he held at 80°F. In 2-3 weeks the seeds have germinated and the plastic cover is removed. When seedlings have produced 4-5 leaves they are transplanted into 4-inch pots containing the same medium used for germination. Seedlings are finally repotted into 6-inch pots using our normal 2:1:1 medium.

The young plants are first critically evaluated once they develop to a full 6-inch pot size.