The Orchid Grower

In the second article of this four-part series, find out how to cash in on orchids, the second hottest potted flowering plant in the United States.

Figure 1. Some of the components used in orchid media. From left: An orchid mix composed of fir bark, coarse perlite, coarse peat, and shredded sphagnum moss; fine grade pumice; coarse sphagnum peat; medium grade Douglas fir bark; fine grade aged Monterey pine bark; and coarse perlite (sponge rock).

by ***YIN-TUNG WANG, MATTHEW BLANCHARD, ROBERTO LOPEZ*** *and* ***ERIK RUNKLE***

MANAGING the root zone of potted orchids can be one of the most critical aspects to growing a healthy crop. In this second article of our four-part series, we present research-based information on how media components, watering and fertility influence growth of potted phalaenopsis (*Phalaenopsis spp.*) orchids.

Media Components

In their natural habitats, most phalaenopsis orchid species are epiphytic plants, meaning that they grow on tree trunks and limbs. Their roots are exposed to air movement and absorb moisture from the humid air, as well as from rains and dews. Because of this, when we grow phalaenopsis in containers filled with an artificial medium, we must consider aeration, capillary action, water and nutrient holding capacity, stability and weight of the medium components, as well as cost and consistency. Coarse materials are often used to allow plenty of air movement through the media. Ground bark from the Douglas fir and costal redwood trees has been used for over half a century for growing orchids. Although Douglas fir and costal redwood are host plants for *Phytophthora ramorum*, the fungus that causes the Sudden Oak Death disease, orchids grown in bark have been exempt from the quarantine list.

Nearly all commercial orchid growers make their own media. Although most modern orchid media still contain fir bark, one or more of the water absorptive materials such as sphagnum peat, perlite, sphagnum moss, coconut husk chips and diatomite is mixed with bark for improved plant growth (Figure 1). For example, research at Texas A&M University showed that plant growth was vastly improved in a medium consisting of 20 percent coarse sphagnum peat and 80 percent fir bark, compared to fir bark alone.

Bark

Fresh-ground bark does not hold much water, which can be problematic when bare root phalaenopsis are newly planted. When bark starts to hold more water and nutrients, it decomposes quickly and ties up some of the nutrients it holds. In fact, there may be no detectable amount of nitrate-nitrogen in a bark medium.

Fir bark particles do not allow capillary action and do not readily transfer moisture from the bottom of the pot towards the surface. A medium of only fir bark can hold too much water once it begins to degrade, which can lead to severe root rot and poor plant performance.

The imported aged bark obtained from the Monterey pine, grown in New Zealand for lumber, has been used by an increasing number of orchid growers in the United States. Our research found that aged Monterey pine bark holds more moisture and nutrients and maintains a higher pH than fir bark (Figure 2). In addition, this aged pine bark does not decompose as quickly.

Figure 2. Phalaenopsis planted in a mix of coarse perlite, coarse sphagnum peat and fir bark (left) or aged Monterey pine bark (right). Plants were provided with a constant fertility of 100 ppm nitrogen from Peters 15-5-15 Cal Mag. *Photo courtesy of Texas A&M University.*

Sphagnum Moss

Pure sphagnum moss is probably the single best material for growing young phalaenopsis orchids in warm (tropical and subtropical) climates. Many progressive growers plant plantlets from flasks into plug trays with sphagnum as the sole growing medium. Taiwan is the leading exporter of phalaenopsis orchids, and nearly all are produced in sphagnum moss (Figures 3 and 4). Although moss from New Zealand is of higher quality, many growers use Chilean moss because it is less expensive.

Figure 3. An excellent crop of phalaenopsis being grown in soft, clear plastic pots filled with sphagnum moss at Taiwan Sugar Corp.

Moss has a low pH and absorbs large quantities of water and mineral nutrients. Thus, growers must pay close attention to watering and fertility, especially those located in more temperate climates where plants lose water less rapidly. In addition, inexperienced consumers often overwater plants sold in sphagnum, leading to root rot and plant decline. For these reasons, many growers in northern climates avoid using a sphagnum moss-based medium.

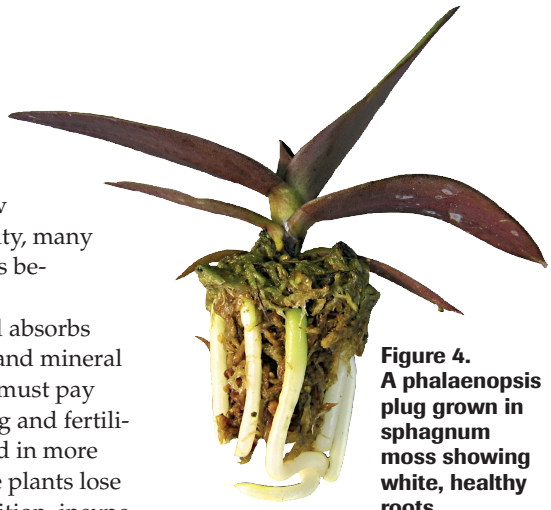

Figure 4. A phalaenopsis plug grown in sphagnum moss showing white, healthy roots.

Transplanting

Phalaenopsis imported into the United States arrive as bare root plants, and thus immediate transplanting is necessary (Figure 5). Regardless of the medium components, transplanting requires attention to detail and is quite laborious. Roots should be spread out in pots before medium is added. It is very important to position medium between the roots so there are no large air pockets in the pot. A stick is sometimes used to push down and compact the medium to hold the plant in place. However, if the medium is compacted too much, it could hold too much water and have inadequate aeration. It is also important to ensure that plants are planted at the correct level. Plants planted too deep may have more disease problems

and could rot, and those planted too shallow may not root into the medium properly and may not have adequate support for flowers.

Phalaenopsis roots that are exposed to light have chloroplasts and perform photosynthesis. A majority of phalaenopsis growers in Taiwan and the Netherlands, and many in the United States, use clear pots that allow light to penetrate into the pots. Root photosynthesis likely contributes very little to total plant photosynthesis. However, because roots avoid darkness, roots of plants grown in clear pots generally stay inside the pot better than the roots of plants grown in opaque pots (Figure 6).

Figure 5. Bare root phalaenopsis plants packed in shredded newspaper for exporting from Taida Orchids in Taiwan.

Watering

Growing a good crop of orchids requires skillful and attentive watering. The succulent phalaenopsis roots should dry slightly before being wetted again. Orchids with pseudobulbs (the enlarged stem) store water in them and can withstand periods of drought. However, phalaenopsis do not have pseudobulbs and therefore are intolerant of extended dry conditions.

Phalaenopsis have succulent leaves that do not show signs of stress until several days of a water deficiency. Research has shown that the uptake of carbon dioxide (used in photosynthesis) steadily declines when water is withheld. When subjected to two or three weeks of dryness, the excess loss of moisture will cause the succulent leaves to "flop" and can cause one or more of the lower leaves to turn yellow and abscise.

In general, medium must be allowed to dry before being watered again, but it should never be allowed to dry out completely. Even in hot summer climates, phalaenopsis in a water absorptive medium require watering only every five to seven days in 6-inch (15-cm) pots and at three to five day intervals in 4-inch (10-cm) pots. Less frequent watering is appropriate in cooler climates.

Maintaining a high relative humidity reduces watering frequency and is conducive to leaf growth. We recommend the relative humidity to be around 70 percent to 80 percent. Long (half-inch) brownish or greenish succulent root tips are signs of active plant growth. Low humidity can quickly cause the edges of flowers to become dry and papery.

Figure 6. Phalaenopsis grown in opaque pots (left) and clear plastic pots (right). The roots of phalaenopsis are better contained in a pot that is translucent to light.

Fertility

There have been – and still are – misconceptions about proper fertility of orchids. In the past, phalaenopsis were mistakenly thought to need very little fertilizer because plants were often grown in improper growing media and thus plant growth was poor. Research in the past decade has revealed that phalaenopsis is a moderate feeder when grown in more water-absorptive media. When complete fertilizers are used, there is little or no effect of fertilizer type on leaf growth and flowering when grown in a medium containing 20 percent peat and 80 percent bark. Plants supplied with 200 ppm nitrogen at every watering were superior to plants fertilized with 100 ppm of nitrogen (or less) at every watering. Therefore, we recommend incorporation of a complete fertilizer delivering 150 to 200 ppm nitrogen at every watering.

Another misconception is that a high concentration of phosphorus ensures excellent flowering. Research has indicated that many growers have been using excessive concentrations of this nutrient. In one study, phosphorus varying from 22 to 242 ppm (with 100 or 200 ppm of nitrogen) did not influence growth or flowering of phalaenopsis. Preliminary research indicates that 25 to 50 ppm phosphorus is adequate to grow an excellent crop.

For growers in cold climates, consider using a lower fertilizer rate during the flowering cycle due to reduced vegetative growth. Fertilization can be withheld completely once an inflorescence has reached 10 inches (25 cm) in length, or after the first flower has opened, without affecting flower count or size.

Salinity

Roots of phalaenopsis are very sensitive to salinity and can be injured when salts accumulate in the medium. When salinity of the irrigation water (before adding any fertilizer) increased from 0 to 1.4 dS/m, root fresh weight decreased in one study. Many orchid growers have installed reverse osmosis (RO) equipment to provide water that is low in dissolved salts. If straight RO water is used for irrigation, supplemental calcium and magnesium must be used to avoid potential deficiency problems.

A desirable electroconductivity (EC) of the water before adding fertilizer is 0.5 dS/m or less. We recommend that growers maintain a medium leachate of 1.5 dS/m or lower when using the pour-through technique. When medium EC becomes too high (2.0 dS/m), timely leaching with clear water is recommended.

Look for next month's *Greenhouse Grower* for the third article on production of phalaenopsis. It will focus on light and temperature requirements for vegetative growth and flowering, height control and managing diseases and insects. **GG**

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