St. Augustine Orchid Society
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Nitrogen in Fertilizer

December 2002

by Dr. Courtney Hackney, hackneau@comcast.net

Orchid Growing Tips

With winter beginning the 21st of this month, it might seem strange to be discussing fertilizer. Nevertheless, the growth and flowers you see this year are due, at least in part, to the ability of your orchids to obtain nutrients. The rise of the orchid pot-plant market has sparked a level of research into orchid culture not seen since the cut flower days more than 50 years ago. A recent article by Dr. Yin Tung Wang at Texas A&M published in Phalaenopsis (Journal of the International Phalaenopsis Alliance) documents how fertilizers affect the growth of orchids.

In case some readers are new to the language of fertilizer, a few basics are in order. Fertilizers are nutrients and fall into two groups, macro- and micronutrients. Nutrients required in large quantities such as nitrogen, phosphorus, and potassium belongs in the first group, while 30 or so additional nutrients are required in very tiny quantities. Most micronutrients occur in sufficient quantities in surface or ground water and only need to be added if rainwater or Reverse Osmosis (RO) water is used. Calcium and magnesium, however, are two micronutrients that are usually added by the grower because they do not occur in sufficient quantities in water.

There remain many scientific questions regarding the best form of fertilizer for orchids, even though these questions are answered in most orchid books. Most of the information in books is anecdotal or based on small samples. Wang's article tests many of the assumptions about fertilizers and provides enough information to allow both the commercial grower and hobbyist to use its findings.

His first study compared urea, nitrate, and ammonium, the three different forms of nitrogen found in fertilizers. The question has been whether orchids could use all three forms equally well and what dose grew orchids faster. Most fertilizers specify a rate of application that provides 200 ppm (parts per million) of nitrogen regardless of form. Wang is able to grow Phalaenopsis from seed to 29-inch leaf span in 25 months with this rate of application.

Some authorities contend that urea, an inexpensive form of nitrogen, is unavailable to orchids and is thus wasted as a fertilizer for orchids. Urea is also reputed to accelerate the degradation of media forcing more frequent repotting. On the other hand more expensive forms of nitrogen, nitrate (NO_3) and ammonium (NH_4), can be absorbed directly through the roots of orchids and quickly used for growth.

How do orchids obtain this fertilizer? Wang found that Phalaenopsis were not able to obtain significant levels of fertilizer through leaves, a process practiced by some growers called foliar feeding. In fact, water passing over leaves or through media provides little time for absorption by the plant. It is only when roots come into contact with water containing fertilizer absorbed onto particles in the media that fertilizer and water are absorbed. Water is held on particles by surface tension and pulled into the plant from the particle surface. Thus, the medium is as important as the fertilizer in orchid culture.

Bacteria found on the surface of the medium can compete with plants for nitrogen. They use nitrogen and in the process degrade organic media such as fir bark. When urea is used in fertilizer some bacteria use this form and convert it into nitrate, which can then be used

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by the orchid plant. Thus, a medium that promotes bacteria growth can make nitrogen available from urea, while other media may not.

The Texas A&M experiment used a medium that was 70% fir bark and 30% peat. Peat provides a large, surface area for bacteria to convert urea to nitrate. Wang found no difference in growth using different types of fertilizer, even when the proportion of nitrogen from urea was over 50%. Rates of nitrogen application of 200 ppm (full strength) resulted in larger plants with more flowers and better roots compared to both higher (400 ppm) and lower rates (50 ppm and 100 ppm) of application.

This is an excellent study, but those not familiar with all aspects of plant nutrition might misinterpret or misuse the results. High fertilizer levels grow orchids more quickly, but pots will require excellent flushing to remove fertilizer salts that accumulate in the medium. These plants also require frequent repotting or there is risk of the bacteria in the medium degrading the medium to the point that it becomes mushy, a condition that can destroy orchid roots.

Wang's study used Phalaenopsis grown under ideal light conditions and likely treated with fungicides and bactericides at the slightest sign of a problem. The overapplication of nitrogen can lead to increased risk of rots, but the under-application of nitrogen can also cause problems. An orchid not receiving an adequate supply of nitrogen discards its old leaves as it recycles nitrogen into new leaves. My experience is that rates of nitrogen application of 100 ppm provide good growth for a hobbyist without producing the soft leaves that can result from over application of nitrogen. Whether leaves become soft or stay hard under high nitrogen fertilizer levels depends on other factors as well, especially the ratio of other nutrients in a fertilizer; the subject of next month's column.