St. Augustine Orchid Society
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Reverse Osmosis Water

by James Arnold, jgroundskeeper@aol.com

After a bite from the orchid bug in 2006 I rather quickly found the slipper orchids. Oh, I had others too but Paphiopedilums and Phragmipediums were the favorites. After some plants died and others were barely hanging by a thread, I became concerned that the chemicals added to the municipal water system were in part to blame.

1. The outside of James' 12 x 30 ft greenhouse

2. Inside the greenhouse

A decision was made to switch to well water. What could be better than water from Mother Earth? After a few months of using the well water, things became worse. Most of the plants stagnated and some died. Everything was tried: more light, less light, different fertilizers. Nothing seemed to make much difference. A commercial grower suggested sending a sample of the well water to a lab for testing. After reviewing the results with a few commercial growers and fellow society members, it became obvious that the well water was less than desirable. The high alkalinity coupled with the high calcium, sodium and chloride levels were not good for the slipper orchids.

3. 100 gallon per day RO unit

It was time for more drastic changes. With the greenhouse filling up with more and more expensive species and hybrids, I could no longer just let them limp by on water of questionable quality. A 100 gallon per day reverse osmosis (RO) system was installed. Treated municipal water rather than the well water is first run through a water softener system to remove the calcium and magnesium minerals responsible for fouling the membrane. The RO system is a three-stage unit with a sediment filter, carbon filter, and the RO membrane.

How does it work? Water is forced through the membrane with the help of a pressure boosting pump. The pump increases the pressure 10 to 15 psi, a must in the winter when the source water is colder slowing production. The membrane removes the solids that are dissolved in the water. Afterwards the water has less than 10 ppm or parts per million total dissolved solids. The clean water is stored

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inside the greenhouse in a 100 gallon container used on farms for watering livestock, covered with plywood to keep out the light and control algae growth. Water is pumped directly from the farm container with a 1/3 HP sump pump, 20 ft hose with a wand and low-pressure water breaker.

4. 100 gallon container to hold the RO water

The reverse osmosis water is very pure so fertilizing is a must. I feed at every watering with 15-5-15-5-2 Cal-Mag formula at 50 ppm nitrogen. The calcium and magnesium in the fertilizer are in the nitrate forms. They are readily available to the plants. Because the RO water has no buffering capacity, the pH of the water/fertilizer mix drops into the 3's, about the same as orange juice. A potassium silicate product is used to raise the pH back up to 5.5 or so. This also provides silica to the plants that was removed from the source water by the RO system.

In the winter the water may need to be heated, even when storing the treated water in the greenhouse, which is kept at minimum 50 F temperature. Cold water can shock plants and may slow or halt growth all together. Two 30 gallon aquarium heaters are used to heat the water to 65 to 70 F.

5. Typical root system of paphiopedilums grown with RO water.

The pH of the media should be checked on a regular basis. High nitrate fertilizers may cause a rise in pH out of the desirable range of 5.4 to 6.2. A few plants are checked each month with the pour thru method using steam distilled water. First water the plants well, wait about a half hour, then pour enough distilled water thru the media to get about an ounce of water. Test the water with a portable meter, such as the Blue Lab Combo meter. It may be necessary to rotate in a more acidic reaction formula fertilizer to help maintain the pH in desired range.

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5. Paphiopedilum Saint Swithin 'Jake Butler' AM/AOS, CCM/AOS
photo courtesy of Art Russell

The RO system is not without its negatives. Storage of the RO water can be an issue. If not for the space taken up by the RO container, there could be another small table for seedlings. Waste is a concern; some units use four gallons of water to make one gallon of clean water, although the newer units may be more efficient. Water shortage could be a problem in summer because the unit cannot meet the increased water requirements. Plan ahead, buy a bigger unit than you need. Collections tend to grow and so will the water consumption. Also remember that in the winter it takes longer to produce because of cooler water temperatures. The sediment and carbon filters should be changed on a three-stage unit every three months, at a cost of about $15. The membrane can last up to five years, but I change it every year, purchasing a replacement on Amazon for approximately $25.

Clean RO water has been good for my plants, rewarding me with a few AOS awards, four of which are CCM's. Maybe, coupled with dedication and attention to detail, RO water might be the answer to your water woes.