Watering and Fertilizing Your Orchids

Sue Bottom
St. Augustine Orchid Society

How Often Should I Water?

- **Potting Mix** – how long does your mix hold water?
- **Pseudobulbs vs. Fleshy Leaves** – how much water does your orchid store?
- **Growing Area** – can you control the amount of water your orchid receives?
- **Humidity** – how humid is it?
- **Growth Season vs. Winter Rest** – is your orchid growing rapidly or resting?
- **When you Water, Water!** – water freely when watering, then don't water until the plant needs water

General Rules of Thumb

- **Summer Growing Season** - two or three times more frequently than in the winter
  - Phals – once a week or so
  - Cattleyas and Dendrobiums – every 2 or 3 days
  - Vandas and Mounts – once or twice a day
- **Winter Resting Season** - half or a third as much as in summer
  - Phals – every 10 or 14 days
  - Cattleyas and Dendrobiums – every 7 or 10 days
  - Vandas and Mounts – every other day

Watering in the Spring

- **Rousing from Winter Rest** - plants responding to increase in sunlight, day length and temperatures
- **Humidity is Low** - water evaporates rapidly so you can water freely
- **Gradually Increase Frequency** - shorten days between watering events
- **Nighttime Watering** - water at dusk with plain water, water with fertilizer in the morning
- **Sunny vs. Cloudy Days** - frequent watering when sunny, don't water on gray or rainy days

Watering in the Summer

- **Day and Nighttime Temps Rising** – plant growth actually slows with temps over 90 or 95°F
- **Humidity is High** – water evaporates less rapidly so you can water a little less freely
- **Resume Morning Watering** - vegetation dry by nightfall to minimize bacterial and fungal problems
- **Tropical Storm Season** - during extended rainy and gray weather, either protect orchids from rain or consider protective sprays & hard drying out

Watering in the Fall

- **Second Growth Spurt** - new green root tips when temps and humidity mediate in late September
- **Humidity is Low** - water evaporates rapidly so you can water a little more freely
- **Winter Rest Period is Coming** - by mid to late fall, you will slowly add days between waterings
- **Prepare Winter Dormant Plants** - Certain Dendrobiums (nobile, seminobile, callista) are deep winter sleepers and Catasetinae are semi dormant during winter, reduce watering frequency and no fertilizer after Thanksgiving

Watering in the Winter

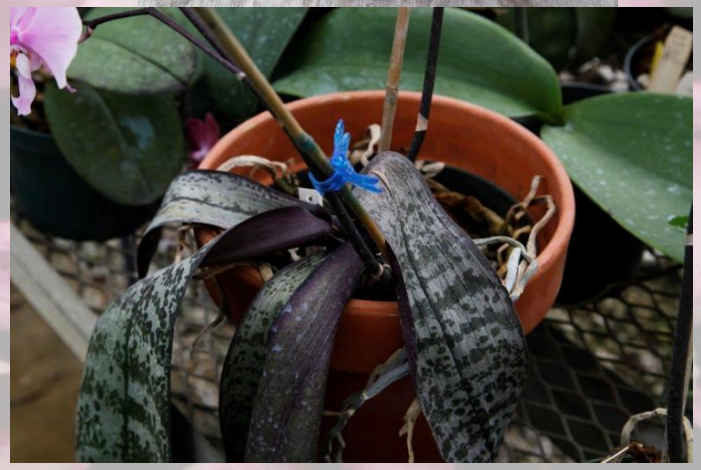
- Watering is Greatly Reduced - perhaps half of your summer watering frequency
- Gray and Cloudy Weather - water early in the morning and never when gray and cloudy
- Phals and Paphs - continue growing in winter, like to be moist but not wet
- Cattleyas and Oncidiums - let dry between waterings
- Dendrobiums - Treat evergreen varieties like cattleyas, water deep winter sleepers sparingly, no fertilizer
- Catasetinae - No water or fertilizer after leaves yellow

Dehydration – Either You Aren't Watering Enough or Roots Have Rotted from Decaying Mix

Symptoms: The plant looks dehydrated, leaves are limp and wilted. If it looks dehydrated, it probably is, but why?

Not Watered Enough: Are you watering frequently enough? With enough water when you water?

Potting Mix is Rotten: If the roots are rotten, the plant cannot absorb water no matter how much you water.



Knock it Out of the Pot: The next step will be obvious.

Edema – Blisters from Watering on Gray Days or When the Nights Turn Cool

Symptoms: Excess water is absorbed by the roots more quickly than it can be shed by the leaves, causing swelling of plant cells and producing a blister-like lesion. Occurs when plants are watered late or on cloudy/rainy days and the nights turn cool.

Prevention: Water early in the morning when nighttime temperatures drop below 65F. Reduce watering in the fall when plant growth slows.

Rots – from Water Standing in Plant Leaves and Pockets

Symptoms: Rapid rotting of leaves and new growths from bacteria growing in water standing in new growth.

Conditions Causing Rot:

- Phalaenopsis and Vandas - if water is allow to stand in the crown it will kill the heart of the plant.
- Cattleyas – the sheath around the pseudobulb can form a pocket in which water can accumulate, often leading to rot of the new leaves and pseudobulb.
- Catasetums – water can get inside the unfurling leaves at the top of the pseudobulb and not drain causing the leaves at the apex of the pseudobulb to rot.

Prevention: Be careful watering, water the roots not the plant. Don't allow water to stand in the crown of plants. Peel back cataphylls on cattleyas to prevent pocketing. Don't water catasetums until the new growth is 5 or 6 inches tall and unfurled.

Watering Devices

- Hand Watering
  - Water Wand
  - Water Breaker
  - Fogg It Nozzles – great for vandas
  - Touch 'n Flow Trigger Valve
- Automated Systems
  - Mister Heads
  - Drip Irrigation
  - Timers

Water Quality

- pH – measure of how acidic or basic your water is, affects availability of minerals
- Alkalinity – most critical component affecting media pH, high alkalinity can cause micronutrient deficiencies
- Soluble Salts – salt accumulation in the root zone can cause root tip burn, salts are in raw water and fertilizers, high salt content can result in hard water marks on leaves that plug plant pores
- Calcium – required by young growing tissues, strengthening stems and promoting strong overall plant growth, irrigation waters should have 40 to 80 ppm
- Magnesium – important component of chlorophyll, irrigation waters should have 20 to 40 ppm

St. Augustine Area Well Water Quality

- Sources – water is largely derived from public water supply and private wells in limestone and shell
- Most of Our Well Water Isn't the Greatest for Orchids
  - Water is high in alkalinity and soluble salts
  - Calcium present but not easily available due to high pH
  - Magnesium generally not present in high enough concentrations
  - Sodium may be present from natural deposits or salt water intrusion (never water orchids with softened water, the sodium will kill them)
- Deep Artesian Wells – much higher quality, low salt and alkalinity content, may be low in calcium and magnesium
- Get Water Tested – send sample to lab like QAL or JR Peters (who will also recommend a fertilizer), take sample to pool water testing or do colorimetric test

Analyses of My Irrigation Water

	Target Levels*	Acceptable Level	Well Water	Pond Water
pH, units	5.5 – 7	4 – 10	7.6	6.8
Alkalinity, mg/l as $CaCO_3$	40 - 160	< 400	430	46
Soluble Salts, mmhos/cm	0.20 – 0.80	< 1.5	1.02	0.32
Calcium, mg/l	40 – 80	< 150	164	26
Magnesium, mg/l	20 - 40	< 50	7	4
Sodium, mg/l	< 20	< 50	36	26
Boron, mg/l	< 0.10	< 0.5	0.11	0.09
Iron, mg/l	< 1	< 4	0.17	0.31

*Target levels as defined by QAL in the irrigation water lab report modified upward for calcium and magnesium per university and fertilizer company recommendations

Results of Water Analyses

- Testers Report on Tonight's Results
  - Low Alkalinity Water
    - Group 1 < 60 ppm, Group 2 60 – 150 ppm
    - Typical of some deep wells, rainwater
    - Typical of city and county water supplies
  - High Alkalinity Water
    - Group 3 150 – 200 ppm, Group 4 >200 ppm
    - Typical of our shallow well water
- More Detailed Analyses of Great Value

Fertilizer Constituents

- Macronutrients
  - Nitrogen, Phosphorus, Potassium
  - Form of nitrogen very important: Nitrate nitrogen (available to orchid), Ammonia nitrogen (available to orchid, generates acidity) and Urea (not available to orchid, requires microbial conversion)
- Macro Micronutrients
  - Calcium
  - Magnesium
- Micronutrients
  - Boron
  - Copper, Iron, Manganese, Molybdenum and Zinc

Fertilizers Can Affect the pH in the Root Zone of Your Orchid

- Once you know your water type, choosing the right water soluble fertilizer is easy.
- Fertilizers high in ammoniacal nitrogen produce an acidic reaction.
- For low to moderate alkalinity water (<150), an essentially neutral fertilizer formulation is best to prevent an abrupt drop in the substrate pH.
- For high alkalinity water (>150), an acidic fertilizer formulation helps neutralize the effect of water alkalinity and makes the naturally occurring calcium and magnesium more available to the plant.

Potting Mix Also Impacts Substrate pH

The type and amount of organic matter present in potting mixes affects the pH in your orchid's root zone

- **Sphagnum Moss** - a very water retentive medium that becomes so acidic that bacteria and fungi cannot survive in it
- **Organic Matter** - like bark, coconut husk and redwood bark and to a lesser extent tree fern decompose over time and their decomposition results in increased acidity in the root zone
- **Inorganic Matter** - like aliflor or hydroton has little buffering capacity

Select Fertilizer Based on Water Quality and Potting Medium

Low Alkalinity Water or Organic Potting Mix. If you have pure to moderately alkaline water or if you grow in a highly organic mix like bark or coconut husk, choose a basic (non-acidity generating) fertilizer like a Cal Mag fertilizer.	**High Alkalinity Water.** If you have moderately high to high alkalinity water, choose an acid generating fertilizer, one that has about half of the available nitrogen in the ammonia form that will help neutralize some of the alkalinity in the root zone (the other half being nitrate, avoid urea formulas).
Cal Mag Fertilizer. The Peters Excel 15-5-15 Cal Mag or 17-3-17 Peat Lite Neutral Cal Mag are low phosphorus MSU type fertilizers that contain supplemental calcium and magnesium. Additional magnesium supplementation may be required.	**Acidity Generating Fertilizers.** A balanced 20-20-20 fertilizer, available at retail outlets, Peters Excel Multi Purpose 21-5-20 and Peters Professional 20-10-20 Peat Lite Special are good choices though supplemental magnesium will be required.

Fertilizers for Each Water Type

Fertilizer Label Information	**Fertilizer for Low Alkalinity Water**	**Fertilizer for High Alkalinity Water**
	17-3-17 Peat Lite Neutral Cal Mag Fertilizer	21-5-20 Peat Lite Special Fertilizer
Nitrogen Forms	4.0% ammoniacal and 13.0% nitrate nitrogen	7.3% ammoniacal and 12.6% nitrate nitrogen
Calcium and Magnesium	4.0% calcium 1.25% magnesium	no calcium no magnesium
Potential Acidity or Basicity (lbs $CaCO_3$ equivalent per ton)	27 Basicity	390 Acidity

Nutrients Delivered to Plant

Fertilizer Solution Levels calculated at 1/4 tsp/gallon	Weekly Feeding Recommended Levels (ppm)	Low Alkalinity Pond Water with Cal Mag Fertilizer	High Alkalinity Well Water with 21-5-20 Fertilizer
Nitrogen	60 - 100	67 ppm	80 ppm
Phosphorus	10 - 20	5 ppm	8 ppm
Potassium	60 - 100	61 ppm	64 ppm
Calcium	40 - 80	42 ppm	164 ppm
Magnesium	20 - 40	9 ppm	8 ppm
Conclusions	1. Dilute (1/4 tsp/gal) fertilizer solutions are perfectly acceptable if you fertilize weekly or with each watering		
	2. Supplemental magnesium should be supplied to your plants regularly even if you use a Cal Mag fertilizer. 1/4 tsp/gal will provide 33 ppm magnesium.		

Symptoms of Calcium Deficiency

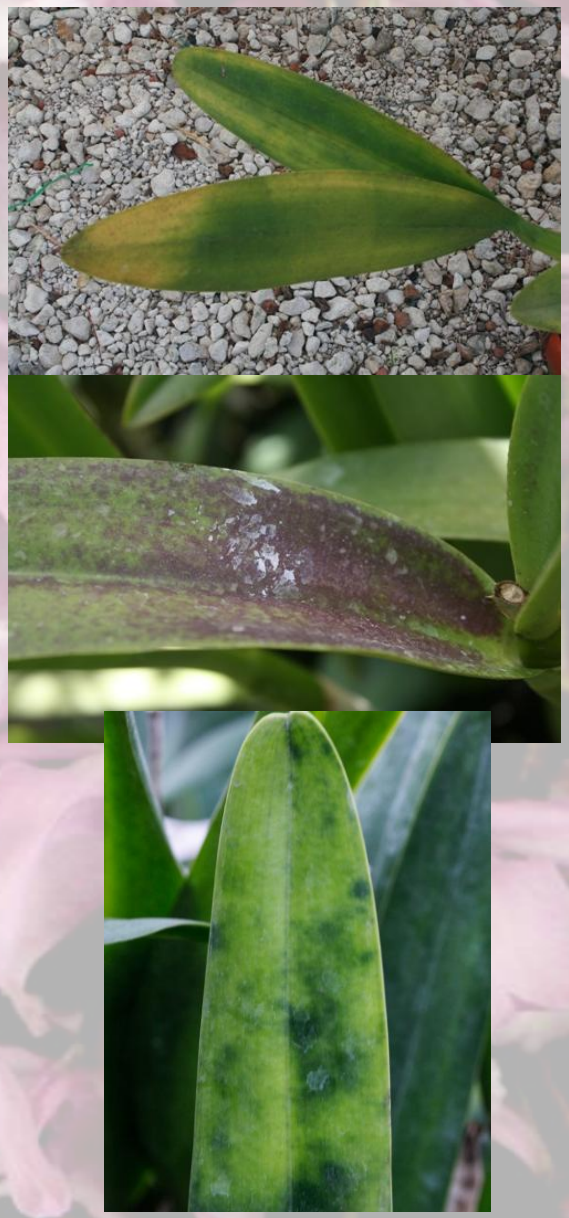
Symptoms: Calcium deficiency has a similar appearance to a bacterial or fungal rot, but is really the same problem as blossom end rot in tomatoes. It affects cattleyas primarily during periods of rapid growth. Calcium, a lesser macronutrient, is used to build cell walls. Deficiencies usually occur in spring and summer during periods of active growth. New leaves may turn black at the tips. The affected area has an advancing yellow band. Bud growth may be inhibited or buds may develop improperly. A calcium deficiency may also cause death of root tips.

Treatment/Prevention: Supply extra calcium when the plant is in active growth. Use a good cal mag fertilizer, add calcium nitrate at the rate of 1/4 to 1/2 teaspoon per gallon to your water (alternating with Epsom salts) between fertilizations, add 1 tablespoon of dolomitic lime per gallon or top dress with powdered dolomite as a source of calcium and magnesium during the hot months when calcium requirements are high. You can also make the calcium present in well water more available to the plant by using an acidity generating fertilizer like 20-10-20.

Symptoms of Magnesium Deficiency

Symptoms: Magnesium deficiency can result in cupped leaves, a reduction in growth and marginal or interveinal chlorosis (yellow along leaf edges or between veins) and usually is exhibited in the middle or older leaves. Plants grown with a magnesium deficiency can exhibit chlorotic mottling after exposure to extremes of temperature as well as an increase in anthocyanin (red/purple coloration) in leaves, particularly after exposure to cooler temperatures.

Treatment/Prevention: Supply extra magnesium when the plant is in active growth. Use a good cal mag fertilizer, add Epsom salts at the rate of 1/8 to 1/4 tsp weekly or 1/2 teaspoon per gallon to your water each month (you can add a megadose of up to 1 tsp/gallon as a correction to reddened leaves), add 1 tablespoon of dolomitic lime per gallon or top dress with powdered dolomite.



Nutritional Supplements

- Calcium Nitrate
  - available from feed stores in small quantities or OFE
  - ¼ tsp/gal supplies 60 ppm calcium and 50 ppm nitrogen
  - don't apply at the same time as magnesium sulfate
- Magnesium Sulfate (Epsom salts)
  - available from grocery store and greenhouse grade available from BWI
  - ¼ tsp/gal supplies 30 ppm magnesium
  - don't apply at the same time as calcium nitrate
- Potassium Nitrate
  - available from OFE and BWI
  - ¼ tsp/gal supplies 150 ppm potassium and 40 ppm nitrogen

Fertilizer Bottom Line

If you match the acidifying effect of your water soluble fertilizer to the alkalinity of your irrigation water and are using a balanced low urea commercial fertilizer at a rate of 50 to 100 ppm nitrogen, your likely only serious mineral nutritional concern is magnesium (and maybe calcium).

- **Choose Target Nitrogen Level** - For a mixed collection, 70 ppm N should work well for weekly feeding. Use the calculator from the First Rays website to get your fertilizer addition rate in teaspoons of fertilizer per gallon of water, or as a rule of thumb 1/4 to 1/8 tsp/gal.
- **Supplemental Magnesium** – Consider adding magnesium sulfate (Epsom salts) with your fertilizer. Apply with your regular fertilizer, either 1/2 tsp/gal monthly or 1/8 to 1/4 tsp/gal weekly.
- **Flush Pots Regularly** - Flush your pots religiously, once or twice a month, with your raw water. Water until water runs out the bottom of the pot and then water some more. This will dissolve the salts. Wait 15 to 60 minutes and then repeat this flushing procedure.

Delivering Fertilizers to Your Orchids

- Gallon Jug – mix 'n pour
- Ortho Sprayer – hand held chemical mixer $12 (for 4 gallons of fertilizer, add 1 tsp of fertilizer, fill to 32 oz line with water, set top dial to 8 oz/gal)
- Hozon Siphonex – eductor $20 (a venturi based system works on pressure drop, use a ¾" hose less than 30' long with unrestrictive watering head)
- EZ-FLO Fertilizer Injector – $60 or so, slightly more sophisticated eductor system, also pressure dependent, solution may be diluted as tank is emptied
- Dosatron – injector $300, most functional but expensive

Time Release Fertilizers

- Too much trouble to fertilize? Growing outside? Have some heavy feeders? Try time release fertilizers
- Resin coated so fertilizer release is temperature dependent, Dynamite vs. Osmocote
- Look for low middle number time release fertilizer with supplemental magnesium and calcium, get estimate of how long fertilizer lasts at our temperatures

Bloom Boosters and Orchid Fertilizers – Don't Buy 'em

- **Bloom Boosters** – high middle number (phosphorus)
  - Don't bother with them, regardless of what the books say
  - Works because high phosphorus also means low nitrogen (nitrogen promote vegetative growth, its absence, rather than the presence of phosphorus, may promote blooming)
  - May have some value for preparing winter dormant plants for the resting period
- **Orchid Fertilizers** – high first number (nitrogen)
  - Intended for use in high organic potting mixes like bark
  - Supplies the extra nitrogen the bacteria need to break down (rot) the bark and still have some nitrogen left over to feed your orchid
  - Don't use in non-bark potting mixes

Orchid Supplements & Snake Oils

maybe they work and maybe they don't

- **Root Stimulants** - seaweed, Dip 'N Gro, Superthrive, rooting hormones, after repotting and monthly during the growing season
- **Fish Emulsion** - organic fertilizer with low nutrient content (such as 5-1-1) and some micronutrients and vitamins
- **Ethyl Alcohol** - vodka, fast growing orchids, weekly to monthly during the growing season, $\frac{1}{4}$ tsp per gal
- **Quantum Growth** (Innoculaid) – probiotics for your orchids
- **Axiom** (Messenger) – foliar spray with harpin to boost systemic acquired resistance to disease in your orchids
- **Mega Thrive** - foliar spray with urea, boron and molybdenum

Final Analysis

- Proper light, fresh air, watering and temperature are the most important factors in how well your orchids grow and flower
- Once your culture is maximized, fertilizers are the next way to push your orchids to grow better and flower more
- Calcium and magnesium are essential nutrients not always present in generally available fertilizers
- After the basics are mastered, you can play with the snake oils to see if there is any improvement
- Over water in summer, under water in winter, use dilute fertilizer and Epsom salts with each watering, flush pots monthly with fresh water