The Atlanta Orchid Society Bulletin

Affiliated with the American Orchid Society, the Orchid Digest Corporation and the Mid-America Orchid Congress
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Newsletter Editor: Danny Lentz **Society Librarian: Elaine Jacobson**
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MARCH EVENTS

The Meeting:

8:00 PM Monday, March 8, 2004, Day Hall
Mr. Demetri Hubbard, Atlantis Hydroponics
Using Instruments in Growing Orchids

Demetri Hubbard of Atlantis Hydroponics will be talking about instruments that can be used to grow orchids. Examples include pH, TDS, and light meters as well as artificial lights. Atlantis Hydroponics has stores in Atlanta, College Park, and Athens and offers a wide variety of items that might be useful in growing orchids. Demetri will be bringing a limited number of instruments for sale along with maps to their stores should you wish to visit. Atlantis Hydroponics' web address is http://www.atlantishydroponics.com.

Greengrowers at David Mellard's house
Saturday 3/27 at 2:00 PM

See orchids growing under fluorescent and high intensity lights and maybe a finished greenhouse. David also has one of the best Trillium collections in the US along with numerous carnivorous plant bogs. See directions on page 6.

Inside This Issue

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THE ATLANTA ORCHID SOCIETY

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Refreshments

COLLECTOR'S ITEM

***Maxillaria sanderiana* Reichb.f.**

max-ill-AIR-ee-a san-der-EE-an-a

Tribe: Maxillarieae

Subtribe: Maxillariinae

Etymology: Latin *maxilla*, jawbone

There are some 700 species, give or take a few, in this genus, ranging from Florida throughout the West Indies and Central America to southern Brazil and northern Argentina. Most species are epiphytic. There are several groups within the genus, sometimes having been recognized as distinct genera. The pseudobulbs, when present, are one-to-four leaved apically, but most of the species have only one leaf on top of the pseudobulb. The inflorescences are one-flowered, produced singly or in groups from the base of the pseudobulbs or from the axils of the sheaths of the rhizome or young stems.

Maxillaria sanderiana is known from Peru and Ecuador where it grows at elevations of 1,200 to 2,400 meters. Theses spectacular plants are large, caespitose (clumped), and produce pendent inflorescences from the base of the one-leaved pseudobulbs. The flowers are several inches across and resemble a *Lycaste* and have a sweet fragrance. Good culture requires high humidity, good air movement and a cool to intermediate greenhouse. Plants are best grown in baskets of exceptionally well drained media to accommodate the pendulous inflorescences.

picture courtesy of Andy's Orchids, Encinitas, California

EVENTS OUT AND ABOUT

March

Saturday, 3/6. Orchid Show, Orchid Society of East TN, Bristol, TN. Contact: Leonard Passmore (423-282-5126).

Monday, 3/8. Atlanta Orchid Society monthly meeting, 8 PM Atlanta Botanical Garden, Day Hall. Speaker: Demetri Hubbard, Atlantis Hydroponics.

Saturday, 3/14. American Orchid Society monthly judging, Atlanta Center, 2 PM, Atlanta Botanical Garden basement workshop. If entering plants, please try to arrive before 1:30 PM to allow time for research and paperwork. A 30-minute training session sometimes starts at 1:30 PM.

Saturday, 3/20. Orchid Show, Greater Pensacola Orchid Society, Pensacola, FL. Contact: Mary Roberts (850-477-4935).

Saturday, 3/27. Greengrowers at David Mellard's house (2 pm).

April

Saturday, 4/3. Heart of Dixie Orchid Show, Madison, Alabama (near Huntsville). Contact: Josie Asquith (256-881-2571).

Saturday, 4/10. American Orchid Society monthly judging, Atlanta Center, 2 PM, Atlanta Botanical Garden basement workshop.

Monday, 4/12. Atlanta Orchid Society monthly meeting, 8 PM Atlanta Botanical Garden, Day Hall. Speaker: Irvin Granier.

Saturday, 4/17. Mobile Area Orchid Society Show, Mobile, Alabama. Contact: Joe Paine (251-666-6505).

MINUTES OF THE FEBRUARY MEETING

The meeting was called to order by President Evan Dessasau. The minutes were approved as written.

Teresa Fuller announced that the Botanical Garden is still in need of volunteers for the Fuqua Orchid Center. They have also expressed a need for assistance with their Master Gardener Hotline answering orchid related questions. If you are interested in helping in either of these areas please call Teresa.

Margot Brinton spoke of the upcoming SEFS and plant check-in.

Scott Smith announced that society dues are payable to him at your earliest convenience.

We welcomed 2 new members and 4 visitors.

David Mellard asked that anyone not receiving his or her newsletter to please let him know.

Pat Cleveland of the Mid-American Orchid Congress spoke of upcoming events at the Waverly Hotel in May. There will be speakers on such topics as the orchids of Brazil, culture and hybridizing, Paphs., Oncid. intergenerics, and the orchids of South Africa.

Evan Dessasau presented a gift of two ceramic orchid pots to past President Linda Miller in recognition for her hard work and dedication.

Elaine Jacobson announced that there are lists on the library doors of all the new books available.

There was a break for refreshments brought in by Barbara Dampog, Sandy Phillips, Gary Collier, Elaine Jacobson, Cathy Caine, Carolyn Dufano, Rhett Nowell, and Teresa Fuller. Thank you to everyone for all the great food.

Paul Thurner announced results of the Show Table Judging after the speaker. Judges were David Mellard, Mark Malaguerra, and Marianne Gilmore.

There were lots of nice plants on the raffle table, with several brought in by Roy Harrow and Helen Weil.

There being no further business, the meeting was adjourned.

Respectfully submitted,

Teresa Fuller, secretary

FEBRUARY 2004 EXHIBITION TABLE AWARDS
with notes by Ron McHatton


Cattleya aurantiaca

CLASS 1: CATTLEYA ALLIANCE

Blue	*Cattleya aurantiaca*	Reinke / Collier
Red	*Slc.* Frolic 'Orange Beauty'	Brinton / Park
White	*Brassavola nodosa*	Reinke / Collier

Cattleya aurantiaca Here we go again with name changes. Whether or not this will stick remains to be seen but, based on genetic data, this species as well as several others including *C. bowringiana, C. skinneri, C. deckeri,* and the natural hybrid *C. xguatemalensis* have been removed from the genus *Cattleya* and a new genus, *Guarianthe*, has been described for these species. While very closely related to *Cattleya*, this group of species apparently has significant DNA differences that warrant the separation. For those interested, the original description was published by Wesley Higgins in last year's *Selbyana* and a summary was published in Orchids Magazine August 2003.

Slc. Frolic 'Orange Beauty', AM/AOS This clone has an Award of Merit which was not indicated on the entry tag. The award was granted in 1997 to a plant carrying 17 flowers on two inflorescences.

CLASS 2: CYMBIDIUM no entries

CLASS 3:	Blue	*Dendrobium rigidium*	Dampog
DENDROBIUM	Red	*Dendrobium nobile*	Hallberg

Dendrobium rigidum More name changes. Recently, the Rhizobium section of *Dendrobium* which includes this species as well as *D. linguiformis, D. pugioniformis, D. racemosa, D. teretifolia,* and *D. wassellii* was elevated to genus level with the description of *Dockrillia*. This genus contains some 30 species and is centered in Australia with about 18 species and New Guinea with about 10 species. These species are typically of low to intermediate altitudes, growing epiphytically or lithophytically in rainforests and open forest. They often require bright light to grow and flower to their potential. *Dockrillia rigida* (*Dendrobium rigidum*) is a widespread Australasian species extending from eastern Cape York Peninsula in Australia through the Torres Strait Islands and into New Guinea. It is a lowland species. The species is easy to grow in warm conditions on hardwood or cork slabs which allow the plants to become pendulous.


Epc. Rene Marques 'Flame Thrower'

CLASS 4: EPIDENDRUM

Blue	*Epc.* Rene Marques 'Flame Thrower,' HCC/AOS	Brinton / Park
Red	*Epidendrum coriifolium*	Hartong

Epc. Rene Marques 'Flame Thrower', HCC/AOS What a beautiful example of the dominance of Epidendrums in hybridizing. In this particular hybrid, *Epidendrum pseudepidendrum x C.* Claesiana, the *Epidendrum* parent is also a natural tetraploid. For those unfamiliar with *C.* Claesiana this is a primary hybrid between *C. intermedia* and *C. loddigesii*. This hybrid is a cute, small flowered white or purple traditional *Cattleya* that carries two to 3 or so flowers per inflorescence. With that in mind, the only question you can ask when you see one of the *Epicattley* hybrids is "What happened to the *Cattleya*?" Simply put, its there. It's influence is what keeps the hybrid from getting 3-5 feet tall!


Brsdm. Shooting Star 'Maui Meteor'

CLASS 5: ONCIDIUM ALLIANCE

Blue	*Brsdm.* Shooting Star 'Maui Meteor,' HCC/AOS	Hartong
Red	*Oncidium cheirophorum*	Lentz / Morgan
White	*Vuylstekeara* Aloha Passion	Hansen

Oncidium cheirophorum This species occurs from El Salvador to Panama and Colombia. This species is very closely related to *Onc. ornithorhynchum* from which it differs in yellow flowers (those of *Onc. ornithorhynchum* are a pale pink) and lack of fragrance (*Onc. ornithorhynchum* is the source of the intense chocolate or vanilla fragrance in *Onc.* Sharry Baby 'Sweet Fragrance', AM/AOS). It is interesting to note that *Onc. cheirophorum* suppresses the expression of pink pigmentation in its hybrids while *Onc. ornithorhynchum* suppresses yellow. The result of the primary cross between the two species, *Onc.* Twinkle, is a race of predominantly cream colored flowers with an occasional seedling coming out pink. This species as well as its close relative are is relatively easy to grow and flower well. It is tolerant of a wide range of temperatures from cool to intermediate as long as it is given bright light. In the near future, it is quite likely that these two species will be moved to a new genus.


Phrag. Sargeant Eric

CLASS 6: CYPRIPEDIUM ALLIANCE

Blue	*Phrag.* Sargeant Eric	Hansen
Red	*Paph.* Gina Short	Lentz / Morgan
White	*Paph.* Hsinying Rainbow	Lentz / Morgan

Phragmipedium Sargeant Eric First, this spelling of the name is correct (rather than using the American spelling). The cross is *Phrag.* (Eric Young x *sargentianum*) and *Phrag.* Eric Young is *Phrag.* (*besseae x longifolium*). While the use of *Phrag. sargentianum* can be expected to reduce the size of the resulting hybrid flowers, its dominance for red intensification more than offsets the smaller size. When mated to *Phrag. besseae* hybrids the results are intense reds and if mated to flowers with brown tones the results tend to be deep mahogany tones. Another worthwhile feature in breeding with *Phrag. sargentianum* and its close relatives is the production of multiple inflorescence branching as the plants mature. In this particular cross, all three species involved contribute branched inflorescences. A truly mature plant will be stunning!


Phal. Rose Baysa 'Carmela'

CLASS 7: PHALAENOPSIS ALLIANCE

Blue	*Phal.* Rose Baysa 'Carmela'	Hallberg


Ascf. Cherry Blossom

CLASS 8: VANDACEOUS ALLIANCE

Blue	*Ascofinetia* Cherry Blossom	Dampog


Lycaste Always

CLASS 9: MISCELLANEOUS OTHER GENERA

Blue	*Lycaste* Always	Brinton / Park
Red	*Coelogyne mossiae*	Hansen
White	*Denrochilum acuminatum*	Hallberg

Coelogyne mossiae The genus *Coelogyne* is closely related to *Pleione* and *Dendrochilum.* The genus is widespread from northern India, through southeast Asia, southwest China, the Philippines and on to the islands of the eastern Pacific. The genus is divided into a number of distinct sections based on growth/flowering habit and floral characteristics. By far the section that has had the most attention over the years circumscribes the cool growing, relatively large flowered species from the Himalayan region of India and southeast Asia. This is due in large part to their large flowers but also their greatly reduced need for winter watering and warmth. In this geographic region, the summers are characterized by 4 to 6 months of extremely heavy rainfall followed by a remarkably drier winter. While little rainfall occurs during this period, the region is bathed in nightly fog and due that limits the desiccation of the plants. In cultivation, these plants benefit from nearly continuous moisture. As the growths mature and winter approaches the plants should be gradually allowed to dry out until the front pseudobulbs slightly shrivel. For the remainder of the winter months watering should be very limited or reduced to morning misting. If maintained too wet and warm during these winter months flowering will be less than optimal.

Greengrowers Directions – David Mellard's house

3409 Regalwoods Drive, the house with the carnivorous plant bogs in the front yard.

1. **Going north on I-85 from downtown.**
   Exit at Northcrest/Pleasantdale, a dual exit
   Turn right onto Northcrest
   Go past the driving range and turn left onto Regalwoods
   Go about 200 yards, house on the left (3409 Regalwoods Drive)
2. **Going south on I-85 from Gwinnett County**
   Exit at Pleasantdale/Northcrest, a dual exit
   Go straight across Pleasantdale
   Follow the signs to Northcrest
   Turn left onto Northcrest
   Go across I-85 and past the driving range
   Turn left onto Regalwoods
   Go about 200 yards, house on the left (3409 Regalwoods Drive)
3. **Going south on I-285 from GA 400/Perimeter Mall**
   Take the Chamblee Tucker exit at I-85/I-285
   Turn left onto Chamblee Tucker
   Go across I-285
   Turn left onto Northcrest (at the Chevron Station)
   Turn right onto Regalwoods
   Go about 200 yards, house on the right (3409 Regalwoods Drive)
4. **Going north on I-285 from I-20/Northlake Mall**
   Take the Chamblee Tucker exit just before I-85/I-285
   Turn right onto Chamble Tucker
   Turn left onto Northcrest (at the Chevron Station)
   Turn right onto Regalwoods
   Go about 200 yards, house on the right (3409 Regalwoods Drive)

PHALAENOPSIS, EASIER THAN AFRICAN VIOLETS
© Ron McHatton

No other orchid is better suited for home growing than *Phalaenopsis* and their hybrids. Plants with long-lasting sprays of lovely mothlike blooms in a broad array of colors are inexpensive and widely available. White and pink species and hybrids flower during the late winter into spring while yellows, reds and other novelty colored hybrids reach their peak during the summer and fall months.

In addition to ready availability, if mature plants are given reasonably care you may be surprised to find out how easy they really are to grow and flower.

LIGHT

Phalaenopsis and their hybrids thrive at light levels suitable for African Violets. *Phalaenopsis* foliage should be naturally semierect, and of a medium to light olive-green. Dark green, limp foliage indicates too little light.

They will adapt to bright window light (with little or no direct sun) or to fluorescent light (at least two 40 watt tubes). An unobstructed east-facing window or a shaded southern exposure will work well for these orchids.

Hold your open hand about a foot away from your plants, between the plants and the light source. For *Phalaenopsis* you should see a diffuse shadow of the outline of your hand. No visible shadow means too little light and a sharp shadow too much light.

TEMPERATURE

Phalaenopsis are comfortable under conditions you are comfortable. Night temperatures should be 60 to 65F and days about 10 to 20F warmer. Seedlings should be kept a few degrees warmer for rapid growth. For winter and spring blooming species and hybrids, a slight cooling, to around 55F, in the fall will encourage blooming.

Phalaenopsis and their relatives appear to be more stressed by lower temperatures at their roots and bottom heat may prove to be quite beneficial. This can be especially true if the perfect light exposure happens to be at a window in a room that is otherwise too cold for their liking. In addition to providing welcomed warmth, a pebble or gravel-filled heated tray under the plants will also add needed humidity to the growing area.

WATER

Mature plants should not be allow to dry out between watering and seedlings need constant attention to moisture. Watering is best done during the morning hours so that any water standing on the foliage is dry by nightfall. With a little practice, you will be able to judge the dryness of your plants by lifting the pots. Dry medium weighs much less than damp medium and, for plants in clay pots, moist medium will cause the pots to feel cool to the touch.

Many factors will influence watering frequency. Newly potted plants will need watering more frequently than plants that have been in the same growing medium for longer. High temperatures, bright light, low humidity, and fast air movement will all increase your plant's need for water. As an aide, use the pencil test: Sharpen a wooden pencil to expose new wood. Insert it into the pot about an inch below the medium's surface and twist a few times. *Phalaenopsis* should be watered when the pencil tip is still slightly moist.

One more word on watering. Correct watering is not sprinkling the potting medium with a little water. Take the plants to the sink and run enough tepid water through the medium so that it pours out of the drainage holes. This is the only way to assure that the medium is thoroughly wet and it also helps to flush soluble salts from the medium.

HUMIDITY

Phalaenopsis need 60 to 70% humidity. The simplest way to raise humidity around plants is to grow them on water-filled trays or saucers filled with pebbles. The tray should be a minimum of 11/2 inches deep, filled to the rim with ¼ to ½ inch pebbles. Keep the water level within ½ inch of the surface. This allows the pebbles to remain moist but keeps the water from saturating the bottoms of the pots.

Plants are also effective humidifiers. Arranging your orchids in groups with other moisture-loving plants will go a long way to increasing the local humidity of the growing area. If these simple methods of raising humidity are insufficient for your growing area, consider the addition of a cool-vapor or ultrasonic humidifier.

FERTILIZER

Most fertilizer problems result from too much rather than too little fertilizer. "Weekly, weakly" aptly describes the constant feeding regime (when plants are actively growing) that works best for orchids. Each time you water your orchids, or with every other watering, give them a quarter-strength solution of good balanced fertilizer.

POTTING

Repotting should be done every one to two years before the mix breaks down too far. This is best done in the late spring after the main flowering season, using a well-drained but water retentive mix. Resist the urge to select a pot size based on the leaf span of the plant. Pot size should ALWAYS be the smallest pot that will adequately contain the root mass.

ORCHID RESOURCES

Join a local society. It's your best connection to other people's experiences. There are two in Metro Atlanta. The Atlanta Orchid Society meets on the second Monday of each month at 8PM at the Atlanta Botanic Garden. On the south side, the South Metro Orchid Society meets on the fourth Monday of each month 8PM at the Reynolds Nature Preserve in Morrow.

Join the American Orchid Society (www.orchidweb.org). The Society's monthly magazine *Orchids* is a treasure trove of useful information and orchid resources.

Metro Atlanta has two nurseries specializing in orchids and both open by appointment; Peachstate Orchid in Woodstock (770-751-8770) and The Atlanta Orchid Company (706-675-3583 www.theatlantaorchidco.com).

For those who want blooming plants but perhaps don't have the time and energy to learn to grow them, Greenman Inc. (678-984-8953 or postmaster@greenmaninc.com) offers a reasonably priced boarding service. They will take your plants, care for them and return them to you when they bloom again.

Reasonably priced potting materials are simply not available locally. If you have a few plants, Hastings Nursery and some of the Home Depots carry limited supplies, however, mail order is your best bet for greater selection or larger quantities. Tropical Plant Products in Orlando, Florida (www.tropicalplantproducts.com) and OFE International in Miami (305-253-7080 or ofe-intl.com) are good mail order sources.

RECENT ACTIVITIES OF THE ATLANTA JUDGING CENTER

The following awards were granted at the January session of the AOS Atlanta Judging Center. They are provisional awards pending official publication in the *Awards Quarterly*. Certificates of Horticultural Merit and Certificates of Botanical Recognition are also provisional pending identification by an AOS certified taxonomist prior to publication of the award.

© Judy Cook

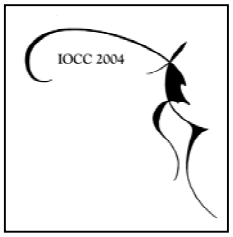
Phal. Tristar Peoker 'Martinique', AM/AOS, 81 pts
(Golden Peoker x Salu Spot)
Five flat, nearly round flowers on one inflorescence; sepals and petals pastel yellow overlaid with smokey raspberry spots; lip pastel yellow with raspberry overlay changing to oxblood proximally; column white; substance firm, texture waxy.
Natural spread horizontal 8.0 cm, vertical 7.9 cm
Exhibitor: Pat Cleveland

© Judy Cook

Phrag. Sergeant Eric 'Bessie Studier', HCC/AOS, 78 pts
(Eric Young x sargentianum)
One flower and one bud on one 68 cm inflorescence; dorsal sepal mimosa yellow flushed coral red with darker veins; synsepal mimosa yellow with coral red veins, darker on edges; petals mimosa yellow overlaid dark coral red on distal two-thirds, dark red brown hairs basally; pouch coral red with slightly darker veins, interior mimosa yellow spotted coral red; staminode mimosa yellow overlaid with coral red pubescence; substance moderately firm, texture matte.
Nat. Spr. 10.5 cm h, 8.5 cm v
Exhibitor: Mountain View Orchids

© Judy Cook

Paph. (Pulsar x Cocoa Cherry) 'Barry Drake', AM/AOS, 82 pts
One flat, well presented flower on one 33 cm inflorescence; dorsal sepal wine red with raised dark burgundy veins; abbreviated synsepal dark burgundy; petals burgundy, slightly lighter centrally, hirsute, with several dark, almost black warts; pouch dark burgundy; staminode pale green flushed burgundy; substance firm, texture of sepals and petals laquered, pouch matte.
Nat. Spr. 10.0 cm h, 9.0 cm v
Exhibitor: Mountain View Orchids



Conservation Workshops at Selby Gardens

Workshops offering conservation principles that apply to many fields are just one part the International Orchid Conservation Congress (IOCC) at Marie Selby Botanical Gardens, May 15-23, 2004. Don't miss this opportunity to hear presenters from the global conservation community. For those unable to attend the entire conference, a special one-day registration of $95 allows students to pick and choose a particular day of lecture topics. Full conference registration is $350. Registration for workshops is independent from the conference and fees vary (see below). Register online at **www.selby.org/iocc.**

Application of RAMAS Red List Software

May 15-16, 2004 (*Saturday, Sunday*)
Workshop introduces the use of the RAMAS Red List software in evaluating species against the IUCN Red List criteria. It begins with a brief overview of the IUCN Red List categories leading to the discussion of uncertainty issues in Red List assessments. Demonstration of the use of RAMAS Red List software to make these assessments and the incorporation of uncertain data follows. Participants are encouraged to bring data.
Instructors: Dr. Resit Akcakaya, Applied Biomathematics, and Lorena Endara. Workshop fee: $135 for conference registrants, $160 for public

Population Dynamics Applied to Orchid Conservation

May 15 –16, 2004 (*Saturday, Sunday*)
Workshop teaches participants methods to determine the probability of persistence of a species or population. Participants discuss these questions: What is the probability of a population or species going extinct? What parameters of the life history stages should we manipulate to impact population persistence? Participants learn what data to collect in the field and how to perform the analysis. Participants understand the value as well as the limitation of these techniques to conservation.
Instructors: Dr. Raymond Tremblay, University of Puerto Rico, and Pavel Kindlmann. Workshop fee: $135 for conference registrants; $160 for public

Mycorrhizal Propagation Techniques

May 15, 2004 (*Saturday*)
Workshop introduces basic concepts of modern symbiotic orchid propagation techniques. Topics covered include: seed collection, mycorrhizal symbiont isolation, seed propagation, and seedling processing.
Instructor: Scott Stewart, Environmental Horticulture Dept., University of Florida. Workshop fee: $50 for conference registrants; $75 for public

Terrestrial Orchid Propagation and Transfer to Soil and Habitat

May 19, 2004 (*Wednesday*)
Workshop provides overview of the current techniques to isolate beneficial fungi from plants. Program includes a preview of a new soil-baiting technique to determine the presence and abundance of soil fungi. Participants learn the latest methods of field inoculation to improve seedling performance when transferred to soil or habitat. *Instructors: Dr. Kingsley Dixon and Dr. Andrew Batty. Workshop fee: $25 for conference registrants; $50 for public.*

© Danny Lentz

To submit material for the newsletter, please send to Danny Lentz:

DBLGONGORA@BELLSOUTH.NET

MAIL TO: Danny Lentz
1045 Wordsworth Dr.
Roswell, GA 30075

The deadline for submissions is the 20th.

If you would like to receive the newsletter electronically, please send your email address to Danny Lentz.

Please visit our web site at http://www.atlantaorchidsociety.org . If you have suggestions or, better yet, material to contribute to the site, contact Tom Kaschak at 678-474-9001

Remember that Tom is a volunteer also and will certainly appreciate the help.

JOIN THE AMERICAN ORCHID SOCIETY

For $40/year, you reap the following benefits:

- 12 issues of *Orchids*, the Society's monthly full color magazine chock full of insightful articles and tempting ads for plants and supplies.
- 10% off on purchases from the Society's Bookstore and Orchid Emporium.Reduced or free admission to participating botanical gardens.

For a limited time, if you join for two years ($72) you will also get a $30 gift certificate (good on an order of $100 or more) at any one of 13 commercial growers who advertise in *Orchids.* **JOIN TODAY**. For information, contact David Mellard.

JOIN THE ORCHID DIGEST CORPORATION

Don't let the name fool you, the Orchid Digest is a non-profit membership-based organization dedicated to orchids. Designed to appeal to the mid-range to advanced grower nothing beats the *Orchid Digest*. For just $28/year you get 4 issues of full-color, in-depth articles about orchids. The magazine is large format and the fourth issue of the year is always an extra-special issue devoted to a single genus.

For membership application forms contact David Mellard.

The April Meeting:

Monday, 4/12. Atlanta Orchid Society monthly meeting, 8 PM Atlanta Botanical Garden, Day Hall. Speaker: Irvin Granier from Louisiana will speak about culture of Dendrobium and Cattleya using his AOS award slides.

Future Greengrowers:
April 24 : Linda Miller

Understanding pH management and plant nutrition
Part 3: Fertilizers

Bill Argo, Ph.D.
Blackmore Company, Tel: 800-874-8660, Int'l 734-483-8661, E-mail: bargo@blackmoreco.com
Originally printed in the Journal of the International Phalaenopsis Alliance, Vol. 13 (2), pg.24-27, 31.

When you select a water-soluble fertilizer for your plants, the primary goal should be to supply your plants with a sufficient amount of essential plant nutrients for good growth and flowering. The problem is that there are probably as many misconceptions about fertilizers as there are fertilizers labeled as "orchid special".

The "best" fertilizer to use on your plants is the one that not only supplies nutrients, but also complements the alkalinity and nutrient content of your irrigation water. In this article, we will help you understand how selecting a fertilizer will affect the pH and nutrient levels in the substrate. You will learn why water-soluble fertilizers are classified as acidic, neutral, or basic based on their fertilizer reaction in the substrate. Finally, with the information given in this article, you should be able to decide for yourself which fertilizers will work best for your growing conditions.

Solution pH and the effect that fertilizer has on substrate-pH two different aspects of water-soluble fertilizers

There is a great deal of confusion when it comes to understanding the difference between the pH of the fertilizer solution and the effect that fertilizer has on substrate pH, and why they are important to the health of your plants.

Just like with water pH, the pH of the fertilizer solution is a direct measurement of the balance between acidic hydrogen ions (H^+) and basic hydroxide ions (OH^-), and can be measured with a pH meter. The pH of a solution can range between 0 (very acidic) and 14 (very basic). At a pH of 7.0, the concentrations of H^+ and OH^- are equal, and the solution is said to be neutral. When the pH is above 7.0, the concentration of OH^- is higher than H^+, and the solution is said to be basic or alkaline (not to be confused with alkalinity). When the solution is below 7.0, the concentration of H^+ is higher than OH^-, and the solution is said to be acidic.

The effect that a water-soluble fertilizer has on substrate pH is dependent on the reactions that take place once the fertilizer has been applied to the crop and are based on the type of nitrogen contained in the fertilizer. There are three types of nitrogen used in water-soluble fertilizers: ammoniacal nitrogen (NH_4-N), nitrate nitrogen (NO_3-N) and urea (Figure 1). Uptake of ammoniacal nitrogen causes the substrate-pH to decrease because H^+ (acidic protons) are secreted from roots in order to balance the charges of ions inside the plant with the solution surrounding the outside of the roots. Urea is easily converted into ammoniacal nitrogen in the substrate and therefore can be thought of as another source of ammoniacal nitrogen. In contrast, uptake of nitrate nitrogen increases substrate-pH because OH^- or HCO_3^- (bases) are secreted by plant roots in order to balance nitrate uptake.

Another important fertilizer reaction is a process called nitrification. Several types of bacteria in container substrates (including inert substrates like coir, bark, peat, rockwool, and scoria) convert ammoniacal nitrogen to nitrate nitrogen. Nitrification releases H^+ (acidic protons), causing the substrate-pH to decrease.

Consider the difference in the amount of acidity supplied by a solution with a pH of 5.0 verses the amount of acidity supplied by 100 ppm of ammoniacal nitrogen. A solution with a pH of 5.0 would supply about 0.01 mEq/liter of acidic hydrogen ions to the substrate. If all the 100 ppm ammoniacal nitrogen were converted into nitrate nitrogen through nitrification, the maximum amount of acidity produced would be 14.2 mEq/liter of acidic hydrogen, or about 1,400 times more acidity than would be supplied by a solution with a pH of 5.0. Put another way, applying 100 ppm of

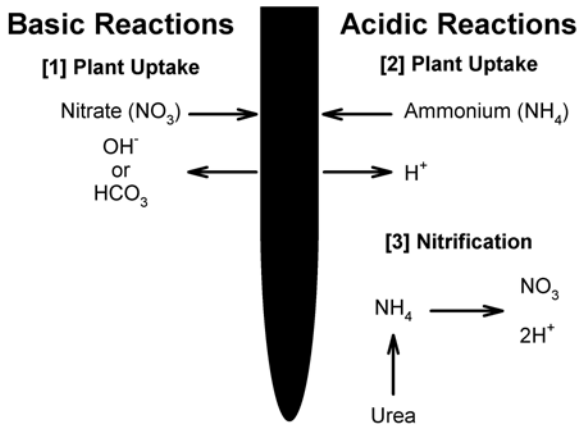


Figure 1. The effect of different forms of nitrogen on medium-pH. Nitrate nitrogen (NO_3-N) only effects medium-pH through plant uptake [1]. Ammoniacal nitrogen (NH_4-N) effects medium-pH through both plant uptake [2] and nitrification [3]). Urea must first be converted into ammoniacal nitrogen before it can be taken up by the plant [2] or go through nitrification [3].

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Table 1. The nitrogen content of selected commercially-available granular and liquid water-soluble fertilizers. The alkalinity concentration that provides a stable substrate pH should be viewed as an approximate guideline only. Use these values as a starting point. Any changes to the fertilizer program should be based on the actual measured pH of the crop.

N-P_2O_5-K_2O Formula	% NH_4-N	% Urea-N	% NO3-N	Fertilizer reaction[1]	Proportion of the total nitrogen in the ammoniacal form (NH_4-N + urea-N)	Alkalinity Conc. (in ppm CaCO3) that provides a stable substrate pH
Granular fertilizers						
21-7-7 GC,SC	9.1%	11.9%	-	A 1520	100%	250 or more
9-45-15 GC,SC	9.0%	-	-	A 940	100%	
30-10-10 GC,GM, SC	2.1%	24.7%	3.2%	A 1039	89%	
20-20-20 GC,GM, SC	3.9%	10.5%	5.6%	A 680	72%	
6-30-30 GM	2.7%	-	3.3%	NA	45%	
10-30-20 G, SC	4.4%	-	5.6%	A 425	43%	150 to 200
20-10-20 GC,GM, SC	8.0%	-	12.0%	A 430	40%	
21-5-20 SC	6.5%	1.9%	12.6%	A389	40%	
19-4-23-2 Ca GC	5.7%	-	13.6%	A 140	30%	
17-5-17-3 Ca-1 Mg GC	4.2%	-	12.8%	A 0	25%	75 to 150
15-5-15-5 Ca-2 Mg SC	1.2%	2.1%	11.8%	B 141	21%	
15-3-20-3 Ca-1 Mg GC	2.4%	-	12.6%	B 75	16%	
14-4-14-5 Ca-2 Mg GC	2.0%	-	12.0%	B 200	14%	50 or less
13-2-13-6 Ca-3 Mg GC, SC	0.8%	-	12.2%	B 380	6%	
13-3-15-8 Ca-2 Mg GC	0.7%	-	12.5%	B 420	5%	
Liquid fertilizers						
10-5-5-2 Ca-0.5 Mg DG	3.7%	-	6.3%	NA	37%	150 to 200
7-9-5-2 Ca-0.5 Mg DG	2.6%	-	4.4%	NA	37%	
7-7-7-2 Ca-0.5 Mg DG	2.1%	-	4.9%	NA	30%	75 to 150
3-12-6-2 Ca-0.5 Mg DG	0.7%	-	2.3%	NA	23%	

[1] Pounds of acidity (A) or basicity (B) per ton of fertilizer.

DG = Dyna Gro, GC = GreenCare, GM = Grow-more, SC = Scotts (Peters)

To Calculate the proportion of the total nitrogen in the ammoniacal form

$$\frac{\%\ NH_4\text{-N} + \%\ \text{Urea-N}}{\%\ \text{Total Nitrogen}} = \text{Proportion of the total nitrogen in the ammoniacal form}$$

Example: 20-20-20

$$\frac{3.9\%\ NH_4\text{-N} + 10.5\%\ \text{Urea-N}}{20\%\ \text{total nitrogen}} = 72\%\ \text{of the total nitrogen is in the ammoniacal form}$$

ammoniacal nitrogen has the potential to supply the same amount of acidity as a solution with a pH of 1.8. The acidity produced by a solution with a pH of 5.0 would be equivalent to the nitrification of 0.14 ppm ammoniacal nitrogen (almost undetectable).

While the effect that different nitrogen forms have on the substrate pH is more complicated than this simple example, it does give you an idea why the nitrogen form of the fertilizer has a much greater effect on the substrate-pH than does the solution pH.

The main problem with predicting how the nitrogen form affects substrate pH is that the key reactions are not consistent. For example, the application nitrate nitrogen (NO_3-N) can cause the substrate-pH to increase, but only if it is taken up by the plant. If plants are small, or are stressed and not growing, nitrate has little influence on substrate-pH. The application of ammoniacal nitrogen (NH_4-N) can cause the substrate-pH to decrease even if the plant is small or is not growing, because in addition to plant uptake, nitrification will occur independently of the plant. However, nitrification is inhibited by low substrate-pH (starting at around 5.5), low substrate temperature (less than 60°F or 15°C), and lack of oxygen through water-logging.

Finally, you never apply either all nitrate nitrogen or all ammoniacal nitrogen to your plants. Most fertilizer is a mixture of salts containing different forms of nitrogen and so the overall reaction produced by the fertilizer will depend on the ratio of the different nitrogen forms. There are also other factors that either magnify or buffer the reaction of the fertilizer including the substrate (cation exchange capacity, residual lime, decomposition – to be covered in a later article) and the irrigation water.

Water alkalinity also influences the fertilizer reaction.

When discussing how water-soluble fertilizer affects substrate-pH, it is important to understand that water-soluble fertilizer cannot be applied without irrigation water. The best guide when selecting an appropriate water-soluble fertilizer is to balance the proportion of nitrogen in the ammoniacal form (acid) against the irrigation water alkalinity (base) (see Table 1). Although other factors affect substrate-pH, research has shown that it is the balance between the ammoniacal nitrogen in the fertilizer and water alkalinity that has the greatest effect on substrate-pH on long-term crops.

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Table 2. Fertilizer salts used to produce selected commercially-available granular and liquid water-soluble fertilizers.

N-P_2O_5-K_2O Formula	Derived from
Granular fertilizers	
21-7-7 [GC,SC]	KCl, $NH_4H_2PO_4$, $(NH_4)_2SO_4$, urea,
9-45-15 [GC,SC]	KCl, $NH_4H_2PO_4$
30-10-10 [GC,GM, SC]	KNO_3, $NH_4H_2PO_4$, Urea
20-20-20 [GC,GM, SC]	KNO_3, $NH_4H_2PO_4$, Urea
6-30-30 [GM]	KNO_3, $NH_4H_2PO_4$, KH_2PO_4, KCl
10-30-20 [G, SC]	NH_4NO_3, KNO_3, $NH_4H_2PO_4$,
20-10-20 [GC,GM, SC]	NH_4NO_3, KNO_3, $NH_4H_2PO_4$,
21-5-20 [SC]	NH_4NO_3, KNO_3, Urea phosphate
19-4-23-2 Ca [GC]	NH_4NO_3, $Ca(NO_3)_2$, $KNO_3NH_4H_2PO_4$
17-5-17-3 Ca-1 Mg [GC]	NH_4NO_3, $Ca(NO_3)_2$, KNO_3, $Mg(NO_3)_2$, $NH_4H_2PO_4$
15-5-15-5 Ca-2 Mg [SC]	NH_4NO_3, $Ca(NO_3)_2$, KNO_3, $Mg(NO_3)_2$, Urea phosphate
15-3-20-3 Ca-1 Mg [GC]	NH_4NO_3, $Ca(NO_3)_2$, KNO_3, $Mg(NO_3)_2$, $NH_4H_2PO_4$
14-4-14-5 Ca-2 Mg [GC]	NH_4NO_3, $Ca(NO_3)_2$, KNO_3, $Mg(NO_3)_2$, $NH_4H_2PO_4$
13-2-13-6 Ca-3 Mg [GC, SC]	$Ca(NO_3)_2$, KNO_3, $Mg(NO_3)_2$, $NH_4H_2PO_4$
13-3-15-8 Ca-2 Mg [GC]	$Ca(NO_3)_2$, KNO_3, $Mg(NO_3)_2$, $NH_4H_2PO_4$
Liquid fertilizers	
10-5-5-2 Ca-0.5 Mg [DG]	
7-9-5-2 Ca-0.5 Mg [DG]	NH_4NO_3, $Ca(NO_3)_2$, KNO_3, $MgSO_4$,
7-7-7-2 Ca-0.5 Mg [DG]	$NH_4H_2PO_4$, KH_2PO_4, H_3PO_4, KCl
3-12-6-2 Ca-0.5 Mg [DG]	

[1] Actual P and K are the actual expected values obtained in a solution at 100 ppm nitrogen and are how the values would be represented if a laboratory analysis were performed on the solution. To calculate actual P as P2O5, multiply value by 2.3, to calculate actual K as K2O, multiply value by 1.2.

DG = Dyna Gro, GC = GreenCare, GM = Grow-more, SC = Scotts (Peters)

Ammonium nitrate (NH_4HO_3), ammonium sulfate ($(NH4)_2SO_4$), calcium nitrate ($Ca(NO_3)_2$), magnesium nitrate ($Mg(NO_3)_2$), monoammonium phosphate ($NH_4H_2PO_4$), monopotassium phosphate (KH_2PO_4), phosphoric acid (H_3PO_4), potassium chloride (KCl), potassium nitrate (KNO_3),

To understand how the alkalinity concentration in the water and the percentage of ammoniacal nitrogen in the fertilizer interact to affect substrate-pH, picture a balance with water alkalinity on one side pushing the pH up (i.e. liming effect), and on the other side, with the ammoniacal nitrogen pushing the pH down (i.e. acidic nitrogen).

If either of these factors is out of balance, then the substrate-pH will be affected. For example, using a fertilizer very high in ammoniacal nitrogen (like 30-10-10) with low alkalinity water (like RO or rain water) is very effective at driving the substrate-pH down because there is nothing to neutralize all the acidic hydrogens (H^+) being produced through nitrification or plant uptake. Another example would be using a fertilizer low in ammoniacal nitrogen (like 13-3-15) with a high alkalinity water source (like well water commonly found in the Midwest of the United States). In this case, there would be little if any acidic hydrogens (H^+) produced to neutralize the liming effect of the water alkalinity, plus the large amount of nitrate nitrogen uptake would also add to the liming effect.

It is important to note that the two things that affect substrate-pH the most (water alkalinity and ammoniacal nitrogen) can not be directly measured with a pH meter. Water alkalinity must be measured with an alkalinity test (see Part 2 of this series for a list of commercial laboratories that do alkalinity testing). The percentage of ammoniacal nitrogen in the fertilizer needs to be calculated based on the information supplied on the fertilizer bag (See Table 1).

What about potential acidity or basicity?

Many water-soluble fertilizer labels state the potential acidity or basicity of the fertilizer in units of equivalent pounds of calcium carbonate ($CaCO_3$, or agricultural lime) per ton of fertilizer. Potential acidity or basicity indicates the type of reaction produced, while calcium carbonate equivalency indicates the strength of that reaction.

For example, 20-10-20 has a potential acidity of 430 lbs. per ton of fertilizer. If one ton of 20-10-20 were applied to a field soil, we would estimate that 430 pounds of $CaCO_3$ (lime) would be required to neutralize the long-term acidity produced from the fertilizer.

There are several problems when trying to relate potential acidity or basicity and calcium carbonate equivalency to growing plants in pots containing an inert substrate. The original values come from a method first presented in 1933 using field soil (pH-independent CEC), rather than inert substrates like peat or bark. The calculated values are based on assumptions related to how much of each nutrient remains in the soil profile, is used by the plant, or is leached from the field soil. The equivalent value of pounds $CaCO_3$ per ton of fertilizer has little meaning in soilless culture where fertilizer applications are typically based on the concentration of nitrogen in parts per million contained in a nutrient solution, not the total weight of the fertilizer applied to a pot. Finally, the alkalinity of the irrigation water is not taken into account when calculating acidity or basicity. At best, the potential acidity or basicity and calcium carbonate equivalency should be interpreted as a general tendency of the fertilizer to raise or lower medium-pH over time.

Macronutrients.

The second way a water-soluble fertilizer affects nutrition management is through the direct effect it has on nutrient concentrations is in the root medium. A complete fertilizer program provides several "macronutrients" (needed in large quantities) including nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S).

Blended water-soluble fertilizers that contain nitrogen, phosphorus, and potassium are formulated by

combining two or more fertilizer salts (Table 2). Fertilizer "salts" in this case mean any chemicals that contain plant nutrients in a water-soluble form. Ammonium phosphate is an example of a fertilizer salt, and in water this salt dissolves into separate ammonium and phosphate ions. The ammonium provides the plant with N and phosphate provides P.

There are many water-soluble sources of nitrogen, some of which only supply nitrogen like urea and ammonium nitrate. However, for most other nutrients, the choices are limited. For example, calcium nitrate is the only form of water-soluble calcium. There is also typically only one source of potassium, potassium nitrate. Monoammonium phosphate is the usual source of phosphorus. Magnesium is supplied either as magnesium nitrate or magnesium sulfate. Sulfur is supplied by ammonium sulfate or magnesium sulfate.

Because of limitations in the number of fertilizer salts used to blend fertilizers, the ratio of macronutrients (N-P-K-Ca-Mg) directly affects the percent ammoniacal nitrogen. For example, fertilizers that are high in calcium tend to also be high in nitrate, because calcium nitrate is the only water-soluble source of calcium. Fertilizers that are high in phosphorus are often also high in ammonium because phosphorus is usually supplied as monoammonium phosphate.

Certain fertilizers generally cannot be mixed at high concentrations. Salts containing sulfate, for example magnesium sulfate, are not compatible in the same concentrated stock solution with calcium nitrate because a reaction occurs where insoluble calcium sulfate (gypsum) will form as a precipitate . If a blended fertilizer contains both calcium and magnesium, then the sources have to be calcium nitrate and magnesium nitrate or two stock tanks must be used. Similarly calcium nitrate and monoammonium phosphate cannot be mixed in the same concentrated stock solution at high concentrations because insoluble calcium phosphate will form as a precipitate (solid). However, the amount of calcium and phosphorus that can be mixed in the same stock tank can be increased by lowering the pH of the stock tank. Commercially available fertilizers that contain calcium and phosphorus tend to have low levels of phosphorus (i.e. 13-2-13-6 Ca-3 Mg) and will also contain a weak acid to lower the pH of the concentrated stock solution.

The nutrient content of the irrigation water is also important. In some cases, it can supply a large percentage of nutrients (especially calcium and magnesium) to the plants. In other cases, the reason for choosing a specific fertilizer is to resist the effects of unwanted ions like sodium, chloride, or boron. Only when the nutrient content of an irrigation water is extremely low (like with rain water or reverse osmosis purified water) can it be ignored.

How to read a label from a fertilizer bag or bottle.

All fertilizer labels should contain three numbers representing the percentage (by weight) of nitrogen, phosphorus, and potassium contained in the fertilizer. For nitrogen, the value listed represents the actual percentage of nitrogen contained in the fertilizer. However, for historical reasons, fertilizers sold in the United States (and much of the rest of the world) list the percentage of phosphorus as P_2O_5 and potassium is listed as K_2O. To calculate the actual percentage of phosphorus, multiply the listed value by 0.43, and for potassium, multiply the percentage by 0.83. For example, 20-20-20 really contains 20% nitrogen, 8.6% phosphorus (actual P), and 16.6% potassium (actual K).

Nutrients other than nitrogen, phosphorus, or potassium are voluntarily listed on the label under the "guaranteed analysis" section and the values listed represent the actual percentage in the fertilizer. To be listed on the label, they either have to reach a minimum level (Ca at 1%, Mg at 0.5%, S at 0.5%, Fe at 0.1%, Mn, Zn, Cu at 0.05%, B at 0.02%), or they can be in the fertilizer but left off the label, or the label can contain "For continuous liquid feed programs" which exempts the fertilizer from the minimum critical level on micronutrients.

Micronutrients

Micronutrients (iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), boron (B), and molybdenum (Mo)) are also required by plants for acceptable growth. In the past, Field soils were the primary source of micronutrients, and so the additional application was not often necessary. However, since the switch to inert substrates for growing plants in containers, the application of micronutrients has become a necessity.

The sources of micronutrients used in water soluble fertilizers typically come in two forms, inorganic salts (all micronutrients) or chelates (only iron, manganese, zinc, and copper). Inorganic salts are material that dissolve in water to form ions that are available to the plant. For example, iron sulfate will dissolve into separate iron (Fe) and sulfate (SO_4) ions. Chelates are organic molecules that envelop the ion and protect if from interacting with other ions in the soil solution that may make it unavailable to the plant.

There are many chelating molecules available, but only three that are in common use in horticulture, EDTA, DTPA, and EDDHA. These abbreviations refer to the chemical structure of the organic molecule. The difference in the chelates is how tightly the ion is bound. In general, manganese, zinc, and copper chelates are only found in the EDTA form. In comparison, there are three forms of iron chelate, but the most common also is the EDTA form.

Resin-coated fertilizer

Resin-coated fertilizers are water-soluble fertilizers covered by a resin or plastic membrane that limits the solubility of the fertilizer salts. In general, resin coated fertilizer contain high levels (50%) of ammoniacal nitrogen (NH_4-N) and no calcium (Ca), and typically little if any magnesium (Mg).

The initial release of nutrients from resin-coated fertilizers occurs because of imperfections in the coating of a percentage of the prills. Mixing equipment that damages the coat on the prills will also cause a high initial release. To test for initial release, put some resin-coated fertilizer in a glass of water and allow to sit overnight. If there the EC of the solution increases, then there is an initial release. This initial release should be thought of as a starter fertilizer.

The long term release of nutrients from resin-coated fertilizer is affected by only one thing, temperature. In general, the higher the temperature, the higher the release rate, and the lower the temperature, the lower the release rate.

Resin coated fertilizers are typically sold based on release durations. For example, Osmocote 14-14-14 has a release rate of 3-4 months. At an average temperature of 68^{o}F (20^{o}C), 14-14-14 will release 80% of the fertilizer salts contained in the prills over 3-4 months. However, if the average temperature of the substrate is much above 68^{o}F, then 14-14-14 may only last 2-3 months. High greenhouse temperatures have been known to cause excessive release of nutrients from resin-coated fertilizer resulting in salt buildup in the substrate.

Conclusion

Understanding how to fertilizer your plants starts with understanding what is in the bag or bottle of fertilizer and what is in your water. However, this still doesn't guarantee success. Proper fertilization of your plants is more than just selecting the "right" fertilizer. It also applying the fertilizer correctly. In the next article, we will discuss different factors that affect the concentration of fertilizer that you apply to your plants, and some of the concepts about fertilizers that may or may not be correct.

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