CIOS News

November 2024 | Des Moines, Iowa

How do your lights measure up?

Brian Johnson

My Light Setup

Over the years my light setup has gone through many reconfigurations. After a decade of changes I've wound up with a mix of various fixtures and technologies. For some time I've been curious how my motley collection stacked performed. I suspected I might find some stark differences, and possibly some big inefficiencies.

Recently club member Keith Lowe, in an effort to improve his own growing, asked several club members to measure their light setups using his PAR meter so he could compare them to his own space. I took that as a sign it was time to buckle down and get serious about my setup.

I have several primary light fixtures mounted on a home-built, three tier light stand I've used for years to start seeds and grow orchids. The fixtures are all variants of a common 4 foot shop light.

They consist of:

Two generic 4 Foot Shop Lights - Fluorescent T8 bulbs, one warm, one cool in each fixture - both positioned on the lower level

Two generic 4 Foot Shop Lights - Converted from fluorescent to bypass ballast LED, one cool white LED tube and one blue/red (blurple) "Grow" LED tube in each fixture - one on the upper level, one on the middle level.

One Generic 4 Foot LED Shop Light - Cool white (4000k) LED installed on the middle level.

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Pictured left: The author's DIY 3 tier light stand. It shows all the light technologies in use. Each level is a 2' x 4' growing area with hanging provisions for two 4' light fixtures, but the upper level only has one fixture in use. If you looks closely you can see the light color/quality is slightly different on each level.

You can also see a clamp-on style workshop light with an aluminum reflector. I use these in conjunction with LED flood lights to spot light large specimen plants, seedling tubs, etc… They're outside the scope of this article.

Next Meeting

December Holiday Party!

12/1/2024 - 1pm

Union Park United Methodist Church

2305 East 12th Street

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Measuring

Going in to this project I had a few questions running through my mind. I knew my old fluorescent fixtures were relatively inefficient compared to me LED lights, but how much more? Also, shop lights like I've been using for years tend to spill light out their sides which is good for lighting large areas like a garage or workshop, but not great for directing light down on to your plants. Would that affect their measure performance? And that generic LED shop light – it was certainly bright, at least to my eyes, but how much of that light was actually useful for plant growth?

So, with a borrowed PAR meter (thank you Keith!) in hand I set out to answer those questions. I took measurements directly under each fixture at a distance of 20 centimeters from the light source, and I took 3 readings along the length of the fixture and averaged the results. I chose the 10 and 20 cm distance as most of my plant leaves/canopies fall in that distance range. I also threw in a 10 cm measurement for my DIY converted LED lights – they are low intensity lights and are placed very close to the plants (10 cm or less).

Front Position Fixtures	Rear Position Fixtures
Upper Level Converted LED **70** µmol/m²/s @ 20 cm **105** µmol/m²/s @ 10 cm	Upper Level Fluorescent (not in use)
Middle Level LED Shop Light **130** µmol/m²/s @ 20 cm	Middle Level Converted LED **100** µmol/m²/s @ 20 cm
Lower Level Fluorescent **90** µmol/m²/s @ 20 cm	Lower Level Fluorescent **110** µmol/m²/s @ 20cm

Table 1: Measurement results. Notice that the converted LED fixture on the top shelf measured 70 but the converted fixture on the middle shelf measured significantly higher. I turned off the LED shop light in the front position of the middle shelf and retook the middle shelf converted LED measurement. It read 80, confirming that the reflective Mylar lining the back of the shelf was making some difference and that the light spill from the shop light in the front position was significant.

Table 1 shows the measurement results of the in use fixtures on each level. I had suspected that my old fluorescent shop light fixtures would have similar output to the LED shop light, but in reality they weren't event close. They barely outperformed my low wattage LED conversion fixtures. For comparison the fluorescent bulbs each consume 32 watts of power, but the inexpensive LED tubes in my converted fixtures each consume 17 watts. Nearly twice the power consumption for similar effective light outputs.

But what does it mean?

The numbers in Table 1 are all well and good, but what do they mean in context of plant growth? For reference Table 2 shows recommended light levels for various orchid genera compiled by Dustin of herebutnot.com:

Orchid Types	Recommended Light Level
Low-Light Orchids (Mottled-Leaf Paphs, Jewel Orchids, Phals)	40-80 µmol/m²/s
Moderate-Light Orchids (Onc, Phrags, Epidens, Dends etc)	80-150 µmol/m²/s
High-Light Orchids (Cattleya)	150-350 µmol/m²/s
Very High-Light Orchids (Vandas)	350-600 µmol/m²/s

Table 2: Recommend light levels. Source article " Light Recommendations: PPFD (PAR) for Orchids and Houseplants" published by Dustin aka "Here But Not"on herebutnot.com

Per the numbers in Table 2 we can see that my light setup is suitable for low to moderate light orchids. Most of my plants fall in those categories, but I do have some Cattleya that could benefit from additional light.

Upgrades

The entire process revealed several problems with my light setup. My old fluorescent shop lights were very inefficient. My generic LED shop light, while performing reasonably well, has poor light quality – it flickers and the colors under the light look washed-out and dull – a typical product of cheap driver electronics and cheap, low CRI diodes. And the DIY converted fixtures were also under-performing, and the traditional "blurple" grow light bulbs I used are not very nice to work under. It's hard to see what your plants look like when everything is pink-purple. It was time for an upgrade!

I browsed Amazon and found LED grow lights under the Freelicht "brand" name. These lights combine full spectrum warn and cool white LED's with supplemental red and blue. I chose a pair of their 40W (250W Equivalent) model. Per the specs listed on the site, they should measure 105 µmol/m²/s at 9 inches (22cm), or 320 µmol/m/s at 9 inches.

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I have no idea why the site lists two different figures, but I rolled the dice and made the purchase.

After installing the new lights I took some measurements. They averaged 160 µmol/m2/s at 20cm. Not bad. What really impressed me was the quality of the light. I immediately noticed improvement over the cheap LED shop light and fluorescent fixtures.

The new lights are also much more "directional". The light spill from the sides of the fixtures is much less than the shop lights. If I had to integrate or use grow lights in a living area of the home, and not just the basement I would happily use these. The light quality was so good that I picked up the 60W (350W Equivalent) version of their grow light, also from Amazon.

I removed my fluorescent fixtures from the bottom shelf, and replaced both with the single LED shop light fixture. The single 50 watt LED shop light fixture produced similar light levels to the pair of old fluorescent fixtures consuming around 130 watts total. A huge efficiency improvement.

Conclusions and Recommendations

If you're still using fluorescent shop lights I highly recommend making the switch to newer LED grow lights – they are far more efficient, and the light quality is quite good both in terms of PAR (useful for plants) and CRI (quality). It was nice getting a good idea of how my lights were actually performing. I was operating under the "if it's bright it's good enough" mind set for a long time. Proper measurement revealed some real inefficiencies in my old setup.

And if you want more info on any of the terms I used in this article, check the 'Definition of Terms' on page 8.

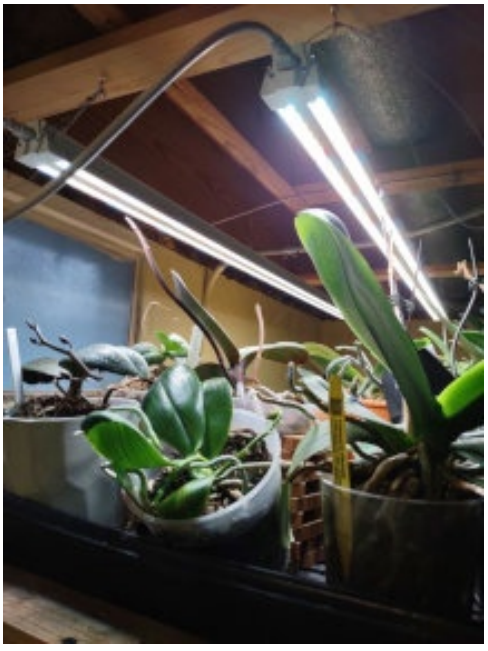
Products and Resources

Freelicht 40w LED Grow Light

Freelicht 60w LED Grow Light

PAR Light Meter

HereButNot article "Light Recommendations: PPFD (PAR) for Orchids and Houseplants"



Pictured above, left to right:
Left - The light emitted from 'blurple' LED fixtures has no or very little yellow and green components making leaf diagnosis and health monitoring challenging. However, they are still relatively economical and plants will happily grow under them.
Center - While measuring light output using a PAR meter I snapped a photo of my cheap LED shop light. The vertical black bars picked up by the camera translate to your eyes as flicker which some, including myself, find annoying, It's indicative of cheap electronic driver components in the light fixture.
Right - My new lights emit a nice, steady glow, with no flicker, and the CRI is high. Good quality lights makes leaf health and pest problems easy to spot, and are generally more pleasant to work under.

December Meeting and Holiday Party!

Our next meeting will also be our annual holiday party. It will start one hour earlier than usual at 1pm. The club will be providing ham for the main dish – please bring a side and/or dessert to share!

Also, please bring your own table setting (plates, cutlery, glasses, etc…) and a beverage of your choice.

We will have a short business meeting before the meal, including our annual officer elections – see the President's message below for this year's list of nominees.

We look forward to seeing you there!

12/1/2024 - 1pm

Union Park United Methodist Church

2305 East 12th Street

President's Message and Election Nominees

New faces, new events, and new orchids – the CIOS has had some great opportunities for growth and change this year. I'd like welcome our new members this year, and thank you for joining us. I hope we can make your orchid growing journey even more rewarding and fulfilling. Thank you to all our veteran members for sticking with us. I've said it before and I'll say it again, everything we do is only possible thanks to our great members. And I hope everyone has had a chance to try their hand at a new plant and maybe the joy and delight of a new flower.

So in this season of thanks, I thank you all for being a member of the CIOS and making this club a great space where we can share our passion for orchid growing!

It's also election season, and as your current president I'm proud to announce our 2025 candidates

Your 2025 Board Candidates

President
Brian Johnson

Vice President and AOS/OD Liaison
Maria Fedorova

Secretary
Ardie Strawman

Treasurer and Librarian
Chriss Barck

E-Board Year 1: Jason Rauscher

E-Board Year 2: Carol Lewnau

E-Board Year 3: Jenny Howell

Webmaster: Carson Whitlow

See you in December!
Brian Johnson, CIOS President

Basking in the glow of my basement lights. I thankful for the opportunity to step into a room filled with bright light and green plants as the cold and dark of winter rolls in.

November Meeting Brief

Ardie Strawman

We have a balance in our checking account of $2984.55 plus the CD of $5000. Chriss reported that we have new magazines that can be checked out. A question was asked about our Zoom subscription. It costs $171 for a year and we generally use it for various online presentations.

Old business – Reiman Gardens Orchid Fest. We were told that Terry, who is the other vendor at this show, has non-Hodgkins lymphoma and will not be a vendor in February, 2025. We are going to look into finding another vendor, possibly Natt's or Anything Orchids. The plants we sell will come from Doc Bannister and Fred Clarke.

The election of new officers for 2025 will take place at our December meeting. The nominees are: Brian Johnson for President, Maria Fedorova for Vice-President, Ardie Strawman for Secretary, Chriss Barck for Treasurer and Librarian, Jenny Howell for 3rd year Eboard to fill the end of Maria's term, Carol Lewnau for 2nd year Eboard, and Jason Rauscher for 1st year Eboard, and Maria for liaison for AOS and Orchid Digest.

New business – The December meeting will be our Potluck lunch and will begin at 1pm, instead of the usual 2pm meeting time. Elaine Notis will bring the ham, and members will each bring a side dish or dessert. Members will also bring their own plates, silverware, and drinks. After the election of officers for 2025, the business meeting will be kept short so we can enjoy the food and each other's company. :-)

Brian said that now is the time to renew club membership for 2025. Dues are $15 for a single and $25 for a family and can be paid to Chriss.

Maria gave a presentation on the Eastern Iowa Orchid Show. We had a lovely display and won many individual ribbons.

Meeting adjourned.
Respectfully submitted,
Ardie Strawman, Secretary

Show and tell plants were brought by Brian, Leo, Carol, Maria, Chriss, and Jason.

The program was given by Carson Whitlow on his trip to Manitoba in 2009, with Lorna Whitlow, Leo Schlunz and others. It was very interesting to see what orchids grow in the wild in northern Canada!

November Show and Tell Photos

Upcoming Events

Tamiami international Orchid Festival

January 17-19, 2025, Miami, FL

Tamiami Event Page

Miami's largest, most diverse orchid show. Over the past twenty years, the Tamiami International Orchid Festival has not only become a great Miami orchid show, but a nationally and internationally recognized orchid event. The January 17-19, 2025 Tamiami International Orchid Festival will be the largest orchid show in the United States.

The World Slipper Orchid Conference #3

January 17-19, 2025, Grand Naniloa Hotel Hilo, HI

Orchid Digest Events Page

Includes Lectures, Friday night dinner, Saturday lunch, and Saturday night dinner.
Scheduled Speakers:
Chu Xuan Canh (Vietnam), Frank Cervera (USA), Elizabeth Chen (Taiwan), Tim Culbertson (USA), Olaf Gruss (Germany), Marc Hachadourian (USA), Harold Koopowitz (USA),Alessandro Valenza (Italy)

Orchid Society of Minnesota "Winter Carnival 50th Anniversary Orchid Show"

January 25-26, 2025, St. Paul, MN

OSM Winter Carnival

Get ready for an amazing experience as the St. Paul Winter Carnival Orchid Show returns for its 50th year celebration! This dazzling event has evolved into the ultimate winter extravaganza for orchid enthusiasts across the Midwest, drawing in a staggering crowd of nearly 5,000 lovers of these exquisite blooms.

Immerse yourself in the Orchid Society of Minnesota's spectacular vision, meticulously curated by the Show Committee. Prepare to be whisked away from Minnesota's icy embrace to the lush embrace of tropical wonderlands, right within the heart of the conservatory.

We extend a warm invitation for you to bask in the awe-inspiring splendor of our showcased orchids. Delve into the wealth of orchid wisdom offered by our passionate members and seize the opportunity to acquire top-notch orchids from our exceptional vendors. Collaboratively, the Show Committee and the Marjorie McNeely Conservatory staff have worked together to make the 50th Anniversary something special.

Madison Orchid Growers Guild "Orchid Quest"

February 1-2, 2025, Madison, WI

Orchid Quest Event Details

Orchid Growers Guild's "Orchid Quest" is being held February 1 - 2, 2025 at the Monona Terrace Community and Convention Center, 1 John Nolen Dr, Madison, WI 53703.

For more events see
'The Orchid Mall Announcements and Events'
orchidmall.com/announce.htm

Explanation of Lighting Terms

Brian Johnson

Confused by lighting terminology and jargon? Don't worry, we've got you covered.

"Band" or "Bandwidth" – refers to the range of frequencies that a source of light emits. If you imagine a light spectrum in your mind with colors ranging from red to violet, the red end of the spectrum is low frequency, and the violet light is high frequency. LED's, for example, produce a very narrow light band. Which is why they glow brightly at specific frequencies which we perceive as distinct colors like red, green, blue, yellow, etc… In the late 90s shortly after blue LED's were developed, some clever person(s) figured out that if you coated a blue LED with the right blend of phosphors, some of that blue light would be converted to red, green, and other frequencies of light creating a wider band of emitted light appearing to our eyes as white. You can also combine individual red, green, and blue LED's to create a range of apparent colors including "white" light, but these "RGB" LED lights are used primarily for decorative and display purposes and aren't covered here.

"Full Spectrum" – light sources that produce a continuous band of light (mainly) in the visible spectrum. The light produced will appear white to our eyes but will usually have peaks and dips at various frequencies designed to produce an output that looks "good" to human eyes but also produces as much useful light for plants as possible.

"Phosphor" – A special blend of chemicals that "fluoresce" or glow when exposed to radiant energy. They absorb that energy and then emit light of various colors depending on the mix of chemicals. Tune the makeup of the phosphor properly and you get white light. Fluorescent chemicals are what give fluorescent lights their name

"Blurple" – Chlorophyll absorbs mainly red and blue light so for many years grow lights have been tuned to emit a spectrum with enhanced enhanced red and blue giving them a pink/purple hue. This became pretty extreme in the early days of LED grow lights when they used a combination of primarily narrow band red and blue LED's creating a very distinct and intense bright pink-purple color. The term "blurple" was used to describe these lights to distinguish them from "white" or "full-spectrum" lights.

"Lux" and "Lumens" – lumens measure the amount of visible light radiated by a light source. Lux, or luminous flux, measures the amount of light falling on a surface. If your light source is producing 10,000 lumens, it would be extremely bright, even dangerous to look at up close. If those 10,000 lumens were spread over a thousand square meters, the lux would be 10,000/1,000 or 10 lumens/square meter. But if you had a 1,000 lumen source shining on to a ten square meter surface, the lux would be 1,000/10 or 100 lumens/square meter. For your light source to be effective you need to consider the size of the space you are lighting. Also keep in mind that lumens are a measure of how bright a light source appears to human eyes, not how much of that light is useful for growing plants, or the quality of that light aka CRI.

"PAR" and "PPFD" – PAR is "Photosynthetically active radiation" and refers to the spectrum of light used by organisms that use photosynthesis for energy production, like plants. It's a bit wider than the human visible spectrum, ranging from up into near infrared and down into ultraviolet, 400 to 700 nanometers. PPFD, or photosynthetic photon flux density, is a measure of how much light in the PAR range is hitting a given area every second. Modern grow light specifications should include PPFD measurements. The unit of measurement is µmol/m²/s – the amount of PAR photons falling onto a square meter of area every second.

"CRI" – or "Color Rendering Index", is a measure of how accurately colors are rendered when lit by an artificial light source as compared to natural sunlight. The higher the CRI, on a scale of 100, a light source is, the more natural the light appears. Higher CRI light sources are more pleasant to work under and make seeing subtle differences in color and shade much easier. Utility lights like outdoor or shop lights can have low CRI figures (80 or below), while good quality indoor lighting will have a high CRI rating (90 and above). It's a useful measure of the "quality" of a light source. Incandescent bulbs have a high CRI as a natural consequence of the white-hot filament light source they employ, but are wildly energy inefficient. LED's and fluorescent lights are much more efficient, but have been playing catch-up in terms of CRI. However, it's now easy to find LED lights (including grow lights) that provide the best of both worlds - high CRI and high energy efficiency.

Membership

The Central Iowa Orchid Society (CIOS) was organized in 1961. It is a nonprofit social club. Membership in the CIOS also includes membership in the Mid-America Orchid Congress.

Yearly dues are $15 for an individual or $25 for a family. New members joining after July 1st are only required to pay one-half the annual membership fee - $7 for an individual or $12 for a family. Membership can be renewed starting January 1st and dues become delinquent after the February meeting. Members will be dropped from the roll if dues have not been paid in six months.

Meetings are generally held on the first Sunday of every month at the Union Park Methodist Church, East 12th & Guthrie, Des Moines and begin at 2:00 pm.

Among the advantages of membership in CIOS are a large library of orchid literature, programs, displays and discussions on blooming plants, helpful advice, door prizes, and friendly socializing about orchids.

We invite you to attend a meeting and see for yourself the excitement that orchids generate. While there, inquire about membership or send in the below membership application to:

Central Iowa Orchid Society
c/o Chriss Barck, Treasurer
16402 J Ave.
Perry, IA 50220

CIOS Officers

President - Brian Johnson

Vice President - Carson E. Whitlow

Secretary - Ardie Strawman

Treasurer - Chriss Barck

E-Board Member (1st Year) - Carol Lewnau

E-Board Member (2nd Year) - Maria Fedorova

E-Board Member (3rd Year) - Jenny Howell

Immediate Past President - Roy Molina

American Orchid Society & Orchid Digest Liaison - Maria Fedorova

Librarian - Chriss Barck

Webmaster - Carson Whitlow

General correspondence can be sent to:
Central Iowa Orchid Society
c/o Carson E. Whitlow
22957 280th Street
Adel, IA 50003

General email:
centraliowaorchidsociety@gmail.com

Central Iowa Orchid Society

Membership Form

Please make checks payable to the Central Iowa Orchid Society. $15 for single, $25 for family membership

Name: _____ Telephone: _____

Address: _____ City: _____

State: _____ Zip Code: _____

Indicate Family or Single: _____ Email: _____

Amount Enclosed: $_____ or:

Credit Card #: _____ Exp. Date: MO ____ YR ____ Security code: _____