St. Augustine Orchid Society

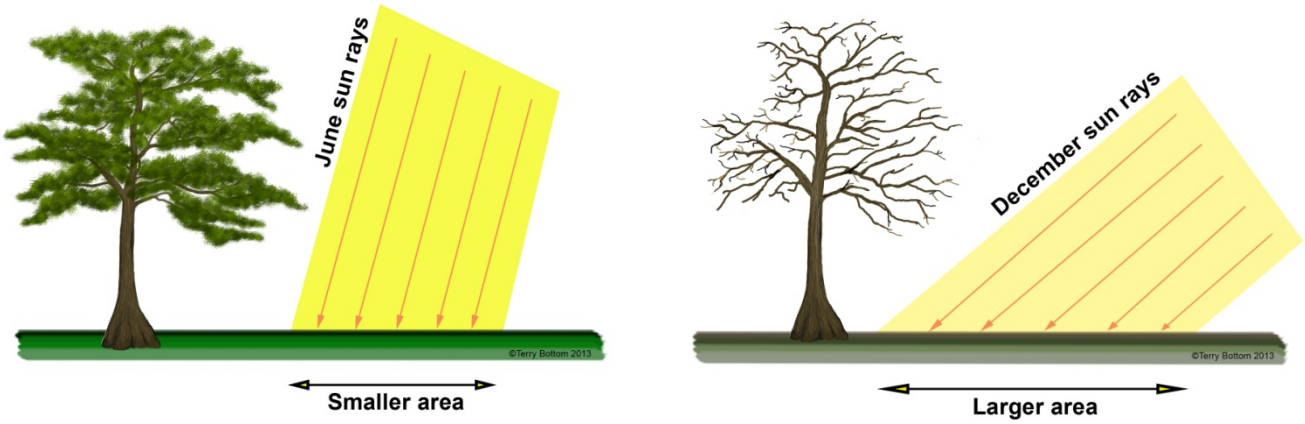
www.staugorchidsociety.org

Seasonal Changes in Light

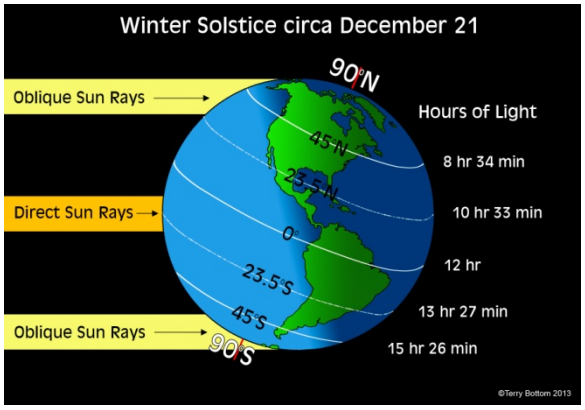
by Sue Bottom, sbottom15@hotmail.com

The real orchid food is light, not that blue stuff that comes in a jar. Solar radiation, the energy that comes from the sun, fuels the photosynthesis process by which the chlorophyll converts carbon dioxide and water into sugars and carbohydrates that are used by the plant to grow. If your plant produces a sufficient reserve of food, it will have the energy to produce lots of flowers when the time comes. Fertilizer contains the mineral and trace element nutrients that are used by the plant when it is in active growth, but as a rule, light rather than fertilizer is the limiting factor for growth. Understanding seasonal changes in light levels and duration can make you a better orchid grower.

A long time ago, in a galaxy far, far away, we learned that the reason we have seasons is because the Earth is tilted on its axis by 23.5 degrees. The angle at which the sun's rays strike the Earth's surface determines the amount of solar energy received per unit surface area.



The solar radiation is the greatest when the sun's rays are directly perpendicular to the Earth's surface. When the sun's rays hit the Earth at a more oblique angle, the light is spread out over a larger area so there is less energy per unit area. The direct sunlight is more intense causing the Earth to warm in the summer, and the oblique sun rays allow the Earth to cool in the winter. Varying lengths of day light and darkness also trigger growth responses in orchids and many other plants.



Winter Solstice. Since the summer solstice, the days have gotten shorter by a minute or two each day. The sun is getting lower in the sky so the sun's rays are hitting the Earth at an oblique angle causing the light to be less intense. On the winter solstice, we have the lowest amount of incoming solar radiation (insolation) received on any day of the year, less than half of what we receive in the summer in St. Augustine. The shorter day length and reduced insolation cause the Earth in the northern hemisphere to cool.

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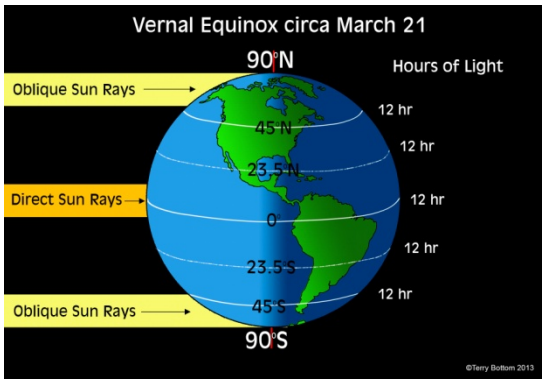
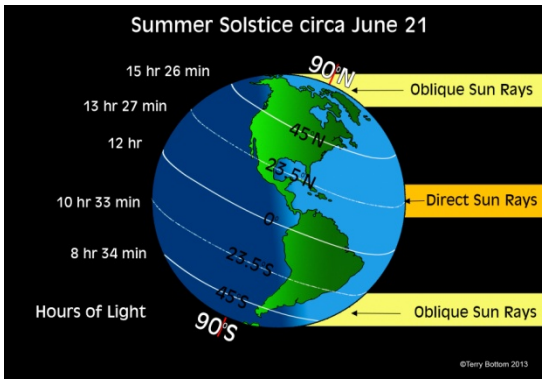
The direct sun rays are impacting the Tropic of Capricorn at 23.5ºS in the southern hemisphere where they are enjoying summer.

Is it any wonder that our plants are resting during the winter? In the winter, our plants may still be growing but at a greatly reduced rate because the insolation is much less intense and the hours of daylight (and potential photosynthesis) are at the lowest level of the year. We try to align our watering and fertilizing habits to match our plants' reduced growth rate, so we water and fertilize probably half as frequently and the fertilize dose is cut in half from our summer levels.



Vernal Equinox. After the winter solstice, the days lengthen by a minute or two each day as the sun rises higher in the sky and the sunlight slowly increases in intensity. On the vernal equinox circa March 21, the sun's rays are most direct and therefore most intense at the equator. In St. Augustine, we receive about 87% of the solar radiation received at the equator. The day and night lengths are the same across the Earth, there are 12 hours of light and darkness everywhere.

The lengthening day length and higher sun angle are causing spring to bloom. By the vernal equinox, the plants have gotten the message and are increasing their rate of photosynthesis in response to the increase in solar radiation. We respond by increasing the frequency of watering and dosage of fertilizer to match our plants' growth rate. By the end of April we have moved our orchids to their summer homes and added an extra layer of 30% shade cloth to the greenhouse. This shade cloth will protect the plants from the intense summer sun and shade them to prevent excessive leaf temperatures and sunburn.



Summer Solstice. The days continue to get longer by a minute or two each day until the longest day of the year on the summer solstice circa June 21. The sun rises higher in the sky and the sun's rays are more intense as we move to the summer solstice where the direct sun rays impact the Tropic of Cancer at 23.5º north of the equator. The amount of insolation we receive in St. Augustine is about 30% greater than what we receive at the vernal equinox and more than twice the amount we receive at the winter solstice. We get about 14 hours of daylight and 10 hours of darkness on the solstice. The increased insolation and day length cause the Earth to warm.

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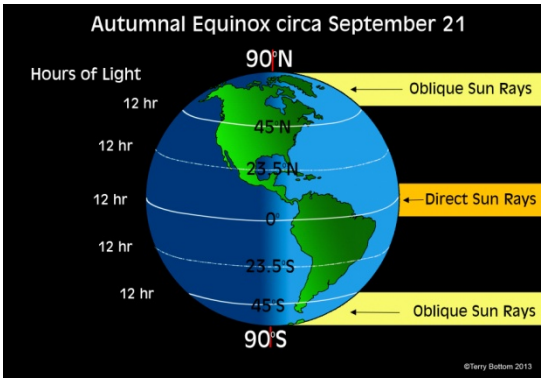
Watering and fertilizing frequency is increased to accommodate the increased light intensity and duration throughout the summer. As long as you are seeing green root tips, you should be watering and fertilizing heavily. In the dog days of summer, you may slow down just a little bit because the plant metabolism seems to slow down when ambient temperatures are above 95F. Sometimes the solar radiation is so intense that it can cause the leaves to burn. Sunburn is really a thermal effect, because the leaf temperature has gotten too high, sometimes far in excess of the air temperature. We protect our plants with extra shade cloth to reduce insolation, increasing air movement to cool hot leaves with fans and spraying water under benches and on clay pots to cool them.



Autumnal Equinox. After the summer solstice, the days begin to shorten by a minute or two each day. The sun rises lower in the sky and the sunlight slowly decreases in intensity as we approach the autumnal equinox in September. This allows the Earth to start cooling once the retained heat from the summer sun dissipates. The sun's rays are the most intense at the equator The solar energy we receive in St. Augustine is slightly greater than our average annual rate. The day and night lengths are the same across the Earth, there are 12 hours of light and darkness everywhere.

We get a second growth spurt in the fall when the temperatures moderate and we water and fertilize freely through October. With the fall comes a decrease in day length, solar radiation and temperatures that translate into a slower growth rate for our plants. We remove the extra 30% shade cloth after the autumnal equinox to increase light in the greenhouse for the remainder of the fall and winter. We gradually add days in between watering events and cut the fertilizer addition rate in half to accommodate the lower winter growth rate. We can then kick back and enjoy the blooms from all the energy our orchids stockpiled throughout the long growing season!

Citations:

PhysicalGeography.net
Pidwirny, M. (2011). Earth-Sun Relationships and Insolation. Retrieved from http://www.eoearth.org/view/article/151844

Short, Nicholas M. Sr. Meteorology – Weather and Climate: A Condensed Primer. Retrieved from https://www.fas.org/irp/imint/docs/rst/Sect14/Sect14_1a.html
Sun Angle and Seasons. Retrieved from http://www.geog.ucsb.edu/~joel/g110_w08/lecture_notes/sun_angle/sun_angle.html