St. Augustine Orchid Society
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Good Orchid Growing, or the Concept of Stress on Plants

by Dr. Carl L. Withner, Canadian Orchid Congress

Why are some orchid growers more successful than others - I mean, in growing fine plants with beautiful flowers? They produce the kinds of plants that show maximum qualities, the kinds of specimens you know are possible but that you can never quite achieve. Why do some people have a "green thumb" and others have only what is termed in some parts of Brooklyn the "dreck effect"? Well, my wife says I think like a plant, and although I'm reputed by some to have a green thumb, I know that others can grow much better plants than I do. This puts me under some stress, but the main problem is that my plants don't or can't improve their situation. Eventually you compromise between what you know and what you do - I'm starting to write this now about the stress on the grower, when what I wanted to do was write about stress on the plants.

The idea is that whenever you have less than perfect conditions the plants are under stress and respond with less than maximum growth. Perhaps this is just as well, for if we all grow such plants, bursting with vigor, who would have room for them all anyway? All orchid greenhouses are too small (they're built that way, it would seem) and that produces the first sort of stress - from overcrowding. One of my friends says he specializes in growing orchids back into their pots, but I don't really think that is his intention. Few people, apparently, have the courage and determination to keep their greenhouses with sufficient "lebensraum" for every plant. Sooner or later, one plant begins to shade another; flower spikes are broken or distorted; petals are crumpled; roots grow into other pots, and sure enough, something behind something else dies because it wasn't watered, or you didn't notice that the roots had rotted off from lack of repotting. Each plant obviously needs its own niche for exposure to a proper environment for maximum growth and flower production.

We are involved here with what is called in biological circles the principle of limiting factors. This idea may be stated by saying that whenever any process, such as growth, is controlled by a variety of factors, any one of them can be limiting at any given time. At one time it may be the amount of light, at another the temperature, or in turn any one of many other environmental or internal factors may be involved. Whenever the balance among factors is not optimal, the plant is placed under stress. If the stress is too great, it may die, or alternatively, produce smaller growths, not flower, produce fewer or poorer flowers, lose leaves, form blind sheaths, or just plain rot.

Light is most often a critical factor, one that can easily cause stress. If individual leaves are not saturated by light, each does not make the food that is possible through photosynthesis. This means fewer reserves for cellular respiration and maintenance processes in the plant and it may mean a lack of sufficient additional reserves for growth and flower production. When reserves are plentiful, multiple growths may break, leaves and bulbs may turn a healthy shade of red, and sugary nectar droplets will be formed on the sheaths and flowers, even on the leaves of some orchids. Since new growths depend upon the vigor and reserves of previous growths with good root supplies, continued lack of stress from sufficient light is critical. Light, along with production of food, has other effects

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on the plant, namely, the production of heat. This occurs within the tissues of the plant, as well as within the greenhouse which is really an infra-red trap. Each plant, according to its origins in nature - on low savannah or high cloud forest - grows best within a particular temperature range. Exceeding this range can slow down the rate of metabolism and growth or, in other words, produce a stress that prevents maximum results. So while increasing the light for photosynthesis, be careful to control heat buildup.

But we are not finished with the light and its detrimental heat effects. Excess light causes a deterioration of chlorophyll, yellowing the leaves, and eventually causing them to fall from the plant prematurely. The heat also causes an increased water loss from the leaves so that they become collapsed, soft, and pliable, and bulbs become wrinkled and ridged. One immediately proceeds, as an average response, to overwater the plants to make up for this obvious dehydration - only to kill the roots and worsen the total picture. Decrease the heat by increased air movement; diffuse the light; increase humidity to prevent excess water loss; don't overwater the roots. Be patient if the plant is new until it makes one or two growths under your specific conditions and has had a chance to adapt.

At this point you are beginning to see the interrelationship of all these variables and how the principle of multiple factors gets to work. Everything from cuticle thickness (relating to humidity and conditions the plant was grown under previously) to the type of flower pot used plays a role in the total process. Orchids grow slowly, and they die the same way, so fortunately, you usually have an opportunity to change whatever is not optimal and alter their deterioration.

Orchid roots need lots of air and a certain humidity to stay alive. The velamen does not cover the very apex, and if humidity is low such tender tips have difficulty in surviving, particularly if nutrients in the water, or its pH, are not favorable. Good green roots continuing their growth into the air without stunting or stopping are a fine measure of proper humidity and good general conditions. Since roots absorb water at a given rate, only a certain amount can enter them within a stated period of time. If water loss through leaf or flower surfaces is excessive because of heat or low humidity, the plant loses turgor, gets soft and wilty with shrunken pseudobulbs. This condition is not cured by additional watering. There cannot be any faster uptake by roots, particularly if they are waterlogged, so the resolution of this stress involves heat and humidity control.

Proper humidity has remarkable effects on orchids, aside from keeping root tips alive. It seems to produce a real change in vigor and growth. The leaves expand more fully, flowers open to larger size and stay in good condition for longer, leaves last for an extra year without falling, bulbs don't shrivel, more buds break for new growths. Everything goes better with humidity, even petal spotting and root rotting, unless you also have buoyant air as well. The humidity and good air go hand in hand, and many times the lack of them, it seems to me, causes more stress than lack of proper light and temperature.

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The factor causing least stress under average conditions is nutrient availability. Because of advertising and convenience it is easier to provide fertilizer than high humidity, proper temperature, or proper watering. In bark, with its lack of nutrients, this factor may become critical because of the almost total lack of necessary ions. With other media - osmunda, moss, or tree fem - the stress may be decreased as natural nutrients are available in degree. Of course, the balance of the chemical compounds, the pH of water, presence or absence of sodium, carbonates, etc. can complicate this picture unbelievably.

How is it then that the plants can grow at all – each with its season to grow, another to rest, a period of flowering? I'm always impressed by the adaptability of orchids and their tolerance of greenhouse, windowsill, or under light conditions. The question is, how close do we come? How many plants from various niches do we try to grow together? And which environmental factors are at work producing stress conditions and limiting the growth or flowering of individual plants? As your "green thumb" develops, you'll begin to know at a glance, or at least you'll have some definite ideas, and what will you do about them? The more ideal your conditions, the fewer fluctuations in their supply at critical times, the less stress your plants will have. They will begin to look better and produce the fine flowers you deserve.

Note: The late Dr. Carl L. Withner wrote this article for the Orchid Society of Nova Scotia in May of 1997, and it was reprinted in the March 2002 Canadian Orchid Congress newsletter, a great searchable source of orchid information.