BEGINNER'S SERIES

Orchid Culture — 6 — Watering

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Need it be said that water is vital to plant life? Plants are predominantly composed of water. Water is important to nearly every physiological process ongoing in living plant tissue. Carbon dioxide and water are combined in photosynthesis to make the food necessary for plant survival. Water performs another essential function in plants by acting as a vehicle for the uptake of minerals through the roots, as well as for the distribution of minerals, food and other substances within the plant itself. An orchid grower need only provide too little water, or too much, to realize how crucial it is to orchids.

A Mature growth of *Trichopilia suavis* exhibits a case of "accordian pleating", and is stunted, because of inadequate water during its active growth.

UNDERWATERING AND OVERWATERING

Most orchids, particularly the epiphytes, have evolved to withstand dry conditions to some extent. Unlike other more tender plants, orchids don't sually cry out that they need water by wilting in a dramatic fashion. Instead, a prolonged period of almost deliberate water neglect is usually necessary to produce drought responses in a well-rooted orchid. These responses are subtle at first. A slight shriveling of the succulent leaves of *Cattleya*-type orchids (see A.O.S. Bulletin, July 1981, page 794), for example, can be noticed with close observation by sight — and touch. Turgid succulent leaves are smooth; those under water stress, developing wrinkles and bumpy patches, feel rougher. Thinner but still leathery orchid leaves may curl under water deprivation. Some orchid leaves may react by dying back at the tips. With persistent drought, leaves may lighten in color, turn yellow, or even die and turn brown. Pseudobulbs, which normally develop furrows with age, will become deeply grooved under chronically dry conditions. All these symptoms should suggest to the grower that the orchid so responding is not taking up enough water to compensate for water loss.

These *Tolumnia* leaves are shriveled not because of under-watering, but because of root loss resulting from overwatering.

Being more needy, actively growing leaves and pseudobulbs are the most vulnerable to stress. Expanding leaves, especially those of the more thin-leaved genera, are likely to develop a case of "accordion pleating" without adequate moisture. Leaves and pseudobulbs often will be stunted at maturity if deprived during this critical stage.

Overwatering is a far more common error committed in orchid culture. All zealous orchid growers know how hard it is to resist watering, even when it might very well be unnecessary, or harmful! Ironically enough, watering too much can bring about the same responses in orchids as watering too little. The reason for this lies in the ability of the roots to take up the water needed. Watering a potted orchid more frequently than necessary results in a perpetually soggy, eventually decomposed potting medium. A medium high in water content or decomposed is poorly aerated. Without oxygen, roots cannot grow or properly take up water and nutrients. Under such conditions they will prematurely die. An orchid with imperiled roots cannot absorb the water it requires. Losing this ability, over-watered orchids frequently desiccate.

Watered too frequently immediately after watering, this *Cattleya* hybrid lost its roots and rhizome to black rot -- and by then it was too late for saving.

An overly-wet orchid is also more subject to disease. Orchid rots (*Phytophthora cactorum, Pythium ultimum, Rhizoctonia solani*) can easily infect unhealthy, saturated roots, spread from there into the rhizome, and kill an orchid "from the ground up" before the unwary grower can take any corrective action. Giving an orchid more water than it needs during those critical times of active growth can also, as with underwatering, lead to poor development and stunting of new leaves and pseudobulbs.

Overwatering this *Rhyncholaelia digbyana* while in growth severely stunted the two pseudobulbs in the foreground. A more normal growth (behind, center) followed with less frequent watering.

Since both underwatering and overwatering can cause similar responses in orchids, how is the grower to know on which side he or she is erring? If an orchid is distressed to the point where symptoms such as those just discussed begin to appear, it is time to consider the all-important roots. An idea of what condition the root system is in can be gotten by jiggling the plant. A well-established orchid with a healthy root system usually won't budge in its pot. If such an orchid is showing signs of desiccation most likely it is being underwatered and only needs more frequent watering to regain its turgor. On the other hand, a plant with a distressed root system, having few healthy roots to hold it in place, will shift easily in its pot with a nudge. If the orchid in question does so, it may be necessary to take the plant out of the pot to examine its root system firsthand. Any disruption which may be caused in the process is well worth the possible resolution of a potentially serious problem.

If an orchid has been overwatered for some time, probably both its potting medium and its roots will be dark, wet and decomposed. Very few orchid roots can survive such wet and airless conditions, and they will very likely separate from the plant when "depotted". Dead orchid roots are darker than those which are alive, and will easily pull apart with the slightest tug. (In contrast, live roots generally are lighter in color, and will hold on tightly to both the plant and bits of potting medium.) What dead roots remain attached to the plant should be removed, and the orchid repotted in suitable, fresh media. With few if any viable roots, it should then

A healthy root system, as in the case of the *Catasetum pileatum* shown here, is necessary for any orchid to make use of the water it is given.

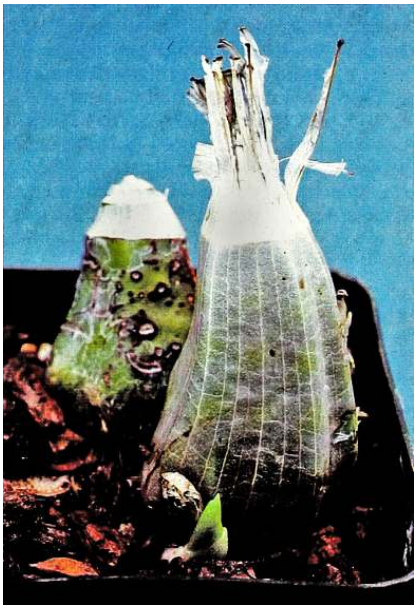
be moved into low-light, high-humidity conditions to prevent further desiccation until new roots form. The urge to continue watering excessively must be conquered now or never, because new roots are unlikely to develop in a wet medium. Keeping the medium slightly moist with infrequent watering will encourage root development. Once sufficient roots have initiated and penetrated the medium, more frequent watering can be carefully resumed.

Growers have been known to put their rootless, newly repotted orchids into polyethylene bags to achieve the high humidity levels conducive to new root formation. If this method is followed, care must be taken to keep the bagged plant out of all direct light. After all, what good is a stewed orchid?

Some orchids may show signs of inadequate water, in spite of good root systems and frequent watering. In such cases, the potting medium may be unsuitable. It may dry out too quickly for the plant in its present growing conditions. This was probably the case with the Trichopilia suavis potted in bark and pictured in this article. In spite of almost daily watering called for because of rapid drying, accordion pleating and stunted growths developed (although the flowering was surprisingly good). Repotting in a mix with greater water retention may help provide the plant with a longer drying cycle and more even moisture.

Without live roots, this paphiopedilum is incapable of absorbing the water it desperately needs. Note the symptoms of severe desiccation.

How often should an orchid grower have to water to avoid problems caused by overwatering and underwatering? Were growing conditions and an orchid's needs unvarying, a recommendation such as "Water once a week without fail for happy orchids" could be given. This just isn't the case



A deciduous calanthe in a state of rest needs little water — until growth resumes (foreground, center) and new roots are initiated.

FACTORS DETERMINING WATER DEMAND

Every sunny day plants lose great quantities of water because of transpiration through (evaporation from) their leaves. This water of course needs to be replaced, through the absorption of water by the roots, for the unimpaired functioning of the plant. Any environmental condition which increases the transpiration rate of an orchid will correspondingly increase its water needs. These include high light, high temperatures, low humidity and rapid air movement, as discussed in previous articles in this series. An orchid's vegetative characteristics also have a say in its water requirements. Leafy, terrestrial species have more surface area from which water can transpire and therefore will need more water than, for instance, a terete species adapted to a dry, epiphytic habitat. Whether a plant is in active growth or dormant likewise influences its demand for water. Many orchids, especially species and primary hybrids, have "rest periods" during which watering should be curtailed, in contrast to periods of rapid growth when watering needs can be at their highest.

What an orchid is growing in or on has a significant effect on watering practices. Some media dry out faster than others. Potting media composed of fine-grade materials, particularly mixes containing peat moss, retain more water and are less subject to air; thus, they dry out more slowly. Coarse media dry out more quickly, having less surface area to absorb water, and larger air pockets to bring about more rapid evaporation. Fresh potting media, particularly those containing bark, tend to resist water at first and dry faster than later when they have had a chance to decompose and settle. Orchids on slabs and the like dry out the quickest of all, being constantly exposed to air on a surface of limited water-holding capacity. In addition,

what the growing medium is in determines drying rates. Media in clay pots generally dry out more rapidly because the clay is porous and "sweats", drawing water out of the media to evaporate on the outer surface of the pots. Impervious to water, plastic pots do not have this tendency. Media in such containers dry out more slowly as a result. Also, the size of the container is a factor in watering. Larger pots, containing more media, will retain more water and take longer to dry than smaller pots which can dry far more quickly. Big pots often have a central core of media which, being so protected from the air and other drying forces, takes considerable time to dry. This can be a problem in specimen culture.

Conditions Affecting Watering Frequency	
Water an Orchid More Often:	*Water an Orchid Less Often:*
When high-light conditions prevail.	When low-light conditions prevail.
When subject to high temperatures.	When subject to low temperatures.
Under low humidity conditions.	Under high humidity conditions.
With rapid air movement.	With little air movement.
With thin, broad and abundant leaves.	With thick, narrow and few leaves.
When in active growth.	When not actively growing.
In a coarse, porous mix.	In a fine-grade, water-retentive mix.
In fresh potting medium.	In old, decomposing medium.
On a slab.	In a pot.
In a clay pot.	In a plastic or non-porous pot.
In a small pot.	In a large pot.

WHEN AND HOW TO WATER

Knowing how various conditions in the growing environment affect the water needs of orchids, a grower will have some idea as to when his plants will need water. Nevertheless, only in examining the potting medium for water content can it be determined whether in fact watering is required. After all, because most if not all of the water is taken up by the roots, the area where they reside is perhaps of the most concern in watering.

Rarely is it recommended that a potting medium be allowed to become totally dry for orchids in active growth, whatever the genus. A nearly-dry potting mix will generally look lighter in color, seem lighter in weight, and feel drier to the touch than when it has just been watered and is wet. Porous media such as those orchids require can be deceptive, however. The surface inch may very well be dry while the more pertinent region further down where most of the roots usually reside can still be adequately moist. Clay pots are helpful in this regard, as they sweat water as long as the medium is wet. But with the more common plastic pots, many growers rely on other indicators to determine water content, such as the weight of the mix. By habitually lifting pots at all stages of wetness, and keeping an eye on the plants, one can develop a good sense of how light an orchid should be when it needs water.

I grant it may be a bit unrealistic to suggest to even the beginner with a small collection of orchids that he or she go around every day lifting every plant in deciding whether to water. After all, it is far easier to remember that, for example, "Saturday morning is watering time." We all tend to fall into a routine, even if our orchids do not. This is not to say that the majority of orchids in any one collection might not survive, and even prosper, under such a watering regime. But a number of plants will inevitably suffer, receiving more or less than their present needs require. Since most hobbyists' collections are especially heterogeneous, consisting not only of radically different species and hybrids, but plants in all types of containers and media, it might be wise for the beginner to fight this tendency and to try to accommodate as much as possible the diverse needs of all his orchids.

The efficient arrangement of the hobbyist's orchid collection can be of great help in meeting these disparate watering needs. Naturally, first consideration in arranging a collection should be given to meeting light preferences; without adequate light, the rest may be inconsequential. But after this requirement has been attended to, consideration can be given to arranging the plants according to their water needs, taking into account the various factors discussed earlier which influence water demand. Only representative plants then have to be examined daily to decide watering for an entire group of orchids with similar water needs. In this way, much time and effort can be saved in watering a well-ordered collection.

Leaf spot, probably bacterial in nautre, easily spreads from leaf to leaf with splashing water, and is a detraction from the bright flowers of this *Cattleya* Jinn.

When watering is called for, it should be done thoroughly, to the point where the medium is entirely moistened and water comes out the drainage holes of the pot. In watering some care should be taken to avoid splashing the leaves, and to water during periods in which conditions are conducive to drying. Admittedly, not every successful grower swears by this. Certainly orchids grow in the wild quite contentedly, becoming dripping wet from "head to toe" with every driving rain and swirling mist. We would all like to duplicate these natural conditions, but realistically it is seldom feasible. Conventional growing conditions typically fall short of matching the optimum conditions in which orchids can be found, especially in terms of humid air movement around the entire plant, leaves and roots alike. Water on the leaves and around roots in the potting media, therefore, generally takes longer to dry in cultivation than in nature. This, combined with the fact that most orchid collections are (or inevitably become) congested, predisposes the cultivated orchid to infection. Foliar and root diseases present but usually confined in nature can spread rampantly in a concentrated collection, especially if water is splashed from one leaf to another, or high levels of moisture persist in the potting media.

Watering in the morning, on preferably the start of a sunny day, is often suggested in the literature because it usually just precedes conditions (of higher light and temperature) which will lead to the most rapid evaporation of whatever water may accumulate on the leaves. Such a practice also lessens the chance that overly-wet conditions possible in the media immediately after watering will be prolonged. Likewise, because of similar considerations regarding disease control, it is never recommended with orchids that water be "recycled", even though it is tempting for the indoor grower, who has to drain and collect the water given his plants.

SUMMARY

Watering orchids is very much a process of trial and error. The difference between a successful grower and one less so lies not in the fact that one makes errors in judgment while the other does not. All orchid growers, novice or experienced, make occasional mistakes in watering, especially with new plants whose needs are probably unfamiliar. But the expert orchid grower is more likely to be a keen observer of the condition of his plants — above and below the media surface. Suspicious by nature or by design, he will be the first to sense any adverse reaction to present watering practices, and the first to take the proper corrective actions.

Water is the means by which orchids obtain the nutritional elements essential for their survival. Naturally occurring water is an alphabet soup containing a number of these necessary elements dissolved in solution. To this water solution, in orchid-growing practice, we add water-soluble fertilizers. Fertilizing orchids properly will be the topic of the next article for this series. — *84 Sherman Street, Cambridge, Massachusetts 02140.*

REFERENCES

American Orchid Society, Inc. *Handbook on Orchid Pests and Diseases*. Revised Edition.