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ORCHID MANAGEMENT VS. ORCHID CONSERVATION

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Rumblings about the success of the CITES (Convention for International Trade in Endangered Species) legislation are beginning to emerge and recent amendments suggest that fine tuning is under way. The minutes of the Orchid Specialist Group of the Species Survival Commission, IUCN meeting in Glasgow on April 28, 1993 recorded several serious problems involving permits for the Glasgow meeting and other anomalies resulting from the Kyoto decisions that excluded all flasked seedlings from CITES regulations and determined that all hybrids of Appendix I plants should be treated as Appendix II plants (Balistrieri 1993). It is the thesis of this paper that the word "conservation" has limited application to orchids as we approach the millennium and that management of what we already know exists is as important to the maintenance of orchid species collections and the gene pool as the attempts to maintain habitats and restrict trade. This is not to argue against large scale attempts at conservation, but it is necessary to recognize that many such efforts are doomed by the advancement of technology, expanding industry, contempt for environmental programs and the exploding population growth in many countries where orchids are abundant. Several management techniques exist even for the owners of modest collections.

Hopefully meristem efforts will multiply. I recently visited two modern facilities in Brazil which were meristemming exceptional specimens of native species in an effort to supply world demand without further damaging native populations. Hobbyists should attempt to self their exceptional clones and trade them into other collections. Seed pods on healthy plants in even the smallest collections demonstrate a commitment to orchid management and conservation. Much conversation on the internet (such as Willis Dair's Orchid List Digest) suggests that further development of flasking is the fruitful wave of the future. Here in Canada at the Royal Botanical Gardens we have recently opened the Alexander Parker Orchid Propagation Laboratory so that the descendants of our New World Orchid Species Collection may be shared with members of our society and the international orchid community. Currently CITES permits transportation of sterile flasks across international borders.

For the long term, however, we can only hope that extensive changes to CITES will occur. Rather than lament the unavailability of certain species or the imminent disappearance of many previously circulated species, orchid growers should be encouraged to propagate what they have on a limited scale in even the most modest collections so that even the capital of plants in captivity may be expanded and shared with institutions and hobby growers alike. We are especially responsive to Fred Hillerman's repeated warnings that many Madagascar orchids, even those in rather general circulation, are in danger of becoming extinct. Meristemming is one method of meeting this problem, but it is obviously not possible on a limited scale. Creative division of plants, exchange of "insurance" plants and deposit of rare specimens in established botanical gardens are highly recommended.

One limited technique for the management and propagation of orchids is available by using plant regulators. Although hormonal propagation of orchids is still in its infancy, some startling successes have been noted and the method allows modest increase in any collection, no matter how small, and without any specialized or sterilized equipment. Most of the available preparations have been developed for Phalaenopsis (Brasch & Kocsis 1982), but some successes have been noted in various vandas, angraecoids and several other genera and many hybrids. Certainly the potential for multiplication of virtually any orchid exists.

Conditions for the application of hormone preparations to orchids vary from grower to grower. Some applications result in more flower spikes rather than keikis (Hawaiian for "baby plants"). Recent research, especially in Australia suggests that there are four major aspects of the cultural environment that affect hormonal absorption and plant modification. Growers seeking to multiply their valued plants should make certain that the four environmental conditions are maximized for their plants. These are normal conditions for good growing, but are especially important if propagation management is intended. There is a growing suspicion that cytokinins

(the group of hormones that influence cell differentiation and produce clones) are produced largely in the roots of plants. As a result root development must be maximized if plant management for cloning is intended (Elliot 1971). The following criteria are crucial:

1) *Photoperiod*

One of the most difficult adjustments which orchids have to make when being moved to a temperate zone from the tropics is to the length of daylight available to them. Near the equator night and day are almost equal, but as one moves north or south the day length changes. Photoperiod is also a problem when growing under lights, especially when one tries to cheat a bit and get in a few extra hours of light in order to "help things along." The fact is that orchids require darkness in order to absorb nutrients (and presumably vitamins and hormones) and to manufacture tissue out of them. Studies at the University of Calgary have concluded that photoperiods in excess of 12 hours are counter-productive. If hormone preparations are not producing proper results, the photoperiod should be studied carefully. Greenhouse growers may be experiencing negative results because of interference from street or yard lights. Even though bud-set may be satisfactory, an inappropriate photoperiod could be preventing proper hormonal activity in the plants.

2) *Temperature*

The maxim that orchids generally thrive in the three accepted temperature gradations of minimum night temperatures of 55, 60 and 65 degrees F (13, 15 and 20 degrees C) with a desirable drop of 10 degrees F (5 degrees C) at night over normal day temperatures has been repeated so often that many growers pay little attention to the abstract rules. This is complicated by eager popularizers of the hobby who suggest that if you can grow African violets on the window sill, you can also grow orchids. Well, yes, perhaps, for a short time, but the inevitable will happen and even if a few stones in a tray may help the humidity in Florida or Panama, it takes more than a few whiffs from a sprayer or a tray of stones to raise our northern centrally-heated homes above the standard 5–8% humidity during the winter. Certainly much success on window sills has been achieved, but optimum conditions are not there and a plant will only throw a keiki as an act of desperation in such conditions. There is little point in producing an extra plant if the mother plant is destroyed in the process. Traditional optimum temperature and humidity are absolutely necessary for hormonal management and propagation to take place.

3) *Water Stress*

We pay relatively little attention to this problem in North America, but it is a growing problem in orchid cultivation and especially important for hormonal absorption and reproduction. As water supplies diminish and deteriorate and more growers depend on private wells, reverse osmosis and alternative supplies for water, stress from nutrient excess or absence is becoming more important. Water quality is especially important for hormonal absorption and reproduction. I have discussed the problem with particular attention to orchids elsewhere (Brasch 1982), but some recent research indicates that calmodulin (a calcium-like protein) may seriously affect hormonal absorption (Elliot *et al.* 1971) This means, in short, that hard water may seriously affect hormonal absorption. If, as many suspect, much of the hormonal material is produced in the roots, it follows that only a plant with healthy roots is going to be able to absorb not only hormones, but vitamins and fertilizer as well. Using hormones as a desperate attempt to save a sickly plant is not going to demonstrate proper stewardship of an endangered species. The correct pH (generally about 6.5) and mineral solids is an absolute necessity for propagation by plant regulators.

4) *Mineral Nutrition*

Much has also been written about the proper fertilizer to use, but little is said about micronutrients after the general discussion of nitrogen, phosphorus and potassium is concluded. Little research has been conducted on the specific purposes of various minerals in orchid nutrition, but there is a growing realization that the three main elements are not enough. There is also a growing suspicion that the hormones generally known as cytokinins are not only important as cell differentiators, but that they are general regulators of the plant growth cycles as well. So three main fertilizers won't do the job. If your current fertilizer doesn't contain the micro-nutrients iron, manganese, zinc, copper, boron or molybdenum, hormones may not be absorbed into the plant. Moreover, even less has been written about magnesium salts (usually sulfate) required for general plant health (Morrison 1988). When magnesium deficiency is added to poor root development associated with water stress, the possibilities of hormonal propagation are distinctly limited.

Because of the nature of the entire cultural process, some success may be achieved without optimal conditions, but if propagation is not satisfactory, adjusting the photoperiod, temperature differentiations, water quality and mineral nutrition may result not only in satisfaction, but in the

knowledge that you are contributing to the perpetuation of your own collection and quite possibly to the perpetuation of an endangered species. The almost daily documentation of the destruction of native habitats as well as the recent natural and man-made disasters in Florida and other centers of orchid propagation render the concept of orchid conservation almost obsolete. There are a few notable exceptions, but tax laws, national barriers and the desperation of the rural poor require that rather than preach conservation we should develop techniques of intelligent management of those resources at our command. This is not only the responsibility of professional conservationists but the stewards of every orchid collection, including the modest hobby-grower.

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