

HOW I'VE BEEN GROWING BONSAI INDOORS UNDER FLOURESCENT LIGHT *

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Twenty five years ago, when my first experiments with growing little trees under fluorescent light began, I had one distinct advantage over today's bonsai beginners. At the time, I hadn't read a lot of books and articles making the whole project sound almost impossible.

I hadn't been told you have to mist the foliage regularly. I hadn't been told I'd need a humidifier or cool mist vaporizer. I hadn't been told you have to run a fan to circulate air. I hadn't been told cheap, cool white, fluorescent tubes need to be supplemented with incandescent bulbs. And, I hadn't been told most plants grown indoors still need a cold rest period with temperatures below 50°F. for several weeks each year.

READ THIS CAREFULLY! I am not following today and have not followed any of the procedures listed above. This is not to say some of those practices might not have helped my indoor bonsai grow faster, flower more or look healthier. I don't know. Not being able to offer broader experience, I can only record what has worked "well enough" for me.

When I began hearing then reading that one could grow plants adequately well indoors without special or expensive "grow lights," my winters for ten years had been spent dreaming about bonsai I would grow outdoors come spring and I had a shelf cluttered with attractive little bonsai pots, pots too small to keep anything alive in outdoors with only the once a day attention I was willing to give.

AHA! This might be a way to use those tiny pots and grow bonsai --- and grow as a bonsai enthusiast --- year around. Two small rooted cuttings of pyracantha were brought in from outdoors. The "shop light" was dropped down over my workbench next to the furnace. And the experiment, the indoor fun that continues today, began.

It soon became apparent that fluorescent light bonsai growing offers a number of advantages. It is a very controlled situation with no weather extremes. Trees grow year around so one can practice and make bonsai progress year around. It is great winter therapy available even when it's cold and dark outside. It is good use for those irresistible little pots one tends to accumulate. And, it makes possible growing a surprising number of small bonsai close at hand in a very limited space.

Suppose you are compelled to try fluorescent light bonsai too. What do you need to know? What will you need to do? Actually, a tree's basic requirements are few. Provide light, water, fertilizer, suitable growing medium and protection from extremely hot or extremely cold temperatures and success is highly likely if not guaranteed. Of course, starting with healthy plant material tolerant of indoor growing conditions will be a big boost for your growing project too. Let's discuss each of these issues in turn.

LIGHT. Usually, the first question that arises is "*do I have to use fluorescent light?*" "*Can't I grow my indoor trees near a window?*" Well, yes. Most kinds of plants people grow as indoor bonsai can, if rotated regularly, be grown successfully using only the light from a nearby window. If African violets or other house plants grown for their flowers --- rather than foliage plants which are, generally, more dark tolerant --- survive near your window, growing indoor bonsai in the same location should be no problem.

You can find out what you can do in window light by experimenting. Plants commonly recommended for indoor bonsai will survive well enough. Common plants are common because they are tolerant; they take abuse.

Although some adjustment must take place when trees come in and go out, moving these window bonsai outdoors --- if you want to do that --- during the warm months will strengthen them and increase growth.

Having said you can grow bonsai in window light, I still feel you make it easier for yourself and your indoor trees --- especially if window space is limited --- if you substitute even the most economical kind of fluorescent lighting for window light. The major advantage here is that light availability is very consistent without fluctuations due to extremes of sun and cloudiness; temperatures are more even also.

What you can do is simple enough. A standard four foot, two tube, 40 watt fluorescent unit --- we are talking about the shop light with reflector costing less than \$20 at the local discount store --- is suspended or supported from below in such a way that the tubes are very close to --- almost touching --- the tops of your tallest bonsai. The tubes are cool white, cheaper than most others.

You can't picture this? Imagine two, three-gallon size, plastic, nursery containers upside down on a table, their centers about four feet apart, and the ends of the shop light reflector resting on these containers. You can build supports requiring less space but I've used this nursery pot setup repeatedly when I needed quick extra lighting. Keeping your bonsai close to the tubes is important because the light energy available to plants drops off dramatically moving away from the source. The mistake beginners most often make is not keeping fluorescent light bonsai close enough to the tubes. Although I have fluorescent units mounted at different heights, most are not more than nine inches above the surfaces on which my little bonsai sit.

When I began experimenting with fluorescent light bonsai, I read some U.S. Department of Agriculture publications suggesting 14 to 16 hours of fluorescent light daily is adequate for growing plants indoors. So I thought why not try 16 hours as a compromise. This has worked quite well. I have experimented with longer light periods, but keep coming back to 16 hours.

An economical timer is handy to avoid having to remember to turn your lights on and off. The kind of device some people use to control a light and make their home look lived in when they are away will work.

The publications I read also suggested replacing fluorescent tubes used for growing plants annually if they are on 16 hours a day. The reason for this is that light output diminishes gradually over time. Since light intensity will be increased significantly by fresh tubes, it is best to change one of the tubes in a two-tube unit one day then wait a day or two before changing the second tube to avoid damage to delicate growing tips. This is what I've done.

WATER. My practice has been to check each tree daily --- nothing more than once a day --- to see if it needs water. Those that are dry or becoming dry on the soil surface are watered. Those that are not dry will usually be healthier if they wait another day. Avoid keeping your soil constantly full of water. Not being in strong sun or wind slows the drying of these little trees dramatically compared with the same size pot outdoors. Even so, some species dry much more rapidly than others, Experience will soon tell you which ones get extremely dry --- even to the point of wilting --- in a day if not watered at the first hint of surface drying. At the other extreme are those kinds that dry the soil very slowly and will go several days before the soil mix begins to look dry at all.

Incidentally, a sudden reduction in water use, a sudden slowing of soil drying, by any tree is a warning that it is struggling and this is a time to be very careful in watering. Make sure you let the soil of a weak tree dry between waterings but do not let it stand dry.

Watering of my first few experimental fluorescent light bonsai was done with a spray bottle like some people use in applying cleaner when washing windows. Each tiny tree and its soil were misted thoroughly until water ran through the drain hole. As the indoor bonsai collection grew in number, this process became unacceptably time consuming and my hand got tired. I then found I could water more efficiently using a small watering pitcher with a fine spout.

Unfortunately, the pitcher that functioned well was metal and eventually rusted out. The plastic replacement widely available, about one and a half quart capacity, didn't work nearly

as well because its spout had a much larger opening and the heavier water stream tended to wash soil mix out of little pots. After struggling with this for longer than one likes to admit, the thought occurred that it might be possible to alter this spout to limit the water flow. Ultimately, a small, four-hole, shirt button was secured to the tip of the spout with epoxy. This has worked very well; enough water flow and not too much.

While watering with the mister and later the succession of pitchers, I always held my little trees over an open container to catch the drainage water. One evening when watering more hurriedly than usual I was suddenly inspired to immerse the pot of the tree being watered in the drainage water in an effort to accelerate the process. A few bubbles rose to the surface and as I lifted the tree from the water, I understood immediately that this watering was more thorough and much quicker than what I had been doing with mister and pitchers.

From that day on I began watering all my indoor bonsai by immersing the soil. This went along well for a while, then an accumulation of whitish material began to appear on the soil and the moss of some trees was beginning to die. Thinking about this a bit, I concluded that minerals (salts) the trees couldn't use were probably beginning to accumulate since they were not being leached, or flushed away by running water through the soil. And, if I didn't begin leaching again my trees might suffer.

Rather than discontinue watering by dipping, what I began doing was to dip then follow up with a very weak fertilizer solution applied with the modified watering pitcher thus leaching and fertilizing at the same time. This is what I still do. This fertilizing process will be described in more detail below.

It seems important to note here that although I've gotten by using our town's very hard, well water on my outdoor bonsai, I use soft water indoors. This is not water that has been treated by a water softener. In the past, during the humid months, we have run a dehumidifier in our basement. The mineral free water it collected was used in watering the indoor bonsai. More recently, I've found that water discharged from our new central heating and air-cooling equipment works fine too. When water released by combustion and air conditioning processes runs low, rainwater caught in a large trash container set under the eaves is carried to the basement to water the indoor bonsai. Snow also has been brought in occasionally and the melt water used.

This is not to suggest that you can't get by watering indoors with hard water. I am convinced you can. It's just more difficult and regular leaching becomes more important.

Note: To water freshly potted trees without washing all the soil mix away, a basting syringe or similar bulb syringe works very well until enough roots have grown to secure the soil mix when dipping.

FERTILIZER. Of course trees do not rely on fertilizers, so-called "plant foods," as energy sources. Their energy, held in the tree as carbohydrate, comes directly from the sun. Typically soil, decomposing organic matter and fertilizer are the sources for plants of some 20 mineral elements (nutrient elements) now considered essential to their health. Use of soil-less mixes to grow our bonsai makes regular fertilizer application essential.

My indoor fertilizing practice has been intentionally kept simple. I have used commercial fertilizers such as Miracid, Miraclegro, Peters 20-20-20 or Rapid-gro in very dilute solution applied almost every watering year around. When in a big hurry, an application may be skipped. This fertilizer solution is made up five gallons at a time by adding one level teaspoon of fertilizer to five gallons of water; so the concentration is one-fifth teaspoon per gallon.

After watering well, some of this weak fertilizer solution is run through the soil. So, as stated earlier, this process leaches and fertilizes at the same time. One caution. Experience shows that even this weak solution can do a lot of damage to some trees when applied on dry soil. Make sure you water first then apply the fertilizer. However, fertilizing with this weak solution can be done immediately after watering without damage.

I do not fertilize newly potted or repotted trees until they begin to produce new foliage. I also withhold fertilizer from sick trees since it seems to do more harm than good.

GROWING MEDIUM. Most people who persist as bonsai growers agree that choice of soil mix, "growing medium" if you prefer, is very important. But then confusion arises. Beyond the general principles that wonderful garden soil is inadequate in a pot and high porosity coupled with good moisture retention are desirable, we don't agree on what to do.

A bonsai growing doctor tells me that in medicine when many different remedies are being used in treating a problem you can be sure none of them work well. Makes one think.

This is certainly not the last word on soil mix. It is merely a statement of what I've been doing. Actually, this is going to sound suspiciously like the old story of the college professor who confided to a colleague that he'd used the same test questions without change for thirty years. His astounded friend was compelled to ask, "*Didn't your students catch on?*" The professor's response was, "*No, I just changed the answers.*"

The mix I used longest and felt very comfortable with was one part, by volume, starter chicken grit (small particles of granite) available at stores dealing in livestock feed, two parts sphagnum peat (not sphagnum moss) available in bales at our local garden centers and three parts baked clay. Baked clay?

Early in my experiments, the baked clay was clay cat litter. I soon discovered clay cat litter can be quite variable and that it was necessary to put a handful of the material in a jar of water and shake it up to see if the particles disintegrated before using it in my soil mix. What I wanted were stable particles that did not turn into mud when wetted.

I have also used with success several of the baked clay products sold for scattering on floors to soak up oil and grease where automobiles are repaired. Again, these products are somewhat variable and it is good to shake a sample in water before incorporating the material in one's soil mix.

Although more expensive, the baked clay I use now is the product Turface used in constructing golf greens and athletic fields. I have not had a problem with Turface particles disintegrating. I buy the particle size now labeled "MVP" and screen this over an eight-mesh screen (eight openings per inch). Material retained on the screen goes into a coarser mix used for large trees outdoors and for a drainage layer in a few of my bigger indoor bonsai containers. Turface passing through the eight-mesh screen and retained on window screen (sixteen-mesh) is what I use in my "regular" 1-2-3 indoor mix.

Even though the starter chicken grit particles are mostly a good size, screening them over window screen eliminates some dust.

The sphagnum peat is whisk-broomed through a four-mesh screen to break up clumps and remove larger chunks of debris. Then it is shaken through a five-mesh screen to separate the useful material into two sizes. Larger peat particles passing the four-mesh and retained on the five-mesh screen are used --- with the larger Turface --- in my coarse mix. It is peat that passes the five-mesh screen then is retained on a sixteen-mesh screen, used to remove fines and dust, that goes into regular, 1-2-3, indoor mix.

After screening, the three ingredients --- grit, peat, and clay in 1-2-3 proportions --- are then blended until the mix looks uniform. Too much mixing just generates more dust. In recent years, tiring of screening peat and feeling that a faster drying mix might be superior to the 1-2-3 ratio, I have experimented with a 1 part grit, 1 part peat, 3 parts clay mix and been very happy with it. At one time, I experimented with a peatless mix of 1 part grit: 3 parts baked clay then gave it up because it dried too quickly. Most recently, I have begun trial use of a mix of 1 part grit, 1 part peat, and 4 parts clay. It is still too early to say how this is working out.

No matter what ingredients one chooses, screening them over sixteen-mesh screen to eliminate fine particles and dust, thus opening up the spaces between the larger particles, should always be beneficial.

If you are wondering how different in water retention and aeration after watering your soil mix is from my 1-2-3 mix, there is a quick way to make some comparisons. All you will need are a measuring cup of water and an eight-ounce foam cup completely full of your dry soil mix. From the measuring cup, add water slowly to your soil mix until you have filled all the space between and within the particles. Note the amount of water used. Compare this figure with water

amounts ranging from 4.25 to 4.75 ounces required to fill the space in the same quantity of my 1-2-3 mix.

Now, holding the foam cup --- full of water and soil mix --- over the measuring cup, slash the bottom edge in several places so water can drain freely. Note the amount of drainage collected. Compare this number with 0.85 to 1.24 ounces of drainage from my mix.

Not being able to add at least 4 ounces of water to 8 ounces of soil is reason to be skeptical. Drainage amounts much less than 0.75 or much more than 1.25 ounces are also questionable.

TEMPERATURES. I am often asked what temperature I maintain in the basement where I grow my indoor bonsai. Actually, this temperature changes slowly in response to outdoor temperatures. In periods of extended warm weather, it has risen as high as 84°F. Extended cold results in a chilly basement with temperatures in the 64°F to 66°F range. I have not been particularly conscious of growing problems at either temperature extreme. However, repotting warm climate plants during the warm season does seem to work better than repotting during cold months.

KINDS OF TREES, Theoretically any tree, shrub or vine that doesn't require a cold, dormant period to thrive is a possibility. I have personally experimented with plants from more than three dozen genera growing them as bonsai indoors year around with no outdoor vacations. In doing this, it was soon apparent that some are easier to keep healthy than others. Generally the easier ones are those mentioned most often as indoor material in bonsai books and magazines.

Some personal favorites, kinds I have found very rewarding, are dwarf forms of boxwood (*Buxus* spp.); small-leaved kinds of cotoneaster (*Cotoneaster* spp.); figs (*Ficus* spp.), especially creeping fig (*Ficus pumila*); Greek myrtle (*Myrtus communis*), especially the dwarf form (*Myrtus communis* 'Compacta'); firethorns (*Pyracantha* spp.), especially the dwarf variety 'Teton'; azaleas (*Rhododendron* spp.), especially 'Hino Crimson'; Chinese sweetplums (*Sageretia theezans*); and serissas (*Serissa* spp.), especially some of the snow-rose clones.

Also, do not ignore small-leaved clones of English ivy (*Hedera helix*) They are exceedingly difficult to kill, cuttings are guaranteed to root and nice trunks develop much more quickly than most people expect.

Now, how about needle evergreens as fluorescent light bonsai? I have heard again and again that junipers (*Juniperus* spp.) cannot be grown indoors for any length of time. I know that even if I swear here that my two oldest indoor junipers have grown inside under cool white fluorescent light for 21 and 19 years respectively with no outdoor vacations, there will be those who read this and continue to assure their friends that it cannot be done. Admittedly juniper growth is slow under fluorescent light, but they survive and are healthy.

I am convinced that most people, trying to be nice to their trees, over water junipers indoors. Let the soil surface of the established juniper get definitely dry between waterings. Incidentally, boxwoods, cotoneasters and serissas respond well to this treatment too; most azaleas also in my experience.

Other needle evergreens that have done well for me indoors under fluorescent light are true cypresses (*Cupressus* spp.), false cypresses (*Chamaecyparis* spp.), and surprisingly, little gem Norway spruce (*Picea abies* 'Little Gem').

Now, some kinds tried indoors which lived for a while but gradually declined, seeming to need a cold dormant period and/or changing day length, must be noted here too. They are pines (*Pinus* spp.), maples (*Acer* spp.), quince (*Chaenomeles* spp.) and spirea (*Spiraea* spp.).

I suggest that you make an effort to get some of the kinds of trees I've especially enjoyed, but be adventurous and experiment too. The more species you try, the more fun you will have, and ultimately you will have more bonsai too.

OTHER ISSUES. We need to talk about clear "plastic," actually polyethylene, bags. Caution! Do not put a plant enclosed in a poly bag in direct sun. It can get very hot, what

scientists call the greenhouse effect. However, the same poly bag --- I use Baggies purchased at the local supermarket --- can be very useful to the fluorescent light horticulturist because this light doesn't cause the extreme heating inside the bag that sunlight does.

My understanding is that there are microscopic pores in these bags, pores small enough to prevent water molecules from escaping yet large enough to allow oxygen and carbon dioxide exchange between air inside and outside the bag. A bonsai enclosed in one of these bags cannot dry out. The humidity inside is 100 percent. After watering thoroughly, I enclose any newly potted or repotted tree in a poly bag. The bag is dropped over the tree and its pot then folded underneath the pot so the bonsai is completely enclosed. This gives the disturbed tree time to make internal adjustments in a relatively stress free environment.

I usually leave the tree bagged under the fluorescent light about a week, not much longer. Swelling buds and new growth are signals that it is time for the tree to come out. This abrupt change from extremely moist to drier air can be quite a shock to a weak plant. What I do to ease the transition --- I call it programmed re-entry --- is to remove the poly bag for just half an hour the first day I take it off. In the case of an unusually sensitive or weak tree, this first outing may be only 15 minutes. Then next day the bag is taken off twice as long. The next day the out time is doubled again. This doubling each day continues until the tree is out for eight hours. When the tree comes out the next day, it stays out, usually without curling a leaf.

The same technique can be used during vacations. Before I accumulated too many indoor bonsai for it to be practical, I watered my trees well, bagged them and left them under the fluorescent lights for as long as two weeks without problems. Well, some trees did die when I pulled the bags off before I realized it was necessary to go through the programmed re-entry again.

How often do I repot my indoor bonsai? I've let some trees go as long as six years between repottings and some of them died. My goal now is to repot on a two or, at the most, three-year cycle because it seems less stress on the bonsai.

Dean Bull's "The Capillary Siphon" article --- BCI Magazine, Vol. 31, No. 57, Sep-Oct 1992 --- opened my eyes. His suggestion was to use cord from a rayon mop head as a drainage wick. Somehow, Dean's idea had not occurred to me. This certainly would be simpler and probably more effective than techniques I'd tried in an effort to pull water from wet-standing pots to save weak and dying bonsai. The first cord mop head I found was cotton and not nearly as active in wicking as I expected. So I went back for a rayon mop head and did find its strings wick much better.

Using curved tweezers, I push about 3/4 inch or so of mop string, depending on pot size, through the waterlogged pot's drain hole and past the screen covering the drain hole so the string's end lies in that very wet zone where soil mix rests on the pot floor. The rest of the foot or two of cord runs to the table edge and hangs over. Water from the saturated layer runs down the wick quickly. This leaves the soil above moist but with much more of its pore space air-filled so the tree's roots are not suffocating for lack of oxygen.

This is in contrast to the sick tree standing abnormally long in water-logged soil because being weak it is not using much water, and because roots need oxygen to be efficient in taking up water even though it is all around them. Remember that soil physicists tell us oxygen diffuses 10,000 times faster through air than through water! Better set a container beneath the dangling string if you don't want a puddle there. I call these mop strings "bonsai life savers." I am sure they saved the lives of several weak trees for me.

If you are a beginner and have read this far without being too intimidated, finish this article and go get yourself some plants --- more than a few --- that you don't have too much invested in monetarily and emotionally, then start your own experiment to find out what it takes for you to keep them alive. Oh yes. If you really want to grow bonsai under fluorescent light or any other way, don't give up too easily!

* This text is an update of Jack's "*Growing Fluorescent Light Bonsai as Winter Therapy*" article published in: International Bonsai, Issue No. 4, 1996; and in Bonsai [British], Issue No. 34, Summer, 1997.

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