POTOMAC
BONSAI
ASSOCIATION
Newsletter
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CALENDAR OF EVENTS

HOLIDAY GREETINGS

MERRY CHRISTMAS

HAPPY HANUKKAH

6 December Satruday — NORTHERN VIRGINIA (703) 938-0683. Note changes in time and place for the December meeting which will be an evening dinner at the Tachibana restaurant on Lee Highway. For more info call the above number.

18 December Thursday — BROOKSIDE (301) 774-9028 Sligo Urban Recreation Center, 500 Sligo Avenue, Silver Spring, MD. NO BEGINNERS' COURSE. 7:30 p.m. ANNUAL HOLIDAYS PROGRAM - slides or movies on bonsai. Bring a bonsai or related gift for exchange, viz. starter plants, pots, stands, scrolls, rocks, tools, books,- in other words items you have seen at previous meetings. Eggnog and goodies will be served.

For information on the following clubs telephone numbers to call are: ANNAPOLIS (301) 263-3995; BALTIMORE (301) 669-1487; BOWIE - Jim Sullivan at work 496-5195 or at home 262-9633; KIYOMIZU (301) 423-8230; WASHINGTON (202) 583-2676.

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ARBOR HOUSE

The ARBOR HOUSE is the name of the log-cabin which serves in part as the gift house for the U. S. National Aroboretum.

Volunteers are needed to help in the gift house. If you are unaware of what is sold in the gift house, it should be of interest to you to know that included in the items stocked by the gift shop are bonsai books, tools and pots. Be one of the first in-line to peruse new shipments of articles for sale including the pots. The gift shop has an excellent source for pots and once a shipment is on the shelves, it moves very fast.

Interested parties please contact the following person for more information:

Nelly Greves
Staffing Chairman of the National Capital
Area Federation of Garden Clubs
Telephone: 836-5871

FERTILIZING BONSAI

This article is in a sense, a wrap-up of what information has surfaced since the article titled "ORGANIC FERTILIZER" appeared in the May 1986 issue of the PBA Newsletter and another - "PLANT NUTRIENTS" in the September 1986 issue.

At the BONSAI DESIGN SYMPOSIUM held by International Bonsai last September, Bill Valavanis who organized and ran the symposium, briefly described what he has concluded from his experimenting with a bonsai fertilization regimen. He allowed that he had witheld advocating the new procedures until his experimenting verified their practicability. Bill indicated that there would be article on what he has come up with in a forthcoming issue of his excellent bonsai magazine "INTERNATIONAL BONSAI". (A yearly subscription for 4 of the magazine published quarterly can be obtained by sending $ 20.00 to THE INTERNATIONAL BONSAI ARBORETUM, William N. Valvanis, Publisher and Editior, 412 Pinnacle Road, Rochester, NY 14623.)

At present there are a large number of bonsaiists using soil mixtures which contain almost none if any nutrients. A soil mix which I use consists of Terra Green and Gran-I-Grits (fired clay and crushed granite chips) in varying proportions. As is evident using such ingredients, there is no likelihood that diseases and harmful parasites such as nematodes found in soils taken from the earth, will attack your plants'root systems and cause their eventual demise. Furthermore, I have yet to find any natural soil that is coarse enough so that water does not remain trapped in the soil and cause root-rot. The end result for me and others who use a mix of fired clay pellets and crushed granite, is that some procedures for fertilizing the bonsai must be adapted which is consistent with the lack of nourishment in the soil mix. (As pointed out by a horticulturist who took it upon himself to research a number of bonsai books to ascertain what is considered THE ideal bonsai mix, that no two books agreed as to what is or are proper bonsai soil mixtures. In fact ask other bonsai club members and not two will agree on soil mixes.)

In brief, what Bill Valavanis has determined is that a vigorous feeding schedule for your bonsai will keep them looking healthy with new growth and good color in the foliage. Heretofore, my general impression was that one should use a liquid fertilizer at maybe even one-half strength every two weeks. On the other hand if you prefered using fertilizer dumplings or balls,- replacing them once a month is satifactory. What Bill Valavanis has found is that the bonsai can take a heavier feeding schedule, i.e. the appplication of liquid fedrtilizer in conjunction with fertilizer balls.

THE IMPORTANT POINT IS THAT ONCE THE FEEDING SCHEDULE HAS BEEN STARTED IT SHOULD NOT BE INTERRUPTED. It is inviting disaster especially if you do not feed in the latter part of the Summer and then feed in September or thereabouts. The tree will be jarred into trying to produce growth due to the shot of fertilizer

and the sudden spurt of energy will weaken the tree so that it will not be able to adjust to going dormant. The tree will be more likely to expire.

The feeding schedule begins in the Spring when new growth starts to appear. It ends just before the trees are to become dormant and to be put away for the Winter. (A word of caution for people with indoor bonsai, - see Paul Lesniewicz's book "INDOOR BONSAI" to find out about feeding your species of indoor tree over the Winter.) The feeding rate is as follows:

Liquid fertilizer - full strength once per week.

Fertilizer balls - change once per month

The liquid fertilizer is fed once per week because daily waterings quickly leach out the nutrients left by the liquid fertilizer. Bill Valavanis suggests that you might alternate between brands of liquid fertilizer. As pointed out in the article Plant Nutrients, brand name powders for making liquid fertilizers besides the standard content (NPK or nitrogen, phosphorous or potassium) have different makeups of macro and micro-nutrients,- one brand may contain some that are not found in another brand. Hence varying between two or more brands of fertilizer may insure that a more complete spectrum of macro and micronutrients is fed to your plants.

Fertilizer balls are basically suppliers of NPK. John Y. Naka"s suggestion for making the balls is to mix while dry one-part blood meal, two-parts cottonseed meal, and one-part bonemeal (the latter especially for flowering plants). The mixture is kneaded with water until it reaches a consistency such that it can be rolled or worked into a ball. It is usually wise to have added some drops of malathion to the water to prevent maggots from developing in the balls. The balls must be allowed to dry (about 2 weeks) before they are ready for placement on the soil of a bonsai pot. Daily waterings will slowly leach the nutrients from the fertilizer balls and transfer them to the soil and root systems. The Japanese recommend removing the fertilizer balls every month so that they do not disintegrate and thereby clog up the soil mix, destroy the soil-mix porosity, and induce root rot and bacterial growth (fungi). The replacement fertilizer balls should be spotted on the soil in a different place from where the balls that were removed had rested. This will give more even distribution of the fertilizing action around the root system. The balls are placed inboard of the periphery of the pot and as far away as possible from the trunk of the tree. The fertilizer balls which have been removed after about one month of sitting on the surface of the soil of the bonsai pot, can be distributed around plants in the garden to fully wear out their usefulness.

Following Pete Jones lead (the article "ORGANIC FERTILIZER" in the May 1986 isse of the Newsletter), a visit was made to The Organic Garden and Herb Shop, 7030 Carroll Ave., Takoma Park, proprietor Mr. Norman Bernhardt, telephone (301) 270-4111. Some substitutes for blood meal, cottonseed meal and bone meal were purchased- i.e. respectively Nitro 10, Soft Phosphate and Green Sand. A comparison of their NPK values is listed below:

NITROGEN (only)

Dried blood meal - NPK= 11-0-0, up to 11% nitrogen with a faster release than Nitro 10.

Nitro 10 - NPK= 10-0-0 with slow, gentle release of fertilizer into soil.

PHOSPHATE (only)

Colloidal or Soft Phosphate - NPK=0-22-0, up to 22% plus trace elements.

NITROGEN plus PHOSPHATE plus POTASSIUM

Cottonseed Meal - NPK= 6-2-1, great for acid loving plants.

NITROGEN plus PHOSPHATE

Bone Meal - NPK= 0-30-0, up to 30% phosphorous, reduces acidity.

POTASSIUM

Greensand - NPK= 0-0-7, 7% potash plus 22 other elements.

The procedure for making fertilizer balls was followed using instead of blood meal, cottonseed meal and bone meal, equal parts of NItro 10, soft phosphate and greensand dry mixed and then made into fertilizer balls using water without malathion or sevin added. The results were quite rewarding in that the Nitro 10-plus fertilizer balls had the following advantages over the blood meal-plus balls:-

Drying time was reduced to about 3 days vice two weeks.
The vile smell that accompanies the blood meal balls is not present with the Nitro 10 balls.
Squirrels do not bother the Nitro 10 balls.
Nitro 10 balls have potash in them which is more than the almost insignificant amount in the blood meal balls.

The last comment above surprised me in that so little potassium or potash was supplied in the blood meal-balls. The previous article "PLANT NUTRIENTS" indicated that plants need potassium in large amounts especially if they are receiving nitrogen and phophorous in higher amounts than the potash. Hence, for those bonsaiists using the blood-meal balls, potash in the form of hardwood ashes can be sprinkled on the surfaces of the bonsai soil.

To add confusion to what seems to be an area of uncertainty in that whatever fertilizer technique one uses to keep bonsai happy, there is the subject of using liquified seaweed as a foliar spray. The following is a copy of the advertising brochure MaxiCrop and Foliar Feeding which is concerned with the benefits purportedly derived from the use of the item named MaxiCrop.

Maxicrop and foliar feeding

Foliar feeding was discovered in 1844 and introduced some twenty years ago, when it was held by some people as a revolutionary

method of fertilization, which would replace all established methods of plant nutrition. The more realistic persons made less spectacular claims for this new technique and have been rewarded by seeing foliar feeding become an established part of crop husbandry, being complimentary rather than replacing established base fertilization, pest and disease control techniques.

This booklet sets out to explain what foliar feeding is, what foliar feeds contain, and the reasons why they have become useful, established products.

What foliar feeding is

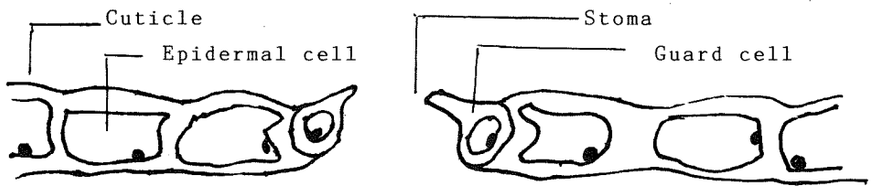
Foliar feeding is a method by which plant nutrients are supplied to the plant via the leaves, rather than the roots.

It was originally observed as early as the 1880's that plant metabolites could be leached from the leaves by rain. And so it was proposed that if plant substances could move out of the leaf, could they not equally, simply move in the reverse direction, that is, into the leaf

Studies with fluorescent materials, which act as dyes, and radio-active tracers enabled research workers to follow the passage of plant nutrients through the leaves and into the plant system, and also to determine the rate at which they travel. In this way the absorption of nutrients by the leaves has been established. These techniques not only showed that plants can absorb nutrients through their leaves, but also gave an indication of the rate at which nutrients are absorbed therein.

Work using apples and beans shows that significant absorption takes place within as little as ten minutes after applicaion and that after thirty minutes an appreciable amount of the substances sprayed on the leaf have been absorbed.

There appears to be no conclusive evidence as to the manner in which nutrients enter the leaf. Entry is thought to be possible by two routes. One is through the imperforated cuticle and an alternative through breaks in the cuticle, such as the stomata and the hydathodes.



Epidermal layer of a diagrammatic leaf.

The upper and lower surfaces of leaves are covered initially by single layers of flattened epidermal cells. The main purpose of these cells is protection. The epidermis - this layer of epidermal cells - is so thin that transpiration can take place through it, but before the leaf is very old a layer of the substance called cutin forms over the surface of the leaf and prevents further transpiration. This continuous covering of

cutin, which is a resistant fatty material, renders the outer walls of the leaves more or less water and gas tight. Very often the cuticle is coated with wax which increases this water and gas resistance. This wax is present to a high degree in evergreens and gives these leaves their characteristic shiny appearance.

It is thought that plant nutrients sprayed onto the leaf might be absorbed to some extent through this treble protective layer - first the wax, then the cuticle , and then the epidermal cells. This could occur by the process of diffusion if this protective layer exhibits a degree of permeability. Permeable membranes are those which allow certain materials to pass through them. This occurs when such materials are present in greater concentrations on one side than on the other; then they pass through to the side in which they are present in less concentration. It is possible that this is one way in which plant nutrients could be absorbed by the leaf.

However, it is more likely that nutrients are absorbed through natural breaks in the leaf. The most common of these are the stomata, which are slit-like openings between two guard cells. The guard cells enable the stomata to be opened and closed. The purpose of the stomata is gaseous interchange; carbon dioxide finds its way into the leaf via the stomata and oxygen finds its way out of the leaf via the stomata. It has been suggested that the plant nutrients could find their way into the leaf through the stomata, but there is one obstacle in the path of this argument. This is that the guard cells which surround the stomata are so shaped as to make the entry of water impossible unless it is forced in under pressure. The guard cells give the stomata such a shape that drops of water are unable to pass through. If it were the case that plant nutrients were being absorbed by the stomata, then anything which reduced the size of the water droplets should increase the absorption of the foliar nutrients. However, research workers are still debating whether or not this is the case. One piece of supporting evidence comes from the use of ultra-low volume sprayers which use very fine droplets and seem to be the most effective method of applying foliar feeds.

There are other natural openings in the leaf, for example, the hydathodes which are water secreting glands and which are present on the edges and tips of the leaves. However, these are not present as frequently as stomata and not nearly in sufficient quantities to be the route for the considerable absorption of foliar sprays that takes place.

So the mechanism by which foliar nutrients are absorbed remains something of a mystery. What is known, however, is that they are absorbed and that they are absorbed quickly.

Despite the paucity of fundamental understanding, a considerable amount is known about the absorption of various nutrients. For

instance, urea nitrogen is absorbed, transported, and metabolized as quickly as any plant nutrient. Uptake of urea is most rapid at night or in the early morning - this could be due to the higher relative humidity of the air at this time. The elements sulphur, chlorine, and iodine are known to be very rapidly absorbed. Whereas the rate of absorption of magnesium varies during the day, and it is better absorbed at night. Magnesium, calcium, strontium, and beryllium have a rapid initial absorption, but this is followed by the failure of the plant to absorb anymore. Iron, manganese, zinc, copper, molybdenum, and cobalt act in the same way. This is thought to be because these elements have limited mobility within the plant and become accumulated in the leaf, thus precluding further absorption. Cobalt is only absorbed under the action of light and in the presence of sugars.

In more general terms absorption rates are greater for young leaves than for older leaves and usually absorption is greater on the underside of the leaf than on the exposed surface. (HENCE SPRAY SHOULD HIT THE UNDERSURFACES OF THE FOLIAGE.)

Finally, it should be mentioned that urea, potassium, phosphorous, sulphur, and iron have all been shown to be absorbed through the bark of deciduous fruit trees, and zinc has also been shown to be absorbed through the bark of citrus trees. It would appear that the leaf is not the only area which is capable of absorbing foliar nutrients.

What foliar feeds contain

1 NPK

Only in specific instances are foliar applications of NPK mixtures to be recommended. H. S. Wittwer of the Department of Horticulture at Michigan State University has said categorically 'Foliar application of most commercially available NPK mixtures is an expensive and unnecessary operation for most crops'. NPK can be much more cheaply applied as a base dressing and when given in a foliar feed may well diminish the absorption of the more important constituents of the foliar feed. All proprietory foliar feeds sold in this country, apart from Maxicrop, contain large proportions of NPK.

It must be emphasized, however, that in certain situations foliar applications of NPK are of extreme benefit. The obvious example of this is in hydroponically grown crops, the most common of which is tomatoes. Another example in the use of high nitrogen foliar sprays is on apples to build up nitrogen reserves in order to ensure good bud development for next spring and to reduce scab. However, these are isolated cases.

2 Trace elements

These are the major constituents of most foliar feed and are the plant nutrients which are economic to administer by foliar feeding. Trace elements are acquired by the plant more widely than most people realize. Magnesium, calcium, sulphur, iron,

boron, manganese, molybdenum, zinc, and copper all have known roles within the plant, but many more trace elements may be found in plants and although deficiencies cannot be seen in gross terms in the absence of these elements, it would appear that they are necessary for the health, vigour, and maximum production of any plant. So any really effective foliar feed must attempt to supply as many trace elements as possible.

But the trace elements in the foliar feed must be present in the right proprtions , since an excess of one trace element can inhibit the absorption of the other trace elements.

One of the advantages of making a foliar feed with a soluble solution of seaweed is that not only does one obtain a complete range of trace elements - 55 in all -but these trace elements are present in the proportions in which they are found in the plants and thus this is the ideal proportion for absorption.

The role of trace elements within the plant is varied and complex. In general terms they are primarily involved as constituents of complex chemicals known as enzymes. Enzymes are catalysts which speed up the vast number different chemical reactions that are involved in plant growth and development, including respiration, transpiration, starch synthesis, etc. They are also involved in the hormones which contol the various processes which go on within the plant and they have individual roles of their own, very often of fundamental importance to the plants. The role of trace elements and the deficiency thattheir absence causes have been described more fully in our booklet "Maxicrop and Trace Elements".

3 Hormones

Most foliar feeds contain small but significant amounts of growth hormones.. Maxicrop contains both auxins and gibberillins. In Maxicrop a range of growth hormones are present which are preserved in the extraction process. Work at Aberdeen University showed that these growth promoting substances are effective at 1:100,000 dilution. One of these compounds, for example, stimulates and maintains growth of the stem and the root. Another, indoleactic acid , starts growth in both the root and stem. The hormone gibberellin, for example, has been shown to be important in barley and other cereals in stimulating the synthesis of certain hydrolytic enzymes. But above all, the effect of the auxins and gibberellins is to increase the growth of the plant as long as they are not administered in excessive amounts.

4 Sugars and organic acids.

Maxicrop is unique as a foliar feed in that it contains a wide range of organic compounds variously classed as sugars, mannuronic, and other organic acids, etc. The sugars and organic acids are especially important in that they have what is known as a chelating property together with the trace elements. In their commonly occuring form trace elements are poorly absorbable by the plant, but the sugars and organic acids in the liquid extract of seaweed associate themselves with the trace elements to make them proportionately more absorbable by the plant.

These organic substances also have the property of wetting agents, that is they reduce the droplet size of the carrying solution. It will be remembered from the discussion on the mechanism of foliar feeding that one of the factors against the theory that foliar feeds are absorbed through the stomata is that the guard cells of the stomata are so arranged that normal droplets are unable to enter via this route. The ability of the organic substances in the Maxicrop to reduce droplet size could be of considerable aid to absorption.

What foliar feeds do

Foliar feeds have a wide and diverse range of activities and we intend to look at them separately.

1 Increase in yield. The main reason given to a crop is, of course, to increase the yield. Foliar feeds do increase yields. It is difficult to generalize quoting figures, but in almost all crops economic increases in yields are seen. That is to say, the use of foliar feed is profitable.

The main effect on yield is thought to be due to the effect of the trace elementss. Just as plants are unable to absorb from the soil, under normal conditions, sufficient NPK to achieve maximum yields, likewise they are unable to absorb sufficient amounts of the trace elements. By supplying trace elements via the leaves, one increases the crop carrying ability of the plant, whatever it may be.

2 Improved quality. Foliar feeds have been observed to increase the quality of a wide range of crops on which they are used. Quality in most cases is difficult to define, but in crops like soft fruit and apples, improved quality is seen as a better skin finish, more even size, a better color, and an improved flavor.

3 Increased resistance to pests and disease. One of the surprising things to come out of the use of foliar feeds containing trace metals was the observation that they reduced the incidence of pest and disease infestations on a wide range of crops. Experiments using Maxicrop have demonstrated this effect upon such diverse conditions as powdery mildew in turnips, botrytis in strawberries, damping-off in seedlings, and black bean aphid attack on broad bean plants. Subsequent work done by M. D. Austin has also shown significant effects upon the fruit tree red spider mite and upon glasshouse red spider mite. This, and a vast amount of other work, seems to suggest a general inhibitory effect of Maxicrop against pests and disease. At the moment the mechanism is not understood. But perhaps in general terms the foliar feed not only increases the health and vigor of the plant, but also increases its ability to resist by stimulating its natural defenses against pest attack and disease infection.

4 Chemical fertilizer utilization. Observations, now supported by work done in several Universities, mainly in Russia, have shown that the use of foliar applications of trace elements increases the amount of NOK the plant takes up from its root medium. In other words foliar feeds have been shown to increase the amounts of NPK that the plants absorb through their roots and to increase the

efficiency with which they utilize the chemical fertilizers offered to them in the soil. This has a practical application, for it has been demonstrated that cereal farmers are able to reduce their NPK applications and substitute for them in part, with a Maxicrop spray applied at the same time as weedkillers. They had observed increases in yields at no extra cost, but with reduced NPK applications. In view of the various estimates of nitrogen leaching from the soil - from 40% to 80% - this is an economic use of Maxicrop as a foliar feed.

5 Storage life. The storage life of crops, which are not immediately sent to market on harvesting, is of vital importance to the grower, who is is interested in getting maximum prices for his crop. Foliar feeds have been seen to increase storage life on a wide range of crops. At Clemson College, South Carolina, it was discovered that the use of Maxicrop foliar feed applied during the growing season increases the storage life of peaches. This effect has also been noted in England, notably with apples and strawberries.

6 Maxicrop and other sprays. Maxicrop can be mixed with almost all other sprays, which greatly reduces the cost of its application. An added benefit of using a foliar feed in conjunction with weedkiller is that the foliar feed offsets the set-back to growth inevitably incurred by the crop on the application of the weedkiller.

Below is tabulated the trace minerals and elements in an analysis of the content of a liquid seaweed foliar feed. (All figures given in percent.)

Ag Silver	.00004	Ga Gallium	Trace	Pd Palladium	Trace
Al Aluminum	.193000	Ge Germanium	.000005	Pl Platinum	Trace
Au Gold	.000006	H Hydrogen	Undeclared	Ra Radium	Trace
B Boron	.019400	Hg Mercury	.000190	Rb Rubidium	.000005
Ba Barium	.001276	I Iodine	.062400	Rh Rhodium	Trace
Be Beryillum	Trace	Id Indium	Trace	S Sulphur	1.564200
Bi Bismuth	Trace	Ir Iridium	Trace	Se Selenium	.000043
Be Bromine	Trace	K Potassium	1.280000	Sb Antimony	.000142
C Carbon	Undeclared	La Lanthum	.000019	Sl Silicon	.164200
Ca Calcium	1.904000	Li Lithium	.000007	Sn Tin	.000006
Cb Niobium	Trace	Mg Magnesium	.213000	Sr Strontium	.074876
Cd Cadmium	Trace	Mn Manganese	.123500	Te Tellurium	Trace
Ce Cerium	Trace	Mo Molybdenum	.001592	Th Thorium	Trace
Cl Chlorine	3.680000	N Nitrogen	1.467000	Ti Titanium	.000012
Co Cobalt	.001227	Na Sodium	4,180000	Tl Thallium	.000293
Cr Chromium	Trace	Ni Nickel	.003500	U Uranium	.000004
Cs Caesium	Trace	O Oxygen	Undeclared	V Vanadium	.000531
Cu Copper	.000635	Os Osmium	Trace	W Tungsten	.000033
F Fluorine	.032650	P Phosphorous	.211000	Zn Zinc	.003516
Fe Iron	.089560	Pb Lead	.000014	Zr Zirconium	Trace

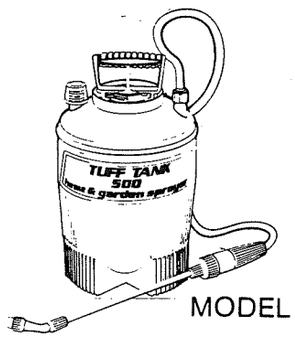
COMPONENTS		CARBOHYDRATES		VITAMINS
Protein	5.7%	Mannit	4.2%	A - B1 - B2 - B12
Fat	2.6	Alginic	26.7	C - D - E - K
Fibre	7.0	Methylpentosans	7.0	Riboflavin - Niacin
N. free extract matter	58.6	Laminarin	9.3	Choline - Carotene
Moisture	10.7	Undefined sugars	14.4	Pantothene
Ash	15.4			
	100.0%			

The above breakdown of the makeup of a liquid seaweed foliar feed may not be of intense interest to the readers but by the sheer size of the list, one should be impressed.

My bonsai have been tucked away for winter storage and I must say that they do look healthier than they have in the past. I'm attributing this to my using fertilizer balls of Nitro-10, Colloidal Phosphate and Greensand with a foliar feeding of seaweed every 2 to 3 weeks plus feedings of liquid fertilizer interspersed about once per week between the foliar feedings of the liquid seaweed fertilizer.

Now that there wont be too much to do with the outdoor bonsai, a good occupation will be to make fertilizer balls. I'm going to make some from blood meal, cottonseed meal and bone meal and another batch using Nitro-10, Colloidal Phosphate and Greensand. I'l try them on separate plants. Either fertilizer balls will take care of the NPK requiremnet. However there still remains another question to answer,- how to supply the macro and micro nutrients. Using the Bill Valavanis way- supplementing fertilizer balls with liquid fertilizers, one not only puts more NPK into the soil in the bonsai pot but also by alternating between 2 or more liquid fertilizer brands, different macro and micro nutrients present in various manufacturers' products will take care of supplying some but not all of the micro and macro nutrients. Now I'm faced with more options,- using liquid fertilizers and thereby increasing the amounts of NPK or going strictly with a liquid seaweed foliar feeding,- each are supposed to be applied once per week. Well, with all the combinations that can be tried, next year's growing season should be an interesting one.

While on the subject of foliar feeding and fertilizer balls, here's some things that may be of interest. I finally bit the bullet recently and splurged a little under $15.00 on tank garden sprayer. It is to be used not only to apply the liquid seaweed to the foliage but also insceticides. At first I was apprehensive in purchasing a plastic tank sprayer since past experience has always shown metal items to be more durable. To my surprise not only is the TUFF TANK sprayer well-made but it is also designed so that you can easily disassemble it and put it back togehter again without mis -



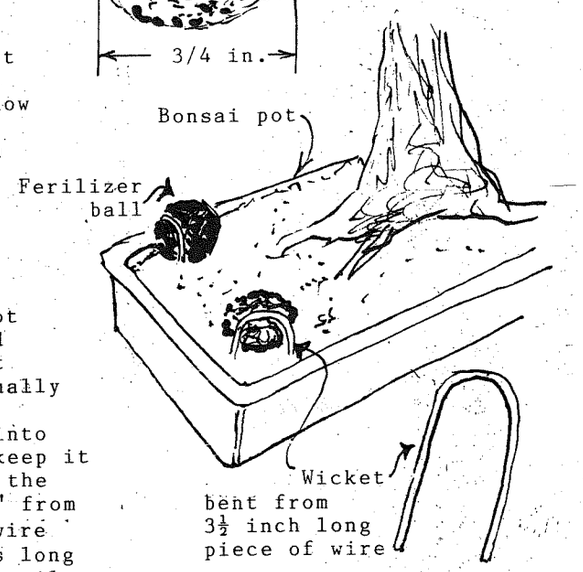
MODEL TS-500

assembling any parts.

Fertilizer balls are normally about 3/4 inch in diameter. However, these would look out of place on small bonsai. One can resort to making the diameter of the balls smaller, but then how small do you want to make them? This is something you will have to resolve and perhaps spread the ingredients on the surface of the soil in their powdered form.

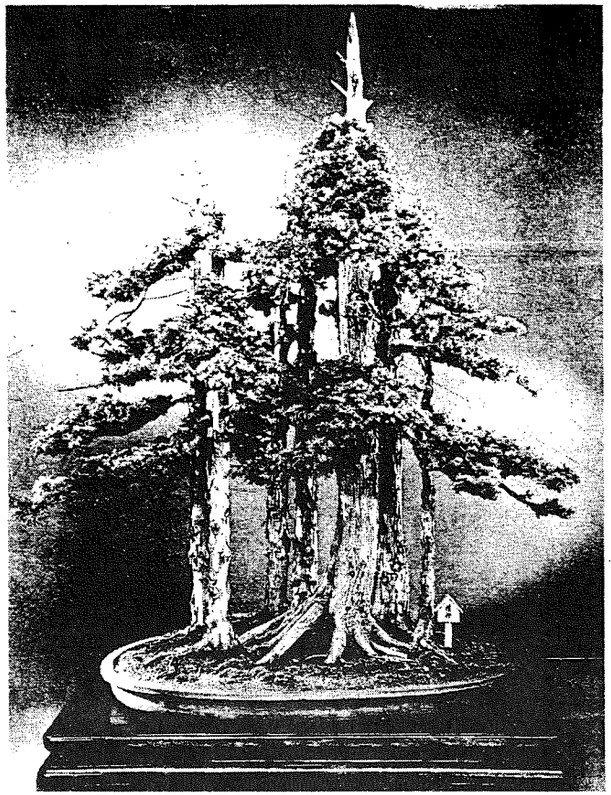
Sometimes the surface of the soil in the bonsai pot has a marked slope to it and fertlizer balls will not sit where they are placed. (Usually it is recommended that the fertilizer ball <u>not</u> be dug into the surface of the soil to keep it from rolling off.) Follow the Japanese and make a "wicket" from an old piece of wire. The wire should be at least 3½ inches long so that it will grab in the soil.

Full-size of normal fertilizer ball.



bent from 3½ inch long piece of wire

Make sure that around the edge of the pot that the soil is below the rim of the pot so that water and fertilizer do not flow out over the edge of the pot instead of penetrating into the soil in the pot.



135 Juniperus chinensis var.foemina, výška hlavního stromku 116 cm, stáří 30 let. Název kompozice Gošin - Strážce ducha. Miska z dílen Tokoname v Japonsku. Pěstitel Jošio Naka, Los Angeles
Jedno z vrcholných děl současné bonsajistické tvorby. Začátek pěstování 1954. Sesazení do formy lesíku v roce 1964.

The above picture is familiar to all of you but the caption is different. The picture was copied from "BONSAI miniaturni strm v misce" by V. and Z. Hrdlickovi and Petr Herynek, Praha, Czechoslovakia, 1985. The book is a very good one and among the pictures of outstanding bonsai, John Y. Naka's GOSHIN is pictured. The book was sent as a very kind and generous gift by Prof. Ladislov Drozdik, a resident of Bratislava. Thanks to Slovesko-Anglico dictionary which he gave me when visiting in Czechoslovakia in 1985, I can manage some of the translation of the above: "Juniperus chinensis var.foemina, height of tallest tree 116 cm (46 in.) age 30 years. The name of the composition is Goshen - Protector of the Spirit. The pot is from the Tokoname kiln in Japan. Creator John Naka, Los Angeles.
"Each treetop makes the above bonsai creation. The creation was begun in 1954. Consolidation into a forest was done in 1964."

Bonsai like other artforms is universal in its appeal and when one travels, mentioning bonsai usually thaws out any meeting.