GROUND BARK AS A GROWING MEDIUM FOR CONTAINER NURSERY STOCK

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Our first experiments with growing in ground bark were started in the spring of 1954. These experiments were motivated by our search for a material that was economical and light in weight, could be easily handled, and was readily available and still would have good appearance when used as a growing medium. The first year we planted 200 *Azalea mollis* in three different lightweight media: fresh sawdust, aged sawdust, and ground bark. The plants grown in fresh sawdust showed a marked deficiency of nitrogen under the culture they received. There was very little difference in the growth of the plants grown in aged sawdust and ground bark. Aged sawdust was eliminated, however, as being not too readily available. Since 1955 we have planted in ground bark and have grown a variety of plants including pine, fir, rhododendrons, azaleas, pieris and heather.

We have used both Douglas fir bark and hemlock bark and have found little difference between them as far as growth is concerned. Hemlock bark breaks down somewhat faster than fir bark which is a disadvantage when plants are to be left in the container for periods greater than one growing season. We use fir bark exclusively for this reason.

Even though we began using bark because of its low cost and light weight, we soon found that bark has other properties that are far more important and that the use of bark would substantially reduce our production costs. Bark is an organic substance that contains appreciable amounts of plant food, enough in fact that nutrients that are not supplied by the bark can be inexpensively added in solution through the water system. Also, if the bark is not ground too fine, the larger particles will hold up indefinitely and a perfectly drained medium is always available. The bark should be passed through a 3/8 inch mesh screen. It can then be used without fertilizer additives and without the addition of sand or other materials usually used to promote drainage. This, of course, eliminates the costly labor of mixing before planting.

Think a moment of what this means to us in dollars and cents. The University of Georgia Agriculture Experiment Station, in a recent study of the cost of producing container nursery stock, found that peat moss and sand mixtures average 3.5 cents per gallon container when all costs, including the cost of mixing, are considered. Compare this with 0.4 of a cent for bark, a material that will give comparable results. Peat moss and sand mixtures cost $35.00 for the material for 1000 gallon containers. The same amount of Douglas fir bark costs only four dollars.

Let us take a look at the nutrients in ground bark as it is delivered from the mill. Each load is tested before it is used, even though there is never much variation. Tests are made with the Simplex soil test kit and the test results are computed to pounds of nutrient in 1000 square feet of bark six inches deep. This measure is convenient for computing fertilizer requirements. As our containers are about six inches deep, this is the amount of nutrient for 1000 square feet of growing area.

Fresh bark does not contain much nitrogen. There is a trace of nitrogen in the nitrate form and usually about one pound per 1000 square feet in the form of ammonium. We carry five pounds of total nitrogen for each 1000 square feet of growing area and easily add the additional four pounds through the sprinkler system. Low-biuret urea and diammonium phosphate are used principally as nitrogen sources.

Bark contains about one-half pound of available phosphorus, which is about one-fourth of our continuous level. However, bark contains a reserve of phosphorus that slowly becomes available as the bark is weathered. A continuous level of two pounds to 1000 square feet of growing area is maintained by the addition of diammonium phosphate as required.

Bark is well supplied with potash. A typical load will contain the equivalent of three pounds per 1000 square feet which is our desired level. In addition, more potash becomes available as the bark breaks down and the plants are usually supplied with an adequate amount of potash for the first year. Potassium chloride is used when the additions of potash become necessary.

In addition to the three basic nutrients, bark contains appreciable amounts of iron and magnesium.

Bark is quite acid in reaction. The initial pH averages about 5.0. No correction of pH is made for rhododendrons and other acid-loving plants, but pH is raised for the conifers to about 6.5 by the use of calcium nitrate as a nitrogen source. Calcium nitrate used periodically with our slightly alkaline water will hold the pH at the desired level.

Overhead sprinklers are used for irrigation. Sprinklers are placed twenty-five feet apart so that the water from each sprinkler overlaps those adjacent to it. Half-round sprinklers are used around the perimeter. This arrangement gives a fairly even distribution of water which is essential when fertilizer is applied through the water. Each block of sprinklers covers an area of approximately 15,000 square feet. Water is given according to the needs of the plants, the main consideration being that the plants never become dry. However, if any water at all is given, then enough is applied so that some water drains from the bottom of the container. This is a precaution against the build-up of soluble salts in the container.

Fertilizer is injected into the water system with a GEWA fertilizer injector. The fertilizer is dissolved in an oil drum to which a 1/4 h.p. pump is connected. The device makes fertilizer mixing an easy chore. The drum is filled about half full of water, the pump started, and the required amount of fertilizer added. After a few minutes the mixture is ready to be pumped to the injector.

We test for nutrients and fertilize once a week throughout the growing season. A sample from each irrigation plot is obtained with a soil sampling tube so that the sample is representative of the full depth of the container. Samples are taken from several containers in the plot and thoroughly mixed so as to obtain an average sample. The results of the test determines the amount of fertilizer to be added to the irrigation water. Our standard nutrient level in the containers is five pounds of nitrogen, two pounds of phosphorous and three pounds of potash for each 1000 square feet of growing area. These levels are maintained in the conifer plots from early spring until frost. The fertilizing of our rhododendron plots are discussed below. This system of testing and fertilizing is simple and puts the feeding of our plants on a scientific basis. The difference between the test results and the standard nutrient level is injected into the water during the next irrigation. Fertilizer is injected at the rate of two or three pounds of fertilizer to 100 gallons of water. Higher rates of injection are perhaps possible but, from experience, these levels will not cause leaf burn from too strong a concentration of fertilizer.

A somewhat higher level of phosphorous and a lower level of nitrogen is held in the rhododendron plots. Phosphorous is held at three pounds, nitrogen at four pounds, and potash at three pounds. These levels are maintained through the first part of the growing season but as soon as the terminal bud begins to form, the nitrogen and potash are reduced to one pound each. We have enjoyed excellent color and bud set with these conditions.

The use of bark has some disadvantages. More of an annoyance than a disadvantage are the many small, sharp slivers that make the wearing of gloves necessary while the plants are being potted. Hemlock bark does not contain these slivers but, as I mentioned before, hemlock bark is not suitable for long-term growing.

Bark is hard to wet initially. For the first few weeks after planting, the plants must be watched very closely to prevent drying out. After the bark is thoroughly saturated, however, it has very good water-holding properties.

Newly-planted material will require additional nitrogen fertilizer for the first few months. When possible, we place all newly-planted material under a separate sprinkler system to facilitate giving the required nitrogen. When it is necessary to intersperse newly-planted material with older material, we topdress the containers with a teaspoonful of an organic nitrogen fertilizer, such as blood meal.

To summarize:

Douglas fir bark is of low cost and light weight.

Bark contains appreciable amounts of plant nutrients.

When properly screened, ground bark can be used without sand or other material. usually used to improve drainage.

With proper water and fertilizing practices, bark is an excellent material for producing good quality container nursery stock at substantial savings.

MODERATOR JOE KLUPENGER: Thank you, Floyd, for a very interesting talk on a growing medium using bark dust. Our next speaker on soil mixtures, is one that needs no introduction here this morning either. He has come along from many years back in pioneering a lot of container-grown material in this area, as well as gadgets and gimmicks to increase production, and now studies with different types of soil mixtures. He is Dan Schmidt with Schmidt Brothers Nursery. Dan!

SOIL MIXTURES

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MIX — To unite or blend into one mass.

MIXTURE — Compound formed by mixing.

SOIL MIXTURE — Several ingredients mixed together.

Soil mixtures for containers should have four important qualities:

1. SUPPORT
2. MOISTURE
3. AERATION
4. FERTILITY

1. SUPPORT — *Firm enough mix to hold up the plant.*
2. MOISTURE — Soil mix should have ability to hold moisture between irrigations . . . it also should have good drainage.
3. AERATION — Soil mix should be porous enough to let the gases in and out of the soil. If the soil mix is too fine, water will fill up these pores and will reduce aeration.
4. FERTILITY — Mineral nutrients: Most green plants are known to require at least twelve chemical elements:

1. Nitrogen	5. Magnesium	9. Manganese
2. Phosphorous	6. Sulphur	10. Copper
3. Potassium	7. Iron	11. Boron
4. Calcium	8. Zinc	12. Molybdenum