SAWDUST AS A CONTAINER GROWING MEDIUM

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Interest in using sawdust and other timber residues such as shavings and bark as a potting medium has recently come to the fore in Australia. This interest, no doubt, has been fostered by the expense of imported peat moss and shortages of Australian sedge peats. Growers have also noted that overseas nurserymen have used these wood materials with success. For several years wood materials hae been used in a limited way by a few Australian nurseries. I first saw terrestrial plants growing in a mixture of partly decomposed sawdust and spent tan-bark in the early 1950's. Nevertheless, fresh Eucalyptus sawdust has only recently become very popular as an organic constituent for container growing.

Physical Properties. Baker (1) explained that sawdust is one of the best organic constituents that may be used in a growing medium. Its outstanding properties are as follows:

1. Readily available in a uniform grade.
2. Chemically uniform.
3. Stable to fumigation.
4. Easily made into a uniform mix.
5. Resistant to loss of nutrients by leaching.
6. Fertility low (initially).
7. Relatively inexpensive.
8. Moisture retention good.
9. Light *in weight.*
10. Shrinkage negligible.

It would appear that few materials obtainable at present could match sawdust as a growing medium.

Nitrogen Nutrition. Baker (1) points out the effect of adding low nitrogen and high carbon materials to your growing medium, as follows:

100 lbs. of shavings = 35 lbs of carbon and 0.2 lbs of nitrogen.
35 lbs of carbon, 40% assimilated by soil fungi = 14 lbs of carbon assimilated.
Ratio of carbon to nitrogen in soil fungi = 10 to 1 = 1.4 lbs of nitrogen assimilated.

The shavings supplied 0.2 lbs of nitrogen, but the fungi required 1.4 lbs. So that 1.2 lbs of nitrogen had to be added for the decomposition of the shavings. In this way you can calculate the approximate amount of nitrogen needed when shavings are added.

Our Eucalyptus sawdusts contain resin which actually retards the microflora's ability to decompose it. So, even when supplied with extra nitrogen and conditions that would favour decomposition, our hardwood sawdusts decay rather slowly. This is one of its good points; it is not going to shrink much. If complete decomposition cannot be achieved, less than the calculated amount of nitrogen may be needed.

Mixes and Nitrogen Materials Used.

Mix 1. A sawdust and sandy loam 1:1, was used for a wide range of trees and shrubs for several years. This was for outdoor growing of ½ gallon, 1½ gallon and larger sized containers. A very coarse and lumpy form of dried blood was added at the rate of 6 lbs per cubic yard of mix. Calcium, phosphorus, potash, etc. were also added.

Problems: Decomposing lumps of dried blood on the surface attracted hoards of small flies and it was also foul smelling. Even small lumps close to the plant seemed to encourage stem decay. The containers were heavy when wet and, if some of the sandy loam was too finely textured, it tended to water-log.

Ammonium sulphate was used experimentally as an alternative to dried blood. It was soon discarded, however, as the mix was too high in soluble salts, the pH dropped to a level very rapidly, and it was extremely corrosive to metal containers.

Mix 2. This consisted of fresh sawdust and coarse sand, 3:1, with 5 lbs of chip form U.F. 38 (urea formaldehyde) added per cubic yard of sawdust, plus other essential elements. Most hardy plants grew in this mix beautifully.

Problems: Heating of the mix up to 140^{0}F in one and two gallon black plastic containers due to decomposition and high summer temperatures seemed excessive. Tall growing plants tended to blow over during windy weather as it is light in weight. A saprophytic fungus appeared in many containers. Though apparently not interfering with the plant root growth, it did tend to clog up the air spaces causing the sawdust to cake and reduce water penetration. Nitrogen deficiency symptoms appeared about 12 weeks after using the mix, even though liquid feed with each irrigation had been used, so the nitrogen needed to be increased. Osmocote, at the manufacturer's suggested rates, was also used but extra nitrogen was again needed as the mix aged. The worst thing that occurred was two micronutrient toxicities, zinc and manganese. These toxicities appeared in only a few species. Liquidambar trees seemed badly affected showing stunting, leaf distortion, and necrosis of the leaf blade. Of course, this isn't going to happen every time you use sawdust, but it did happen with a particular lot.

Good point. Early spring and autumn use did not show so high a temperature rise; in fact, the warmth of the mix during the cool nights stimulated root growth on most plants.

Other Mixes. Various mixes of sawdust and Australian sedge peat or imported German peat have been more successful than either the sawdust or peat moss used alone. U.F. 38 was used to stabilise the sawdust.

Other Considerations. If you haven't used sawdust in your mixes before and you intend doing so, try it on a small scale first. Whatever physical components and proportions you wish to use, test the pH of the mixed materials and adjust the pH to your requirements before you add any nitrogen materials. All the sawdusts I have ever used have been very acid, needing about the same amount of lime as German peat. You will notice that a rise in pH will occur after the addition of the U.F. 38, but will drop to a more satisfactory level after about 3 weeks. If you add nitrogen before adjusting the pH, you may find very little lime is needed. But in a few weeks time the pH will have dropped markedly.

I do not use mixes containing appreciable amounts of sawdust for potting rooted cuttings of shrub and tree seedlings, or for germinating shrub and tree seed as many seem sensitive to the higher salinity or ammonium release of these fresh sawdust mixes.

The Advantages. The advantages that I have found of sawdust and sawdust/peat mixes over loam soil mixes are as follows:

1. Roots grow right to the bottom of the container and there are dense fibrous roots throughout the mix.
2. The sawdust is still in excellent physical condition even after 1½ years in a container.
3. More uniform moisture throughout the pot than any other mix I have used.
4. Easier to use and less soggy after prolonged heavy rain.
5. Light and easy on the machinery used for mixing.
6. Lighter for staff to handle and for trucking.
7. Hand removal of weeds easier because of its loose, friable nature.

I think most of the problems, such as overheating etc., could be overcome by composting, but I would like to point out that to be even at least 6 weeks ahead enormous stockpiles would be required. Unfortunately, space required and the sawdust availability would not allow composting to be feasible.

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LITERATURE CITED

1. Baker, K.F. 1957. The U.C. System for Producing Healthy Container-Grown Plants. *Calif. Agr. Exp. Sta. Man.* 23.

BUDDING AND GRAFTING TECHNIQUES IN THE PRODUCTION OF STREET TREES

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The production of street trees from seed or cuttings in the past has been a slow and haphazard process with very indifferent results being obtained.

Seed from trees such as *Ulmus procera* (*U campestris*) gives such a wide variation in type that as many as 50% of seedlings need to be discarded. The other major problem is to grow the seedlings to an acceptable street tree height, i.e., 12 to 15 feet with a nice smooth trunk of 4 to 5 inches caliper. Usually *Ulmus procera* seedlings require 8 to 10 years or longer to reach this size and, even after initial culling, the finished products generally require further culling.

One method that we use to great advantage to overcome these problems and obtain 100% straight trunked trees of 12 to 15 feet in 3 to 5 years is by budding or grafting.

Selected cuttings of *Ulmus procera* are planted in the open ground, lifted after one year, trimmed and replanted out in nursery rows 9 inches apart with 3½ feet between rows.

Budwood from selected parent stock is then used to bud the stocks, using a normal T-bud during February. These stocks are then cut back to the bud during July - August. Those having buds that did not take are grafted using a simple whip and tongue graft, although, generally, 95 % bud take is achieved.