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Using Bark and Sawdust for Mulches, Soil Amendments and Potting Mixes

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Bark and sawdust are often used to mulch or amend soils for horticultural crops. When incorporated into the soil, these materials improve soil structure and tilth, increase the nutrient holding capacity of sandy soils and improve water drainage. As mulches, they reduce soil moisture loss, reduce or prevent weed growth and are decorative in landscapes. Bark is a useful component in soilless potting mixes.

Properties of sawdust and bark

To take advantage of the beneficial properties of sawdust and bark, use the materials properly. Several factors should be taken into account when using them to amend or mulch soils: nitrogen depletion, soil acidification and the toxicity of certain woody materials.

Soil nitrogen

Sawdust and bark products often have been blamed for poor plant performance, giving rise to the belief that wood products are toxic to plants. In many cases, however, reported problems have really been due to soil nitrogen depletion.

Nitrogen depletion is most severe when woody materials are incorporated into the soil. It is seldom a problem when the materials are used as mulches.

In soil, naturally occurring microorganisms that decompose woody matter require materials with about 1 to 2 percent nitrogen to proceed with decomposition. Most uncomposted sawdust and bark contain only a few tenths of 1 percent nitrogen. Soil microorganisms needing additional nitrogen to decompose these materials use soil nitrogen, making it unavailable for plant growth.

The reduction in available nitrogen lasts from several months to several years depending upon the species of wood being decomposed, its original state of decomposition, its coarseness and soil temperature. Hardwoods (broadleaf trees) generally decompose more rapidly than softwoods (conifers) and need larger amounts of additional nitrogen. Softwoods cause less initial depletion of soil nitrogen, but the effect lasts longer.

To avoid nitrogen depletion when incorporating uncomposted hardwood products into the soil, add 25 pounds of actual nitrogen with each ton of sawdust or bark. Incorporate about 12 pounds of nitrogen the following year. For uncomposted softwood materials, incorporate about 12 to 13 pounds of nitrogen with each ton of sawdust or bark and incorporate 6 to 7 pounds of nitrogen the following year. Any kind of nitrogen fertilizer can be used.

To calculate the amount of a particular fertilizer to apply, divide the amount of actual nitrogen needed by the percentage of nitrogen in the fertilizer. For example, if you need 10 pounds of actual nitrogen and are using a fertilizer that contains 20 percent nitrogen, divide 10 by 0.2 (20 percent) to arrive at 50 pounds of fertilizer.

Because mulches are on top of the soil, they are relatively unexposed to soil microbes, dry out more rapidly than the soil and lack a suitable environment for decomposing organisms. As a result, mulches decompose more slowly and use less nitrogen during decomposition each year than incorporated materials do. When using woody materials as mulches, additional nitrogen should not be needed to prevent soil nitrogen depletion.

Acidity

Most wood products are acidic, with pH values ranging from 3.5 to 7.0, depending upon the tree species (pH 7.0 is neutral). Except for plants that are very sensitive to soil pH, the change in soil acidity caused by incorporation of wood products is usually negligible. Rhododendrons, azaleas and blueberries grow best where the soil pH is between 4.0 and 5.5 and actually can benefit from the slight soil acidification caused when sawdust or bark are used as mulches or soil amendments.

Where soil pH values are already below the optimum for a particular crop or use, neutralize the acidity

of soil amendments before incorporating them. Mixing 100 pounds of finely ground limestone into each ton of uncomposted sawdust or bark should offset any pH problems. Composting woody materials before using them also reduces excess acidity and pH problems. Mulches seldom contribute to pH problems and require no additions of lime.

Using sawdust or bark that has been stored in large, unaerated piles can cause severe soil pH problems. Fermentation in a pile of sawdust or bark can turn the materials very acidic and "sour." Sour sawdust and bark are dark in color, have a pungent, vinegarlike odor and can have pH values as low as 1.8.

Avoid souring by keeping sawdust and bark piles no larger than 15 feet wide by 8 feet high and by turning the piles at least twice each month. Keep the materials well drained by placing them on crowned, convex surfaces that prevent water accumulation. Simply keeping the piles dry will largely prevent souring. Unless you are composting the material, don't add nitrogen to the piles. Wait until incorporating the material into the soil and add nitrogen at that time.

Determining pH — The best method of determining the pH of your soil is to have a soil test performed by an analytical laboratory. A University of Idaho Extension agricultural agent can provide information on proper soil sampling techniques and laboratories for analysis. Soil testing kits and meters sold through garden centers and magazines vary widely in quality. Some provide good approximations of soil pH; others don't.

Toxicity

During the past century, many reports have claimed that various wood products are toxic to plants grown in containers or in the ground. Western redcedar, in particular, has often been reported to be extremely toxic to all other plants. Most of these reports lack proof.

Inhibitory substances — Although examples of one plant producing materials that are toxic to others are well documented (such as juglone produced in walnut roots and leaves), few studies have focused on the toxicity of wood products. Some of the substances in wood that reportedly are toxic to plants are tannins, monoterpenes, turpentines and resins.

Research has shown that monoterpenes at high concentrations can inhibit seed germination and/or growth of some plants but that at low concentrations they can improve seed germination. Most wood products lack enough monoterpenes to seriously inhibit plant growth.

Composting or leaching woody materials helps to remove most inhibitory substances. Fresh bark and sawdust normally cause more toxicity problems than aged materials.

N fixation inhibition — A 1927 study indicated that cedar sawdust slightly inhibits nitrogen fixation by soil-dwelling bacteria, whereas sawdust of ash, maple, larch, white and yellow pine and white and red fir has no effect. In other studies, sawdust from maple, larch, ash and red fir has inhibited nitrate formation by soil microorganisms. The needles of white fir, yellow pine and cedar also inhibit nitrate formation. Composting or adding nitrogen along with woody materials normally prevents inhibition of plant growth.

Toxic leachate — Leachate (water that has drained through a material) from western redcedar is very toxic to fish and can kill some fish species in concentrations as low as 10 parts of leachate per million parts of water. Prevent water that has leached through fresh redcedar materials from reaching surface waters or fish ponds.

Cedar leachate also corrodes iron, brass and copper. Farm or garden equipment exposed for long periods to runoff from fresh cedar materials may be damaged. The leachate reacts with metals in the soil and rapidly loses its toxic and corrosive characteristics.

Recommendations — The bottom line is that most sawdust and bark products are safe to use as mulches around most plants. Whenever sawdust and bark are incorporated into the soil, however, a good practice is to compost them for 1 or 2 years and leach them well with water before incorporation. When uncomposted sawdust or bark is mixed into the soil, add nitrogen at the same time.

Until documented research suggests otherwise, avoid fresh sawdust or bark from redwood (*Sequoia sempervirens*), incense cedar (*Libocedrus decurrens*) or western redcedar (*Thuja plicata*) around germinating seeds, young seedlings and bedding plants. These materials should pose few problems for plant growth if they are composted before use. They can be used fresh as mulches around established plants.

There are indications that steam sterilization of cedar sawdust increases its toxicity to sensitive plant species. Some people are allergic to redcedar. Avoid breathing dust from redcedar materials.

Composting soil amendments

Composting sawdust and bark before incorporating them into the soil will eliminate most soil nitrogen, pH and toxicity problems. Composting also kills many disease-causing organisms. Composting is unnecessary for woody materials that are used only as mulches.

The rate and quality of composting are greatly enhanced by adding topsoil, limestone and nitrogen-rich organic materials such as manure, freshly mown clover or alfalfa to compost piles. Finely ground materials decompose much more rapidly than coarse chips. Turn compost piles at least every other week to ensure proper aeration. Keep compost piles moist but not saturated.

Although nitrogen must be added to compost piles for woody materials to decompose, large amounts of fertilizers (including manures) should be washed out of the finished compost with water to remove high

salt concentrations. Additional nitrogen fertilizer may have to be added to the soil when composted sawdust or bark is incorporated in order to maintain optimal plant growth. Conduct a soil test to determine whether extra nitrogen is needed. In the absence of a soil test, look for signs of inadequate nitrogen such as sluggish plant growth and light-colored, yellowish leaves.

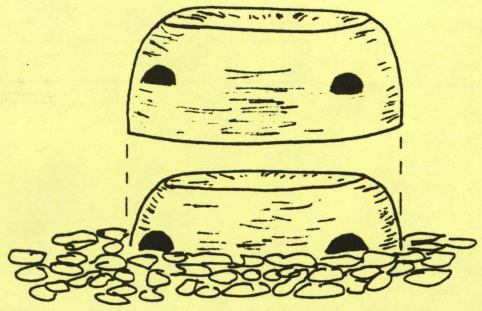
Application techniques for mulches

Apply mulches to the correct depth — Normally, keep mulches 2 to 4 inches deep and several inches away from the trunks of trees and shrubs. Deep mulches can hold moisture against trunks or stems and inhibit air movement. The resulting moist, still conditions increase crown rot and other root disorders. Deep mulches also inhibit the growth and development of new shoots and suckers from the crown and lower trunk. Use Table 1 to calculate the amount of mulch needed.

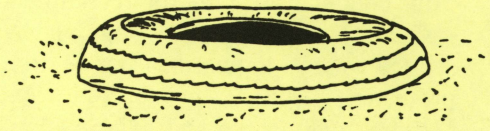
Don't mulch cold, wet soils — Mulched soils warm up and dry out slowly in spring. The resulting cold, wet soils can reduce root growth and activity, reduce nutrient availability and increase the likelihood of root and crown diseases, especially in northern climates. Disorders such as iron chlorosis are often associated with cold, wet soils. On sites where soils are naturally cold or wet, organic mulches are not recommended.

Give mulched plants enough water — Sawdust mulches and mulches made from finely ground bark repel water. After a 2-inch rainfall or overhead irrigation, only the top ¼ inch of a 4-inch mulch typically is wet, while all of the mulch below the surface layer is dry. Because the roots of some plants tend to concentrate their growth in sawdust mulches, water stress can be a problem. Coarse wood or bark chips repel water less than more finely textured materials do, and roots seldom grow into them. Using drip irrigation lines over or under the mulch can help provide sufficient water to plants.

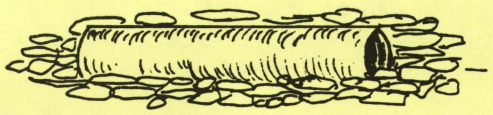
Control rodents around mulched plants — Mulch provides excellent cover for rodents that can girdle stems and roots, killing woody plants. Avoid applying thick layers of mulch immediately around the base of trees and shrubs. If you do use organic mulches, you may find that you need poison bait or mechanical traps to control rodents.



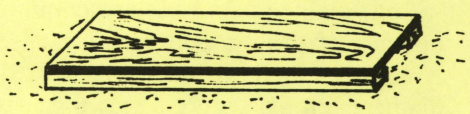
Opaque plastic bottle bottom with entry holes. Set into the ground so that holes are even with the top of the mulch.



Tire split in half and laid on the ground.



2- to 3-inch pipe partially buried in mulch.



Flat boards with or without risers to lift them above the ground.

Fig. 1. Typical bait and trap stations for rodents. For ornamental situations, stations can be painted dark brown or green to blend with surroundings.

Place poison bait at stations throughout your planting rather than spreading or broadcasting it. Traps also should be located in rodent tunnels or at stations. Stations create shelters that attract rodents. Tires that have been split in half and laid flat with the open side down make excellent bait and trap stations. Wide, flat boards and short lengths of pipe that are at least 2 inches in diameter also make good stations (Fig. 1).

Some rodents quickly become used to and avoid certain baits. You may find it useful to alternate among several different ones. Check with a University

Table 1. Weights and volumes of bark and sawdust for use as mulch.

	Large bark chips	Small bark chips	Sawdust
1 cubic foot weighs	15 lb	14 lb	12 lb
1 cubic yard weighs	405 lb	378 lb	324 lb
1 cubic yard makes a 1 inch layer that covers	323 ft	323 sq ft	323 sq ft
Amount needed to cover 100 sq ft to a 1-inch depth	8.4 cu ft	8.4 cu ft	8.4 cu ft
Amount needed to cover 1 acre to a 1-inch depth	135 cu yd	135 cu yd	135 cu yd
1 inch per acre weighs	27 to 28 tons	25 to 26 tons	21 to 22 tons

Note: The figures are for air-dried Douglas-fir bark and mixed conifer sawdust. Large bark chips were 2 to 3 inches long by ½ inch thick. Small bark chips were 1 to 2 inches long by ½ inch thick. The sawdust was screened through a ¼-inch square mesh wire. Values for other materials will depend upon the tree species, the size of the bark chips and sawdust and the moisture content.

Table 2. Soilless mix compositions.

Type of mix	Sand	Bark	Peat moss	Vermiculite	Perlite	Dolomitic lime
	(% total mix by volume)					(lb per cu ft of mix)
Potting mix - light	10	90	—	—	—	.25
Potting mix - light	—	—	50	—	50	.25
Potting mix - medium	20	40	40	—	—	.25
Potting mix - medium	—	—	40	30	30	.25
Potting mix - heavy	30	30	20	—	20	.25
Potting mix - heavy	30	30	40	—	—	.25
Cutting flat mix	—	50	—	—	50	—

of Idaho Extension agricultural agent or local agricultural chemical deadler for recommended baits.

Control involving cats, dogs and wild predators can reduce rodent populations but seldom offers complete protection.

Keep cover crops and adjacent lawns mowed short and remove all debris to reduce cover for rodents. A vegetation-free strip of ground between grassy or weedy areas and landscape or crop plants will help to reduce rodent infestations in target areas. The wider the strip, the more effective the barrier.

Soilless potting mixes

Both pine and fir bark are commonly used as components of soilless potting mixes. Cedar bark generally is not. Finely ground bark (less than ¼-inch diameter chips) works better than coarsely ground materials. Bark does not have to be composted before use in soilless potting mixes.

Many different combinations of bark, sand, perlite, peat moss and other materials are used (Table 2). Plant responses to potting mixes vary, so it is always a good idea to make small, trial plantings to evaluate the suitability of a mix for a particular application.

Bark mixes have a lower water-holding capacity than peat-based mixes and tend to drain and dry out more rapidly. Bark mixes therefore provide less stability, and tall, top-heavy plants tend to fall over easily if the potting medium is allowed to dry out. Drought stress is also a concern, and care must be taken to ensure adequate irrigation. Peat moss often is included in bark mixes because it holds water well.

Agricultural lime, preferably a dolomitic type, is recommended for soilless mixes. Make sure sand is a washed mortar grade with uniform particle size. If you irrigate pots from the bottom by capillary mats, you probably will need a heavier mix with about 25 percent sifted topsoil. Any of the mixes in Table 2 should work well with overhead or drip irrigation.

Fertilizers for soilless mixes

Many different slow-release fertilizers are available commercially and are tailored for different crops and uses. Their useful life ranges from about 3 to 12 months. A greenhouse supply firm is the best source of information on slow-release fertilizers suitable for container mixes. Many people prefer to add part of their fertilizer in a solid, slow-release form and the remainder as a liquid during irrigation.

For bark mixes, make sure that sulfur is included in the fertilizer. Adding double the amount of lime to bark mixes will help to prevent blossom-end rot in tomatoes. Gypsum supplies both calcium and sulfur without raising the pH of the medium.

Micronutrients (which are needed only in trace amounts) are included in some slow-release or liquid fertilizers or can be added as a fritted mix available from greenhouse supply firms. The amount of micronutrient fertilizer to add will appear on the fertilizer bag. Try to keep the soilless mix pH (acidity) between 5.3 and 6.0 to ensure that micronutrients remain available.

Blending mixes

Blend the mix components well, especially when adding fertilizer materials. Cement mixers are often used to blend soilless mixes. Simply blending mix components on a clean floor (be careful to prevent the introduction of diseases or insects) using a scoop shovel works fairly well but the resulting mix and subsequent plant growth generally lack uniformity.

Avoid overmixing medium components because excessive mixing breaks down the structure of the materials and can decrease drainage and aeration. Mix only long enough to get a uniform medium.

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