GROWERTALKS

Features

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Boning Up on Bark

Ed Bloodnick & Troy Buechel

Bark mixes have been widely used for greenhouse crops, perennials and container nursery crops for more than 30 years. Many growers prefer bark-based growing media for its porous structure, low water retention and high bulk density that increase pot stability. For greenhouse growers, it may be used for specific crops because of these characteristics. For outdoor nursery applications, it's often the standard for nursery crops.

However, not all bark is equal. Depending on where your bark is sourced and how it's processed, there can be differences in the growing media performance.

Geography of bark sources

Let's look at the sources of bark. The Forest Inventory and Analysis (FIA) program of the U.S. Forest Service is an agency of the U.S. Department of Agriculture (USDA) that continues to conduct inventories of forest resources for more than 80 years. Of the world's total timber forests, the United States represents 10% of this total with about 96% of U.S. consumption of industrial wood from domestic supplies.

Of the total forest land, about 10% of the acreage is classified as reserved, which isn't used for timber harvest. If we break the nation's 521 million acres of timber land into three regions, the North contains 32% of the timber land and other forests. The South represents 40% of the U.S. timber land and has an extensive timber supply used for lumber, pulp, paper and other timber-derived products. The West contains most of the National Parks and reserved forest lands at 28%.

For growing media and container mixes, typically softwood bark from conifer species is used. Conifer bark is the residue or by-product of the lumber industry. In 2011, logging residues totaled 3.7 billion cu. ft. or about 15% to 20% of total harvested trees. A portion of this residue is used for nutrient cycling and forest soil protection, with a significant amount used for wood energy. Only a very small portion is used for horticulture purposes and growing media. (Source: U.S. Forest Resource Facts and Historical Trends.)

Types of bark used for potting mixes

In Canada and the various regions of the U.S., there's a diversity of pine species used for lumber. In the West,

the majority of the softwood coniferous lumber is derived from Fir, Redwood and Yellow Pine (Lodgepole and Ponderosa). In the North, soft wood lumber harvested is derived from Red, White and Jack (sometimes called Grey) pine species and sometimes Spruce. In the South, Southern Yellow Pine species are found, including Loblolly, Longleaf, Shortleaf and Slash pine, which are hard pine species.

With the diversity of trees species, there are differences among these bark sources. For example, bark from western pine species has a medium thickness. Northern pine species tend to have bark that's thinner and more delicate. Bark from Southern pine species is thick, resinous and more resistant to processing before it's used for potting mixes. Use of raw bark in growing media should be avoided since it will vary greatly in its particle size and may contain organic substances that could be problematic for some plant species.

Processing of raw bark

Raw bark from lumber mills varies in particle size and wood content. As the bark is removed from the tree at the lumber mill, some wood splinters and cambium remain attached to the bark. Bark from the tree can be big sections—about 12 in. in size to smaller than 2 in. in size. This depends on the equipment used to remove the bark from the trees at the lumber mill and the tree species processed.

Because of this, most commercial bark producers will hammermill, screen and grade the raw bark to a specific particle range. This is done to achieve a more uniform bark particle size for easier management before proceeding to the next processing step.

Composting and aging

Composting is biological degradation of organic matter to convert the material into nutrients for plant uptake. This is a process of controlled biodegradation by blending, monitoring and turning of stock piles. The resulting finished compost is broken down to a very fine material that has no structure and is undiscernible from the original parent stock.

For pine bark used in growing media, the process of composting is stopped prematurely to prevent complete degradation of the bark particles. Some nursery growers use aged bark. Aged bark requires little manipulation or processing other than turning a pile. Quality bark is managed to create value by "partial composting," careful aging of the pine bark and processing with screens to grade the bark. Most pine bark used for greenhouse growing media is partially composted, aged, processed pine bark.

In southern regions, pine bark is stored in large piles and naturally occurring bacteria will consume the carbon of the pine bark to generate heat in the pile. In northern regions, cool temperatures can limit bacterial activity and the composting process, therefore, ammonium nitrate or urea is often added to the piles as a nitrogen source to accelerate the composting process. In either situation, additional nitrogen can be added to accelerate the composting process.

In the composting stage, the proper mixture of water, oxygen, carbon and nitrogen are needed for the thermophilic bacteria to decompose the lipids and proteins in the bark. During this process, temperatures can be generated between 105 to 165F (40.5 to 74 C). The optimal temperature for bark composting is about 140F (60C) with a moisture content between 50% to 60%. Since this is an aerobic process, air/water balance is critical and piles must be turned to re-introduce oxygen and water, if needed.

Operators pay close attention to the temperature of piles to be sure that the optimal temperature is achieved. When piles are turned, steam will escape from the pile and there's a loss of water. Daily temperature monitoring is extremely important to maintain optimum temperature and produce quality bark. Excessive temperature can damage the quality of the bark and result in spontaneous combustion-causing fire.

The partial composting stage can take from three weeks to eight months, depending on the region, the stock bark processed and ambient temperatures. Pine bark used for greenhouse growing media is "partially composted" since too much biodegradation will break down the structure of the pine bark and produce an excessive amount of fine particles. For bark producers and growing media manufactures, the goal is to achieve a Carbon to Nitrogen ratio (C:N) around 50:1 for the pine bark product and to maintain the integrity of the bark particle.

After partially composting the bark, piles are often "crushed" with a large bucket loader to squeeze the oxygen out of the pile. This slows down the composting process and temperatures decline. This also allows the bark to age and mature with little biodegradation.

Aging allows the pine bark to mature into a useable ingredient for growing media. This is an important process, as this stabilizes the microbial populations, bark particles become less hydrophobic and moisture content can rise in the pile. During this stage, operators monitor microflora within the pile. Different fungi can create layers within the bark pile, producing an anaerobic layer, which can negatively impact the quality of the bark. If necessary, operators will break into piles to turn them to prevent anaerobic layers; however, care must be taken to crush the pile again to minimize the oxygen infiltration, otherwise piles will begin to compost again.

Physical and chemical characteristics

Fresh pine bark has very little uniformity in particle size, is hydrophobic and can be quite acidic. Grading, partially composting and aging of the pine bark stabilizes the C:N ratio of the bark and creates uniformity of particle size. Bark particles will absorb water readily and hold it.

Prior to blending, bark is screened to further grade the bark into various particle sizes. Large particles above 2 in. are usually blended back into bark piles for further decomposition or used for large nursery container mixes. Medium-sized particles ranging from 3/8 to 3/4 in. are screened out for blending of growing media for greenhouse crops, perennials and some nursery applications. Small particles less than < 3/8 in. are sometimes screened out for special applications.

When blended into growing media with other ingredients, small bark particles (fines) can settle between large particles, decreasing air porosity and increasing water-holding capacity. Some growers and growing media manufacturers don't remove bark fines or they blend bark fines back into their formulations to increase water-holding capacity, bulk density and reduce the drying frequency. This works for short-term crops and taller containers where rapid dry-down is an issue. However, care should be taken to avoid fines for long-term crops, as fines can migrate, creating a saturated zone at the bottom of the container.

Good quality, properly processed aged pine bark generally has an EC of less than < 0.5 mmhos/cm3 and a pH around 4.0 to 4.4. If EC is high (>1.0) and pH is below 4.0, there should be a concern about anaerobic

activity, since acetic acid and alcohol are produced in anaerobic conditions. Bark of this nature shouldn't be used for growing media. Properly processed bark should be free of cambium wood splinters, dark brown in color and the texture slightly damp to the touch. The particle size for growing media should be between 3/8 to 3/4 in. with minimal fines. There should be an earthy, forest scent, free of turpentine, sour wine or alcohol odors.

Putting it all together

What makes one bark mix better than another? As discussed here, bark processing is an integral part of producing a quality growing medium. As with any other ingredient in growing media, there are differences in specification and quality. A specification is a documented requirement to be satisfied by a material, design, product or service, compared to quality, which is a measurement for adherence to the specification. Quality pine bark begins with proper processing and management of the raw material.

As with any good quality growing medium, the quality is only as good as the ingredients that are used. When blending with bark, it's important to remember that 1+1 does not equal 2. Bark is a heavy weight ingredient compared to peat moss, perlite, coir and other ingredients. It's important to remember that growing media with bark holds less water than peat-based mixes. As the percent of bark in the formulation increases, the water-holding capacity decreases.

If you're considering a pre-formulated, bark-based growing medium, talk with your supplier to understand what they offer and how they're produced. Ask about the technical specifications of the finished products to understand the intended use of the product. Ask about the features and benefits of the product and decide if these fit your needs. Always try a sample before you buy to see how the product works for your application before switching. All of these questions will help you to make the right decision and improve your success.



1. Bark that's been partially composted and aged to be screened.
2. Final screening of bark before blending of growing media.
3. Pile of southern pine bark ready for blending into growing media. **GT**

Ed Bloodnick is Director of Grower Services and Troy Buechel is Horticulture Specialist for the Mid-Atlantic in the U.S. for Premier Tech Horticulture.