BARK & ROLL OVER

by

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The title sounds like tricks to teach a new family pet, but rolling bark supplies over when they have been undistrubed for a few weeks can save some howling about the bark . This article is an update and reminder that sometimes we have some problems with pine bark inventories, particulary in spring and fall when we have periods of dry weather followed by rainfall. These conditions can create problem in bark supplies. The following paragraphs are a summary of what are my opinions on handling pine bark inventories.

At least two methods of inventorying pine bark are used by bark suppliers. Some companies store pine bark as a coarse inventory product containing particles the size of nuggets, mini-nuggets and mulch along with finer particle products which will be separated for nursery potting bark. If nursery potting bark is inventoried after separation of coarse particle materials, handling procedures and monitoring becomes critical. The inventory piles of nursery potting bark should be stacked at heights less than 10 feet or turned frequently. Lower heights reduce the need to drive equipment onto inventory piles. Heavy equipment driven onto inventories reduce the air exchange in the piles. Bulk inventory piles of nursery potting fines should be monitored for temperature and turned when temperatures exceed 150^{o} F. Inventory piles can become very hot reaching temperatures of 190^{o} F and may spike to temperatures where combustion occurs in the inventory. However, fire is not the only risk when inventories are not turned and not kept moist. Two distinct problems have caused loss of nursery crops when quality control measures have not been practiced during aging and storage of nursery potting bark supplies.

Anaerobic respiration in bark supply inventories can cause death of container crops. Normal decomposition in a pine bark supplies is an aerobic process requiring oxygen. Such biological activity in bark supplies as in all organic components is natural. However, aerobic decomposition must be maintained for all potting components for use in growing ornamental crops. If oxygen is unavailable in the interior of an inventory pile, anaerobic respiration produces several by-products that are phytotoxic to roots of ornamental plants. Acetic acid is one of the by-products . If acetic acid is present, the pH of the pine bark can drop to as low as 2.3. Acetic acid is also a very good extracting solvent. Potassium and numerous other salts are dissolved in the solution in the bark and can damage new crops. Soluble salts from anaerobic bark supplies may be as high as 2.5 dS/m (mmhos/cm). Anaerobic pockets are found below the gray mycelium band in undisturbed inventories. The mycelium band develops 24 to 30 inches below the surface of the pile which is apparently a thermophilic and dry transition zone created by the heat and evaporative moisture loss through steam. The mycelium band acts as an impervious cap preventing water and air movement below the band. The interior of the pile remains moist, however oxygen is depleted by aerobic organisms, then anaerobic organisms populate the interior of the inventory pile. Below this mycelia band, a pH test often reveals very low readings which can be as low as 2.0. If samples are collected and not immediately analyzed, pH may increase as high as in the 3.0 to 3.5 range, apparently due to aerobic processes. However, low pH is not the entire cause of plant phytotoxicity. Many organic ingredients including acetic acid, phenolic and alkaloid compounds are products of anaerobic respiration and may be concentrated in the moisture in the bark even though pH has gone up. After about 3 weeks of wetting, and turning to aerate the inventory, the bark should reach a pH of 4.0, the expected range for pine bark. At that time the bark should be safe to use for potting. Another puzzling aspect of the bark chemistry involves conductivity or soluble salts tests. These readings may be as high as 3.5 dS/m (mmhos/cm). Potassium has been reported to be as high as 200 ppm in such samples with low pH and high electrical conductivity. Apparently acetic acid acts as extractant and pulls salts from the bark . These salts are detected by the conductivity meter and are detrimental to plant growth

Moisture evaporates from inventory supplies as heat and steam are lost. To prevent dry areas in storage piles, irrigate after turning, Sprinklers or soaker hoses can be placed on top of inventory windrows to irrigate them. If irrigation water is unavailable, create a saucer or reservoir in the top of the pile to catch rainfall. Maintaining moisture in the pine bark inventory is important for several reasons. First, dry bark is hydrophobic and will not re-wet quickly. Plants potted into dry bark, wilt and frequently die since very a limited water supply is retained in the substrate. Secondly, mixing dry components creates completely different physical properties than mixing moist components. For example, dry pine bark mixed with dry sphagnum peat moss compress together much like concrete and sand when water is added. Water will actually stand on the surface of these components mixed dry. When moist components are mixed, plump fibers and moist bark particles push apart creating optimal pore spaces for air and water retention. Water drains readily through these same components mixed in a moist state.

Pine bark in dry inventories may also develop high fungal populations recognized by clouds of spores when disturbed. If these inventories are used for potting, rapid growth of mycelium grows throughout the container. Irrigation seems to stimulate mycelium growth however, the bark is hydrophobic and sheds water. Newly potted liners dry out and die of desiccation. Plants shifted up to larger containers, do not grow into the affected pine bark outside of the existing root ball for several months. Once the plants are in the pots, only a couple of alternatives are available. Irrigating profusely and frequently may extend the time to decide how to overcome the problem. Irrigating frequently may mean 5 to 6 cycles over affected blocks per day in sunny hot weather. Most growers that have experienced this catastrophe have found that frequent irrigation is not enough. Directing high pressure jets of water from a hose end nozzle or sprayer may break up the mycelial masses enough to get water to liners and repeated over several days may overcome the problem. Disturbance and breaking up of the mass of mycelium in the pot is the key to getting water to liners. The other alternative to salvage liners is to re-pot into unaffected pine bark The key to avoiding the problem is to recognize that the cloud is not steam and not using it immediately to pot plants. To prevent this problem, bark supplies need to be stored moist. Processed nursery potting bark (usually 5/8 to 3/8 inch and finer particles) should be thoroughly wet (50% by weight) before being placed in inventory piles. Inventory piles should be turned and re-moistened occasionally as bark is aged or stored.

To avoid problems related to inventorying procedures of pine bark supplies, nurserymen should watch or designate someone to observe as bulk potting materials are unloaded at the nursery. If inventories are excessively hot and steamy (> 160^{o}F), or if mycelium clumps are seen in the bark, check pH and electrical conductivity. Pine bark can be tested for pH and electrical conductivity by collecting 3 to 4 samples of approximately 1 cup volume for each sample. Mix 1 cup of the pine bark with 2 cups of distilled water in a large bowl or vessel, stir, let the sample sit for about 20 minutes, stir again, then test the solution using a pH pen or pH meter and conductivity pen or meter. The solution can be filtered by pouring the slurry through a coffee filter if needed. Pine bark ready for immediate use should have a pH of 3.9 to 4.5. Old bark supplies or mixes of hardwood/pine bark sources may have a pH of 6.0 or higher. However, anaerobic bark may have a pH of as low as 2.5 and should not be used immediately if the pH is below 3.8. Conductivity readings for pine bark which can be used immediately should range between 0.2 to 0.5 dS/m (mmhos/cm). Anaerobic bark has been reported to have conductivity as high as 2.5 dS/m.

If clouds of spores are noticeable, thoroughly soak the entire inventory. Do not use the inventory immediately. The slime mold fungi apparently does remain for long periods in the bark supply, but if plants are potted and irrigated, getting water to roots of plants is difficult   Inventories can usually be wet thoroughly and left 2 to 3 weeks, then re-checked to determine useablilty.

Anytime pine bark inventories are not used immediately and are left undisturbed for three to four weeks at the nursery, check for moisture content, heat, spores, ph and electrical conductivity before potting new crops. If observations and results cause questions about usability, irrigate and turn the inventory again and check it after two weeks.

Nurseries should establish an understanding with their pine bark supplier regarding any warranty of product. Does the bark supplier guarantee the pine bark to be immediately useable upon delivery? If the answer is no, then the primary responsibility for quality control shifts to the nursery to check inventories when they arrive. Visiting your bark supplier is also a good quality assurance measure. Observe practices at the bark plant including how high are the inventory windrows, do you see any mycelium in any inventory windrows? How do they handle inventory supplies ?   Is equipment run up on windrows to stack inventories and create space for more bark ? Does the bark plant have any means to irrigate or moisten windrows during aging and storage? (Most do not so don't although water allows for better handling practices). Casually observing answers to these questions can help growers determine how they need to handle bark supplies when they arrive at the nursery.

Good sanitation practices for potting media at the nursery are extremely important. Storage, mixing and handling areas should be located on a concrete slab at higher elevation than growing areas to avoid contamination from runoff from growing beds. The concrete mixing slabs can be designed to drain water away from the area and avoid swamp-like conditions which look bad and impede movement of equipment and people. Bagged materials such as sphagnum peat moss and bundles of new containers should be stacked on pallets above any standing water and covered to reduce ultraviolet breakdown of bags. Fertilizer ingredients should be stored in dry covered storage areas to prevent premature dissolution or release causing elevated nutrient levels when used during mixing and potting plants. Recycled containers should be washed free of previous mineral or organic potting material and then sterilized with commercially available disinfectants or a 10% sodium hypochlorite solution.

Care in storing and handling components, containers and all materials used in potting new crops is a critical pre-plant step in nursery crop production that can prevent weed, disease and other cultural problems from occurring later in production . The physical and chemical characteristics of potting substrates do have great impact on survival and growth rate of container crops. Assuring that the potting substrate is the same and uniform every time is one of the major steps to reduce plant loss, production costs and ultimately profit for the nursery. Container nursery crop values exceed $50,000 per acre, so plant losses are very costly. For this reason, creating space for storing and handling potting media and potting supplies is the best investment a nursery can make. Nurseries can then turn and moisten potting ingredients prior to containerizing crops, thus solving bark supply concerns.

Published:
Bilderback, Ted. 2000. Bark and roll over. NCAN Nursery Notes Vol 34:(3):53-59.

See article at:
http://www.ces.ncsu.edu/depts/hort/nursery/cultural/cultural_docs/substrates/index.html