COMPOSTED BARK FOR CONTROL OF ROOT ROT IN ORNAMENTALS[1]

by H.A.J. Hoitink, A.F. Schmitthenner, and L.J. Herr [2]

During the past three decades, container production of woody ornamentals has increased in popularity. Container media traditionally consist of sterilized peat moss and some neutral aggregate such as sand, perlite, or vermiculite. In parts of the world other than arid regions, plants in these types of container media are often predisposed to attack by soil-borne pathogens such *Pythium* and *Phytophthora*.

During the past decade, several types of hammermilled barks have been used successfully for the production of healthy, woody ornamentals and pot flowers. In many instances, root rots are absent and root growth in composted bark media is superior to that in sterilized and nonsterilized peat media.

This takes on added significance in light of the current energy "crunch". In Ohio alone, 600,000 cubic yards of peat mixes are sterilized annually to control diseases. Sterilization requires natural or propane gas, fuel oil, or coal. The Ohio usage represents approximately 10 percent of the nationwide energy total used for this purpose. Adequate bark is available in Ohio to replace peat in the media and eliminate need for sterilization. Similar supplies occur in many other states.

Available information on the incidence of disease on plants in composted bark versus sterilized peat or other media is scant at best. Almost all evidence is based on observations rather than on experimental data. Ammoniated bark incorporated in *Phytophthora fragariae*-infested soils in the Oregon Willamette Valley at rates of 40 and 100 tons per acre provided a high degree of control of red stele disease of strawberry during the first and second years following treatment. Plants in bark-treated soils were larger than in untreated soil. In Japan, composted bark has been used for many years for the production of various plants. In addition to marked effects on plant growth, several root rots also were controlled. It has been suggested that increased drainage could account for some of the reduced root rot incidence. Other factors such as inhibitors in bark and hyperparasitic microorganisms also could be involved.

During the past three growing seasons, rhododendrons have been produced at the OARDC in various types of container media. Root growth has been considerably superior in a composted hammermilled bark-sand medium (2:1, v/v) than in various peat-sand media. Furthermore, Phytophthora root rot did not occur in the bark medium, whereas losses occurred in the peat mix. The absence of root rot in the bark mix could be due to the high percentage drained air space of the bark mix (20%) as compared to the peat mix (15%). Good drainage is known to reduce root rots caused by *P. cinnamomi*.

In addition to root rots, certain diseases caused by nematodes also are reduced in bark media. Volumetric bark to soil ratios of 4:1, 2:1, and 1:2 greatly reduced incidence of root-knot on tomato and population levels of plant parasitic nematodes on forsythia.

Tree barks are usually composted before use. At OARDC, the fate of root rot organisms during this composting process was followed. Sugar beet pieces infected with *Rhizoctonia solani*; and rhododendron roots, crown pieces, and adhering soil infested with *Phytophthora cinnamomi* and *Pythium irregulare* were buried in a compost pile. This mix contained per yard (2 bark: 1 sand, v/v):6 pounds ammonium nitrate, 5 pounds superphosphate, 1 pound

1 Reprinted from *Ohio Report*, March-April 1975.

2 Harry A. J. Hoitink is an associate professor, A. Fritz Schmitthenner a professor, and Leonard J. Herr an associate protessor, Department of Plant Pathology, Ohio Agriculture Research and Development Center, Wooster.

elemental sulphur, and 1 pound GU-49 (63% iron oxide). The pile was stacked 6-7 feet high and 8-10 feet wide. Identical pathogen samples were buried in a pile with all ingredients added except ammonium nitrate. A third series of samples was buried in a sand pile. The compost pile was turned once after 4 weeks. Temperature in the compost pile was recorded throughout the composting period.

After 11 weeks, all infected samples were recovered and assayed for the presence of the pathogen. These samples were planted on selective media to test for survival of *P. cinnamoni* and *P. irregulare*; other samples were baited with lupine and sugar beet seedlings to test for *P. cinnamomi* and *R. solani*, respectively. None of the pathogens were recovered from the compost pile. However, all three pathogens were isolated from samples in the bark-sand pile that was not composted (no nitrogen added) nor from samples buried in the sand pile. Temperatures in the compost pile ranged from 100° to 130°F over a period of 10 weeks. In the noncompostsed pile, temperatures reached 60-75°F. In the sand pile, temperatures were similar to the prevailing outdoor soil temperature and ranged from 35-60°F.

These findings suggest that plant pathogens, other than perhaps heat-stable viruses, were killed during the composting process. This may partially explain the absence of root rots in ornamentals such as rhododendron, poinsettia, and chrysanthemum produced in nonsterilized, composted bark media.

Recolonization of composted media by pathogens must be slower than in nonsterilized peat media to fully explain differences observed in the field. Because plants are free of root rots for a long time after potting, an attempt was made to examine the role of inhibitors.

Rhododendrons (Roseumelegans), in 3-gallon containers, were root-inoculated with 2.5 x 10^3 chlamydospores of *P. cinnamomi* per plant. Plants in peat as well as composted bark media were killed by this massive inoculum dose. Presently, the effects of lower inoculum levels which more nearly reflect natural conditions are being tested.

Several attractive advantages are associated with composted bark growing media. A changeover from peat to composted bark could result in:

1) Utilization of all available hardwood bark and subsequent elimination of environmental pollution caused by huge bark piles;

2) Reduction of landscape destruction in peat bogs;

3) Lower fuel consumption for production of ornamentals, and possibly other crops;

4 Reduction, and for some crops elimination, of the need for soil fungicides and hazardous fumigants;

5) Production of healthier plants for use in the landscape;

6) Reduction in production costs of some plants because of more rapid growth leading to shorter production cycles and reduced plant losses due to disease.

Elucidation of the basic mechanisms underlying the apparent inhibition of root diseases on ornamentals in bark media may also be useful for the control of similar diseases of food crops produced under controlled environmental conditions.

ABSTRACT

Cuthbert, R. A., W. N. Cannon. Jr., and J. W. Peacock. 1975. **Relative importance of root grafts and bark beetles to the spread of Dutch elm disease.** USDA Forest Service Research Note NE-206. 4 p.

Root-graft transmission of Dutch elm disease (DED) is sometimes ignored in both research studies and city programs to control DED. We conducted studies in Detroit, Michigan to (1) distinguish between root-graft and beetle-transmitted cases of Dutch elm disease, and (2) determine the relative importance of both kinds of disease transmission. Our results indicate that elms adjacent to 1-, 2-, or 3-year-old stumps have a disease rate three to five times higher than elms not adjacent to stumps. We conclude that in Detroit, which has elm plantings typical of many United States cities, root grafts were probably responsible for more than 50 per cent of the DED transmission in 1973.