

An Assessment of Hardwood Bark from Ohio Sawmills as  
Growing Medium for Horticultural Crops

Edward A. Armbruster

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TITLE: An Assessment of Hardwood Bark from Ohio Sawmills as Growing Medium for Horticultural Crops.

INTRODUCTION: This subject was first suggested by Professor Robert D. Touse, after he had attended an inter-departmental seminar. At this seminar, Dr. H. A. J. Hoitink spoke on the subject of composting bark and using it as a growing medium for potted plants. Dr. Hoitink and other scientists have done a great deal of work on this subject at the Ohio Agricultural Research and Development Center in Wooster. They have also studied the use of composted bark as mulch for flowerbeds and gardens and for use as farm animal bedding.

After talking with Dr. Hoitink and other faculty members, as well as people in the horticulture and bark producing industries, I decided to use the subject of bark for my project. It soon became clear that there was one very important aspect missing in this area. Horticulturists had no way of knowing who to contact to obtain the bark they needed.

PURPOSE: The purpose of this project was to 1) develop a directory of Ohio sawmills that have bark producing capabilities and 2) determine the physical and chemical properties of bark necessary for use in the horticulture industry.

PROBLEM: In past decades, sawmill owners have had to deal with several problems in relation to bark removal. The first of these problems was really what brought about the age of mechanical debarking. Sawmills started selling their chipped slabs

and edging strips to paper mills. These paper mills had no way of removing the bark that was still attached to the "clean" pulp chips and wanted the sawmill owners to install debarking machines. Because mill owners needed to get rid of these chips somehow, many of them obliged the paper industry and bought debarkers.

The next problem that mill owners faced was: what should they do with the immense amount of bark that was taken off their logs! This was usually solved either by burning it (sometimes for fuel, sometimes just to get it out of the way) or simply dumping it in a pile near the mill. However, in recent years, things have changed significantly. Environmental regulations have banned the burning because of air pollution and the dumping because of water pollution and aesthetic reasons.

At the same time, the paper industry in Ohio has made many changes. Due to the development of sophisticated equipment and processes that make it possible to separate the bark from the wood chips, it is no longer necessary for the paper mills to buy "clean" chips. Plus, the paper industry has gone almost completely to buying chips instead of roundwood. For these reasons, the simple solution for the sawmill owners would be to stop debarking their logs (this would reduce the pressure they are getting from the Environmental Protection Agency) and sell the "dirty" chips to the paper mills that have installed this new equipment.

However, sawmill owners have found that there are many advantages to debarking logs. Probably, the most important advantage is that the teeth in the headsaw stay sharper longer when sawing debarked logs. The teeth dull faster than normal when sawing logs with bark on, because the bark picks up a large amount of dirt, rocks, and other foreign material during the logging and yarding operations. When the logs are debarked prior to sawing, it helps to minimize the down time involved in sharpening the saw. Other advantages include: a safer mill due to less waste materials being deposited on the floor and equipment, more income to the mill if the bark can be sold separately, and lumber is more marketable if there is no bark showing. Therefore, the sawmill owner is going to be better off if he goes ahead and debarks his logs. However, he still has the dilemma in that he still has to find someone to buy the bark.

The horticulture industry can use this excess bark as a growing medium for potted plants. To be used for this purpose, the particle size of the bark must be greatly reduced and many sawmills start this process by running the bark through a hammermill. A hammermill is a machine that has a set of knives that spin around a center drive shaft inside a steel housing and chop the bark into very small pieces (roughly one inch square). Therefore, many of these sawmills have the perfect product for the horticulture industry, but prior to this project and the resulting directory, horticulturists had no way of knowing who

to contact to obtain the bark. Hopefully, this study will help both the horticulturists who need bark and sawmill owners who have a product to dispose of.

METHOD OF OBTAINING SAWMILL INFORMATION: Using a copy of the most recent sawmill directory published by the Ohio Department of Natural Resources, I was able to obtain a list of all the sawmills in Ohio that debark logs. This directory provided the names and addresses of the mills and what type of equipment they have. But it did not specify whether or not they have bark for sale.

Next, I received permission from O.D.N.R. to send each Service Forester in Ohio a set of questionnaires for his or her district. (A copy of this questionnaire is provided at the back of this report.) I filled in the information that I was able to get from the O.D.N.R. sawmill directory and sent the questionnaires to the proper Service Forester. I also sent each Service Forester several blank questionnaires, asking them to provide information on any sawmills that might have been built or reopened since the O.D.N.R. directory was published.

Finally, these questionnaires were compiled into the directory that is at the end of this report. I feel that is important to note that the sawmill industry in Ohio is very transient. It is very possible that some of the mills listed in this directory have already shut down and there also may be some operating now, that weren't when I received my information in March of

this year.

PRODUCT PRODUCED: When this project was formulated, I had planned to visit each sawmill that debarks logs, obtain a sample of the bark, and study it as far as particle size, pH, and wood content. However, after talking with people in the horticulture industry, it became apparent that this was not necessary because the horticulturists control all three of these characteristics after they buy the bark. It really doesn't matter what any of these properties are when the bark comes from the mill.

Therefore, I visited a few mills to gain an understanding of how bark is processed. While at these mills, I took samples and brought them back to the lab where I ran tests to determine the general characteristics of hardwood bark coming from the mill. I also did research to find out how, and to what extent, horticulturists change these properties.

Particle size is very important to the horticulture industry. When the bark comes from the sawmill, it may be in large, odd-shaped chunks or it may be in small pieces of fairly uniform consistency depending on whether or not it has been run through a hammermill. It is not really important whether or not it has been hammermilled because after the horticulturists buy it, it is run through a set of screens that separate it by size. If the bark particles do not pass through a screen in which the holes are  $\frac{1}{2}$ " square, it is run through a hammermill. It is then screened again to remove the fines. Fines are very small

(almost dustlike) particles that inhibit plant growth because they hinder drainage and aeration. Gartner, Carbonneau, and Saupe (2) found that the particle size of hammermilled hardwood bark ranges from  $\frac{1}{4}$ " to  $\frac{1}{2}$ ".

pH is another important consideration. When bark comes from the sawmill, it may be just about anywhere on the pH scale. The bark of different species has different pH levels and there are many things that can happen to bark around the mill that will either raise or lower the pH. For example, if heavy equipment is driven over bark at the mill, it frequently results in the fermentation of the bark and the pH may drop to 2.0 or lower (1). Horticulturists control pH by composting and the addition of chemicals during composting.

Composting is "the biological decomposition of organic constituents in wastes under controlled conditions". (4). This means that the bark is kept wet and warm and is allowed to partially decompose. The process is controlled by how much water is added, how high the temperatures are, and how much and what kind of chemicals are added. The optimum pH for composting ranges from 6.5 to 8.5. However, the desired pH following composting ranges from 5.2 to 6.5 for most crops. (6). Horticulturists can obtain just about any pH they want, depending on what type of plant is to be grown. Gartner, Hughes, and Klett (3) found that if the bark has a pH of 7.0 or higher, it is undesirable for good plant growth.

The other characteristic I considered is wood content. This is very important to the use as a growing medium and is the least controllable of the three factors looked at.

The amount of wood in the bark is dependent on the type of debarker used and on how closely this aspect of the operation is controlled by the sawmill manager. Different types of debarking machines remove different amounts of sapwood along with the bark. The machines also must be adjusted for the type of bark (thick, rough, thin, smooth, etc.) that is being removed. If the sawmill manager is not conscious of this and does not carefully control it, chances are that it will not get done.

The reason that wood content is important is that wood decomposes faster than bark. The higher the wood content, the faster composting will take place and the less amount of final product will be left for growing media. Also, Mazur, Hughes, and Gartner (5) found that the smaller the wood content, the better for use as a growing medium.

SUMMARY OF DIFFERENT TYPES OF DEBARKING MACHINES: I felt that it was necessary to develop an understanding of the different types of debarkers being used and what differences, if any, there were in the bark produced by these machines. There are many different types of machines used in the United States, but there are two basic types used by most sawmills in Ohio.

Both of the machines used in Ohio employ the rossing-head

cutterhead. This cutterhead is a cylinder with several spirally-arranged rows of carbide-tipped teeth. These teeth are approximately two inches long and one inch in diameter. Each of the two machines is built by a different company which has its own design using the rossing-head cutterhead. Morbark Industries builds debarkers that have the cutterhead mounted below the bed on which the logs lie. This allows for an excellent degree of control as to how deep to take the bark off the log. The sawmill manager should try to take as much bark off as possible without taking any sapwood.

The H.M.C. Corporation builds machines that have the cutterhead mounted on a hydraulically controlled arm that travels along above the log. These machines are sturdier than Morbark's because there isn't as much chance of the cutterhead becoming clogged with bark. However, there is less control of removal depth on these machines and they tear up the sapwood a great deal, which causes a loss of money for the sawmill.

CONCLUSION: As I researched this project, I found many other uses of bark. Many companies use their bark for fuel or sell it for this purpose. There are quite a few farmers that use bark for animal bedding. Also, there is a lot of use for bark on golf courses and in parks to cover paths. However, many sawmills do sell bark to the horticulture industry and I hope this project will be some help to both the sawmill and horticulture industries in Ohio.

## REFERENCES

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- 2) Gartner, J. D., M. C. Carbonneau, D. C. Saupe. 1968. Tree soil for growing potted plants. Ill. Res. 10(4):16.
- 3) Gartner, J. D., T. D. Hughes, J. E. Klett. 1972. Using hardwood bark in container growing mediums. Amer. Nur. 135(12): 10-11, 72-79.
- 4) Golueke, C. G. 1972. Composting. A study of the process and its principles. Rodale Press, Inc. Book Div. Emmaus, PA. 110 p.
- 5) Mazur, A. R., T. D. Hughes, J. D. Gartner. 1975. Physical properties of hardwood bark growth media. HortScience 10(1): 30-33.
- 6) Smith, Elton M., Cynthia D. Mitchell, and Joseph Rimelspach, "Changes in Mulch and Soil Nitrate Levels Following Nitrogen Fertilization." Ornamental Plants -- 1978, A Summary of Research. O.A.R.D.C., 1978.

DIRECTORY OF BARK PRODUCING SAWMILLS IN OHIO

Adelmann Lumber Company

R.D. #1.  
McArthur, OH 45651

Phone: (614) 596-5864  
Owner: Adelmann Lumber Company  
Product: No hammermill; sell bark  
for industrial fuel.

Allen Lumber Company

Factory Rd.  
Nelsonville, OH 45764

Phone: (614) 753-3445  
Owner: Allen Lumber Company  
Product: No hammermill; sell bark  
for industrial fuel.

Anderson Bros. Enterprises Inc.

Rt. #1.  
Fleming, OH 45720

Phone: No listing.  
Owner: Anderson Bros.  
Product: No hammermill; sell bark  
for industrial fuel.

B & P Stave Company

P.O. Box 376  
Kenton, OH 43326

Phone: (419) 675-2238  
Owner: Philip Pinkley  
Product: No hammermill; sell bark to  
farmers for bedding and to  
the horticulture industry.

Baird Bros. Sawmill Inc.

Rt. #1.  
Canfield, OH 44406

Phone: (216) 533-3122  
Owner: Richard Baird  
Product: No hammermill; sell bark  
for industrial fuel.

*Actual list  
includes 50 to 60  
mills of Ohio's approx 300  
Prof Torrance has complete  
listing*