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Sawdust Mulches for Larger Crops, Better Soils

Edited by

J. L. Overholser



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OREGON FOREST PRODUCTS LABORATORY

State Board of Forestry and School of Forestry,
Oregon State College, Cooperating
Corvallis

THE OREGON FOREST PRODUCTS LABORATORY was established by legislative action in 1941 as a result of active interest of the lumber industry and forestry-minded citizens. It is associated with the State Board of Forestry and the School of Forestry at Oregon State College.

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Sawdust Mulches Used For Larger Crops, Better Soils*

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Large-volume use of sawdust for a mulch on various crops may result in increased yields as shown in field tests at Corvallis during the last 6 years.

The Departments of Horticulture, Soils and Bacteriology at Oregon State College have cooperated with the Oregon Forest Products Laboratory in comparing sawdust with straw, leaf mold, and hay as mulches and also where cultivated into the soil for growing strawberries, blueberries, cane fruits, and annuals such as corn, tomatoes, beans, and cabbage.

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Several million tons of sawdust and other wood residues are produced annually in the Pacific Northwest. While most of this is burned, an increasing amount is being used for mulches by orchardists, growers of small fruit, and nurserymen. It is also finding increasing use as litter in barns and feed lots, and as a soil conditioner in general agriculture. Usage has been largely on a trial and error basis, usually with good results. Like other highly carbonaceous organic matter, however, sawdust under certain conditions can cause a deficiency of available nitrogen in soils and thus retard plant growth. Certain woods or bark also contain tannins and other extractives that may have more or less toxic influence on plants and soil microorganisms. To obtain information and fundamental knowledge on these and other problems arising in connection with agricultural uses of wood wastes, a cooperative investigation was initiated at Oregon State College.

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It is well known that mulching can increase crop yields, but it is essential that mulches be low-cost, readily available materials. In addition, it is desirable that materials used should not require costly applications of nitrogenous fertilizers during the process of decomposition.

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Most of our soils are greatly in need of organic matter because the usual crop rotations seldom maintain soil humus at as high a level as desirable. Wood residues should be utilized for humus maintenance wherever it is economically feasible to do so. Although the emphasis is on sawdust, this material reacts much as do chips, shavings, and bark, except that decomposition is more rapid in the more finely divided material.

Sawdust mulches:

- Improve structure and aeration of heavy soils.
- Increase water absorption and penetration.
- Conserve moisture through weed control and reduced evaporation.

* A summary of information from several sources, including works listed in the selected references and unpublished test results supplied by W. B. Bollen, Bacteriologist, Oregon Agricultural Experiment Station.

- Maintain more uniform soil temperatures.
- Improve the granulation of surface soil.
- Reduce soil erosion.
- Increase organic matter and humus in soil.

As mulches, sawdust and other wood wastes are clean to handle, easy to apply, long lasting, and efficient in conserving moisture. Plants grow well under such mulches, provided nitrogenous fertilizer is added to balance the excess of carbonaceous matter and meet the requirements of microorganisms that slowly decompose the woody material. As a soil conditioner, sawdust is particularly useful when incorporated with heavy soils. Up to 200 tons per acre have been employed for this purpose, resulting in marked improvement in physical condition of the soil. After decomposition has proceeded several years the resulting increase in humus-like organic matter gives the soil an improved porous sponge structure, greater usable moisture capacity, and better aeration.

The advantages of sawdust as a mulch must be weighed against the cost of application and renewal, and the necessity for adding additional nitrogen fertilizer during decomposition. Since wood contains only a small amount of nitrogen, microorganisms decomposing sawdust compete for this element with the crop grown. Potatoes and tomatoes grown with 4 inches of sawdust cultivated into the soil may require as much as 400 pounds of actual nitrogen to the acre the first year. Lesser amounts are needed when the sawdust is used as a mulch, or in later years after application, or with other crops such as strawberries. The nitrogen assimilated by microorganisms is not lost, however, but becomes available to crops after the sawdust is decomposed.

Different kinds of plants vary in their immediate and progressive requirements for available nitrogen and also in their foraging power; hence, they vary in their susceptibility to a reduction in the supply of available nitrogen. In greenhouse studies sunflowers have shown no evidence of nitrogen deficiency in the presence of sawdust, even without added nitrogen fertilizer. Corn, on the other hand, has shown nitrogen starvation symptoms on field plots regardless of fertilizer supplements with the sawdust. Further studies are necessary to evaluate such differences in response, and to correlate them with soil type and growing conditions.

While recommendations will vary for different crops and soil conditions, as a general rule when sawdust is applied during or immediately before the growing season, from 25 to 50 pounds of ammonium sulfate or its equivalent in nitrogen should be added to each ton of sawdust the first year. This treatment may be divided, one half the amount of fertilizer being added with the sawdust and the other half being broadcast later and irrigated into the soil. Treatment should be repeated the second year, after which the decomposition becomes stabilized and requires no more additional nitrogen. Where great amounts of sawdust are incorporated, instead of using a correspondingly heavy dosage of nitrogen fertilizer, a series of small applications sufficient to avoid starvation symptoms during the growing season should be used. Heavy incorporations of sawdust also promote rapid aeration and drying so that moisture must be maintained by additional irrigation.

Douglas fir sawdust mulching is quite promising for use with blueberries, as indicated by test-plot yields. Over a 6-year period, blueberries mulched with sawdust produced more than double the yield from similar plots mulched with oak leaf mold, three times the yield from plots mulched with straw, and almost six times the harvest from plots clean-cultivated. All plots received the same water and fertilization.

Increased yields followed use of sawdust mulch with strawberries, but it was found that sawdust should be incorporated into the soil for strawberries, since mulching favored increase in red-stele disease where present in the soil.

Mixing sawdust into the soil where a lawn is to be started has been found to aid in establishing the grass. Old lawns in poor condition may benefit from light applications of sawdust raked into the grass.

Sawdust also has been found well adapted for use with ornamental trees and shrubs, and vegetables such as cabbage and tomatoes.

Some additional benefits may be obtained from use of mulches. Crops such as tomatoes are kept cleaner, as rain cannot splash mud on mulched plants. Less weeding is required when mulch is used. A six-inch layer of sawdust prevents growth of most weeds other than vigorously growing species, such as Canadian thistle.

While most attention has been given to Douglas fir sawdust, the value of other wood wastes for mulching has been demonstrated. Cedar tow, Douglas fir bark, pine shavings and alder sawdust serve as excellent mulches for blueberries, giving results equal or superior to peat moss. On potato and tomato plants these materials were comparable in effect to Douglas fir sawdust.

Investigation of the agricultural use of sawdust and of the benefits to be derived has led to a better understanding of the problems involved. Use of wood wastes as mulches and soil amendments has been encouraged and has found increasing popular appeal. Waste products of the lumber industry, where locally available at low cost, can effectively replace the relatively expensive peat moss for many purposes. While these products have little or no fertilizing value, when properly used and supplemented with available nitrogen they are proving beneficial to intensive farming in many ways.

A comprehensive report of test results is to be published jointly by the Departments of Soils, Horticulture, and Bacteriology at Oregon State College. Some information is available now in several publications:

Allison, F. E., and Anderson, M. S. The Use of Sawdust for Mulches and Soil Improvement. Circular No. 891, U. S. Department of Agriculture, November 1951.

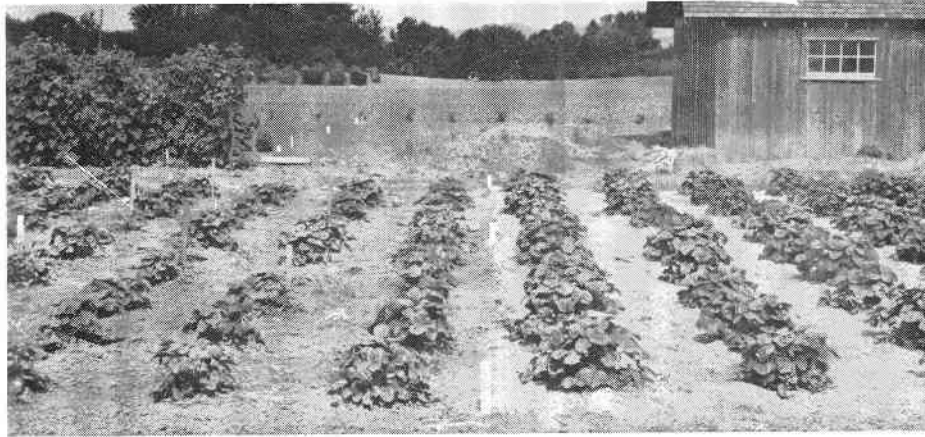
Bollen, W. B. "Mulches and Soil Conditioners: Carbon and Nitrogen in Farm and Forest Products." Agricultural and Food Chemistry, Vol. 1, No. 5, P. 379. May 27, 1953.

Boller, C. A. Growing Blueberries in Oregon. Station Bulletin 499, Agricultural Experiment Station, Oregon State College, Corvallis. June 1951.

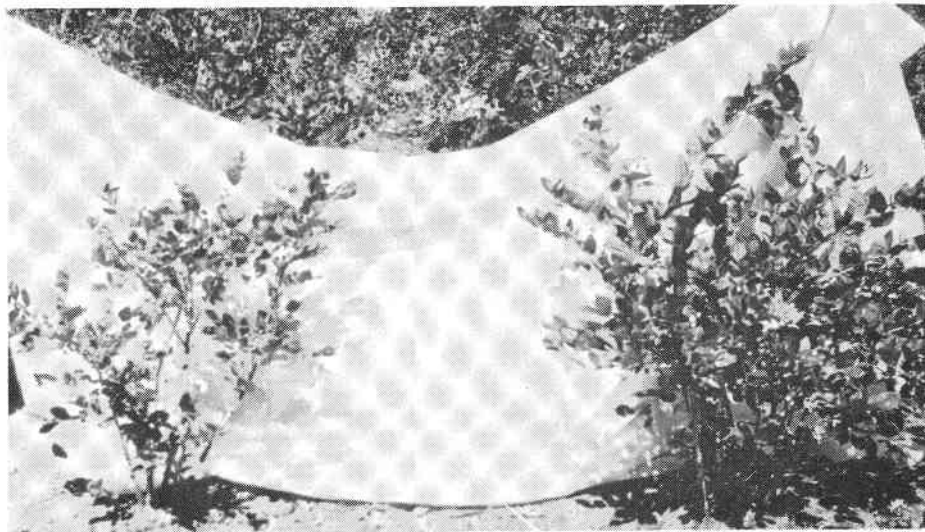
Roberts, A. N. and Stephenson, R. E., Sawdust and Other Wood Wastes as Mulches for Horticultural Crops. Technical Paper No. 576, Agricultural Experiment Station, Oregon State College, Corvallis. Proc. Ore. State Hort. Soc., 1948.

Vaughan, E. K., Roberts, A. N., and Mellenthin, W. M. The Influence of Douglas Fir Sawdust and Certain Fertilizer Elements on the Incidence of Red-stele Disease in Strawberry. Technical Paper No. 839. Agricultural Experiment Station, Oregon State College, Corvallis. May 1954.

Wood Products for Fertilizers. Bulletin No. 32, Northeastern Wood Utilization Council, P. O. Box 1577, New Haven 6, Connecticut. June 1950. (Price \$1.00)



EFFECT OF MULCHING strawberries grown near Corvallis. Plants on the left were cultivated; the ones on the right had a sawdust mulch. Fertilizer and water were applied the same on both plots



MULCHING versus **CULTIVATING** is demonstrated by these two blueberry plants grown for 3 years on a silty clay loam. The plant on the left was cultivated; the one on the right had a 6-inch sawdust mulch. Fertilizer and water applications were the same for both plants.