MULCHING MATERIALS FOR NURSERY SEEDBEDS

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Introduction

The use of mulches, to protect seedbeds from wind and water erosion, and to prevent rapid drying of the soil, is a common nursery practice. The materials used include brush, limbs, burlap, screen, cheesecloth, and sawdust.

Except when bedboards are used, a mulch that will prevent or reduce wind erosion is a necessity. At the Chittenden Nursery the use of straw and burlap was discontinued because of the weed problem and the need for removing the mulch as soon as germination started. This usually occurred when the nursery crew was distributing stock. Sawdust is a good mulch, but it is easily blown away. At our nursery, wire cloth, rolled over the beds after the sawdust was spread, prevented wind erosion fairly well. However, this cloth must be removed from the beds as soon as germination starts. Often several strong winds occur during germination, and unless the soil is protected by watering, the sawdust is blown away and soil movement will start.

Mulching material to be used at our nursery must meet the following criteria:

1. Bind or cling to the soil and not be easily moved by wind or water.
2. Retard surface evaporation and thereby maintain proper conditions for seed germination without frequent waterings.
3. Be porous and absorb water or permit it to percolate into the soil.
4. Be able to remain on the seedbeds indefinitely or until germination is complete.
5. If left on the beds, be able to decompose after one season.

Many materials have been tested in relation to these requirements.

About 10 years ago two petroleum products were tested. They both provided good protection from wind erosion and reduced evaporation.

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Although the beds looked like black top roads, the seed germinated more uniformly and emergence was greater than in the control plots. Because these materials had to be heated and applied while warm with special equipment and because the material cost was high, no further work was done with them.

During the past 6 years tests were made with latex and asphalt emulsions. Dr. J. D. Wilson of the Ohio Agricultural Experiment Station furnished a list of materials he was working with. From a California source we obtained a list of materials that had been used to control erosion on steep roadbanks. From these sources we selected the products that would permit seedlings to grow through them.

Eleven materials have been tried in the past 2 years. These materials were applied to beds that had been unmulched or mulched with sawdust. An attempt was made to randomize each treatment and rate of application. In most cases at least three replications were made, but the results were not analyzed statistically. Summaries of the trials follow:

American Oil Company Anionic and Cationic Emulsions

These materials are applied to a straw mulch used for binding soil on roadbanks. Application is best done with a pressure-type applicator. Both materials were strained to remove any clots. Frequent cleaning of the nozzles is necessary with both materials. This cleaning could be reduced by arranging a system to flush the nozzles after the asphalt emulsion is shut off.

Anionic Emulsion

The anionic emulsion is very difficult to handle and apply. The normal storage life of the material is 1 month; then the emulsion breaks down and coagulates. Also, even the slightest contamination with hard water will cause earlier coagulation. Once the emulsion has coagulated there is no way of correcting it.

Applications were at 64 and 96 gallons per acre, and both rates gave excellent control of wind erosion. Germination in treated plots started earlier and was completed sooner than in the control plots. The data indicate that the lower rate of application is adequate.

Average Stands Anionic Emulsion

Treatment	Gal./acre	Average stand, square feet
With sawdust	64	40.8
Without sawdust	64	34.5
With sawdust	96	28.4
Without sawdust	96	34.0
Control	--	26.2

Cationic Emulsion

The cationic emulsion does not have the defects of the anionic emulsion.

It can be diluted with a solution of 1 gallon of vinegar in 54 gallons of water. Both the straight cationic emulsion and a diluted emulsion (1 part vinegar and water to 4 parts emulsion) were applied in the fall of 1964. The dilution seemed to make application somewhat easier. The trials were to be completed in the spring of 1965.

Encap (EAP 2011)

Encap (EAP 2011) is an experimental product of Esso Research and Engineering Company and is not on the market. This material is quite similar to the American Oil Company anionic and cationic emulsions and presents identical problems. Straining, use of a pressure-type applicator, and frequent cleaning of nozzles are necessary.

It is applied at rates of 80 and 144 gallons per acre, and the lower rate seems adequate.

Sun Terra Seal Black X319-2

This wax emulsion is an experimental product of the Sun Oil Company and is not on the market. Use of

Treatment	Gal./acre	Trees per square foot: Replication 1	Trees per square foot: Replication 2
With sawdust	80	37.8	32.2
Without sawdust	80	37.3	37.2
With sawdust	144	29.0	42.2
Without sawdust	144	26.2	28.0
Control	--	25.3	22.8

a pressure-type applicator is necessary as piston or gear pumps cause the material to foam. Nozzle plugging is also a

problem, but it could be corrected by a system of nozzle flushing.

The material was diluted 1-9 with water and applied at 83 and 124 gallons per acre. All applications gave good control of wind erosion; about 90 gallons per acre would probably give the best control. Application should not be heavy for it will seal out water from the beds.

Treatment	Gal./acre	Trees per square foot
With sawdust	83	16
Without sawdust	83	20
With sawdust	124	46
Without sawdust	124	31

Soil Gard

This material is manufactured by the Miller Chemical and Fertilizer Corporation. This is a latex material mixed 1-4 with water and applied with a regular sprayer at 100, 150, and 200 gallons per acre. The material provides a very good cover, and applications at the higher rates will seal the soil so that the binding must be broken before irrigation. In the fall application, the binding became loose, and the wind blew chips of the material off the beds; control of wind erosion was greatly reduced.

Catalan 251

Treatment	Gal./ acre	Trees per square foot: Replication 1	Replication 2	Replication 3
With sawdust	100	16.3	31.2	34.2
....Do	150	13.2	28.2	31.5
....Do	200	21.0	18.7	26.0
Control	--	22.5	33.0	18.0
Without sawdust	100	34.2	22.5	8.8
....Do	150	31.0	35.7	17.5
....Do	200	25.8	33.8	18.0
Control	--	14.3	28.2	11.8

This is a resin product manufactured by the Catalin Corporation of America.

The material is easily applied with pump sprayers. It was diluted 1-8 with water and applied at 242 gallons per acre. The material seemed to break down overwinter in the fall 1963 beds, and very little control of wind erosion was obtained. In the spring 1964 beds it gave some erosion control but very little improvement in the stand.

Fall 1963

Treatment	Gal./ acre	Trees per square foot: Replication 1	Replication 2	Replication 3
With sawdust	242	16.5	20.5	18.5
Control	--	25.0	45.5	17.0
Without sawdust	242	34.5	29.0	25.0
Control	--	18.5	28.0	12.5

Spring 1964

Without sawdust	242	17.0	38.5	
Control	--	25.5	37.0	

The material costs about $2.50 a gallon and comes in 55-gallon drums.

Evanol (E935L)

This adhesive product, manufactured by the Arabol Division of The Borden Chemical Company, is easily applied with pump sprayers.

This material was mixed with equal parts of water and applied at 310 and 435 gallons per acre. The higher rate gave the best erosion control. Both rates broke down very little overwinter. Better stands apparently are obtained when the material is applied to bare soil.

Fall 1963

Treatment	Gal./ acre	Trees per square foot: Replication 1	Replication 2	Replication 3
With sawdust	310	22.5	31.5	32.0
....Do	435	23.5	22.0	28.0
Control	--	25.0	45.5	17.0
Without sawdust	310	16.5	30.5	22.5
....Do	435	37.5	25.5	22.0
Control	--	18.5	28.0	12.5

This material costs about $1 per gallon.

King Fish

This blended fish product is manufactured by K. C. Mattson Company. It is essentially a fertilizer, but it has stabilized some soil on steep banks.

Thirty gallons per acre of the material was used on beds sown in the spring of 1964. It did not control wind erosion and germination of red pine seed may have been reduced.

Dow Latex 546

This material has been tried during the past several years; it has occasionally given very good results, but it also has given very poor results. It acts on the soil *very* similarly to Soil Gard. A 1:4 mixture with water seemed to give the best control. As with Soil Gard and the asphalt emulsion, care must be taken not to seal the soil.

Slope Retention Blankets

This is an excelsior blanket manufactured by the American Excelsior Corporation. The blanket is composed of a mat of excelsior about one-fourth inch thick, topped with an open mesh cotton netting secured to the mat.

The blankets are held in place with 6-inch wire staples placed about 24 inches apart along the sides. Several of the blankets placed on fall 1963 beds were blown off by a violent windstorm in the spring of 1964. This may have been due to failure to put in enough pins. Where the blankets did hold, wind erosion was prevented. Germination was not as good as in some of the other treatments and only slightly better than in the control.

The netting also made weeding difficult. However, the netting may be removed after the seed has germinated; the excelsior mat is left on the ground.

The cost of the material is about 3½ cents per square foot; thus, it is very expensive for nursery use.

	Trees per square foot	
	Replication 1	Replication 2
On bare soil	20.0	34.0
Control	25.5	37.0

Mulchnet

This material is a kraft paper yarn netting manufactured by the Bemis Bag Company.

It was used on fall 1962 and fall 1963 beds with varied results. It seems to deteriorate somewhat overwinter, and in the spring strong winds tear it apart and blow it off the beds that are not protected by windbreaks. Where the netting remained in place, wind erosion was prevented and a good stand of seedlings was obtained.

The first year the mulchnet was used the netting was left on the beds. This made weeding very difficult; therefore, it should be removed as soon as the germination is completed and the seedlings are established.

The material cost is approximately $190 per acre.

	Trees per square foot
Average stand	30.0
Control	23.5

Turfiber

This is a dried and baled woodpulp manufactured by the International Paper Company.

The material is mixed with water in a special machine (Hydroseeder), and the resulting slurry is sprayed on the seedbeds. The first hydroseeder used had a 250-gallon capacity, enough to cover one bed. In the fall of 1964, a 500-gallon-capacity machine was used. Use of this machine makes it possible to mulch 3 to 4 acres of seedbeds a day.

Fertilizer and seed can be mixed with Turfiber and applied in one operation. This was tried on one bed, but a special nozzle is needed to control the width of spray.

Applications of 1,000, 1,500, and 2,000 pounds of Turfiber per acre were used on the fall 1963 beds. Only one rate, 1,000 pounds per acre, was used on the spring 1964 beds. All applications gave a good coverage of the beds and paths. This material was very effective in preventing wind erosion. Although all rates of applications appeared to prevent wind erosion equally well, stand counts showed an increase with an increase in amount of Turfiber applied.

Fall 1963

		Trees per square foot		
Treatment	Lb./acre	Replication 1	Replication 2	Replication 3
Turfiber	1,000	26.3	22.3	20.8
....Do	1,500	28.7	27.6	31.5
....Do	2,000	31.7	31.4	31.4

Spring 1964

Treatment	Lb./acre	Trees per square foot		
		Replication 1	Replication 2	Replication 3
Turfiber	1,000	27.2	29.7	25.4
Control.....	--	18.0	18.0	15.5

Turfiber costs about $170 per ton in small lots and about $150 per ton in carload lots. The material cost is between $70 and $170 per acre. The 500-gallon-capacity machine costs approximately $2,600.

Shredded Pine Cones

The cones were shredded with a hammermill and spread over the seedbeds with a manure spreader to a depth of about one-fourth to one-half inch. They were not easily moved by wind and maintain an ideal condition for seed germination. The beds where this material was used were *very* uniform in density, made better growth, and had better color than those beds that were mulched with sawdust or not mulched.

Summary

Mulching of seedbeds is desirable so that more ideal conditions for germination can be maintained. A good mulch should be able to do the following:

1. Prevent wind erosion.
2. Retard drying of the soil.
3. Allow percolation of water.
4. Remain on the beds until after germination is complete.
5. Break down and unite with the soil.

King Fish did not prove of sufficient value to warrant its use. Evanol, Soil Gard, and Catalin were of some value, but more trials are needed with different rates of application. Encap (EAP 2011), American Oil Company Anionic Emulsion, and Terra Seal gave very good control of wind erosion, but more tests are needed on methods of application. The American Excelsior Corporation's slope retention blankets prevented wind erosion well where they were properly secured. The stand was not materially increased, and the material cost is excessive. Mulchnet is not very effective in preventing wind erosion, but stands are increased where it remains in place. Turfiber applied at 2,000 pounds per acre gave the best and most uniform results. It is easy to apply, makes a uniform cover, and prevents wind erosion. Shredded pine cones, when available, are ideal for mulching.

Most of the mulches apparently gave as high or higher germination and stand counts when applied to the bare soil rather than sawdust.