FERTILIZING and SEEDING with COMPRESSED AIR

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●MECHANIZATION of highway construction and maintenance procedures has resulted in significant savings in cost. The hydraulic method of seeding and fertilizing slopes has proved to be economical. A new method, utilizing air pressure, promises to be even more efficient for maintenance fertilizing operations and, possibly, for some seeding operations.

Edward M. Davis, State Conservationist of the U. S. Soil Conservation Service in Maryland, successfully employed air pressure to distribute granulated fertilizer, using a Pangborn sandblast machine. The Maryland State Roads Commission subsequently used this machine to fertilize highway slopes as a maintenance procedure.

It was found that a sandblast machine cost about $125. Two men are required to operate such a machine, one to operate the gun and one to hold the suction hose in the fertilizer and move it to a new bag when a bag is emptied. Handling of fertilizer is reduced to a minimum by this procedure. It is necessary to use granulated fertilizer, but this is commercially available at a cost only slightly more than ungranulated material.

In 1952, distance and volume trials were run with sandblast machines by the New York State Department of Public Works. A compressor, providing 100-cfm. pressure, drawn behind a truck carrying the sandblast units and the fertilizer, supplied the compressed air to distribute the granulated type of 5-10-5 fertilizer. Using a 3/4-inch gun nozzle with a pointed air-jet tip, the effective distance of delivery was 70 feet. When a 2-foot piece of ½-inch pipe was added to the gun, distances of 90 to 100 feet were attained.

In volume trials, two guns with 3/4-inch nozzles operating simultaneously delivered 100 lb. of 5-10-5 granulated fertilizer in 2 minutes (a rate of 3,000 lb. per hr.). One gun with the pipe extension delivered only 50 lb. in 5¼ minutes, but in subsequent work it was found to be a useful accessory for treating long slopes.

Following these trials, the Department has used this method to perform maintenance fertilization. The method was most efficient when two sandblast units powered by one compressor were used. This also allowed one operator to concentrate on the upper part of slopes and the other to take care of the lower portion. In actual operation it was found that about 30 acres could be fertilized in 3 hours total time, using granulated 33-1/3 percent ammonium nitrate at about 120 lb. per acre.

Since this was at least twice the capacity of the hydraulic seeder, which depended upon a ready access to water, this new method had intriguing possibilities if some way could be found to seed as well as fertilize with it. In subsequent trials it was found that cereal rye, hairy vetch, and similar-size seed could be used with the machine, either by mixing it with the granulated fertilizer or by itself, but grassseed did not have the required weight to carry satisfactorily. Pelleted seed can be delivered satisfactorily.

Pelleted grassseed had been employed in aerial seeding of the western ranges, but this had not been successful. (See "Seeding Stands from Airplane Broadcasting of Pelleted and Unpelleted Seed in Southeastern Utah," Research Paper No. 22,

Figure 1. Fertilizer is distributed by air pressure from an air compressor.

August 1950, Intermountain Forest and Range Experiment Station, Forest Service, U. S. Department of Agriculture.) This report concerns seed pelleted by a process developed by Dr. Lytle S. Adams. Pellets consisted of a mixture of soil, seed, rodent and insect repellent, and fertilizer compressed into small, hard spheres. Mention is made that Selin (1948) found the effects of pressure to be of primary importance in reducing germination and inducing secondary dormancy.

Another pelleting process, called the extrusion method, was developed but results were also unsatisfactory.

A third pelleting method called an "accumulative" process was developed by Phelps Vogelsang and manufactured under the name of Processed Seeds, Inc., Midland, Mich. Excessive pressures were avoided by using a method whereby the seeds were pelleted while rolling free in a batch process. The pellets are available in three different sizes. Another accumulative type of pellet commercially available is produced by the Filcoat process and distributed by Germain's, Inc., Los Angeles, Calif. The Processed Seed pellet contains small amounts of nitrogen, phosphorus, and potash. The Filcoat pellet utilizes inert material only.

Pelleting is costly, the charge for pelleting the smallest practical size being at present $0.37 per lb. Pelleting also increases considerably the bulk of the material to be handled.

Germination tests conducted by the New York State Seed Testing Laboratory of the State Department of Agriculture and Markets, Alfred University, and the United States Soil Conservation Service at Big Flats, N. Y., indicate a high percentage of germination of this type of pelleted seed. (See Appendix I.) Approximately 12 acres of grass on highways on Long Island and 1½ acres near Hornell established with pelleted seed further demonstrated that the earlier problems encountered with pelleted seed had been successfully solved by the manufacturers.

Figure 2. Details of the nozzle, showing pipe lines from the air compressor and from the fertilizer supply.

Distance trials with the pellets, using the sandblast machine, showed that the method was practical for all but the very longest of highway slopes. (See Appendix II.)

CONCLUSIONS

Maintenance fertilizing of highway slopes can be done efficiently with inexpensive sandblast equipment powered by a compressor delivering 100 cfm. pressure.

A granulated form of fertilizer must be used for this method, and high-analysis granulated material is commercially available.

Seeding can be successfully accomplished using sandblast equipment and pelleted seed. The cost of pelleting and the greater bulk of pelleted seed must be considered along with the efficiency of the sandblast equipment. Based on the limited amount of actual seeding work done with this equipment by the New York State Department of Public Works, it would seem that this method is practical on slopes which cannot be seeded by agricultural seeders and where a nearby water supply is not available for hydraulic seeding.

APPENDIX I

GERMINATION OF PELLETED AND NONPELLETED SEEDS

Tested Experimentally for the New York State Department of Public Works by New York State Seed Testing Laboratory, New York State Department of Agriculture

Sample No.	Kind of Seed	Laboratory Germ.	Greenhouse Germ.
	Nonpelleted Seed (Control)		
76	Alsike clover	79	72
77	Birdsfoot trefoil	11	7
78	Common ryegrass	93	89
79	Redtop	69	41
80	Alta fescue	94	85
81	Red fescue	94	85
82	Canada bluegrass	80	37
83	Kentucky bluegrass	84	50
	Processed Seeds Pellet No. 1		
90	Alsike clover	83	85
88	Birdsfoot trefoil	6	10
92	Common ryegrass	97	91
98	Redtop	67	35
94	Alta fescue	87	80
96	Red fescue	96	88
100	Canada bluegrass	74	36
102	Kentucky bluegrass	61	25
	Processed Seeds Pellet No. 3		
91	Alsike clover	38	84
89	Birdsfoot trefoil	8	2
93	Common ryegrass	96	90
99	Redtop	70	40
95	Alta fescue	94	96
97	Red fescue	92	68
101	Canada bluegrass	77	36
103	Kentucky bluegrass	74	43
	Nonpelleted Seed (Control)		
201	Birdsfoot trefoil	54	33
202	Reed canary grass	63	51
203	Alta fescue	94	80
204	Perennial ryegrass	92	82
205	Creeping red fescue	94	85
206	Orchard grass	89	63

Sample No.	Filcoat Pelleted Seed	Laboratory Germ.	Greenhouse Germ.
195	Birdsfoot trefoil	43	32
196	Reed canary grass	64	57
197	Alta fescue	89	85
198	Perennial ryegrass	81	92
199	Creeping red fescue	94	88
200	Orchard grass	78	70

Note: Conditions in the greenhouse were not too satisfactory for Kentucky and Canada bluegrass; consequently, germination was somewhat low.

APPENDIX II

DISTANCE TRIALS

Processed Seed Pellets

Pelleted Seed Size #	Horizontal Distance Traveled by[a] Seed	Granulated Fertilizer
I	64 feet	100 feet
II	88 feet	115 feet
III	105 feet	105 feet

[a] Measured with a tail wind velocity of approximately 5 to 10 mph and employing a 2-foot pipe ($\frac{1}{2}$-inch) extension fitted to gun.

A variance between 100 and 115 feet in distance traveled by the granulated fertilizer is probably the result of two factors: variable winds and a variance in the size of the fertilizer granules passing through the machine at the time. (The larger granules seem to settle in the container or bag.)

When the pipe extension to the gun was omitted, a distance of 75 feet was effectively covered by a mixture of the three sizes of pellets.

Filcoat Seed Pellets

		Horizontal Distance Traveled Using 3/4-Inch Nozzle	2-Foot Extension Pipe
A.	Reed canary grass	78 feet	130 feet
	Orchard grass	78 feet	130 feet
	Red fescue	78 feet	130 feet
	Alta fescue	78 feet	130 feet
B.	Birdsfoot trefoil	78 feet	109 feet
C.	Perennial ryegrass	-[b]	136 feet

[b] Not enough material supplied in sample to try both methods.

Note: There was a tail wind velocity of approximately 5 mph during the tests except when birdsfoot trefoil was tested. Not enough material was supplied to run trials both with and against the wind and to take an average.

It will be noted that the Filcoat pellets, which were larger in size, traveled greater distances and that their germination was good. The coating did not shatter easily. However, they are much more costly than the Processed Seed pellets. Experimentation in producing smaller (and therefore less expensive) pellets is indicated.