Research Note

USING AMMONIUM SULFATE FERTILIZER AS AN ORGANIC MULCH FIRE RETARDANT

by Gary W. Hickman and Ed Perry

The multiple benefits of organic mulches in landscape environments are well documented (3,7). The few problems associated with mulch use can be minimized or avoided with proper management. For example, development of nitrogen deficiency can be reduced by the addition of small amounts of nitrogen fertilizer to the mulch. Rates of 2 to 3 lb nitrogen per 100 ft^2 of mulch are recommended (2,4). Another problem, particularly in the United States West with its dry summer months, is the fire potential. Several California cities and highway departments report regular mulch fires, particularly near traffic areas, from discarded cigarettes (5). An inexpensive method of reducing organic mulch inflammability—the addition of fertilizer-grade ammonium sulfate, $(NH_4)_2SO_4$—has been suggested in the literature (4). In the 1930s, this chemical was reported by the U.S. Department of Agriculture, Forest Products Laboratory, as the least expensive flame retardant of 136 chemicals tested (6).

The purpose of this paper is to report the results of trials to test the fire retardant abilities of various ammonium sulfate applications to organic mulches used in the landscape.

Methods

Two commonly used organic mulches in commercial landscapes are shredded softwoods from timber operations and chipped mixed hardwoods from municipal pruning. Using aged samples of these 2 mulches, 1 ft^2 (30.5 cm^2) sample plots were established in Modesto, California, with a mulch depth of 3.2 inches (8.3 cm). Treatments included:

A. 3 lb $(NH_4)_2SO_4$/10 gal water/1000 ft^2 mulch (1.5 kg/40 L/100 m^2)
B. 3 lb $(NH_4)_2SO_4$/20 gal water/1000 ft^2 mulch (1.5 kg/80 L /100 m^2)
C. 6 lb $(NH_4)_2SO_4$/10 gal water/1000 ft^2 mulch (3.0 kg/40 L /100 m^2)
D. 6 lb $(NH_4)_2SO_4$/20 gal water/1000 ft^2 mulch (3.0 kg/80 L/100 m^2)
E. Water only—10 gal/1000 ft^2 mulch (40 L/100 m^2)
F. Water only—20 gal/1000 ft^2 mulch (80 L/ 100 m^2)

Each treatment was replicated 4 times and was allowed to dry for 2 hours after treatment. During this drying period from 1:00 P.M. to 3:00 P.M., environmental conditions were as follows: air temperature at 80.0–83.3°F (26.6–28.5°C); relative humidity of 43–49 %; and wind speed of 7.4–8.0 mph (3.3–3.6 m/s) (1).

Following drying, each plot was ignited using a hand-held propane pencil-point burner for 5 seconds to the center of each plot. One hour after ignition, the burned area in each plot was measured.

Results

Table 1. Surface area (%) burned after 1 hour.

Treatment (per 1000 ft^2)		Mulch type (mean of 4 reps) Shredded softwood	Chipped, mixed hardwood
A.	3:10*	33.5ab**	51.4ab
B.	3:20	8.2b	2.8b
C.	6:10	5.9b	3.8b
D.	6:20	6.0b	2.8b
E.	water only 0:10	87.5a	100.0a
F.	water only 0:20	83.8a	100.0a

*lb fertilizer:gal water.
**Means within a column followed by the same letter are not significantly different at p = 0.01 level, Duncan's Multiple Range Test.

Conclusions

The most cost-effective treatment was 3 lb ammonium sulfate in 20 gal water applied over 1000 ft^2 of organic mulch (1.5 kg/80 L/100 m^2) (treatment B). The lower solution rate (treatment A), as recommended in the literature, did not provide significantly better fire retardation than the control treatment (water alone). The higher rate of fertilizer (treatment C) or higher fertilizer and higher solution (treatment D) were not significantly different from the most cost-effective treatment. If treating mulched areas to prevent nitrogen deficiency, then using ammonium sulfate as the nitrogen source and dissolving the recommended rates in adequate water prior to application should also provide effective fire retardation in nonirrigated areas, based on this study. Further research is being made on the longevity of effects of this treatment and effects of rain and irrigation.

Literature Cited

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University of California
Cooperative Extension
Stockton, CA 95205