

The Control of Phytotoxic Fermentation of Wetted Packaging Material During Storage

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Adding sodium or potassium metabisulfite salts to wetted packaging material prevents its fermentation and concurrent production of substances toxic to stored pine seedlings.

Hydromulch,¹ Turfiber,² Cellin,³ and other brands of wood fiber or newsprint products are economically attractive alternatives to sphagnum and peat moss as packaging material to prevent dehydration of seedling roots during storage and transit to the planting site. In Florida nurseries, however, use of such material in bales led to seedling mortality, which was attributed to the production of phytotoxic substances through fermentation of wetted Hydromulch (1). The phytotoxins were believed to have been produced by a yeast-like organism isolated from the material, and the problem was apparently

¹Hydromulch is a trademark of Conwed, 332 Minnesota St., St. Paul, MN 33101, and is a wood fiber material.

²Turfiber is a trademark of Superior Fiber Products Company, 1201 65th St., Baltimore, MD 21237, and is a wood fiber material.

³Cellin is a trademark of Cellin Manufacturing Company, P. O. Box 1707, 70 Industrial Blvd. West, Valdosta, GA 31601, and is a ground newsprint material.

solved by wetting only enough material for 1 day's use. Predicting the exact amount of material needed for 1 day was difficult, however; and questions remained about the possibility of fermentation during storage and transportation of seedlings.

In the study reported here, sodium and potassium metabisulfite were tested for control of phytotoxin production in wetted Cellin and Hydromulch.

Methods

Cellin and Hydromulch were wetted with water containing 0, 3.45, or 6.91 ounces (active ingredient) of sodium or potassium metabisulfite per 100 gallons and stored at room temperature for 36 hours and 31 days. One- and 9-month-old loblolly pine seedlings, with their roots wrapped in the wetted mulch materials, were stored in plastic zip-locked bags, at room temperature for 24 and 48 hours, respectively. Five replicates of 20 seedlings for each treatment were transplanted to flats of soil, which were on a greenhouse bench. Mortality was assessed 1 month after transplanting the 1-month-old seedlings and 3 months after transplanting the 9-month-old seedlings.

The sodium and potassium metabisulfite salts are marketed under several tradenames and are used by winemakers to kill

wild yeasts on the surfaces of fruit.

Results and Discussion

Fermentation and the production of substances phytotoxic to pine roots were controlled by the addition of 6.91 ounces of sodium or potassium metabisulfite per 100 gallons of water (518 mg/l) (table 1). Addition of 3.45 ounces of either of the two salts (averages of the results for the two salts are presented because they were so nearly identical) was insufficient to control fermentation. One-month-old loblolly pine seedlings were more sensitive to the toxic products than the 9-month-old seedlings were. After fermentation, Hydromulch was more toxic to the pine seedlings than Cellin was; and material wetted 31 days was less toxic than material wetted 36 hours.

Fermentation and phytotoxicity can, therefore, occur in baled or bagged seedlings during storage at room temperature, even if seedlings are packaged in freshly wetted mulch material. Refrigeration, known to retard fermentation, should prevent phytotoxicity during extended periods of seedling storage.

Symptoms of seedling toxicity developed first on the young roots and subsequently on larger ones. Roots turned dark brown to black after only 24

Table 1.—Effects of sodium and potassium metabisulfite on mortality of 1-month- and 9-month-old loblolly pine seedlings after their roots were exposed at room temperature for 24 and 48 hours, respectively, to Cellin or Hydromulch wetted at room temperature for 36 hours or 31 days

K- or Na- metabisulfite rate and time wetted	Cellin		Hydromulch	
	Seedling age in months			
	1	9	1	9
--Percent mortality ¹ --				
0 oz/100 gal				
36 hr	100a ²	20a	100a	70a
31 days	39b	4b	100a	28b
3.5 oz/ 100 gal				
36 hr	98a	8b	100a	68a
31 days	26c	3b	100a	27b
6.9 oz/100 gal				
36 hr	0d	0c	0b	0c
31 days	0d	0c	0b	0c

¹Mortality, based on five replicates of 20 seedlings for each treatment, was essentially identical for the two salts of metabisulfite and was assessed 1 month after transplanting the 1-month-old seedlings and 3 months after transplanting the 9-month-old seedlings.

²Within columns, means followed by a common letter do not differ (P = 0.05) according to Duncan's multiple range test.

hours of exposure to the fermented mulch. Necrosis spread through the entire root system soon after transplanting. Mild symptoms included death of feeder roots; seedlings with these symptoms usually survived on the greenhouse bench. Such mild toxicity, however, probably would kill seedlings stressed by drought and other agents in a plantation.

Results of this study confirm an earlier report that phytotoxic substances develop in wetted Hydromulch and similar products when stored at room temperature (1). The addition of sodium or potassium metabisulfite to the water used to wet these products should eliminate the problem and increase the survival of seedlings shipped from nurseries.

Literature Cited

1. Barnard, E. L. Pest management in Florida commercial nurseries. In: Proceedings of the 12th spring symposium of the Florida Section of the Society of American Foresters; Gainesville, FL. Florida Resources Rep. 7. Gainesville, FL: University of Florida, Florida Cooperative Extension Service Institute of Food and Agricultural Science; 1980: 30-40.