

Bahiagrass Impairs Slash Pine Seedling Growth

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Bahiagrass is not only a strong competitor with pine seedlings, but its residues also have an allelopathic effect on pine growth.

The depressing effect of grass on seedling growth and development has been widely noted by nursery workers and foresters. Recently Todhunter and Beineke (2) have reported on growth reductions in black walnut (*Juglans nigra* L.) because of competition from *Festuca arundinacea* Schreb. Walters and Gilmore (3) reported that the same grass allelopathically affected sweetgum (*Liquidambar styraciflua* L.). Reitveld (1) has also reported that several species of grass have allelopathic effects on ponderosa pine (*Pinus ponderosa* Laws.) seedlings.

While studying the survival and growth of slash pine (*P. elliotii* var. *elliotii* Engelm.) on sandy dredge mine tailings in North Florida, we observed a pronounced effect of bahiagrass (*Paspalum notatum* Flügg.) on the growth of slash pine (fig. 1). As the percentage of the ground covered with bahiagrass increased, the height of the 3-year-old pine decreased markedly. To confirm this apparent deleterious effect of bahiagrass on slash pine and to

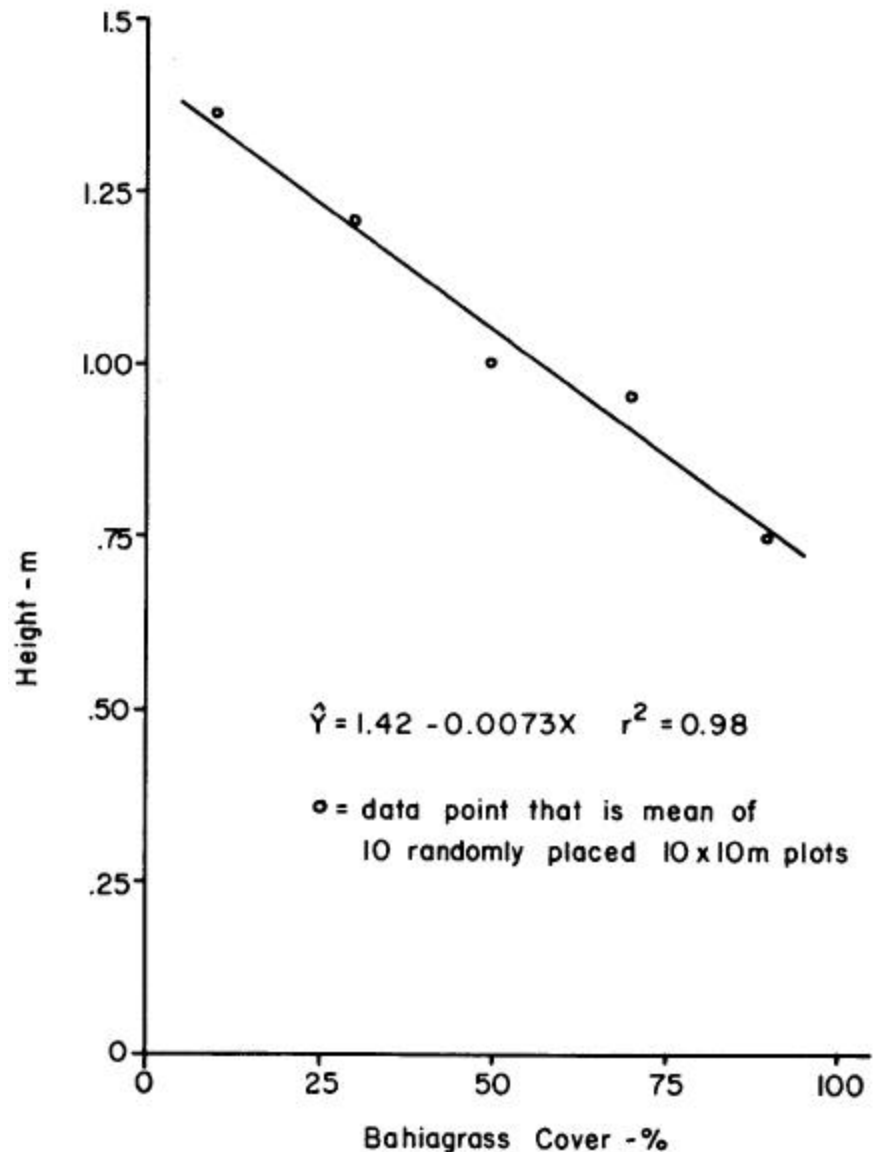


Figure 1.—The influence of bahiagrass cover on the growth of 1+0 slash pine seedlings after 3 years in the field

attempt to discover if it was simply competition or a combination of competition and allelopathy, two greenhouse trials were carried out.

The first experiment was a complete factorial using high and low moisture, with and without supplemental nutrients (the equivalent of 100 kilograms of nitrogen, 45 kilograms of phosphorus, and 80 kilograms of potassium, per hectare); and with either peat moss mulch or bahiagrass mulch, and living bahiagrass. Six replications of dredge mine tailings in 1-kilogram plastic pots were used.

For the living bahiagrass treatment, the grass was sown 1 month prior to planting a 1+0 slash pine seedling in each pot. For the mulch treatments, 25 grams of air-dry material was applied to each pot after the pine seedling was planted. High moisture pots were rewatered when 50 percent of the plant-available water by weight had been used. In the low moisture pots, the plants were allowed to use 99 percent of the plant-available water by weight before the pots were rewatered. After 20 weeks of growth, all treatments were harvested and dry weight per seedling determined.

In the second experiment, 10 newly germinated slash pine seedlings were placed into

dredge mine tailings in 500-gram pots. These were watered with a complete nutrient solution for 2 weeks until they became established. Subsequently, half of the pots were watered with leachate from pots containing living bahiagrass and half of the pots were watered with leachate from pots containing living slash pine. This was continued for 20 weeks; then all five replications were harvested and root and shoot dry weight per pot was determined.

The data from both experiments were then subjected to analysis of variance and a Duncan's multiple range test using a 5-percent confidence level.

Results and Discussion

Not only did the competition from the bahiagrass significantly reduce growth of the pine, but also there was an apparent allelopathic effect of the bahiagrass mulch (table 1). Bahiagrass seems to be a vigorous competitor for both moisture and nutrients. The fertilizer stimulated the grass in both wet and dry treatments, and the grass' increased water use was deleterious to the pine growth. The pine grew as well in the dry treatment, in the absence of grass or grass mulch and fertilizer, as it grew in the wet treatment. The low values

for the dry, fertilized treatments probably represent a salt effect from the fertilizer. Although no trees survived the low moisture plus fertilizer treatment, the grass in that treatment grew quite well.

Watering slash pine with bahiagrass leachates also significantly reduced growth (fig. 2). Root, shoot, and total dry weight of seedlings watered with grass leachate were all significantly less than the corresponding values for seedlings watered with pine leachate. This is clearly an allelopathic effect (i.e., a chemical produced by one plant and released into the environment where it deleteriously affects another plant).

Bahiagrass is a strong competitor for sites where it and slash pine both occur. In addition both living bahiagrass and the decaying residue of the grass are allelopathic to the pine. Thus, if slash pine is to be successfully established in an area with a dense bahiagrass cover, scalping of the sod and subsequent weed control in the scalped zone will be necessary. Once the trees are established, the shade they create reduces the bahiagrass' vigor and the trees easily capture the site.

Table 1.—Dry weight per tree for 1 +0 slash pine grown for 20 weeks in the greenhouse with and without living bahiagrass and bahiagrass mulch

Treatment	High moisture		Low moisture	
	Fertilized	Unfertilized	Fertilized	Unfertilized
	<i>gm</i>	<i>gm</i>	<i>gm</i>	<i>gm</i>
Peat moss mulch	7.2	6.8	4.4	7.1
Bahiagrass mulch	4.2*	3.8*	1.0*	2.8*
Living bahiagrass	1.4*	2.6*	0*	1.7

*Significantly less than peat moss mulch control at the 5-percent level.

Literature Cited

1. Reitveld, W. J. 1975. Phytotoxic grass residues reduce germination and initial root growth of ponderosa pine. USDA For. Serv. Res. Pap. RM-153. Rocky Mtn. For. and Range and Exp. Sta., Fort Collins, Colo.
2. Todhunter, M. N., and W. F. Beineke. 1979. Effect of fescue on black walnut growth. Tree Planters' Notes 30(3):20-23.
3. Walters, D. T., and A. R. Gilmore. 1976. Allelopathic effects of fescue on the growth of sweetgum. J. Chem. Ecol. 2:469-479.

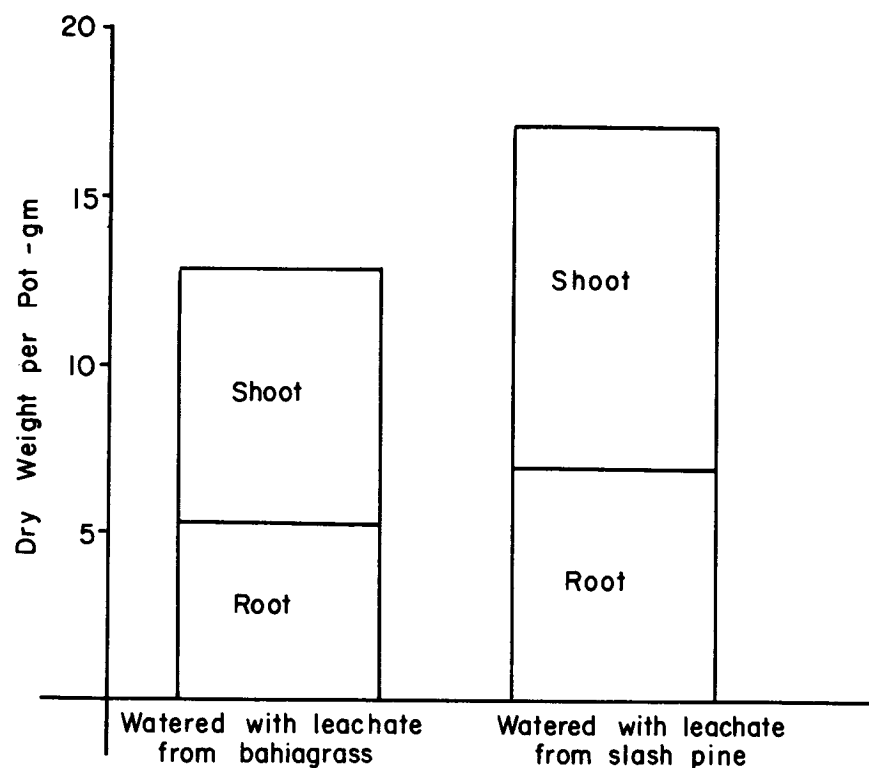


Figure 2.—Depressing effect of bahiagrass leachate on the growth of young slash pine.