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Deer Repelled from Douglas Fir New Growth Using BGR-P and Aversive Conditioning

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Abstract

In 1986 a test was conducted on Capitol Forest near Olympia, Washington to improve the effectiveness of Big Game Repellent-Powder (BGR-P) by conditioning black-tailed deer (*Odocoileus hemionus columbianus*) to avoid browsing BGR-P treated Douglas fir (*Pseudotsuga menziesii)* Mirb.l Franco) seedlings fitted with flagging and other plastic materials. All materials were placed around or over terminals before bud burst and before applying the repellent. Treatments with standard blue plastic flagging and other plastic materials significantly reduced browsing damage during the treated the 1986 growing season. As a result, it was found that the visually aversive stimuli used in this study eliminates the need to apply BGR-P to new growth immediately after bud burst and also eliminates repeatedly applying repellents during a particular damage season.

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Introduction

Browsing Damage

Black-tailed deer feeding on Douglas fir seedlings is the most common and widespread animal damage problem in the coastal forests of the Pacific Northwest. Damage (the reduction of potential seedling height growth) occurs when terminal shoots are browsed. Although black-tailed deer may browse conifers all year around, most damage occurs to new growth mainly during a six- to eight-week period in May and June (Campbell and Evans, 1978). The secret to reducing browsing damage is to protect seedling terminals throughout the early growing season for three or more years after planting or until seedlings exceed 40 inches in height (Campbell and Evans 1975).

Deer Repellents

Various animal repellents are used to discourage deer from eating and injuring conifer seedlings; however, most repellents lose their effectiveness within a few weeks. Further, all registered deer repellents are so-called foliar, or contact chemicals. **They protect only the foliage they adhere to.** New growth occuring after treatment is not protected by the repellent. Consequently, deer repellents must be repeatedly applied to new and untreated foliage to be effective throughout the year or until browse damage is no longer a problem.

Big Game Repellent-Powder (BGR-P; product label EPA Reg. No. 1021-1420; EPA Est. No. 1021-MN-1), a 36 percent inedible egg solid combined with wettable adhesive products, manufactured by McLaughlin Gormley King Company of Minneapolis, Minnesota, is commonly used to reduce browsing damage to Douglas fir and other conifers in the Pacific Northwest.[3] It is somewhat similar to *Deer-Away*- and other putrescent materials reported by Rochelle et al. (1974). To repel deer from browsing new Douglas fir foliage, the McLaughlin Gormley King Company recommends that BGR-P be applied to wet seedlings after bud burst and before shoots exceed one inch in length. This is generally difficult to do operationally because bud burst, even within the same plantation, does not happen at the same time.

Aversive Conditioning

In this study we refer to aversive conditioning as a process where deer learn to avoid feeding on Douglas fir seedlings that have been treated with BGR-P by associating it with a nonfood item—in this case, plastic material.

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[3] The use of trade names is for the information and convenience of the reader and does not constitute an official endorsement or approval by the reporting agencies of any product to the exclusion of others that may be effective.

We first noticed this response in a 1985 pen study of black-tailed deer and decided to test this approach in the field.

Methods and Materials

General Information

The field test was installed on April 30, 1986, before bud burst in a two-year old, 100-acre slash burned clearcut known as A-Pit No. 1 (SE 1/4, Sec. 30, T 17 N, R 3 W, WM) in Capitol Forest, Thurston County, Washington. The site is managed by the Washington State Department of Natural of Resources.

The area had been planted with bareroot 2-0 Douglas fir seedlings in March 1985. Over 80 percent of the seedlings had been browsed during the 1985 growing season. Only seedlings with live buds were selected for treatment.

Treatments and Design

There were ten treatments including untreated control seedlings and seedlings treated with BGR-P (Table 1). Materials that were tested included:

- 1.3- by 12-inch standard, blue, polyethylene flagging material
- 2- by 4-inch clear polyethylene tubing material
- 1- by 3-inch animal intestine sausage casing

The blue flagging was tied loosely to seedlings near terminal buds. The clear tube material was split and fitted to the main stem just under the terminal bud or left unsplit and fitted over the stem as a sleeve. Some of these treatments were dusted with BGR-P and others were not.

BGR-P served as the repellent. First the terminal stem and plastic material were sprayed with water, then the seedling and plastic flag (or tube) was dusted with approximately 0.04 ounces of BGR-P (Figure 1). Treatments without BGR-P were sprayed only with water.

Figure 1. Application of BGR-P repellent to wet Douglas fir seedling and loosely attached plastic flag before bud burst provided complete protection from deer during the 1986 growing season.

Sausage casings, serving as a natural putrescent protein material, were soaked in water and placed over seedling terminals before spraying; they were not treated with BGR-P.

Each of the ten treatments was installed in random rows of 13 seedlings per row per block, totalling three blocks (replications). Field inspections and measurements followed that described by Campbell and Evans (1977).

Results

Deer Use

Deer browsed Douglas fir seedlings mainly from mid-May to mid-July. Observations were made until August 11, 1986, when most tree growth and deer browsing damage stopped.

Comparison of Treatments

Two-thirds (66.7 percent) of the the untreated control seedlings were browsed. All treatments were browsed significantly less than untreated controls (Table 1). Seedlings fitted with blue flagging and treated with BGR-P were not browsed. Browsing on other seedlings fitted with plastic materials and treated with BGR-P ranged from 2.6 to 5.3 percent. Compared to the untreated controls, only about one-third as many seedlings treated with untreated plastic materials were browsed. Deer browse on BGR-P treated seedlings (13.5 percent) and untreated sausage casing (11.6 percent) was statistically similar.

Table 1. Percentages of Douglas fir seedlings browsed by black-tailed deer and seedling height increases after applications of BGR-P repellent treated and untreated materials (39 seedlings per treatment).

	Percent browsed	*	*Average height*
Untreated controls	66.7	a	2.28
Untreated blue flagging	26.3	b	4.09
Untreated split polyethylene	19.9	b c	4.57
Untreated polyethylene tube	19.4	b c	5.07
BGR-P	13.5	b c	4.54
Sausage casing	11.6	b c	4.45
Polyethylene tube (vented) with BGR-P	5.3	b c	5.04
Polyethylene tube with BGR-P	2.6	c	4.59
Split polyethylenel with BGR-P	2.8	c	6.26
Blue flagging with BGR-P	0.0	c	4.79

*Treatment levels with a common letter are not significantly different at the 0.10 level of significance using Duncan's multiple range test.

Seedling Height Growth

Seedling height growth for all treatments was about two to three times greater than that of controls (Table 1). However, these differences were not detectable statistically.

Effect on Foliage

No burning of foliage or phytotoxic effects were observed for any materials installed on or applied to Douglas fir seedlings. Substantial condensation of moisture was observed inside polyethylene tubes. However, the short lengths of these open-ended tubes plus condensation probably resulted in adequate ventilation and cooling to prevent burning.

Discussion and Conclusion

These tests showed that the effectiveness of BGR-P repellent can be improved by conditioning deer to avoid treated foliage and plastic materials fitted near terminal buds of Douglas fir seedlings. The primary values of this procedure are to eliminate the need to repeatedly treat growing foliage and to keep deer from browsing the new growth as long as possible.

Deer in this test appeared to associate untreated plastic materials with nearby BGR-P repellent-treated plastic materials. Using repellent treated materials on some trees and untreated plastic materials on others should significantly reduce browsing damage to treated seedlings in some sites. However, we seriously doubt that untreated flagging alone, without BGR-P treatments, would reduce browsing damage.

Recommendations

We recommend operational trials be made using BGR-P and the plastic flagging treatment on Douglas fir seedlings that might be browsed by black-tailed deer. At least 12 inches of plastic flagging should be tied loosely to the main stem just below the terminal bud shortly before bud burst of Douglas fir. The terminal and material should then be sprayed with water, then dusted with BGR-P. Current registration allows this use of BGR-P repellent.

We further recommend that this method of aversive conditioning also be tried to reduce damage to Douglas fir by elk (*Cervus elaphus*). Similar treatment should also be evaluated in areas where deer and elk cause browse damage during the winter or dormant season.

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