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Repellents For Deer and Rabbits

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Rabbit and deer damage to newly planted trees is a serious problem in many areas of western Kansas and throughout much of the Great Plains. This problem is particularly serious in the establishment of new windbreak and shelterbelt plantings.

Although mechanical protection (wire cages, fencing) has been shown to have long-term effectiveness, this type of tree protection is seldom considered feasible in terms of cost and labor for large numbers of trees, and chemical repellents are usually the preferred alternative. However, recent developments in the use of plastic mesh (VEXAR®) tubing to protect individual seedlings in forest production (Larson et al. 1979) and windbreaks (Baer 1980) indicate a potential for more widespread application of mechanical protection methods than is currently practiced. Also, Matschke (1980) discussed other alternatives to chemical repellents including genetic resistance and cultural practices (preferred browse, use of taller seedlings). Currently, however, chemical repellents are probably the most widely used method for protecting young trees from deer and rabbit browsing in the Great Plains.

TYPES OF REPELLENTS

Repellents for deer and rabbits can usually be classified as either area (odor) or contact (taste) repellents. A few of the more common repellent chemicals or substances are listed below:

Area (Odor) Repellents

Ammonium Soaps of Higher Fatty Acids. A low-level ammonia-emitter originally developed as a spreader-sticker to help pesticides adhere to plant foliage. Can wash off, normally effective for up to 2 months. Up to 3 applications may be required for entire winter.

Bone Oil (containing nitriles). Can be used as a perimeter spray or on saturated fabric or cords. Does not weather well.

Miscellaneous Natural Substances. This "catch-all" group consists of a number of natural substances or derivatives therefrom which have been reported to exhibit repellency for deer and/or rabbits, including: decomposed proteinaceous matter (e.g. putrified fish, fermented egg, packing plant tankage), blood meal, feather meal, human hair, fecal material, seal oil, creosote, and hot pepper sauce (Dodge et al. 1967, Craven 1980, Matschke 1980, H.A. Kluge, British Columbia Ministry of Agriculture, pers. comm.).

Contact (Taste) Repellents

Thiram (tetramethylthiuram disulfide, TMTD). A fungicide, seed protectant and animal repellent. Not to be applied to edible parts of plants.

Putrescent Whole Egg Solids. Currently available commercially only as a deer and elk repellent (not registered for rabbits). A contact repellent but repels by odor. The volatile constituents of fermented egg parallel those found in fermented food products and some of the same volatile fatty acids and amines are found in anal gland secretions of canids (Bullard et al. 1978). A repellent to deer and an attractant to canids.

REPELLENT USE

Under "normal" conditions, repellents can effectively reduce deer and rabbit damage. But, if feeding pressure is extreme or no alternative food is available, repellents may fail to provide protection. As a general rule, contact repellents are best for dormant-season use, whereas area repellents are preferred during the growing season. If contact repellents are used during the growing season, frequent re-applications (approximately 2-week intervals) are required to protect new growth.

Contact repellents can be sprayed, brushed or dipped on. For protection from rabbits plants are normally treated to approximately 18-24" above ground level or expected snow depth. For deer, contact repellents are applied to all foliage, stems or branches within reach. Effectiveness of some contact repellents (such as thiram) can reportedly be prolonged by adding a latex-type sticker to the spray solution. Area repellents are normally applied as perimeter sprays, random treatments, or on absorbent materials distributed within the area to be protected.

KANSAS REPELLENT TESTS

In response to numerous requests for information on use, costs and effectiveness of repellents for protecting young trees from rabbits and deer, the Area Extension Forester (Dale Starkey) and I initiated a test and demonstration of various commercial preparations in 1980-81.

The purposes of these tests were: 1) to demonstrate the effectiveness of various repellent formulations for protecting young trees from rabbits and deer and 2) to determine approximate material and labor costs for the various treatments.

Methods. A newly planted windbreak on the outskirts of Garden City in Finney County, Kansas was selected for the rabbit repellent tests. This was an 8-row windbreak containing fragrant sumac, rocky mountain juniper, bur oak, Austrian pine and cotoneaster. Bur oak was excluded from the test because of poor seedling survival which did not leave enough live trees for a valid comparison. This windbreak planting was being damaged by both black-tailed jackrabbits (Lepus) and cottontails (Sylvilagus).

Three repellent materials were tested. Thiram was applied at concentrations of 7, 10 and 20% active ingredient. Ammonium soaps of higher fatty acids was applied at the label rate for nursery stock of 0.6% active ingredient. Putrescent whole egg solids (labelled only as big game repellent) was applied at the label rate for protection against deer feeding (4.9% active ingredient).

All repellent treatments were applied with a 3-gallon hand sprayer on October 29, 1980. A total of 20 trees of each species (except Austrian pine) were treated in 4 randomly selected blocks of 5 trees each. Because many of the Austrian pine (which had recently been replanted) were already severely damaged by rabbits at the time of initial treatment, we were only able to apply repellent to 9 randomly selected pines for each treatment. Randomly selected controls (untreated) were also included in the experimental design for each species. Quantity of repellent mixture used and time required for application were noted for each treatment.

Damage assessments were made on all trees, both pre- and post-treatment. Damage ratings were based on the following scale: 0 = no damage; 1 = light damage; 2 = moderate damage; 3 = heavy damage. Even though this was a subjective rating scale, some specific criteria were developed to aid in placing individual trees in the appropriate damage category (Table 1).

Results. Final evaluation of the various treatments was made on January 22, 1981 -- 85 days after the initial application. Feeding damage by rabbits occurred to some degree in all treatments; however, all repellent treatments reduced feeding damage on all species compared to untreated controls (Table 2). Data for all rocky mountain juniper treatments were omitted from the results because no significant feeding damage occurred, either before or after treatment.

Cotoneaster and Austrian pine were damaged most severely (damage increase on controls of 2.0 and 1.8 respectively) followed by fragrant sumac (increase of 0.7). Rocky mountain juniper was not damaged at all (Table 3).

We also evaluated putrescent whole egg solids (MGK-BGR) as a deer repellent by randomly treating half of the trees of 4 species in a small nursery planting at Scott County State Park. Although the manufacturers claim only contact repellency for this product (an odor repellent), deer feeding on all trees essentially ceased following the random treatment (Table 4). Whether this was caused by the action of the repellent or by other factors is not clear.

The number of trees treated with one gallon of repellent spray ranged from 170 to 220. This would vary of course with size of trees and between applicators. We estimated that one person, using a hand sprayer, would be able to treat 150 to 200 trees per hour in a windbreak planting. This estimate will vary widely depending on tree spacing, terrain, equipment, etc.

Discussion. All treatments resulted in a reduction in rabbit damage compared to the control. Best protection apparently resulted with thiram treatments, although the putrescent whole egg solids repellent (which is currently registered only for big game) also did about as well. Results with ammonium salts of higher fatty acids (which were apparently less effective) may not be totally comparable because no re-treatments were made and this compound reportedly loses effectiveness after 6-8 weeks. Deer repellency due to use of putrescent whole egg solids was inconclusive due to cessation of feeding on all trees.

Table 1. Damage rating criteria for hardwoods and pines.

Damage Rating	Hardwoods	Pines
0 = No damage	No visible damage	No visible damage
1 = Light	One twig damaged or clipped	Needles lightly browsed
2 = Moderate	Some bark chewed or side branches clipped off	Needles heavily browsed or bark chewed, side bud(s) clipped off
3 = Heavy	Bark heavily chewed or main stem clipped off	Terminal bud damaged or main stem clipped

Table 2. Mean damage rating and cost of rabbit repellents on three windbreak species.

Treatment (Active Ingredient)	Before Treatment (10/29/80)	After Treatment (1/22/81)	Damage Rating Change	Approximate Spray Cost/Gallon* (Range)	Approximate Cost/Tree Material & Labor-$4/Hr
Control	0.4	1.8	+1.4	----------	----------
Putrescent Whole Egg Solids (4.9% a.i.)	0.4	0.8	+0.4	$15.00	$0.09
Ammonium Soaps of Higher Fatty Acids (0.6% a.i.)	0.6	1.5	+0.9	$0.22-$0.44	$0.02
Thiram (7% a.i.)	0.5	0.7	+0.2	$4.16-$19.99	$0.04-$0.12
Thiram (10% a.i.)	0.5	0.8	+0.3	$6.24-$19.96	$0.05-$0.12
Thiram (20% a.i.)	0.4	0.7	+0.3	$12.48-$39.92	$0.08-$0.22

* Varies with brand, concentration and quantity purchased. Based on suggested 1980 prices.

Table 3. Mean damage rating of three windbreak species treated with repellents.

Species	Before Treatment (10/29/80)	After Treatment (1/22/81)	Damage Change (Treated)	Damage Change (Untreated)
Austrian Pine	0.9	1.2	+0.3	+1.8
Cotoneaster	0.6	1.4	+0.8	+2.0
Fragrant Sumac	0.1	0.3	+0.2	+0.7

Table 4. Deer repellent (putrescent whole egg solids) test results, Scott County State Park, Scott County, Kansas. 1980.

Species/Treatment	N	Damage Rating		Damage Rating Change
		Pre-treatment (8/29)	Post-treatment (12/10)	
Bur Oak				
Control	15	0.4	0.6	+ 0.2
BGR	15	0.3	0.5	+ 0.2
Honeylocust				
Control	14	1.4	1.8	+ 0.4
BGR	14	2.1	2.2	+ 0.1
Hackberry				
Control	14	1.5	1.7	+ 0.2
BGR	14	2.1	2.2	+ 0.1
Pine				
Control	41	0.0	0.0	--
BGR	41	0.1	0.1	--

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