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Chemical repellent prevents moose browsing

Kjemisk avskrekkingsmiddel forhindrer elgbeiting

Erik Christiansen

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Norsk institutt for skogforskning (NISK)

Norwegian Forest Research Institute
Direktør/*Director:* Toralf Austin, Box 61, 1432 Ås-NLH *Norway*

NISK-Ås, Box 61, 1432 Ås-NLH, *Norway*, Telf./*Phone* (02) 94 11 60

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Abstract

Christiansen, E. 1979. Chemical repellent prevents moose browsing. Meddr Norsk inst. skogforsk. *00:* 000—000.

The efficacies of two chemical repellents against moose browsing were tested in pen and field experiments. One compound, MGK BGR [R] Big Game Repellent, prevented browsing throughout one whole winter. This longterm effect was manifested even when the subjects were under some nutritional stress. The other preparation — with thiram (TMTD) — had little effect.

Utdrag

Christiansen, E. 1979. Chemical repellent prevents moose browsing. (Kjemisk avskrekkingsmiddel forhindrer elgbeiting). Meddr Norsk inst. skogforsk. *00:* 000—000.

Effektiviteten av to kjemiske avskrekkingsmidler (repellenter) mot elgbeiting ble undersøkt. Forsøkene ble utført med dyr i innhengninger, og som feltforsøk.

Ett av midlene, MGK BGR [R] Big Game Repellent, forhindret effektivt elgbeiting gjennom en hel vinter, selv om forsøksdyrene var utsatt for nærings-stress. Et annet middel — med thiram (TMTD) — viste seg lite effektivt.

Preface

This work was carried out with the aid if Institute of Nature Conservancy, Agricultural University of Norway. Associate professor Olav Hjeljord of this institution kindly put the experimental animals at my disposal, and Mr. Ole Kristian Furulund, at the time a graduate student, did most of the work implicated in Experiments I and II.

I gratefully acknowledge this valuable help.

Ås, november 1978

Erik Christiansen
Norwegian Forest Research Institute
Division of Forest Protection
Section of Forest Zoology
P. O. Box 61, N—1432 Ås — NLH

Contents

I Introduction

Browsing by deer species may be very destructive in young forest plantations in Norway. Of the two important native conifers, Scots pine (*Pinus silvestris*) is generally preferred to Norway spruce (*Picea abies*). Most of the injury is inflicted by the European moose (*Alces alces*). Red deer (*Cervus elaphus*) and roe deer (*Capreolus capreolus*) also cause considerable destruction in certain areas (SKOGSKADEUTVALGET AV 1971, 1972). All three species may cause substantial harm to orchards. The moose is also known to consume ripening grain.

Although the best overall means to control deer damage is to keep the population in check by hunting, there is a need for measures to protect valuable plants.

The present paper reports a study of the efficacies of two chemical contact-repellents against browsing by European moose.

II Material and methods

In a series of four experiments the efficacies of chemical repellents were tested. Experiments I to III were carried out with penned moose, Experiment IV was a field test.

The active ingredient in one of the compounds was thriam — bis (demethylthiocarbamoyl) disulphide — also known as TMTD. Thiram was chosen because it has served as a «standard» in evaluation of experimental repellents (e. g. CAMPBELL & BULLARD, 1972). Furthermore, it is used as a deer repellent in several countries. It has been in common use as a fungicide for several decades.

The other repellent tested has putrescent whole-egg solids as the active ingredient. It was developed by the Weyerhaeuser Company, and is marketed in the US under the name of MGK BGR ^{R} Big Game Repellent (McLaughlin Gormley King Company, 8810 Tenth Avenue N, Minneapolis, Minnesota 55427, USA). The name is abbreviated to BGR in the present text.

In the pen experiments, the subjects were held in three separate enclosures of ca 0,1 ha., located in an old stand of Norway spruce. The animals were given 20—30 cm long shoots from Norway spruce and Scots pine. The repellents had been applied by gently rybbing a soaked glove up the shoots. After drying, the shoots were bundled and tied to the fence inside the pens. Each test lasted 48 hours.

Experiment I (March 10—12, 1977) tested the short-term efficacy of both repellents. Foliage was given in bundles of three shoots to the three test animals, within 2 days of treatment. The foliage — spruce and pine — was weighed after 0, 2, 24 and 48 hours of the experiment.

The test animals were young bulls, one was born in 1975 (Moose C) and the other two (A and B) in 1976. Before and during the experiment they had been given a diet of nothing but hacked hay for more than three months. The last two weeks before the test, they had been given rations of ca 70 % of their normal consumption.

Experiment II (April 10—12, 1977) tested the efficacy of BGR 30 days after treatment. The same three moose as in Experiment I were given the choice between:

1. Foliage treated with BGR and stored outdoors for 30 days.
2. Foliage stored outdoors for 30 days and treated with BGR on the day of the test commencement.
3. Foliage stored outdoors for 30 days (untreated control).

The shoots were kept in a shady place, exposed to precipitation. The foliage — spruce and pine — was weighed after 0, 2, 24 and 48 hours of the test. Shortly before the experiment started, the animals' diet had been changed from hacked hay to conifer and broad-leaf twigs, which were given *ad lib.*

Experiment III (March 30 — April 1, 1978) tested the efficacy of BGR after 160 days. On October 20, 1977, shoots of six young pine trees were treated with BGR. On March 21, 1978, treated and untreated shoots were clipped from these trees. Part of the untreated foliage was treated with BGR on March 22. The shoots were arranged in bundles of six, one shoot from each of the trees. This was done to avoid bias from individual characteristics of the trees. Each moose was given three differently-treated bundles of shoots:

1. Treated with BGR 160 days before the test.
2. Treated with BGR 8 days before the test.
3. Untreated.

Two of the test moose (A and B — bulls born in 1976) were the same as the ones used in Experiment I and II, whereas the third (D) was a cow born in 1977. During the period Desember 15, 1977, to March 22, 1978, they had been given hacked hay only. Part of the period, the hay rations were 80 % of normal consumption. From March 22 through the repellent test period, moose B and D had been given hay *ad lib.* plus grain feed. During these days moose A was given only 60 % of its normal hay consumption.

Experiments IV (field test) On October 20, 1977, a group of 34 young Scots pine trees in a plantation was treated with BGR. The trees were from 1.5 to 3.0 m high. The leader shoots of 1976 and 77, plus the uppermost whorl were gently smeared using a soaked glove. After 160 days (March 21, 1978) and 260 days (July 6, 1978) the incidence of damage was recorded. The particular plantation was chosen because the browsing pressure is extremely high in that area.

III Results

Experiment I. All three moose consumed all the untreated foliage within 48 hours (Table I, Fig. 1). It was observed that the most voracious one ate both the untreated shoots and the thiram-treated ones within a few minutes. First it consumed the thriam-treated foliage, then the control foliage. Immediately after, it clipped off a BGR-treated shoot, which was then discarded.

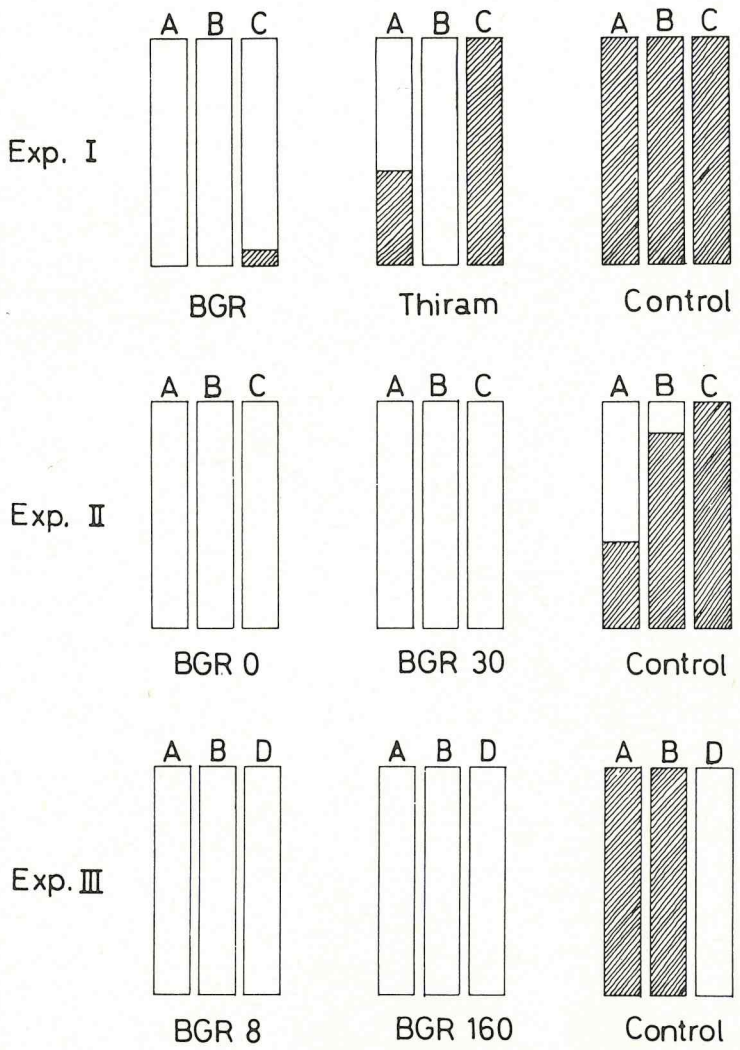

Figure 1. Amount of foliage (hatched columns) taken by the moose after 48 hours of Experiments I—III. The letters A—D refer to individual moose (see text). BGR 0 = treatment immediately before test, BGR 30 = treatment 30 days before test, etc.
Andel av baret (skraverte søyler) som var tatt av elgene etter 48 timer i Forsøk I—III. Bokstavene A—D referer til individuelle elger (se teksten). BGR 0 = behandling umiddelbart før forsøket, BGR 30 = behandling 30 dager før forsøket, o. s. v.

Experiment II. Neither the foliage treated with BGR shortly before the test nor that treated a month earlier was eaten (Table II, Fig. 1). Two of the moose consumed only part of the untreated shoots.

Table 1. Percentage, by weight, of foliage taken after different periods of Experiment I. S = spruce, P = pine.

Vekt-% av baret som var tatt av elgene på forskjellige tidspunkter i Forsøk I. S = gran, P = furu.

		Moose *Elg* A		Moose *Elg* B		Moose *Elg* C	
		S	P	S	P	S	P
BGR	2 hours *timer*	0	0	0	0	0	14
	24 " "	0	0	0	0	0	14
	48 " "	0	0	0	0	0	14
Thiram-repellent	2 " "	48	26	0	0	100	100
	24 " "	48	32	0	0	100	100
	48 " "	48	35	0	0	100	100
Untreated control *Ubehandlet*	2 " "	0	35	31	34	100	100
	24 " "	49	57	39	67	100	100
	48 " "	100	100	100	100	100	100

Table II. Percentage, by weight, of foliage taken after different periods of Experiment II. S = spruce, P = pine, BGR 0 = foliage treated immediately before test, BGR 30 = foliage treated 30 days earlier.

Vekt-% av baret som var tatt av elgene på forskjellige tidspunkter i Forsøk II. S = gran, P = furu, BGR 0 = bar behandlet umiddelbart før forsøket, BGR 30 = bar behandlet 30 dager tidligere.

		Moose *Elg* A		Moose *Elg* B		Moose *Elg* C	
		S	P	S	P	S	P
BGR 0	2 hours *timer*	0	0	0	0	0	0
	24 " "	0	0	0	0	0	0
	48 " "	0	0	0	0	0	0
BGR 30	2 " "	0	0	0	0	0	0
	24 " "	0	0	0	0	0	0
	48 " "	0	0	0	0	0	0
Untreated control *Ubehandlet*	2 " "	0	16	58	53	0	0
	24 " "	35	32	74	68	100	100
	48 " "	41	35	100	72	100	100

Figure 2. Scots pines after Experiment IV (July 6, 1978). The trees in the foreground with white ribbons had their BGR-treated tops intact. On the treated tree to the left, lower, untreated shoots had been clipped. Other trees (behind) were heavily browsed, except for tops which were out of reach for the moose.
Ungfuruer etter Forsøk IV (6. juli 1978). De BGR-behandlete toppene på trærne i forgrunnen (med hvite bånd) var uskadde. På det behandlete treet til venstre var lavere, ubehandlete skudd bitt av. Andre trær på feltet (bakenfor) var sterkt beitet, bortsett fra topper som elgen ikke kunne rekke.

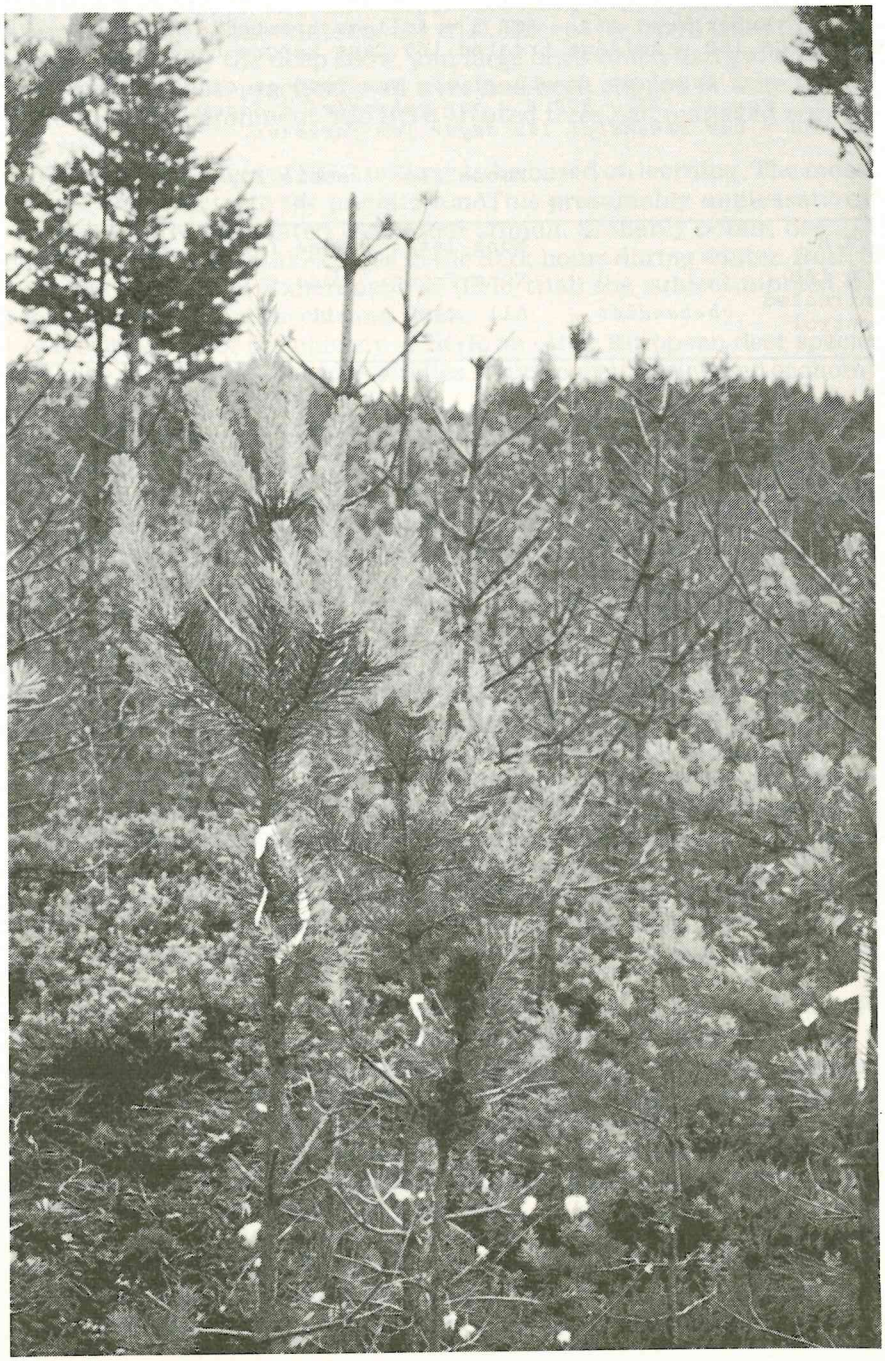

Table III. Amount of pine foliage taken by the moose after 48 hours. Experiment III. BGR 8 = foliage treated 8 days before test, BGR 160 = foliage treated 160 days before test.

Andel av furubaret som var tatt av elgene etter 48 timer. Forsøk III. BGR 8 = bar behandlet 8 dager før forsøket, BGR 160 = bar behandlet 160 dager før forsøket.

		Moose *Elg* A	Moose *Elg* B	Moose *Elg* D
BGR 8		None *Intet*	None *Intet*	None *Intet*
BGR 160		None *Intet*	None *Intet*	None *Intet*
Untreated control	*Ubehandlet*	All *Alt*	All *Alt*	None *Intet*

Experiment III. The two moose bulls consumed all untreated foliage within 48 hours (Table III, Fig. 1). Neither the freshly treated shoots nor those treated 160 days earlier were eaten. The young cow (D) did not eat any of the foliage during the 48 hour test. (This animal had probably never eaten conifer foliage before. After the 48 hour test, she was given fresh pine foliage, which she eventually consumed. After this she ate 38 % of the untreated test foliage within four days of the test termination, but did not eat any treated shoots. At this time the test foliage had lost 18 % of its fresh weight through desiccation, and the palatability was likely to be low).

Experiment IV (field test). By day 160 of the field test (March, 1978), 32 of the 34 young pines had their BGR-treated tops intact. One tree had lost its 1977 leader shoot. On another tree, one shoot of the upper whorl had been clipped. The whole shoot was found under the tree. On 22 of the 34 trees lower, untreated shoots had been clipped off. By day 260 (July) no further damage was recorded. All shoots had developed normally (Fig. 2).

IV Discussion

BGR has been found to give good protection against browsing by American deer, *Odocoileus* spp. and elk, *Cervus canadensis*. This effect is demonstrated in the documents submitted for registration in the US, where, presently, the compound is for sale.

The present data substantiate the claim that browsing by European moose is prevented by application of BGR. Before experiments I and III the animals had been held for a long period and an artificial diet, i. e. hay. Except for moose D, which was raised on food items other than bark, they were all highly interested in bark and foliage of conifers and broad-leaved trees. This urge for a more natural winter browse than hay was manifested in the animals' peeling off the bark of nearly all the old spuce trees within the enclosures.

In the area of the field test (Experiment IV), extensive browsing had taken place during the winter of the trial. Except for small trees that had been protected by the deep snow, and large ones which had grown out of reach of the moose, practically all trees had been clipped or were broken down. In this environment, the BGR-treated trees had managed remarkably well.

The repellent effect of BGR is likely to be based on learning. The moose probably have to taste the preparation. This presumably unpleasant experience is later associated with other stimuli, probably odour, because much of the browsing takes place in the dark hours during winter. Both in Experiment I and in Experiment IV (field trial) the subject nibbled the treated shoots before discarding them.

An evaluation of the efficacy of BGR on other European deer species should be carried out. Likewise, studies of time consumption and economy of application are needed.

Presently, no chemical deer repellent is sold in Norway. No such preparation can be marketed without approval by the Pesticides Board of the Ministry of Agriculture. In other European countries, several such compounds are being sold, many of them based on thiram. The thiram-preparation used in the present study evidently had an unsatisfactory effect against moose.

In forestry, the use of contact-repellents will probably be restricted to a small number of particularly valuable cultures. This is due to the high costs of treating trees individually. In horticulture, however, such repellents appear to have a considerable potential to control damage by deer browsing.

Kjemisk avskrekkingsmiddel forhindrer elgbeiting

Beiting av elg og andre hjortedyr er et alvorlig problem for skog- og hagebruk. Generelt sett er det beste tiltaket mot slike skader å holde bestanden av hjortedyrene på et rimelig nivå. Det er likevel behov for midler til å beskytte særlig verdifulle og spesielt utsatte kulturer mot beiteskader. En mulighet er å benytte kjemiske avskrekkingsmidler (repellenter).

Artikkelen beskriver en studie av to kjemiske avskrekkingsmidlers effektivitet mot elgbeiting på bar av furu og gran.

Det ble utført 3 forsøk med elg i innhegninger og ett feltforsøk i en furuforyngelse som er sterkt utsatt for elgskader (Forsøk IV).

Ett av midlene, MGK BGR [R] Big Game Repellent (senere kalt BGR) hadde god beskyttende effekt mot elgbeiting gjennom en hel vinter, selv om elgene var utsatt for nærings-stress. Det andre midlet, med thiram (TMTD), hadde liten effekt mot beiting.

BGR er ikke en *område-repellent,* d. v. s. den holder ikke skadedyrene på avstand fra behandlete objekter. Forfatteren kjenner ikke til at det fins effektive område-repellenter med varig virkning.

BGR kan karakteriseres som en *kontakt-repellent;* dyrene avskyr midlets smak, og lærer å forbinde denne smaken med lukten av preparatet.

Men dette forhindrer ikke beiting på ubehandlete objekter like ved siden av behandlete. Elgene i feltforsøket åt således ubehandlete, lavere greiner på småtrær med BGR-behandlet topp.

Bruk av kontakt-repellenter medfører store behandlingskostnader. For skogbrukets vedkommende innebærer dette at anvendelsen vil være begrenset til særlig verdifulle kulturer. Hagebrukets mer intensive kulturer kan bære større behandlingskostnader per tre, og en effektiv kontaktrepellent vil trolig kunne få en betydelig anvendelse her.

Dersom et kjemisk avskrekkingsmiddel skal kunne selges i Norge, må det godkjennes av Landbruksdepartementets Giftnemnd. Etter omfattende, praktisk prøving av BGR vinteren 1978/79 vil det bli avgjort om man skal søke om å få midlet godkjent.

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