

# Deer repellent trials on jack pine seedlings at Brule River State Forest: Final Results 2005-2009

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## Overview

Two-year-old bare root jack pine seedlings, planted at Brule River State Forest in the spring of 2004, were treated with 6 different retail deer repellents in the falls of 2005, 2006, 2007, and 2008. (See Table 3 for list of products, active ingredients and costs.) Observations of deer browse incidence were recorded, and height measurements were taken in each spring (mid-June) following these treatments. A September 10, 2007 article in the Forestry Division's newsletter *The ForesTREEporter* detailed the materials and methods of the study as well as the results to that point. This article focuses on the final results and discussion of the study.

## SEEDLING HEIGHT



### Results

The 2009 measurements and observations (like those reported in 2007) showed that seedlings treated by any of the repellents were taller and had lower incidence of deer browse damage than the control (no-repellent) seedlings. **Table 1** shows the average height of all treated seedlings by 2009 was **47.3"** as compared to non-treated at **27.6"**.

The top performing products through 2009 were Plantskydd®, *Thiram* and Repellex™ (average heights: 51.8", 50.7" and 50.5", respectively). Tree Guard®, Hinder® and Deer Off® were less effective but were still significantly better than using no product at all (38.3", 39.5" and 41.5", respectively).

**Table 1: Seedling Height Measurements by Treatment and Year**

	<i>2007 – 1.5 years into study</i>	<i>2008 – 2.5 years into study</i>	<i>2009 – 3.5 years into study</i>
<b>Deer Off®</b>	<b>24.5"</b>	<b>32.6"</b>	<b>41.5"</b>
<b>Repellex™</b>	<b>30.3"</b>	<b>37.2"</b>	<b>50.5"</b>
<b>Hinder®</b>	<b>19.5"</b>	<b>29.4"</b>	<b>39.5"</b>
<b>Plantskydd®</b>	<b>28.7"</b>	<b>39.3"</b>	<b>51.8"</b>
<i>Thiram</i>	<b>27.4"</b>	<b>35.2"</b>	<b>50.7"</b>
<b>Tree Guard®</b>	<b>19.2"</b>	<b>27.9"</b>	<b>38.3"</b>
<b>Avg. of all Repellents</b>	<b>24.9"</b>	<b>33.6"</b>	<b>47.3"</b>
<i>Control</i>	<b>13.7"</b>	<b>18.2"</b>	<b>27.6"</b>

## Discussion

A comparison of heights from 2007-2009 show that the control seedlings are nearly **2 years-of-growth** behind the treated seedlings (in Table 1, compare Avg. of all Repellents 2007 of **24.9 inches** to *Control* 2009 -- **27.6 inches**). These control seedlings were held back by deer pressure but are now gaining ground after attaining a browse height threshold. For this study, that threshold appears to be around **20 inches** in height. Once seedlings attain this size, their terminal shoots and buds tend to be left alone, and browse damage shifts to lateral shoots and needles.

At the onset of this study, seedlings averaged 10-15 inches in height. The 2005 and 2006 fall applications helped the treated seedlings break through the browse height threshold. Deer pressure on the control seedlings kept them below the 20-inch threshold, possibly permanently affecting some seedlings (severe stunting or mortality) and holding back the remaining majority. They finally broke through the threshold during the 2008 growing season.

## DEER BROWSE INCIDENCE

Deer browse incidence was defined as any seedling showing signs of deer browse damage in the past year. The calculated percentages in **Table 2** represent the percentage of browsed seedlings in the treatment population. Quantifying this value became increasingly difficult due to the several years of browse damage present on many seedlings. It was often hard to identify browse that occurred in the last 6 months from that of 1 or more years previous.

**Table 2: Deer Browse Incidence by Treatment and Year**

	<i>2006 - 0.5 yrs into study</i>	<i>2007 - 1.5 years into study</i>	<i>2008 - 2.5 yrs into study</i>	<i>2009 - 3.5 yrs into study</i>
<b>Deer Off®</b>	<b>14.9%</b>	<b>13.8%</b>	<b>6.4%</b>	<b>4.5%</b>
<b>Repellex™</b>	<b>19.3%</b>	<b>1.3%</b>	<b>4.2%</b>	<b>6.5%</b>
<b>Hinder®</b>	<b>10.5%</b>	<b>67.1%</b>	<b>10.8%</b>	<b>12.8%</b>
<b>Plantskydd®</b>	<b>8.8%</b>	<b>10.4%</b>	<b>0.0%</b>	<b>9.1%</b>
<i>Thiram</i>	<b>11.2%</b>	<b>2.9%</b>	<b>8.6%</b>	<b>6.0%</b>
<b>Tree Guard®</b>	<b>10.6%</b>	<b>77.1%</b>	<b>19.5%</b>	<b>23.8%</b>
<b>Avg. of all Repellents</b>	<b>12.6%</b>	<b>28.7%</b>	<b>8.2%</b>	<b>10.5%</b>
<i>Control</i>	<b>48.2%</b>	<b>97.8%</b>	<b>67.5%</b>	<b>30.0%</b>

## 2009 Results

Although not completely accurate, deer browse incidence was observed to be best controlled by Deer Off®, Plantskydd®, *Thiram* and Repellex™ (4.5% to 9.1%) Tree Guard® and Hinder® had some effect against deer browsing (23.8% and 12.8% incidence, respectively), especially when compared to the control seedlings (30%), but were significantly lower than the other four products. This trend seemed to stay consistent throughout the study years.

## **Discussion**

Due to the difficulty in deciphering recent browse from older browse damage, yearly observations for each treatment tended to fluctuate quite a bit and did not show any reliable patterns. Deer Off® maintained the most consistency, with a low rate of browse each year on the seedlings in that treatment. It is also obvious that, each year, the treated seedlings in any treatment suffered significantly less browse damage than the control seedlings.

## **Conclusion**

It is obvious from this study that when jack pine seedlings are treated with any of the 6 deer repellent products tested, height growth gains are significantly higher than using no product at all. Although not monitored here, it is speculated from initial observations that mortality is also higher among more heavily browsed seedlings such as those in the control.

Variation in performance among the products used in this study may be due to a lower residual effect against browsing in the spring when carrying out a fall application. The study showed that the 2 blood plasma products (Plantskydd® and Repellex™) and *Thiram* performed the best in average height.

Future related studies of interest: A study on different conifer seedlings to see if the same method and products work as in jack pine (red and white pine, for example); a study incorporating mortality of browsed seedlings; a study on large versus small seedlings (2-0 or 3-0 versus 1-0 conifers); studies on hardwoods; studies involving different deer populations and pressures.

**Table 3: Deer Repellent Products Used for Treatments**

<b>Product</b>	<b>Active Ingredient (AI)</b>	<b>Rates</b>	<b>Volume (1,000 sdngs.)</b>	<b>*Cost (1,000 sdngs.)</b>
<b>Deer Off®</b>	Whole egg solids, capsaicin/capsaicinoids	0.5 qts/Gal. H2O	1.5 Gallons	\$21.94
<b>Repellex™</b>	Dried animal blood plasma; latex carrier	0.45 Gal./Gal.	1.5 Gallons	\$63.86
<b>Hinder®</b>	Ammonium soaps of fatty acids	0.2 qts/Gal.	1.5 Gallons	\$6.30
<b>Tree Guard®</b>	Denatonium benzoate (Bitrex)	7.76 grams A.I./quart (pre-mixed)	1.5 Gallons	\$57.00
<b>Plantskydd®</b>	Blood plasma and latex carrier	1.1 lbs/Gal.	1.5 Gallons	\$27.71
<b><i>Thiram + Spreader/Sticker</i></b>	Thiram (fungicide)	1 qt/Gal.	1.5 Gallons	\$18.06

*\*Costs are based on an August 2007 internet search.*

*Note: Some repellents may require a pesticide applicator's license if done for hire – please read labels*