

The use of a repellent to reduce bark beetle attacks on logging residues

7. Slovenski entomološki simpozij z mednarodno udeležbo



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INTRODUCTION

- Bark beetles are considered the primary cause of sanitary felling in Slovenia. Especially due to the infestations of the European spruce bark beetle (*Ips typographus*), which is a significant pest affecting Norway spruce (*Picea abies*) across European countries.
- Current methods to reduce bark beetle outbreaks include: lowering hosts abundance, regular surveillance of spruce forest stands, management of logging residues in piles, use of bait logs and permanent traps, short sanitation felling deadlines.
- Existing reactive measures are often insufficient to prevent new outbreaks. A new method that involves using a repellent has already been proven effective in the Czech Republic. Therefore, we decided to test it to try to reduce attacks of bark beetles on logging residue.

The study examined the relationship between bark beetle occurrence in logging residue and repellent use.

METHODS



Figure 1: Logging residue pile with a cross-trap and repellent. Figure 2: Repellent bag. Figure 3: Logging residue pile being surveyed.

- The repellent is a custom-made blend provided by Synergy semiochemical corporation and is based on compounds found in deciduous tree tissues (1,8-cineol, n-hexanol, 1-octen-3-ol, 3-octanol, trans-conophthorin). The repellent works alongside attractants emitted by spruce logging residues to deter pests.
- The blue dispenser is a polyethylene pouch (10cm x 15 cm) and it releases the mixture at approximately 80 mg per day and lasts for 60 days at constant temperature of 25°C.
- Testing was conducted in **mixed spruce stands** over two months (July to September 2024) in forest management region Kočevje and Novo Mesto.
 - ✓ Ten locations placed in pairs were included in the study: five with repellents and five without repellents.
- In the forest stand selective thinning was performed of approximately 25 m³ of wood. The logging residue was as a part of regular practice put into one or two large piles. The repellent was then placed atop.
- Bark beetle abundance was assessed using:
 - ✓ **One trap placed** adjacent to the logging residues.
 - ✓ Infestation levels of two small (<2 cm ø) and two large (>10cm ø) **branch samples** from logging residue piles.

RESULTS

Branches sampled from logging residue piles

SMALL BRANCHES

LARGE BRANCHES

SMALL HOLES

LARGE HOLES

SMALL HOLES

LARGE HOLES

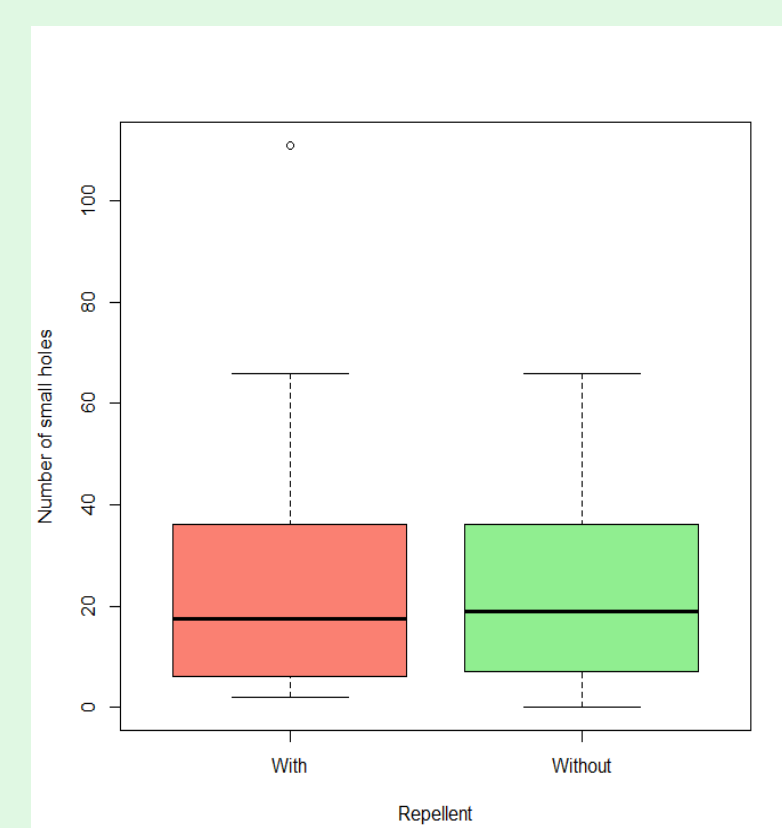


Figure 4: Number small holes in small branches

- Only two large holes were found on a small branch, which was collected at the treatment without repellent.

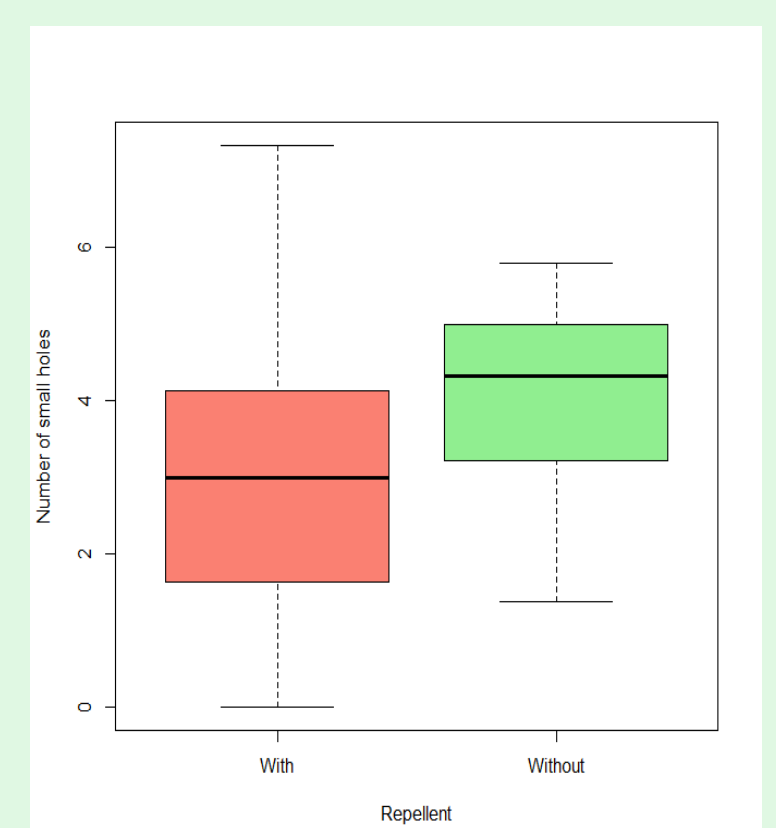


Figure 5: Number of small holes in large branches (shown with log transformation)

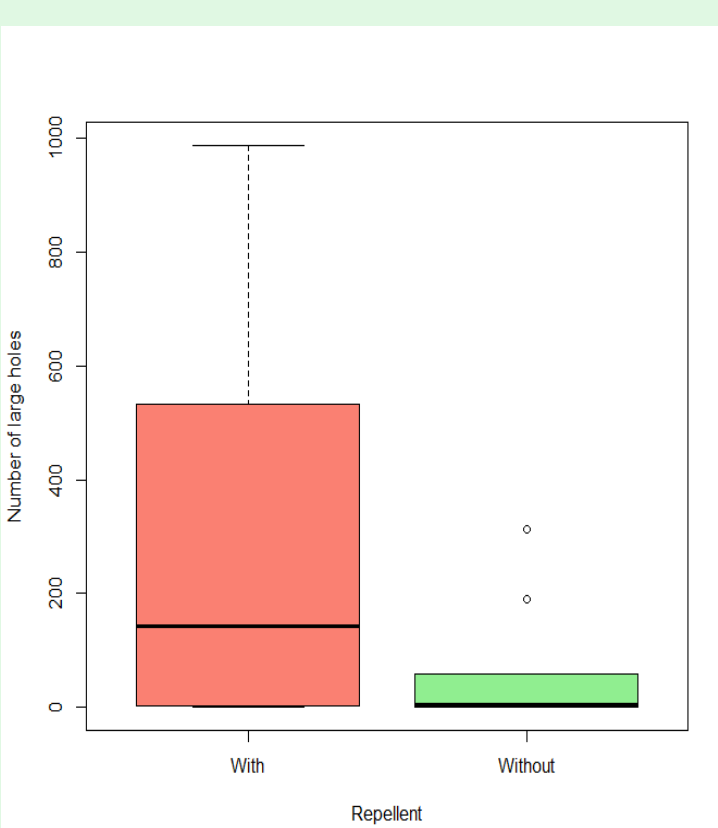


Figure 6: Number of large holes in large branches

- It is believed that smaller holes are most likely formed by *Pityogenes chalcographus* and larger holes by *Ips typographus*. Further analysis is still needed to determine which species were making them.
- We can observe higher numbers of large holes in large branches. However overall, no statistically significant differences were found regarding numbers of different holes in varied branch sizes between repellent use.

Bark beetle catch from traps

NUMBER INDIVIDUALS AND SPECIES

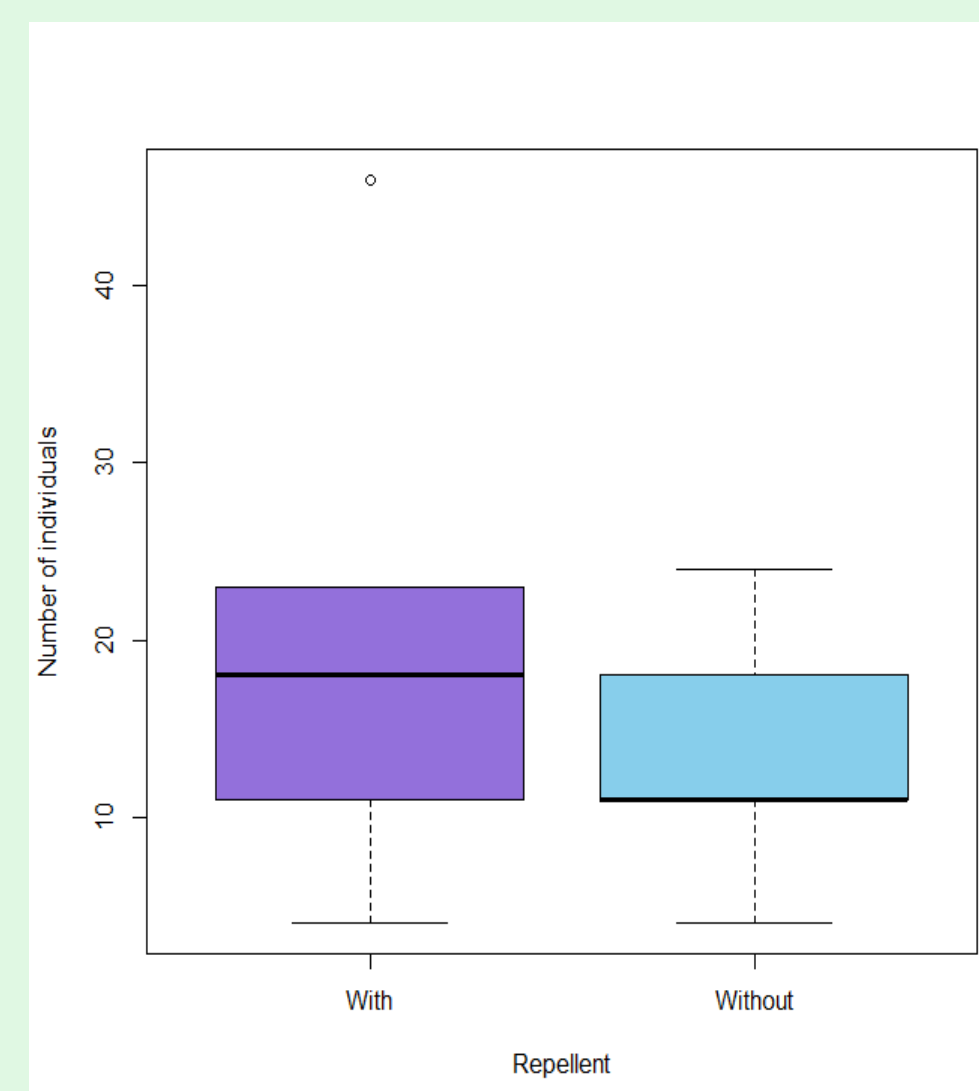


Figure 7: Number of individuals caught per plot.

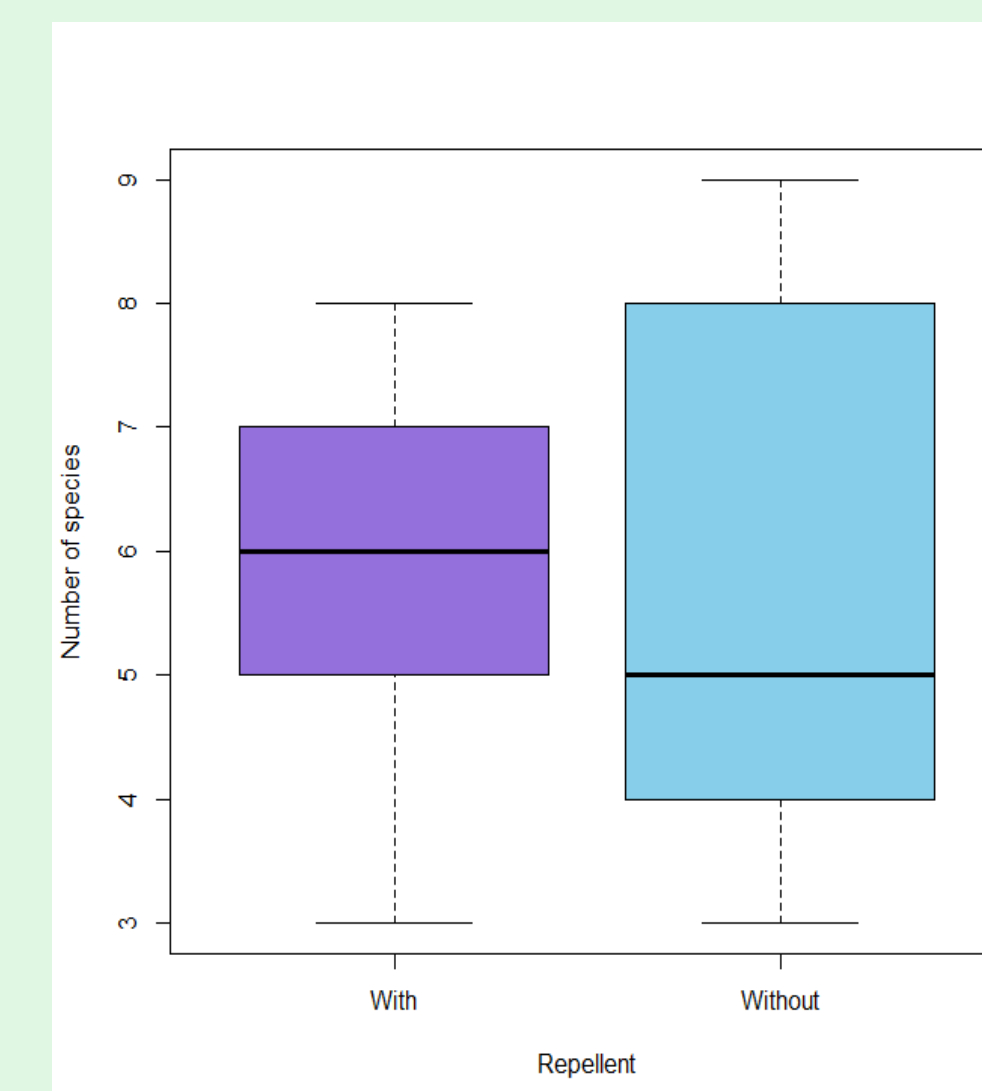


Figure 8: Number of species caught per plot.

- A high variability in number of species was detected between different plots.

Species caught per treatment:
 ✓ Repellent applied: 15 species,
 ✓ Repellent not applied: 11 species.

- A greater number of individuals and species of bark beetles was captured at locations where the repellent was applied. However, no statistically significant differences were found.

Individuals caught per treatment:
 ✓ Repellent applied: 68 beetles,
 ✓ Repellent not applied: 102 beetles.

HOST PREFERENCE

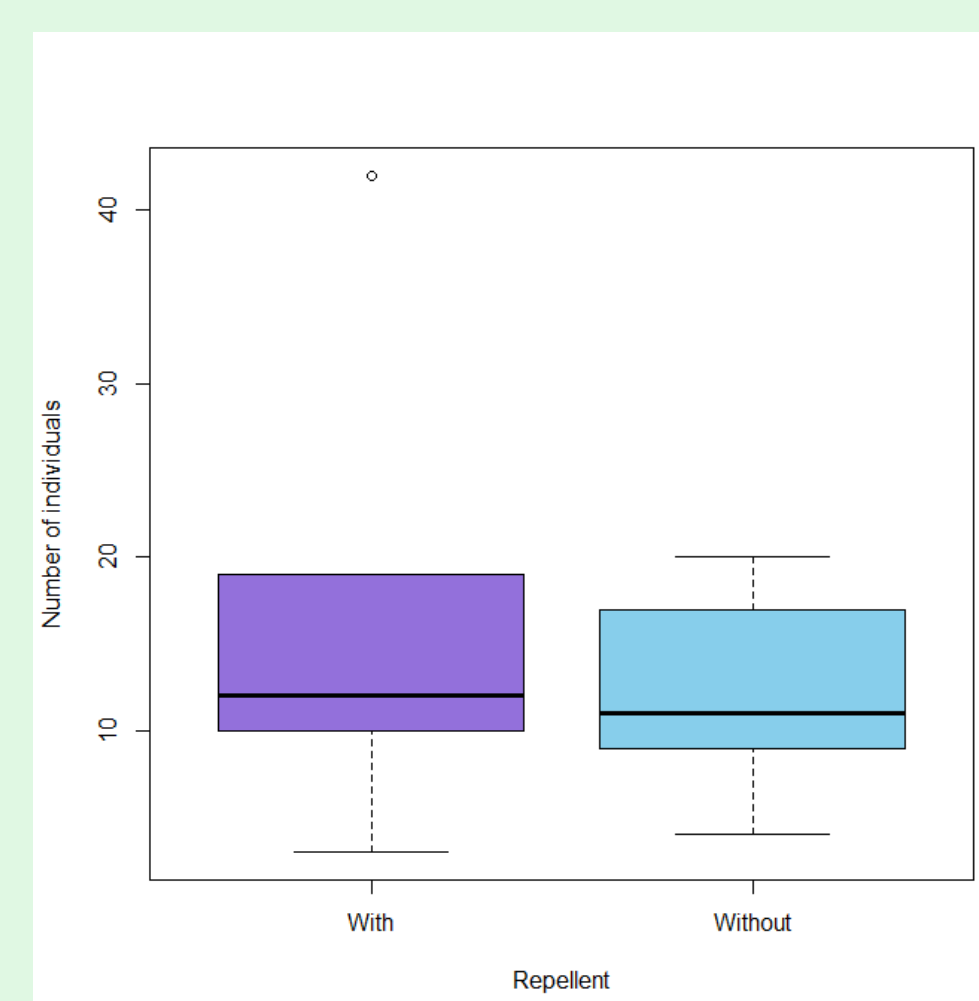


Figure 9: Number of caught bark beetle individuals that primarily attack a conifer host.

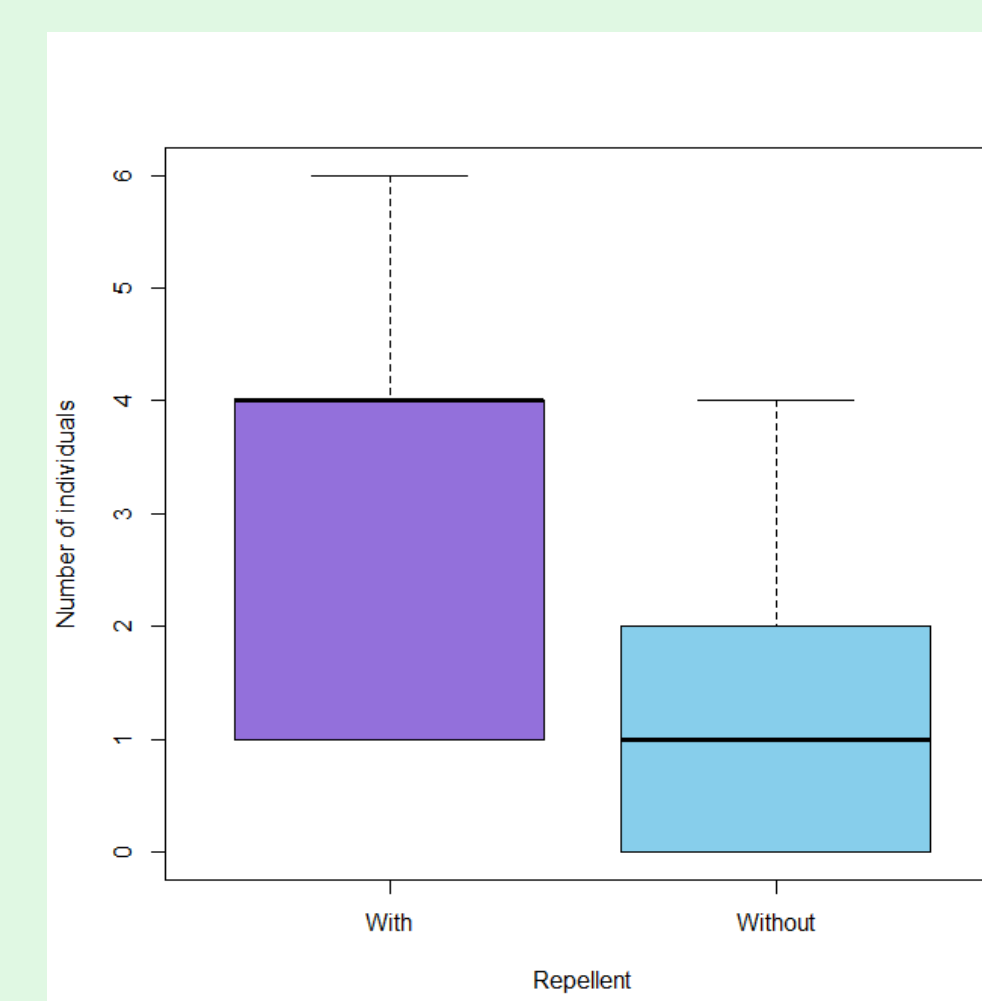


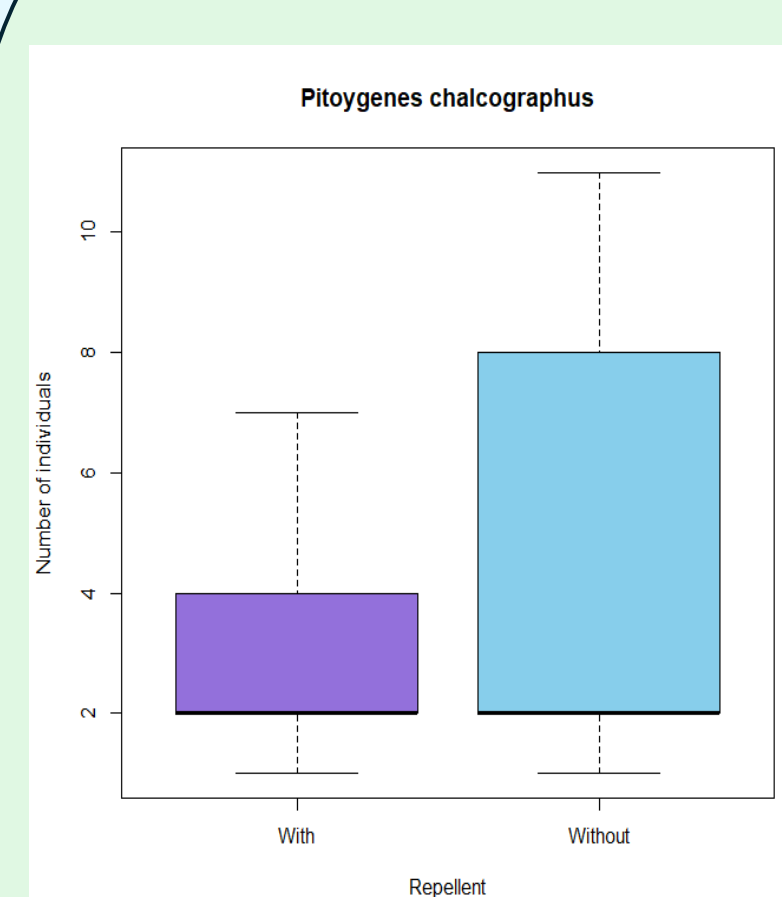
Figure 10: Number of caught bark beetle individuals that primarily attack a deciduous host.

- A greater number of bark beetles that attack a conifer host was caught at treatments with the repellent applied. However, no statistically significant differences were found.

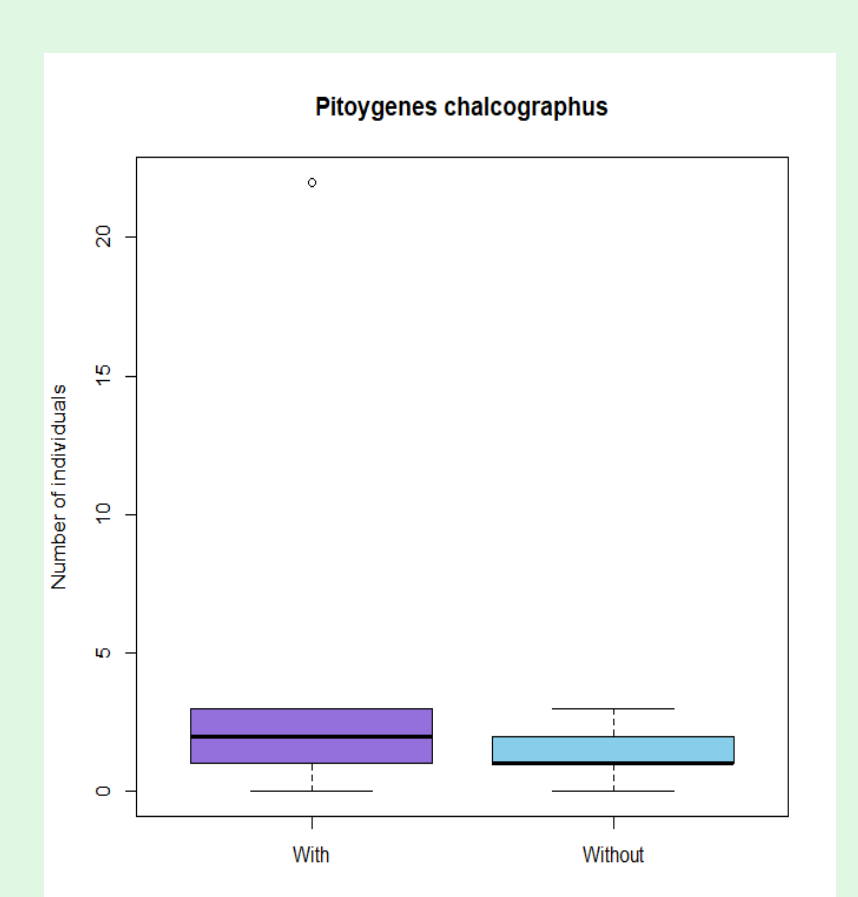
Table 1: Number of caught bark beetle individuals and their host preference.

Repellent	Deciduous host	Conifer host
Without	7	61
With	16	86
Total	23	147

BARK BEETLES WITH THE HIGHEST PREVALENCE



- Four species that also have a conifer host preference had the highest prevalence.
 - ✓ *Dryocoetes autographus* and *Polygraphus poligraphus* show a higher rate of occurrence at plots with repellent.
 - ✓ *Pityogenes chalcographus* and *Ips typographus* show a higher rate of occurrence at plots without repellent.



- Another four species (*Gnathotrichus materiarius*, *Hylurgops palliatus*, *Trypodendron lineatum*, *Xyleborus dryographus*) were only detected at plots with repellent, but only one of them has a deciduous host preference.

- No statistically significant differences were found.

Table 2: Number of caught bark beetle individuals per species.

Species	Host	Repellent		Total
		Without	With	
<i>Crypturgus cinereus</i>	Conifer	4	5	9
<i>Dryocoetes autographus</i>	Conifer	3	22	25
<i>Gnathotrichus materiarius</i>	Conifer	1	1	2
<i>Hylastes cunicularius</i>	Conifer	2	7	9
<i>Hylurgops palliatus</i>	Conifer	1	1	2
<i>Ips typographus</i>	Conifer	16	4	20
<i>Pityogenes chalcographus</i>	Conifer	24	16	40
<i>Pityophthorus pityographus</i>	Conifer	5	1	6
<i>Polygraphus poligraphus</i>	Conifer	7	28	35
<i>Trypodendron lineatum</i>	Conifer	1	1	2
<i>Scolytus intricatus</i>	Deciduous	1	1	2
<i>Taphrorychus bicolor</i>	Deciduous	1	1	2
<i>Xyleborus saxesenii</i>	Deciduous	1	6	7
<i>Xyleborus dryographus</i>	Deciduous	1	1	2
<i>Xylosandrus germanus</i>	Deciduous	4	7	11
Total		68	102	170

Figures 11-14: Number of individuals of the four most commonly caught bark beetles (*Pityogenes chalcographus*, *Polygraphus poligraphus*, *Ips typographus*, *Dryocoetes autographus*)

CONCLUSIONS

- ❖ Higher numbers of species and of individual bark beetles associated with conifer hosts was observed at locations where the repellent was applied.
- ❖ In contrast, *Pityogenes chalcographus* and *Ips typographus* had lower prevalence at treatments with repellent.

Nevertheless, the results of all analysis are not statistically significant, therefore no effect of the repellent was documented.

Acknowledgments

The presentation is supported by the CRP project V4-2218 financed by the Slovenian research and innovation agency and the Ministry of agriculture, forestry and food. The experimental setup was made possible due to efforts of the Slovenian Forest Service and Slovenian state forests d.o.o.