THE PROTECTION OF SPRUCE AGAINST BARK BEETLE BY TREE INJECTIONS

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INTRODUCTION

Tree injection is a method of applying a substance to the conductive tissues of an individual tree [1]. Currently injection into the vascular system of woody plants is mainly used as a defense against fungal and fungus-like pathogens or against insect pests. The main advantage of this method is the direct application of a given amount of the substance into the conducting tissues of the individual. The direct application ensures zero contamination of the surrounding environment by the applied substance and protects the health of the worker who injects it [2]. Tree injection is divided into several groups, according to the volume of substance injected (macro and microinjection) according to the technology of applying the substance into the conductive tissues (drill-based, drill-free), and also according to the method of injecting the substance into the individual (pressurized or non-pressurized injection) [3]. The aim of this research was to set the efficacy of tree injection against *Ips typographus* L.

RESULTS

A total of 350 section were debarked and 28 149 maternal galleries of *I. typographus* were recorded in infested trees (Control: 14 605; injected: 13 544). The mean length (±SE) of maternal galleries was lower in the injected tree (24.57±0.25 mm) compared to the control trees (45.41±0.21 mm). The maternal galleries were significantly shorter at injected trees and its length differed among sections (GLMM: R^2 = 0.85, p < 0.001) (Fig. 2)

In total, 253 256 of larval galleries were recorded in infested trees (Control: 75 468; injected: 177 788). The mean length of larval galleries was lower in the injected tree (17.64±0.02 mm) compared to the control trees (11±0.03 mm). The larval galleries were significantly shorter at injected trees and their length differed among sections (GLMM: R^2 = 0.86, p < 0.001).

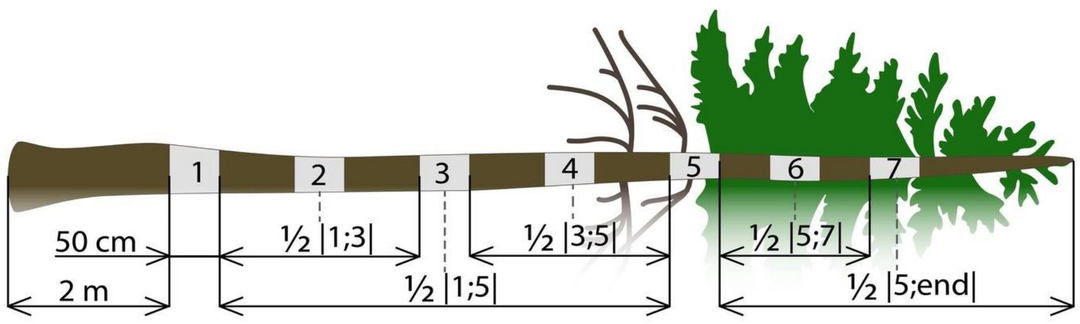

Fig. 1: The position schema of debarked sections on the tree stem

METHODOLOGY

The study area was in the east part of Czechia, near by town Polička. In spruce stands, owned by the Polička town, were set 5 locations. At each of the location were selected 10 Norway spruces, 5 samples were treated by tree drill-based microinjection (QUIK-jet, Arborjet) and 5 samples were controls. For the treatment , Emamectin benzoate (c = 4,5 %) was used in a volume 4 ml in each injected hole. The treatment were carried out at the beginning of April. At the start of bark beetle swarm, the synthetic pheromone was put up to make spruces more attractive for bark beetles. Between 9th and 17th were all 50 spruces felled down. On each tree, 7 sections were debarked around the enitre circumference (Fig. 2). All debarked sections were photographed with scale and with number of section. All photos of section were analyzed by digital image analysis using ImageJ software (NIH, USA). For each section, the parameters of section area, number of galleries, lengths of maternal and larvae galleries were recorded. At 46 sections was the high abundance of bark beetles and it was impossible to set the number of galleries. Therefore, an alternative solution was adopted, which consisted of selecting 1-3 galleries from the entire section that could be reliably measured. For these galleries, the area of the gallery, the lengths of the maternal galleries, and the lengths of the larval galleries were measured. These values were averaged and converted to the area of the section to determine the number of maternal galleries and the number of larval galleries. The data were evaluated in R.

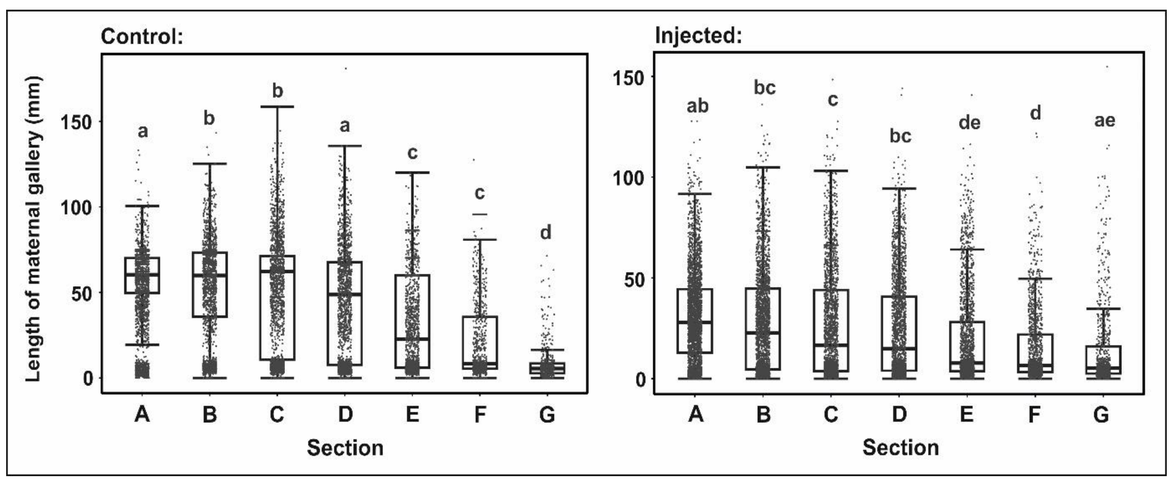

Fig. 2: Length comparison of maternal galleries in individual sections of control and treated trees

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REFERENCES

[1] ARCHER, L., CRANE, J., H., ALBRECHT, U., 2022. Trunk Injection as a Tool to Deliver Plant Protection Materials—An Overview of Basic Principles and Practical Considerations. Horticulture, 8 (6). .

[2]. BERGER, C., LAURENT, F., 2019. Trunk injection of plant protection products to protect trees from pests and diseases. Crop protection 124 (10).

[3] OJO, I., AMPATZIDIS, Y., OLIVEIRA COSTA NETO, A., BAYABIL, H. K., SCHULLER, J. K., BATUMAN, O., 2024. The development and evolution of trunk injection mechanisms -a review. Biosystems Engineering, 240. 123–141.

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