

Methodology of manipulated experiment with Eurasian spruce bark beetle (*Ips typographus* L.) in living trees

Vakula Jozef, Sitková Zuzana, Rell Slavomír, Kunca Andrej, Galko Juraj, Gubka Andrej, Zúbrik Milan, Nikolov Christo

National Forest Centre – Forest Research Institute Zvolen – Centre of Forest Protection Service, Lesnícka 11, SK – 969 23 Banská Štiavnica, email: vakula@nlcsk.org



In the spruce stand situated in Central Slovakia, a manipulation experiment was performed aimed at attracting spruce bark beetle (*Ips typographus*) to living and healthy spruce trees using pheromone dispensers. The experiment was realized in the years 2012-2014 and was the part of the study focused on water-limiting conditions and predisposition of Norway spruce to Eurasian spruce bark beetle attack.



Study plot

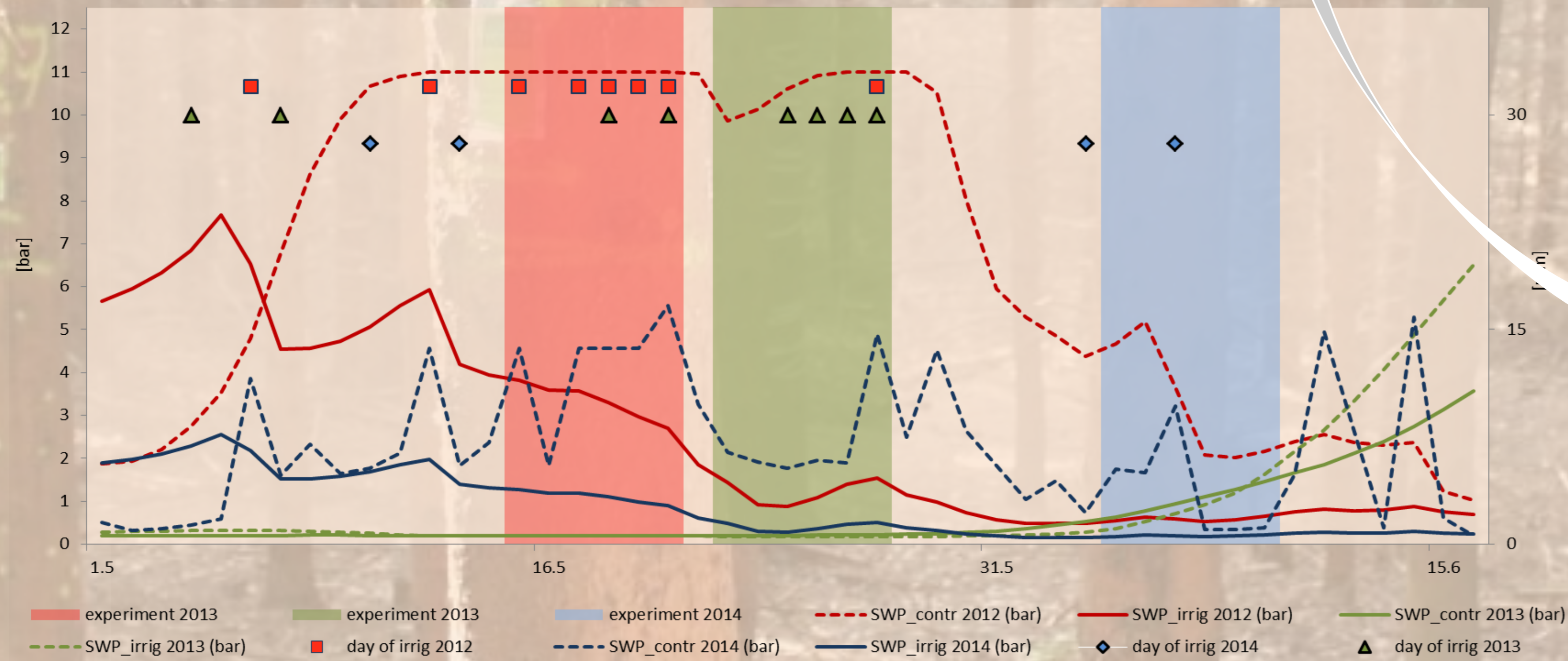
- ❑ The experimental plot was situated in Poľana mountain to the 30 years old spruce stand with elevation 670 m above sea level.
- ❑ Mean tree height was 18m, and mean diameter at breast height $d_{1,30}$ was 21cm.
- ❑ In spite of the low age, spruce trees growing on the fertile sites have the dimensions that are suitable for the development of *Ips typographus*.

Methods

- ❑ The experiment was conducted each year during the summer swarming period, from the end of June to mid July. Six days every year.
- ❑ Two groups of trees were selected in a spruce stand, one irrigated and one non-irrigated group, each consisting of 10 individuals.
- ❑ One pheromone dispenser (IT Ecolure) was installed on each tree at breast height, which attracted *Ips typographus* and caused its mass attack on the trees.
- ❑ On the fifth and six day, we assessed the following gallery parameters: number of entrance holes on the trees, level of primary resin production in gallery (5 level classification), area of secondary resin production in gallery (mm^2), area of nuptial chambers (mm^2), number of parental adults in the galleries (pieces), number of maternal galleries (pieces), length of maternal tunnels (mm^2), and number of eggs per one maternal tunnels (pieces).
- ❑ The number of entrance holes was counted on tree stems up to the height of 260 cm.
- ❑ The galleries were debarked by knife.



Daily average values of soil water potential SWP [bar] in the irrigated plot (irrig) and control plot (contr). Colour areas indicates the periods of the manipulated experiment.



Results

- ❑ Three trees died during the study period of the experiment. The possible reason of the infestation of two trees was near attacked trees (<10m) unnoticed when the experiment was established. Apart from the trees on the experimental plot, some neighbouring trees were also slightly infested (< 5 entrance holes) but all of this survived. The number of entrance holes on dead trees 4th day after the lured were 76, 169 and 26 holes per tree (to the stem height of 260 cm). Trees were infested also after experiment and it was the reason why these died.
- ❑ In the year 2012 experiment showed significant differences between the irrigated and control plot in the gallery parameters that occur after the excavation of a nuptial chamber, or after mating of parental adults. This probably results from the delayed reaction of trees, which was caused by extreme temperatures and the overall slowdown of their defence reactions.
- ❑ The weather conditions in the years 2013 and 2014 was not so suitable than condition in the year 2012.
- ❑ In the year 2012 secondary resin around nuptial chamber was not created in the either case.
- ❑ In the year 2014 maternal tunnel was not created in the either case.
- ❑ The revealed differences prove that drought in combination with extreme temperatures significantly reduces defence reactions of spruce against bark beetle attack.
- ❑ To conclude we can state that good timing of the experiment is difficult because the combination of the desired factors, such as swarming of bark beetles and suitable weather conditions (extreme drought and warmth) has to be ensured.
- ❑ The three-year experiment is currently statistical processed.

References

Vakula, J., Sitková, Z., Galko, J., Gubka, A., Zúbrik, M., Kunca, A., Rell, S., 2014: Impact of irrigation on the gallery parameters of spruce bark beetle (*Ips typographus* L., Coleoptera: Curculionidae, Scolytinae). Lesnícky časopis – Forestry Journal, 60, 1/2014, p. 60-66.

Acknowledgement

This study was co-financed by the Slovak Research and Development Agency under contract No. APVV-0111-10 and contract No. APVV-0707-12.