FLOWERING STRIPS AS A TOOL TO SUPPORT PINE NURSERY HEALTH: EFFECTS ON ARTHROPOD COMMUNITIES AND TREE PERFORMANCE

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INTRODUCTION

The modern European landscape is profoundly impacted by the widespread use of pesticides for plant protection, leading to various negative effects on ecosystems (Raven & Wagner, 2021) and human health (Kim et al., 2017). Reducing of pesticide use has thus become essential to mitigate these risks. One promising possibility is conservation biological control (CBC), which involves supporting natural predators through habitat heterogeneity increasement to suppress pest populations (Holland et al., 2016). The increase in habitat heterogeneity can be achieved through various strategies such as establishment of flowering strips (FSs) (Krahner et al., 2024). FSs enhance the activity and persistence of natural predators by creating structurally complex habitats that supply alternative prey and floral resources crucial for predator reproduction, development, and overwintering (Gardarin, 2023). Although benefits of FSs have been quite widely studied on arable land or in other agroecosystems (Alarcon-Segura et al., 2025), there is a lack of research on their role in forestry, e.g. in woody plant nurseries. Nevertheless, tree nurseries are usually managed very intensively with large doses of pesticides (Leroy, 2024). Therefore, this management needs to by also changed and introducing of FSs could be a suitable pest management method in this kind of habitats, however, jsou nutné studie regarding how they influence arthropod community composition and how these changes affect tree physiological vitality.

AIMS

Our aims were thus compared tree physiological vitality indicators and arthropod communities between plots with FSs established in the interrows and control plots without FSs, to determine whether flowering strips are suitable for use in biological control in tree nurseries.

METHODS

Tree physiological vitality was evaluated using chosen vitality indicators, including quantifying herbivory of needles–dry needle biomass weighing and assessing of needle damage percentage, further measuring of SPAD (relative chlorophyll content) and chlorophyll fluorescence based parameter NPQt (non-photochemical quenching as a stress indicator) using MultispeQ v2.0 instrument three times per study duration. Arthropods were sampled from pine tree canopies by beating method (together with vitality measurement), identified in laboratory and analysed on abundance levels (we divided insect to foreign groups as herbivores–sap-suckers and needle-chawers, predators and omnivores).

Fig. 1: Study design and methods: (A) row without flowering strip, (B) row with flowering strip (C) Measurement of SPAD and NPQt with MultispeQ, (D) Arthropod sampling by beating (photo by Ondřej Košulič)

RESULTS

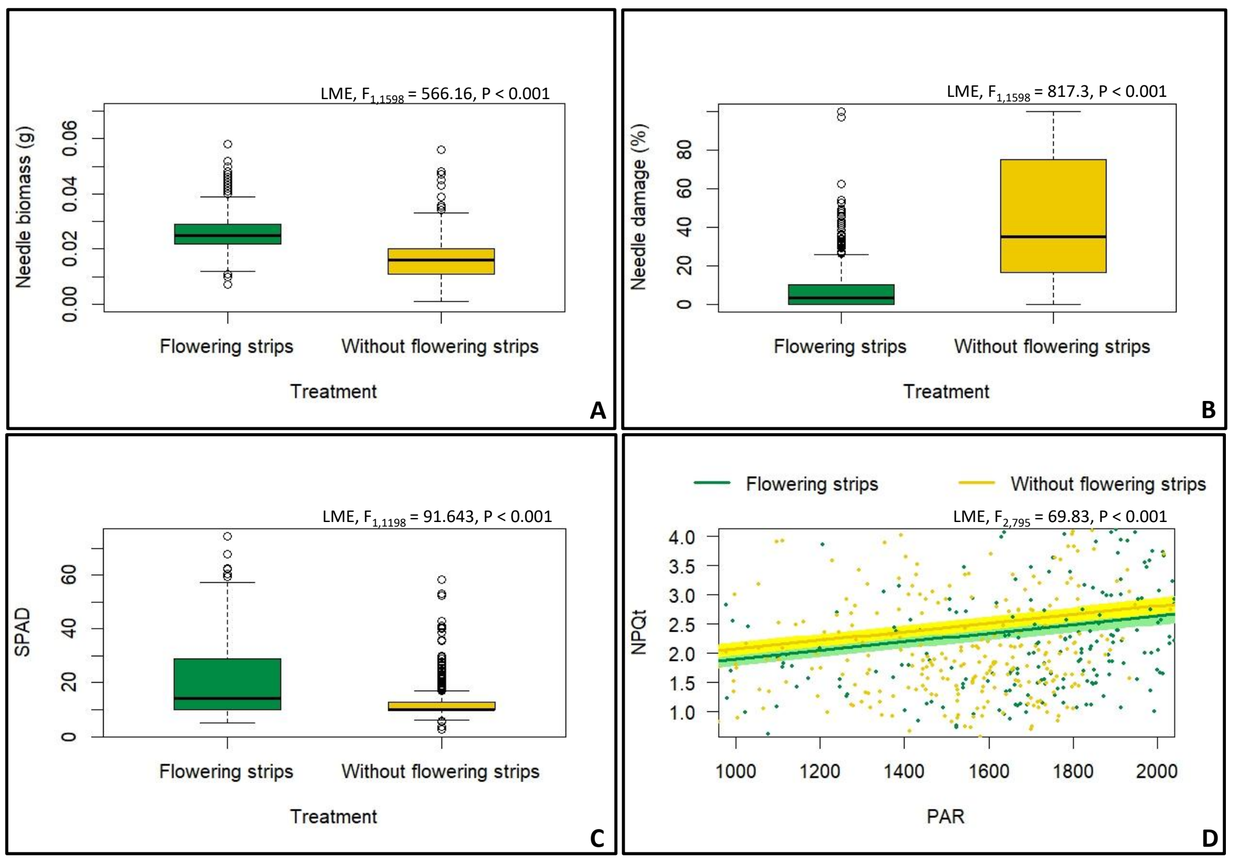

Fig. 2: Tree vitality parameters depended on presence or absence of FSs: (A) dry needle biomass, (B) needle damage, (C) SPAD (special products analysis division), (D) the relationship between photosynthetically active radiation (PAR) and the modified parameter of the non–photochemical quenching (NPQt) In panels [A–C], the thick horizontal lines show medians, boxes are quartiles, whiskers are 1.5 times interquartile range, points are outliers. In panel D, the lines show the estimated relationships and the points are individual measurements.

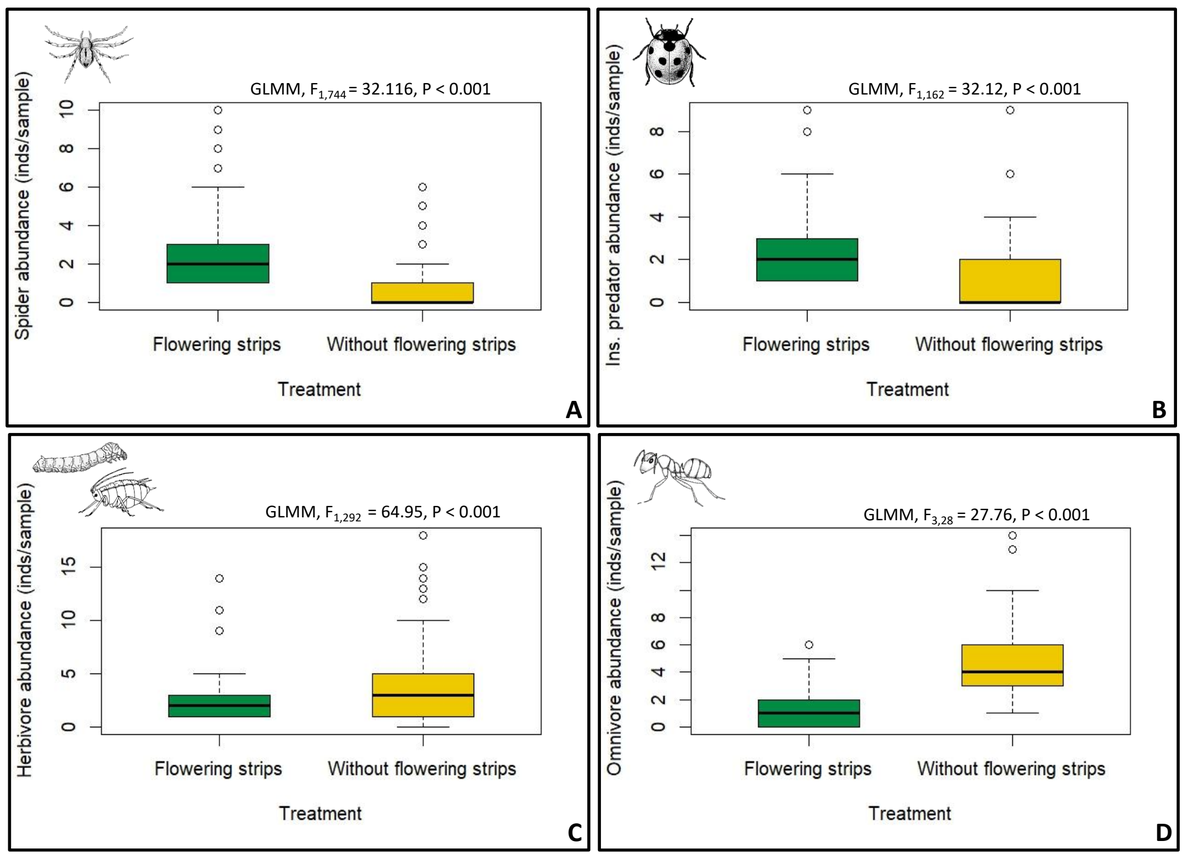

Fig. 3: Arthropod abundance depended on different management–presence or absence of FSs: (A) amely spiders, (B) abundance of insect predators, (C) abundance of herbivores (both sap-suckers and needle-chewers), and (D) omnivores (mainly ants) abundance. The thick horizontal lines show medians, boxes are quartiles, whiskers are 1.5 times interquartile range, points are outliers.

CONCLUSION

Our results showed that the presence of FSs increased natural enemy abundance, reduced herbivore populations, and improved the physiological vitality of pine trees. Therefore, we suggest that integrating FSs into pine nursery management can strengthen biological control services, reduce pest pressure, and promote the growth and health of young trees.

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