IMPACT OF CLIMATE CHANGE ON EFFECTIVE PRECIPITATION BEECH FORESTS IN DIFFERENT THINNING REGIMES

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PROJECT GOAL

The main objective of this study is to determine how drought affects the water balance in a beech stand. In order to assess this phenomenon it is necessary to determine the water balance of beech forest.

INTRODUCTION

Nowadays, we are struggling with a changing climate. Specifically, it is drought, which troubles the whole world [1]. Lack of water during the growing season weakens growth and ultimately leads to complete failure of the tree's lifespan. Drought damaged roots limit the ability of trees to absorb water from the soil. Beech is a relatively adaptive tree, but in lower forest vegetation zones it begins to be more threatened by drought, which is manifested by the gradually dying trunk, the drying of the primary structure of the crown from the top, etc. Main input of water to trees is through part of precipitation - stemflow and throughfall (i.e. effective precipitation), and the rest of precipitation interception stay on the crowns and evaporates back into the atmosphere. The stemflow is run-off water along the trunk and its amount depends on tree species and the shape of the crown [2]. Throughfall is precipitation penetrating through the tree crowns to the soil surface and its amount depends on tree species and leaf area index (LAI) [3].

MATERIAL AND METHODS

The aim of the project was to determine how drought affects thinned beech stands differently. Areas in the Masaryk Forest Křtiny Forest Enterprise were selected for our research. Eight areas were selected, on which we carried out various interventions. No intervention was carried out on the first area (BZS), while the second area was pruned according to standard pruning practices (LHP). On areas 3–8, we selected 50, 80, or 110 target trees and removed 1–2 or 3–4 of their competitors. We also measured the diameter of the trees and the area of their crowns. Seepage measurement – we installed 3 collection troughs with barrels on all of the above-mentioned plots. We measured the amount of water every week. Trunk flow measurement was performed on 3–6 trees in each area.

Fig. 1: Stemflow, photo by Kateřina Macháčková

Fig. 2: Throughfall, photo by Kateřina Macháčková

RESULTS AND DISCUSSION

The precipitation fell 414 mm from 1st April to 20th October. We measured througfall and stemflow and calculated interception during this period. We entered these values into Fig. 1. The values of the interception were the greatest of all precipitation partitioning in almost all thinning variants. Interception was more than 60% in the 110 1-2, 110 3-4 and LHP variants and the lowest (less than 50%) was in the 50 1-2, 50 3-4 and 80 3-4 variants. The values of throughfall were very variable. The lowest values (less than 35%) were in the 110 1-2, 110 3-4 and LHP variants and, on the other hand, the greatest ones (more than 50%) were in the 50 3-4 and 80 3-4 variants. The stemflow had the lowest values of precipitation partitioning. These values never exceeded 5% and at most case were lower than 3%.

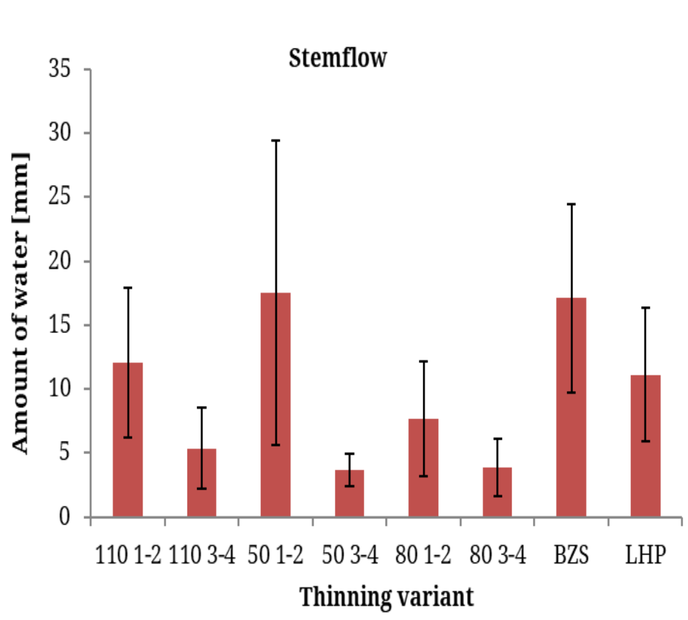

Fig. 3: Stemflow. The wiskers denote standard deviations. different types of structure.

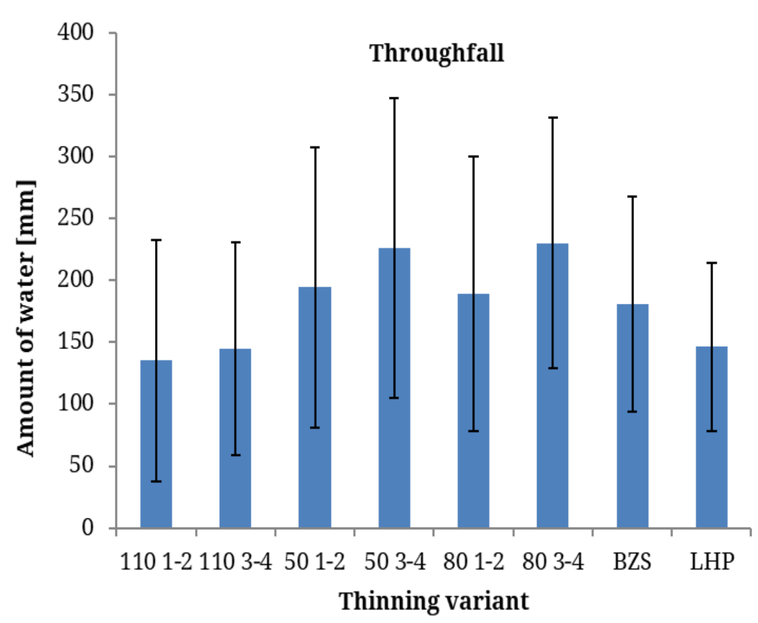

Fig. 4: Throughfall. The wiskers denote standard deviations different types of structure.

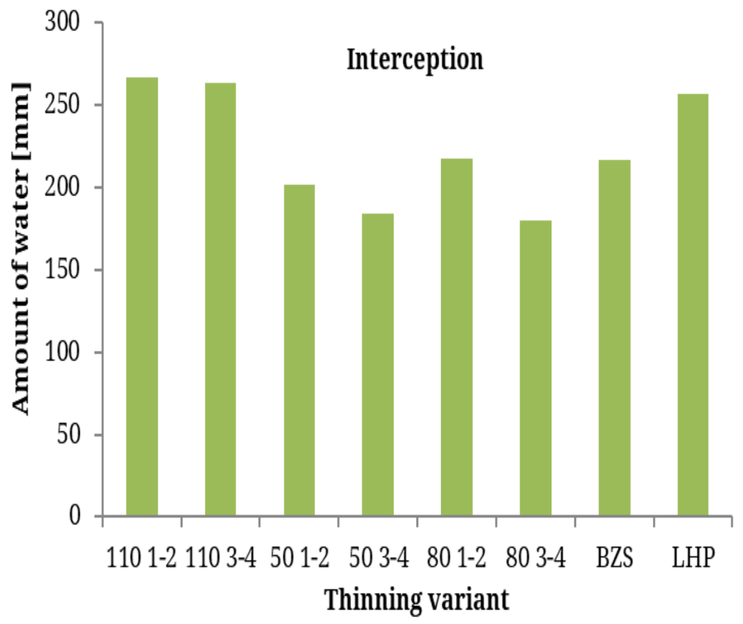

Fig. 5: Interception. The wiskers denote standard deviations different types of structure.

CONSLUSION

Drought significantly affects the water balance in beech stands, with interception representing the largest part of precipitation, especially in heavily thinned or standard-pruned areas. Throughfall varied with thinning intensity, while stemflow contributed minimally to water input. Overall, thinning and pruning practices influence how much water reaches the soil, affecting tree water availability during drought.

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