

Sugar transporter genes' differential expression in Karelian birch (*Betula pendula* var. *carelica*) trunk tissues under different xylogenesis scenarios

Korzhenevskiy M.A.^{1*}, Pomeranets A.K.¹, Gorshkov O.V.², Moshchenskaya Yu.L.¹, Galibina N.A.¹

¹ Forest Research Institute of the Karelian Research Centre of the Russian Academy of Sciences, Petrozavodsk, Russia

² Kazan Institute of Biochemistry and Biophysics of Kazan Science Centre of the Russian Academy of Sciences, Kazan, Russia

* Maksim.korjan@gmail.com

Key words: sugar transporters; xylogenesis; *Betula pendula*

Motivation and Aim: Sugar transport predominant pathway in the cambial zone may determine xylogenesis scenarios. Sugars can flow either through the symplast via plasmodesmata, or through the apoplast via sugar transporter proteins from the conducting phloem to xylem differentiating tissues. The objects of our study are Karelian birch (*Betula pendula* var. *carelica*) plants with figured and non-figured wood, which are characterized by a violation of the orientation and the ratio of structural elements. The aim of the study is to identify the role of apoplastic transport in the Karelian birch trees trunk tissues formation in under different xylogenesis scenarios.

Methods and Algorithms: Karelian birch trunk tissues sampling was carried out at different stages of the cambial growth (24 May, 9 and 27 June) from non-figured plants, and figured plants with short trunks and bush-like trunks. For analysis, fraction (F) 1 (the conducting phloem and the cambial zone), F2 (the differentiating xylem), F3 (mature xylem of the current year) were selected. Transcriptomic data were obtained from F1 and F2. Genes' expression in F3 was assessed by PCR-RT.

Results: Among 49 studied genes (families of sugar transporters *SUT*, *SWEET*, *MST*), 16 were not expressed according to transcriptome data. Among the expressed genes, 13 differentially expressed genes were found. Differences were found between the figured and non-figured forms, while figured plants with short and bush-like trunk forms differed by the expression of only one gene.

Conclusion: The difference in carbohydrate transporters' expression between figured and non-figured forms allows us to speak about the role of apoplastic transport in abnormal wood formation in Karelian birch. Both up- and down-expressed genes are observed, indicating complex changes in the function of short-distance carbohydrate transport.

Funding: The research was supported by the Russian Science Foundation, grant number 22-74-00096 and under state order of Karelian Research Centre of the Russian Academy of Sciences (Forest Research Institute KarRC RAS).