

Towards identification of genetic factors underlying curly birch wood patterning using high-throughput genotyping

Zhigunov A.V.^{1*}, Vetchinnikova L.V.^{1,2}, Volkov V.A.¹, Potokina E.K.¹

¹ St. Petersburg Forest Technical University, St. Petersburg, Russia

² Karelian Research Center RAS, Petrozavodsk, Republic of Karelia, Russia

* a.zhigunov@bk.ru

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We present the project aimed at identifying genetic factors responsible for the manifestation of the wood "patterning" trait in curly birch *Betula pendula* Roth var. *carelica* (Mercklin) Hämet-Ahti. Earlier it was found that the wood "patterning" trait is inherited in the seed progeny of curly birch and preserved during vegetative propagation both in natural populations and in man-made plantations. Experimental evidence for the monogenic nature of inheritance of this trait has recently been obtained. In populations of complete siblings obtained from controlled crosses of contrasting parental genotypes (curly and normal), a classical Mendel segregation was obtained, indicating that the "patterned" allele of the as yet unidentified gene is dominant and in the heterozygous state causes the phenotype of "patterned" wood of the curly birch. In the homozygous state, this allele is fatal. Hence, it is become possible to identify the "patterned" wood gene in curly birch or to identify polymorphic loci closely linked to it.

The project is focused on identifying molecular markers linked with the "patterned" wood gene in curly birch through high-throughput genotyping of trees from sibling's or half-sibling's progeny obtained from different crosses of curly birch, where segregating by the studied phenotype is observed. The latter becomes possible due to availability of high-throughput "genotyping by sequencing" technology (GBS, Genotyping By Sequencing). Based on the results of identification of a large number of polymorphic loci, a search for associations between polymorphic molecular markers (SNPs) and variability of the wood "patterning" trait will be performed. The accessibility of a published "reference" genome for *Betula pendula* will make it possible to use the obtained information of high-throughput genotyping and association analysis to search for the candidate gene responsible for the formation of the studied phenotype.

Identification of the genetic determinants of this economically valuable trait will allow to develop molecular markers of the patterned wood texture trait of curly birch, which can be used at the early stages of plant development. Morphologically, indirect signs of wood "patterning" in curly birch can appear, on average, at the age of 8 years.

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