

P13 – Investigations into shortened internodes degeneration of the variety ‘Neuburger’ for better selection

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Abstract

The cultivar Neuburger is an autochthonous variety for wine production in Austria. Since a couple of years the interest of growers for this cultivar is decreasing due to the short internode phenomenon. Vines concerned by the degeneration lose their normal growing behavior by stunting and shortening of internodes. This decline occurs surprisingly and changes growth behavior also from former healthy looking vines. Maintenance of the variety would require to find genetic indications if a vine will be stable or carries the potential to easily switch to stunting.

We pooled several genotypes of the cultivar with and without symptoms and looked for the obviously differences. Several gibberellines were quantified by mass spectrometry. Only one of the GA substances showed a significant difference between healthy and stunted vines. Finally several genes from the GA metabolic pathway were analysed. We could find differences and mutations but none of them explains the phenomenon for the whole. Involving qPCR we tried to find relationship of RNA level of selected genes to short-internodal vines. Genes from different parts of gibberellin synthesis and the signaling pathway were selected. Two cytochrome P450 monooxygenase genes showed a tendency towards upregulation in one of two sample sets. In the case of gibberellin oxidases, one locus showed a significantly lower level of expression in the short-internodal variant. In the case of the genes involved in the signaling pathway, ambiguous results are found between the sample sets. Furthermore full transcriptome analysis by sequencing was done. Genes that showed significant differences between short-internodal and normal-growing vines as a result of the transcriptome analysis, were selected for further analysis. In some cases, significant differences in expression levels of RNA could be discovered.

For the possible contribution of epigenetic effects we sequenced the genome by nanopore technology. Some genes showed in symptom carrying vines a high degree of methylation. One of them is a DELLA protein. These changes could also be responsible for differences in RNA metabolism. Furthermore defined markers to get access to the genes with relevant mutations were applied. The findings allow the conclusion that the shorten internodes in Neuburger is based on several changes in the genome and not a single mutation.

As a practical approach for deliberating the stunting of selected vines gibberelline applications were performed to them. In some trials the intensity of stunting could be alleviated.

Keywords: grapevine, gibberellines, qPCR, RNA, sequencing, genetic marker