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Screening for Anthocyanins and Polyphenols in Red and Blue Potatoes for Evaluation of Differences in Anthocyanin Biosynthesis

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Potato is among the most important staple foods worldwide. Pigmented varieties can provide a major quantitative source of anthocyanins which are considered to have health-promoting effects, linked to their antioxidant capacity. This promotes an increasing interest in anthocyanin rich colored potatoes as functional food from the food industry, nutritional science and consumers. Pigmented potatoes show a tremendous variability in anthocyanin content and in their specific composition and supply a suitable model system for investigation of anthocyanin side chain regulation in crops, which is the purpose of our study.

Our aim includes deepening the knowledge of flavonoid biosynthesis in red and blue potatoes. We initially performed an LC-MS (liquid chromatography coupled to mass spectrometry) analysis to elucidate the anthocyanin and polyphenol composition of 57 colored potato cultivars. Two tissues of potato tubers, namely flesh and peel, were analyzed separately. Based on the obtained anthocyanin and polyphenol profiles 19 contrasting potato cultivars have been selected for further in-depth studies. Quantification of 21 individual anthocyanins and 43 polyphenols was done in a subsequent MRM (multiple reaction monitoring) analysis. The selected potato cultivars harbor anthocyanins with different backbone and different acyl and sugar conjugates. This observation is supposed to be reflected in the genetic background of the anthocyanin biosynthetic pathway. Results of the LC-MS/MRM based annotation, as well as the correlation of anthocyanin and polyphenol content might hint to phylogenetic relations between the cultivars.

Further studies will include comparative analysis of quantitative differences in anthocyanin content and transcript expression of anthocyanin biosynthesis key genes, validated also by enzyme expression and enzyme activity analyses, in different developmental stages. Additionally, we will study possible promoter regulations of anthocyanin biosynthesis genes and the relevance of transcription factors for regulation of the observed anthocyanin profiles.

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