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ZipChip

Microfluidic capillary zone electrophoresis mass spectrometry analysis of alkaloids in Lobelia cardinalis transgenic and mutant plant cell cultures

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ABSTRACT: Application of a microfluidic CE* device for CZE-MS allows for fast, rapid, and in-depth analysis of large sample sets. This microfluidic CZE-MS device, the 908 Devices ZipChip, involves minimal sample preparation and is ideal for small cation analytes, such as alkaloids. Here, we evaluated the microfluidic device for the analysis of alkaloids from *Lobelia cardinalis* hairy root cultures. Extracts from wild-type, transgenic, and selected mutant plant cultures were analyzed and data batch processed using the mass spectral processing software MZmine2 and the statistical software Prism 8. In total 139 features were detected as baseline resolved peaks via the MZmine2 software optimized for the electrophoretic separations. Statistically significant differences in the relative abundance of the primary alkaloid lobinaline ($C_{27}H_{34}N_2$), along with several putative "lobinaline-like" molecules were observed utilizing this approach. Additionally, a method for performing both targeted and untargeted MS/MS experiments using the microfluidic device was developed and evaluated. Coupling data-processing software with CZE-MS data acquisition has enabled comprehensive metabolomic profiles from plant cell cultures to be constructed within a single working day.