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Cultivation techniques affect the bioactive content and quality of *Echinacea purpurea*

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Commercial medicinal plant production aims to produce high biomass yields with a high content of desired bioactive substances. Earlier investigations have indicated that the content of these substances depend on cultivation techniques. *Echinacea purpurea* plants (Seeds from Pharmaplant, GER) were raised in a greenhouse and planted on a sandy loam soil in Denmark in 2007. Effects of nitrogen application and developmental stages at harvest on aerial parts were investigated (after 2 years) as well as the most beneficial harvest time for roots combined with the prior harvest of aerial parts (after 4 years). The statistical layout was a randomised complete block design with four or six replicates. Phenolic acids and alkamides were extracted from ground, freeze-dried plant material with EtOH-H₂O (70:30) and analysed by HPLC-PDA and LC-MS/MS.

Both nitrogen application and developmental stages had a significant impact on the content of the dominating alkamides (dodeca-2*E*,4*E*,8*Z*,10*E/Z*-tetraenoic acid isobutylamide isomers) in aerial parts, while only the developmental stage had an impact on the phenolic acids. Harvest of aerial parts prior to harvest of roots had no influence on the content of alkamides and phenolic acids in the roots. The most beneficial harvest time for roots was in spring for phenolic acids and also some major alkamides, whereas the content of other alkamides were significantly higher around bloom in summer. If aerial parts/flowers are harvested, it is most beneficial to harvest the roots soon after (one week after). In conclusion cultivation techniques have a major impact on the content of alkamides and phenolic acids in *Echinacea purpurea*.