

Different analytical approaches of authentication of Medicinal Plants: a case study the identification of *Echinacea* spp. roots.

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Accurate authentication of Medicinal Plants is fundamental to ensure that herbal substances are not adulterated with ineffective or potentially harmful substitutes, ensuring the quality and the safety of the final products. Different analytical procedures can be applied to authenticate the raw material; macroscopic and microscopic identification and chemical fingerprinting, like TLC or HPLC, are the official methods.

Molecular Biology technologies, with specific reference to DNA fingerprint methods, represent novel and highly reliable approaches to authenticate botanicals.

In this paper, we evaluate the authentication of different species of *Echinacea*, using different analytical approaches, such as morphology, microscopy, HPLC chemical analysis and the innovative DNA SNP (Single Nucleotide Polymorphism) genotyping fingerprint.

Root tissues of eight species of *Echinacea*, *E. angustifolia* DC., *E. purpurea* (L) Moench, *E. pallida* (Nutt.) Nutt. *E. paradoxa* var. *neglecta* McGregor, *E. paradoxa* (J.B.S. Norton) Britton var. *paradoxa*, *E. sanguinea* Nutt., *E. atrorubens* (Nutt.) Nutt., *E. simulata* McGregor were analyzed with the above-mentioned analytical methods. The identification of this herbal substance is based and is accepted, considering the macroscopic and microscopic and the chemical analyses which are evaluated together. The DNA fingerprinting method, being highly reproducible, is able to rapidly identify and authenticate *Echinacea* root samples. The use of the DNA fingerprint methodology can be applied routinely to carry out quality control programs of *Echinacea* raw materials such as powders and also extracts.