



Authentication of *Actaea racemosa* L. (black cohosh) raw material by a resilient RP-PDA-HPLC method coupled to chemometrics

Marian Bittner, Matthias F. Melzig

Freie Universität Berlin, Institute of Pharmacy, Königin-Luise-Str. 2+4, 14195 Berlin

The North American medicinal plant *Actaea racemosa* L. (Ranunculaceae, syn. *Cimicifuga racemosa*, aka black cohosh) is widely used to treat climacteric complaints. It's a safer alternative to hormone substitution, which comes along with possible severe side effects. Some recent trials demonstrate the efficacy and safety of approved herbal products of pharmaceutical quality [1].

Today, the sales of *A. racemosa* herbal products are increasing. In 2014 the plant was ranked 4th in the list of the 40 top-selling herbal dietary supplements in the United States [2]. Even in 2010 about 63 medicinal products made from *A. racemosa* extracts were approved or registered in the European Union [3]. The increasing demand for the plant material leads to problems with accidental as well as economically motivated adulteration [4]. Therefore reliable tools for herbal raw material authentication prior to manufacturing procedures are crucial.

Contrary to most published methods, the aim of this study was to develop an economical and plain method to distinguish between closely related American and Asian *Actaea* species. Securely established and resilient analytical methods were coupled to a chemometric evaluation of the resulting data.

We developed and validated a RP-PDA-HPLC method to determine the partly hydrolysis-sensitive polyphenols in *A. racemosa* roots and rhizomes, and applied it to a large set of 174 samples consisting of six *Actaea* species. By a chemometric evaluation of the dataset, we were able to differentiate between Asian *Actaea* species (sheng-ma), one American *Actaea* species (Appalachian bugbane) and *A. racemosa*.

Hence, the developed RP-PDA-HPLC method is an excellent tool for authentication of the corresponding herbal raw material, and can be a powerful addition to the thin layer chromatography methods used in the dedicated pharmacopoeias.

Literatur

- [1] Beer, A.M. and A. Neff, *Differentiated Evaluation of Extract-Specific Evidence on Cimicifuga racemosa's Efficacy and Safety for Climacteric Complaints*. Evidence-based Complementary and Alternative Medicine: eCAM, 2013. 2013: p. 860602.
- [2] Smith, T., *Herbal dietary supplement sales in US increase 6.8 percent in 2014*. HerbalGram, 2015(107): p. 52-59.
- [3] Knoess, W., *Assessment report on Cimicifuga racemosa (L.) Nutt., rhizoma*. European Medicines Agency, Committee on Herbal Medicinal Products (HPMC), 2010.
- [4]. Foster, S., *Exploring the Peripatetic Maze of Black Cohosh Adulteration: A Review of the Nomenclature, Distribution, Chemistry, Market Status, Analytical Methods, and Safety*. HerbalGram, 2013(98): p. 32-51.