World Academy of Science, Engineering and Technology
International Journal of Biomedical and Biological Engineering
Vol:12, No:06, 2018

Preliminary Evaluation of Echinacea Species by UV-VIS Spectroscopy Fingerprinting of Phenolic Compounds

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Abstract : Echinacea species (Asteraceae) has received a global attention because it is widely used for treatment of cold, flu and upper respiratory tract infections. Echinacea species contain a great variety of chemical components that contribute to their activity. The most important components responsible for the biological activity are those with high molecular-weight such as polysaccharides, polyacetylenes, highly unsaturated alkamides and caffeic acid derivatives. The principal factors that may influence the chemical composition of Echinacea include the species and the part of plant used (aerial parts or roots). In recent years the market for Echinacea has grown rapidly and also the cases of adultery/replacement especially for Echinacea root. The identification of presence or absence of same biomarkers provide information for safe use of Echinacea species in food supplements industry. The aim of the study was the preliminary evaluation and fingerprinting by UV-VISIBLE spectroscopy of biomarkers in terms of content in phenolic derivatives of some Echinacea species (E. purpurea, E. angustifolia and E. pallida) for identification and authentication of the species. The steps of the study were: (1) samples (extracts) preparation from Echinacea species (non-hydrolyzed and hydrolyzed ethanol extracts); (2) samples preparation of reference substances (polyphenol acids: caftaric acid, caffeic acid, chlorogenic acid, ferulic acid; flavonoids: rutoside, hyperoside, isoquercitrin and their aglycones: quercitri, quercetol, luteolin, kaempferol and apigenin); (3) identification of specific absorption at wavelengths between 700-200 nm; (4) identify the phenolic compounds from Echinacea species based on spectral characteristics and the specific absorption; each class of compounds corresponds to a maximum absorption in the UV spectrum. The phytochemical compounds were identified at specific wavelengths between 700-200 nm. The absorption intensities were measured. The obtained results proved that ethanolic extract showed absorption peaks attributed to: phenolic compounds (free phenolic acids and phenolic acids derivatives) registrated between 220-280 nm, unsymmetrical chemical structure compounds (caffeic acid, chlorogenic acid, ferulic acid) with maximum absorption peak and absorption "shoulder" that may be due to substitution of hydroxyl or methoxy group, flavonoid compounds (in free form or glycosides) between 330-360 nm, due to the double bond in position 2,3 and carbonyl group in position 4 flavonols. UV spectra showed two major peaks of absorption (quercetin glycoside, rutin, etc.). The results obtained by UV-VIS spectroscopy has revealed the presence of phenolic derivatives such as cicoric acid (240 nm), caftaric acid (329 nm), caffeic acid (240 nm), rutoside (205 nm), quercetin (255 nm), luteolin (235 nm) in all three species of Echinacea. The echinacoside is absent. This profile mentioned above and the absence of phenolic compound echinacoside leads to the conclusion that species harvested as Echinacea angustifolia and Echinacea pallida are Echinacea purpurea also; It can be said that preliminary fingerprinting of Echinacea species through correspondence with the phenolic derivatives profile can be achieved by UV-VIS spectroscopic investigation, which is an adequate technique for preliminary identification and authentication of Echinacea in medicinal herbs.

Keywords : Echinacea species, Fingerprinting, Phenolic compounds, UV-VIS spectroscopy
Conference Title : ICMPNP 2018 : International Conference on Medicinal Plants and Natural Products
Conference Location : San Francisco, United States
Conference Dates : June 06-07, 2018