

Nutraceuticals and Botanicals Appeal for New Analytical Solutions

Marcello Nicoletti*

Quality Control Centre, Department of Environmental Biology, University Sapienza of Rome, Italy

Evolution of food supplements never ends. In this moment, new products are invented and rapidly marketed. Starting from the first generation of products simply based on minerals, vitamins, proteins and carbohydrates, the introduction of “other substances” completely changed the scenario.

“Other substances” are potentially everything, by actually they are mainly extracts obtained by plant raw materials treated to obtain the form of food supplements. Therefore, they are commonly known and simply named as “botanicals”. In EU market botanicals account already for about half of the food supplements business and their impact is increasing, being fundamental in the future of the entire sector. A new development is acting with heavy introduction of mono- and multi-functional foods, that someone is calling pharmafoods. As a matter of fact, all they are modern forms of utilization of natural substances adapted to the new living styles and expectative for longer and better lives.

Botanicals are derived from plants, algae or fungi, wild or cultivated, used for centuries in popular and traditional medicines, as well as often as spices and foods. Unlike modern pharmacology and drug development based on single chemical entity, the paradigm of these medicines is the multi-compound, the multi-ingredient preparation obtained by use of several plants.

The common composition of a botanical is based on a single herb or on the combination of more species based on recipes and formula mainly derived from the historical references and empirical experiences. A single herbal drug contains at least hundred of compounds making a complex matrix, in which not single active constituent is considered the only responsible for the overall efficacy, in accordance with the phytocomplex concept.

The long and accurate work of phytochemistry based on the sequence extraction/separation/identification, derived from the correspondence one drug/one illness, generated an immense catalogue of identified natural substances that can be used as useful standards. The common derived practice among natural products analysts is based on the selection of constituents of the raw material to be used as active principles or markers for purpose of identification and quality assessment. The same approach is also dominant in the monographs of herbal drugs reported in the Pharmacopoeias. However, this approach fails often for species of the same genus or taxonomically near, usually containing the same or very similar constituents. Another real problem concerns the determination of quality that cannot be considered derived from single substances, accounting for a single class of compounds.

The market of botanicals is full of new products whose validation is based on the development of new type of quality assessment systems tailored to meet and exalt the characters that make botanicals so unique and requested. Actually the fingerprint approach is used in analysis of herbal drugs using different analytic devices (NMR, HPLC, IR). Among the used analytical tools HPTLC seems a good candidate. HPTLC is the last evolution of planar chromatography with high efficient separation, low cost, rapid execution and evidence of the results. A chromatographic HPTLC fingerprint is a unique sequence of peaks corresponding to the

analyzed sample in its fullness. The aim is obtain resulting fingerprints that can be compared with respect to the number, sequence, position (Rf) and colour of the separated zones, also by digitalic computer-aided evaluation. The fingerprint is a product of the Metaboloma philosophy, that means study as many small molecules as possible, in order to face natural complexity as a resource. The aim is determine the entire pattern of herbal constituent to assess the presence of the plant drug inside the botanical. The fingerprint of the product can be therefore compared with fingerprints of the extracts of the species in the label determining their identification in the product or comparing the quality by presence and quantities of selected constituents, and additionally ensuring evaluation of consistency and stability.

HPTLC data can be easily crisscrossed and completed by other analytic data, like NMR. The HPTLC fingerprint approach was also successfully applied in particular cases, like bud-derivatives and multi-ingredient drugs. In the first case, the pre-treatment and the quality of silica gel avoid the high disturbing effect of the glycerine, allowing the direct analysis of the product. In this way, evidences of the presence of active constituents as well as the identity of the drug can be finally achieved, against the detractors associating bud-derivatives products to the homeopathic ones on the basis of the absence of chemical constituents.

The case of multi-ingredient product is a real analytic challenge. The complexity of the analysis of a single drug must be multiplied for several botanical drugs giving rise to a myriad of constituents. However, also in this case the fingerprint rule can be applied, making a total fingerprint derived from the sum of the extracts of the plants reported in the label. The total fingerprint can be now successfully compared with multi-ingredient products, owing to the exceptional separation capacity of HPTLC.

Use of HPTLC fingerprint in quality assessment of botanicals is still waiting for a general official recognition, but it's already presence in the Chinese Pharmacopoeia as well as in the United States' Herbal Pharmacopoeia is a good start. However, fundamental will be the advanced and tailored applications invented by the analysts scientific community. Multimillion euros botanical market is requested to invest in botanicals specific validation, based on efforts for original analytical work and design of new suitable claims.

*Corresponding author: Marcello Nicoletti, Quality Control Centre, Department of Environmental Biology, University Sapienza of Rome, Italy, E-mail: marcello.nicoletti@uniroma1.it

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