Reaffirming 'ethnobotanical convergence'

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Evolutionary convergence (or convergent evolution) is a term commonlyused by evolutionary biologists to describe important phenomena occurring throughout life on Earth. We agree with Hawkins and Teixidor-Toneu [1] that, despite this relevance, the definition of this term is controversial [2]. Evolutionary convergence is usually defined as the development of similar characters by phylogenetically unrelated (or not closely related) organisms as adaptive responses to similar environmental pressures. But what are phylogenetically unrelated organisms? All organisms are phylogenetically related; we only need to go back in time to find the common ancestor in the Tree of Life. Our purpose in [3] was nonetheless to refer to the emergence of common morphological traits in plants belonging to different lineages within large groups (e.g. families) growing in similar habitats. In our opinion, homology is not appropriate for describing this process. This term, frequently used in zoology and genetics but not botany, refers to structures adapted to equivalent functions or to genes that provide similar phenotypic expressions [4] in different taxa sharing a common ancestry.

We nonetheless reaffirm the definition, rigor and value of the concept of ethnobotanical convergence we proposed. Popular uses are acquired independently by trial-and-error with plants preferentially growing in the immediate environment of people [5, 6], and this traditional knowledge is usually transmitted vertically. The horizontal transmission of knowledge about the uses of plants growing thousands of kilometres away is highly unlikely, especially in isolated cultures, and we cannot hypothesise about their previous contacts.

Plants are selected by people because they are culturally perceived as effective [7, 8], which often happens, as mentioned above, independently in different places of the world.

Both confluence and influence may be considered as forces of the appearance and dissemination of ethnobotanical knowledge. As discussed below, independent but coincidental popular uses of plants (i.e. ethnobotanical convergence), either within a geographical and cultural area or in different locations, indicate similar plant bioactivity, as suggested by Hawkins and Teixidor-Toneu [1], which in turn indicates similar chemical composition, a logical conclusion when dealing with plants included in the same phylogenetic node.

Hawkins and Teixidor-Toneu [1] state that the use of various *Origanum* species as seasonings in western and eastern Mediterranean areas could have come from cultural contacts and transmission between people from both areas. Neither this transmission nor its absence can be proven, but we continue to consider that this ethnobotanical convergence was likely originally due to so-called idiosyncratic knowledge, which could later become general by cultural transmission in each area [9]. This convergent use is likely due to similar chemical composition, implying a similar flavour and ultimately, similar bioactivity, so people would select both taxa for similar purposes. As Hawkins and Teixidor-Toneu [1] mention, linguistic isolation suggests independent but convergent plant discovery and management [10], and the western and eastern Mediterranean cultures in the above example were linguistically isolated (but are no longer due to globalisation). *Manousheh* in Lebanon (Eastern Mediterranean) is currently seasoned with *Origanum syriacum* L. (called *zaatar* in Arabic and *thym*, the standard name for the genus *Thymus*, in French) collected in the wild, whereas western pizza is seasoned in the same place with a cultivated species of *Origanum* (probably *O. vulgare* L.) purchased in the commerce, called *origan* (the standard name for the genus *Origanum*) in French and lacking an Arabic name (M. Bou-Dagher Kharrat, pers. comm.). These two examples illustrate genuine ethnobotanical convergence, i.e. confluence, and (probably quite recently) cross-cultural transmission, i.e. influence, respectively. A similar case, which we think is a product of convergence more than cross-cultural contact, is the consumption of *Cucurbita pepo* L. flowers, which is very extensive in Mesoamerica [11], where the species originated, but which is very rarely consumed in Europe [12], where the taxon arrived much later.

We agree with Hawkins and Teixidor-Toneu [1] that interdisciplinary discussion is enhanced by clear definitions of new terms, which is why we are convinced that our proposed new term “ethnobotanical convergence” will enhance the discussion. The term is based on the accepted meaning of convergence and identifies the independent origin of traditional knowledge.

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