



Review

Does the name really matter? The importance of botanical nomenclature and plant taxonomy in biomedical research

Bradley C. Bennett^{a,*}, Michael J. Balick^b^a Department of Biological Sciences, Florida International University, Miami, FL 33199, USA^b Institute of Economic Botany, The New York Botanical Garden, 2900 Southern Blvd., Bronx, New York 10458, USA

ARTICLE INFO

Article history:

Received 11 September 2013

Received in revised form

18 October 2013

Accepted 23 November 2013

Available online 7 December 2013

Keywords:

Medicinal plant research

Plant taxonomy

Botanical Nomenclature

ABSTRACT

Ethnopharmacological relevance: Medical research on plant-derived compounds requires a breadth of expertise from field to laboratory and clinical skills. Too often basic botanical skills are evidently lacking, especially with respect to plant taxonomy and botanical nomenclature. Binomial and familial names, synonyms and author citations are often misconstrued. The correct botanical name, linked to a vouchered specimen, is the *sine qua non* of phytomedical research. Without the unique identifier of a proper binomial, research cannot accurately be linked to the existing literature. Perhaps more significant, is the ambiguity of species determinations that ensues of from poor taxonomic practices. This uncertainty, not surprisingly, obstructs reproducibility of results—the cornerstone of science.

Materials and methods: Based on our combined six decades of experience with medicinal plants, we discuss the problems of inaccurate taxonomy and botanical nomenclature in biomedical research. This problems appear all too frequently in manuscripts and grant applications that we review and they extend to the published literature. We also review the literature on the importance of taxonomy in other disciplines that relate to medicinal plant research.

Results and discussion: In most cases, questions regarding orthography, synonymy, author citations, and current family designations of most plant binomials can be resolved using widely-available online databases and other electronic resources. Some complex problems require consultation with a professional plant taxonomist, which also is important for accurate identification of voucher specimens. Researchers should provide the currently accepted binomial and complete author citation, provide relevant synonyms, and employ the Angiosperm Phylogeny Group III family name. Taxonomy is a vital adjunct not only to plant-medicine research but to virtually every field of science.

Conclusions: Medicinal plant researchers can increase the precision and utility of their investigations by following sound practices with respect to botanical nomenclature. Correct spellings, accepted binomials, author citations, synonyms, and current family designations can readily be found on reliable online databases. When questions arise, researcher should consult plant taxonomists.

© 2013 Elsevier Ireland Ltd. All rights reserved.

Contents

1. Introduction.....	388
2. Common taxonomic errors.....	388
3. The importance of taxonomy and nomenclature in medicinal plant research.....	388
4. The importance of taxonomy and nomenclature in other disciplines.....	389
4.1. Nomenclature in chemistry.....	389
4.2. Nomenclature in genetics.....	389
4.3. Nomenclature in medicine.....	389
4.4. Nomenclature in microbiology.....	389
4.5. Nomenclature in pharmacology and pharmacy.....	389

* Corresponding author. Tel.: +1 3053483586; fax: +1 305 3481986.

E-mail addresses: bennett@fiu.edu (B.C. Bennett), mbalick@nybg.org (M.J. Balick).

5. Reasons for the lack of concern for botanical nomenclature and taxonomy	389
6. Solutions	390
7. Conclusions	391
Acknowledgments	391
References	391

1. Introduction

Medical research that involves natural products is necessarily an interdisciplinary endeavor. Taking a plant derived compound from the field to the pharmacy requires the expertise of ethnobotanists, plant taxonomists, phytochemists, pharmacologists, medicinal chemists, physicians and clinicians among others. We write from the perspective of botanists, who have dedicated our careers to documenting therapies from the plant kingdom. It has been our experience, in reviewing papers and grants, that many well respected and knowledgeable researchers are woefully deficient in their botanical skills. In one recent case, a grant review panel became quite contentious when one panel member asked why good botanical practices were necessary if the “science of the research projects was good.” Another asked, “Does the [scientific] name [of the plant] really matter?” It is in that spirit that we respectfully title our essay with this very question, which deserves an answer, as it is pertinent to any study of medicinal plants. Moreover, accurate taxonomy is vital to every field of scientific research.

2. Common taxonomic errors

Taxonomic errors abound in the literature. Chan et al. (2012) discussed common problems, especially with respect to traditional Chinese medicine. Despite their admonitions, researchers and reviewers continue to pay too little attention to matters of taxonomy. Taxonomic errors are evident in almost every issue of every medicinal plant journal. In addition to erroneous author citations of binomials and incorrect family assignments, three other problems are frequent common in both proposals and published manuscripts: misspelled specific epithets, misspelled generic names, and use of synonyms instead of the currently accepted names. While a skilled taxonomist may be able to properly interpret misspellings, most researchers cannot. This means that their research cannot be connected to the body of published literature.

Consider one example found in a proposal: *Bacopa monnieri* misspelled as *Bacopa monieri*. An exact search (name in quotation marks) of PubMed generated 104 hits with the correct spelling but only one with the incorrect specific epithet. Some databases searches return close matches when an incorrect name is used. Other databases do not accommodate incorrect orthography. Free online databases now allow quick, easy and accurate verification of most plant binomials. Failure to do so reveals a lack of scholarship in preparing proposals and manuscripts.

Common names are important, but insufficient (Bennett and Balick, 2008; Chan et al., 2012; Obón et al., 2012). There are no rules for their use or formation and one common name can be used for many and often unrelated species, and they vary across languages and within languages. *Salvia*, for example may refer to one several dozen species in a least 3 different families. Conversely, a single binomial can equate to a near limitless number of common names. The only way to unambiguously document a species is to employ a scientific binomial that is linked to

a botanical specimen or voucher. Without this documentation, there is little chance for reproducibility.

Wu et al. (2007) discuss the limitation of common names in Traditional Chinese Medicine. In some cases there was a one-to-one correspondence between the common names of plant products and their scientific names (guan mutong refers to the root of *Aristolochia manshuriensis*). In a case of over-differentiation, three common names referred to three different parts of *Aristolochia debilis*: *madouling* for the fruit, *qingmuxiang* for the root, and *tianxianteng* for the stem. Other common names were under-differentiated: *fangji* can be the root of three species (*Aristolochia fangchi* – *Aristolochiaceae*, *Stephania tetrandra* and *Cocculus orbiculatus* – *Menispermaceae*). In the Iberian Peninsula, the common name *árnica* may refer to one of 32 plant species in six plant families.

Without the use of the correct binomial (including author citation and current family designation) accurate identification is uncertain. Nesbitt et al. (2010) discuss the problem with respect to food plants. Fifty publications that they reviewed listed 502 plant species. More than one fourth of the plants names were obsolete or misspelled. The problem is not unique to plants. Janda and Abbott (2002) note that misidentification can produce “an inaccurate body of information in the medical literature concerning the clinical significance of many microbial species.”

3. The importance of taxonomy and nomenclature in medicinal plant research

“Unfortunately, all of us have to use taxonomy, so it is in all our best interests to have at least a working understanding of taxonomy.” (Calisher and Mahy, 2003)

We are unsure about why it is unfortunate that taxonomy is a requisite, but Calisher and Mahy are correct in arguing that a working knowledge of taxonomy is important. For the past 260 years, biological nomenclature has been guided by the binomial system developed by Carolus Linnaeus. May 1, 1753, the publication date of *Species Plantarum*, is the starting date for botanical nomenclature. The first name validly and effectively published on or after that date has priority. Other names referring to the same taxon are synonyms. Scientist around the world employ the rules of the International Code of Nomenclature for Algae, Fungi, and Plants (known as the International Code of Botanical Nomenclature until 2011), including the rule that there can be one and only one correct name for a taxon in a system of classification.

The universal use of a common moniker allows unambiguous communication and documentation. All reputable scientific journals throughout the world use anglicized Latin names based on the system developed by Linnaeus. Yet, Drebot et al. (2002) accurately note that “Taxonomy is of little interest to most people and scientific journals do not seem eager to understand or employ modern taxonomy.” Linnaeus’s system of nomenclature and classification was innovative in solving the first bioinformatics crisis that resulted from global exploration and an explosion in the number of known species during his lifetime (Godfray, 2007). The system is not perfect, nor does it lack detractors. Nevertheless, it has been universally accepted as the means of ordering global biodiversity. While there is growing support for replacing the Linnaean-based International Code

Download English Version:

<https://daneshyari.com/en/article/2545398>

Download Persian Version:

<https://daneshyari.com/article/2545398>

[Daneshyari.com](https://daneshyari.com)