JOURNAL OF TROPICAL ETHNOBIOLOGY

Vol. V No. 1 **January 2022** **P-ISSN 1693-6892**
E-ISSN 2722-0257

The Ethnobiological Society of Indonesia

Recommendation for Standardization of Botanical Nomenclature in Traditional and Complementary Medicinal Systems

Vinay M. Raole — Department of Botany, Faculty of Science, the Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, India
Vaidehi V. Raole — Department of Sharir Kriya, Parul Institute of Ayurveda, Parul University, Limda, Vadodara, Gujarat, India

Corresponding email — vinaysar@rediffmail.com; vraole3@gmail.com

ABSTRACT

Plant Nomenclature is an essential requirement for publications in drug discovery and in pharmacological investigations in modern and traditional medical systems. Mostly names of plants can be presented by pharmaceutical names or scientific binomial names. In this paper, good and bad aspects of both systems are discussed in the context of the recent scientific nomenclatural framework and the systems for its practical applicability. WHO Programme for International Drug Monitoring and is responsible for the WHO Adverse Drug Reaction (ADR) database that currently contains 3.6 million records. Numerous plant species are used in various formulations of TCM but we are not sure which particular plant species is used as a whole plant or plant part is used for example *Aloe* and *Piper*. In order to monitor pharmacovigilance to herbal medicine products the following nomenclatural criteria are important: (i) only one species of plant name should indicate; (ii) author citation is essential; (iii) it should indicate which of plant part is used. Scientific botanical nomenclature as defined by the International Code of Botanical Nomenclature will a better option. We are of the belief that the adoption of scientific names of plants to denote plant ingredients in traditional formulations are strongly endorsed. This decision if adopted will satisfies all criteria set up by upgrading an old inconsistent system used in publications and formulations will become obsolete.

Keywords: *Ayurveda*, nomenclature, traditional medicine, TCM

INTRODUCTION

Traditional Medicine (TM) and Complementary medicine is getting more attention regularly universally on the soil. However, most often these are adoptions made by the longsuffering common people. Integrating TM or TCM only into mainstream health care would involve detail exploration from various disciplines to know their efficacy, safety, and mechanism of action of TM systems. While, there's a rise within the use of TCM worldwide, research during this area is quite inadequate, with serious problems in accepting the studies conducted (Zhu, 2021). Communication of taxonomists to common researchers can be hindered by specialized terminology that aids concise and effective communication of complex ideas among taxonomists, but may seem obdurate and sophistic to number of researchers in TCM. Carolus Linnaeus (1707-1778) and his work Species Plantarum (1753) is the starting point of scientific botanical nomenclature. Plant names or binomials from before 1753 are not accepted as valid names according to the International Code of Botanical Nomenclature.

Nomenclature is an effect a universal currency – the means of connecting together and accessing the accumulated knowledge of any particular organism.

Plant nomenclature that concerns naming plants for uniformity, stability and universal applicability is an important aspect not only in plant sciences but also in TCM. Nomenclature of herbals and medicinal plant ingredients of plant origin used in traditional medicines is a complex issue. It can be a major problem in pharmacognosy, pharmacovigilance's and in traditional medicine in general. Whenever we trying to collate the data about the negative response to a plant taxa or the plant product. Here we are trying to bring to notice the adverse effect in increased herbal drug reactions. Our main focus is on the herbal products manufactured rather than the loose and crude drugs available in market. Over and above, lack of regulatory mechanism for herbal medicines is creating the problems which turns into health risk to the humans (WHO, 2004). Subsequently, confusion over the identity of the drug plant ingredients, lack of link to published pharmacopoeias and unscrupulous exploitation of herbal market. The main problem can be identified as very limited studies on efficacy, safety and quality of the natural drug plant. The purpose of systems of nomenclature is to provide an unambiguous mechanism that enables biologists and all others who work with organisms to communicate by a scientific name so as to avoid misunderstandings and confusion. Improving the monitoring of the trade of species of medicinal plants is important not just for managing the potential risk of ADRs but also to ensure that material entering the trade is not from endangered species (Cordell, 2011).

The main causes for the current situation are lack of guidelines and regulations combined with the concept "it's natural, so it's safe". If the demand for the herbals keeps enhancing, then there could be problems as most of the plant taxa are collected from wild. So when the demand for any herbal is greater than supply then there is an increased risk of adulterants and poor quality of drugs can be used in manufacturing the herbal or polyherbal medicine. The same species may have different common or colloquial names in a variety of current languages, but can bear only a single correct scientific name. Plant ingredient nomenclature lacks uniformity and various types of names are currently in use: pharmaceutical names; scientific generic names; scientific binomials; outdated scientific names and vernacular names (see table I). This can become a problem if confusion arises from scientific, vernacular and pharmaceutical names, scientific synonyms and the incorrect use of scientific names. If the incorrect species is used in an herbal prescription because there has been confusion in naming the species, then this can lead to serious ADRs (Farah *et al*., 2006).

Only when the names are known, can one look at other variables associated with the material, such as population, ecotype, chemotype, used to describe the herbal ingredients to determine season and time of harvesting, extraction method etc.

In recent years, TCM receiving acceptance at global level and has started working on the standardization of natural resources standard and authentic herbals needs relook for effective scientific communication. In the report it is suggested that name should always indicate only one plant taxa only, source of the name of taxa should be authoritative, the name of plant should also mention about the part of the plant used.

Table 1. General botanical terms required to understand the herbal nomenclature in TCM (Mabberley, 2017; Turland, 2019)

Accepted name	An accepted name is a validly published scientific name (binomial in the case of a species), which should be used to refer to a plant in preference to any other name (synonym) used to refer to this plant in the past.

Vernacular name	Vernacular or common names are the names in any language that refer to certain plant species. These names will often be very local and/or refer to groups of related or unrelated species with similar properties.
Pharmaceutical name	These names consist of the Latin name for the used part of the plant, plus the Latinized scientific generic name. Sometimes the name will also include the specific epithet. These names may also be referred to as pharmaceutical names or Latinized names.
Scientific name	Scientific names of species are binomial names consisting of a genus name and a specific epithet, together forming the species name. Scientific binomials may be followed by the author name. Scientific binomials are often referred to as botanical names, Latin names, scientific names or binomials.
Author	The author is the person who provided the species with a scientific name. Plant names or binomials from before 1753 are not accepted as valid names according to the International Code of Botanical Nomenclature. It is recommended that author names are abbreviated according to Brummitt and Powell (1992) and the International Plant Names Index (2004).
Genus name	The name of a genus is a nominative singular noun, or a different kind of word treated as such, and is written with an initial capital letter (Art. 20.1). The genus name has a capitalized initial letter, and is normally italicized.
Specific epithet	The second part of a binomial name is the specific epithet. The name of a species is a combination of the name of a genus and a specific epithet (Art. 23.1). The specific epithet can be derived from any source whatever (Art. 23.2) and is either an adjective agreeing in gender with the generic name, a genitive noun, a nominative noun or a word treated as such, or two or more united or hyphenated words This distinguishes one species in a genus from the other. The specific epithet is italicized, but without a capitalized initial. Species may be further subdivided into subspecies, varieties, cultivars and forms.
Synonym	A synonym is simply one of two or more names that apply to the same taxon. If one plant has more than one scientific name, then these are synonyms. This can happen, for example, when seemingly different plants turn out to belong to the same species.
Homonym	These are two or more names with exactly the same spelling (disregarding any rank-denoting term, e.g. sect., var.) but based on different types, they usually apply to different taxa. When the same name refers to different species, these names are homonyms. For scientific names this may happen when an author who gives a name to a plant is unaware of that this name has already been used by another author for another plant.

On the basis of above mentioned criteria Farah *et al*. (2006) recommended some specific suggestions after working with number of literary sources available with them. They have suggested the following options, (1) adopt a main name mentioned in any literature, i.e., international pharmacopeias, publications having vernacular, binomial or scientific name, (2) adopt and follow above option but must include and cite all publication approved medicinal plant list which may include binomial and/or pharmaceutical name, (3) adopt only three-part pharmaceutical name consisting of all latinized names generic, specific and part name, (4) adopt only scientific name having generic and specific name in latin with author citation at the last. On the basis of these suggestions the researchers should always use minimum one specific criteria. While, referring these suggestions the researchers have to be quite specific so the confusing names can be omitted and validity of the scientific publication will enhance. Moreover, if it is properly implemented then the problem of ADR can be resolved for authentication of the TCM in all AYUSH systems. Therefore, we would like to suggest some corrective measures to be incorporated not only in selection and utilization of the natural

resources in production of formulations under various traditional systems of medicines.

RESULTS AND DISCUSSION

Nomenclatural Criteria

India has a rich legacy of traditional system of treatment. Ayurveda is the traditional Indian system of medicine which is meant not only for curing the diseases but also for prevention of the occurrence of illnesses. Ayurveda is getting universal acceptance primarily due to its complete therapeutic practice, extensive profound conceptual root and survival of its medicines since prehistoric times (Mukherjee *et al*., 2016). This concept of drugs and preparations developed in earliest times still finds its significance in spite of changes in the environs, lifestyle, culture and disease forms. Quality control of Ayurvedic medicine necessitates knowing what is in chemical constituents of the herbal source, what happens during its processing, chemical investigation and biological assessment till the finished product reaches the consumers (Cordell, 2011).

Currently diversity of plant names leads to time consuming analyses of different names used to describe the herbal ingredients used in various formulations of TCM. By and large, we are not sure which particular whole plant or plant part is used. It is also impossible to determine the what plant taxa is utilised for the formulating the medicine. Vernacular names are not only imprecise in the sense that they may refer to more than one species in a genus, but may also refer to many unrelated species also. For explanation example of Aloe, a medicinal and cosmetic plant having huge commercial value has been given (Table 2). However, it is clear that the standardization of plant names is dire need in the modern scientific world.

Ayurvedic texts Charak Samhita and Sushrut Samhita as well as number of treaties and other texts describes about thousands of single or polyherbal formulations. These are rationally designed and are in therapeutic use since the beginning and even today are commercially formulated. But, the identification, collections and processing of these plant taxa varies due to changes in habitat, season and time of collection. Under the name of scientific herbalism, the herbs described in Ayurvedic materia medica are being explored and marketed as herbal medicine (Niteshwar, 2014). Therefore, pharmacological and epidemiological evidence must be generated to support their safety and efficacy in modern time. Systematic data mining of the huge existing formulations database can certainly expedite drug discovery processes to identify potent molecules from the traditional and folk knowledge. Though in recent years' regulators such as The US Food and Drug Administration (FDA) and few other regulators at global level do have very practical guidelines for 'botanical drug development and herbals' that are no more restricted to nutraceuticals. Hence, there is the necessity of following the proper nomenclature of the plant taxa to overcome the confusing part of any particular taxa.

Table 2. Complications arise if a product states it contains 'Aloe', without further defining the kind of aloe

Vernacular name	Possibly intended species	Accepted scientific names
Kumari Sanskrit	Barbados aloe, West Indian aloe	*Aloe vera* (L.) Burm. f. *Aloe barbadensis* Miller
Ghritkumari Sanskrit	Cape aloe	*Aloe ferox* Mill.
Korphad Marathi	Linalo ´e	*Bursera aloexylon* (Schiede ex Schltdl.) Engl.

Kuwarpatu Gujarati	Indian aloe wood	*Aquilaria malaccensis* Lam.

Option-1: Name should always indicate only one plant taxa only

To satisfy our initial criteria would require a committee to select names for plant ingredients from available pharmacopoeias and scientific publications. Over and above, these would then have to be enforced to standardise the nomenclature in all future sources of communications and formulations.

This does not require any specific data but, recipients will not be able to understand the name properly. Producers of herbal formulations should include the source reference to that particular product. To overcome the confusion and problem for identity synonym checklist data from all sources becomes essential to focus on post product research and testing. On the other hand, we also have to take care of numerous homonyms in available literature. But, this will lead to myriad of herbal names seems to be misleading and confusing. So it will not be feasible in long term or short term gains in standardization.

Option-2: Pharmaceutical nomenclature - three-part nomenclature

This options can be considered as good one, as it would maintain the classical pharmaceutical nomenclature which uses Latinized scientific names. While, pharmaceutical name includes only genus name in Latin we have make the specific epithet also Latin for all plant taxa including herbal medicinal plants. Such pharmaceutical names can be or should be adopted globally. But, enormous amount of Latinization and inflexibility of pharmaceutical names makes it a difficult option for all. Moreover, lack of author citation will create confusion and identity of the herbal plant taxa.

Option-3: Scientific botanical name should also indicate which part of the plant is used

The above options seem to be perfect as it does not require any scientific committee and mere adoption of the accepted scientific binomial name with author citation will serve the purpose. In addition to scientific name it should include the plant part which is used in formulation. In planttaxonomy and botanical nomenclature only one accepted name is assigned to each plant taxa with proper spelling it can solve the problem. The most advantageous part of the botanical scientific name over pharmaceutical name is that they are unique as well as refer only plant taxa. To overcome the confusion correct spelling scientific name is an essential to prevent the confusion if any. Only one major drawback of this option is it does not provide any specific information on the part of plant used, which can be resolved adding separate specific information. At the same time, plant name can be added in any language as it can be translated unambiguously to whatever the language it used and helpful to any scientific researcher in herbal formulations. Over and above it will also helpful to very many pharmacovigilance researcher wishes to. One such example is given below *Piper nigrum and Piper longum* is used as a whole or its fruit, root, stem is used as it is mentioned in different languages and used in another form. Over and above, sometimes it's another species is also used in preparation of formulation e.g. *Piper chaba* or *Piper retrofractum* (Table 3).

Table 3. Complications arise if a product states it contains 'Pepper' without further defining the kind of Pepper

Gajapipar Sanskrit	Java long pepper	Fruit	*Piper chaba* Hunter non-Blume.
Lindipeepar, Pipali Sanskrit	Long pepper	Fruit	*Piper longum* L.
Pipalimool, Marathi	Piper root	Root	*Piper longum* L.
Ganthoda Gujarati Kala mari Gujarati	Black pepper	Seed	*Piper nigrum* L.
Safed mari Gujarati	Black pepper	Seed	*Piper nigrum* L.
Chavaka, Chavka Sanskrit	Cubeb	Stem	*Piper retrofractum* Vahl.

Development of any science depends upon its education plus research. Traditional and complementary medical system is no exception for it. Despite of all these developments currently, research in TCM is thriving hard to produce scientific validation with evidence based documentation especially in Ayurveda. Although, AYUSH committee has done the amalgamation of clinician, pharmacologists, phytochemists and botanist especially taxonomist has done the wonderful job (Nandini *et al*., 2013). Among case reports published in reputed journals, 79 are concerned about toxicity of Ayurvedic drugs, with practically none on safety and efficacy (Patwardhan and Vaidya, 2019). However, the technique of research with advanced contemporary tools has welcomed researchers of other disciplines to take part in research with a more logical approach. When ADR data base and WHO drug dictionary is used for comparison then they have resulted in giving check list of synonyms of vernacular, pharmaceutical and scientific names of the plant taxa. This checklist talks about more than 500 herbal plants and more than 7500 synonyms (UMC, 2005; WHO 2018). Other resources also utilized for standardization, i.e., USDA-ARS-GRIN taxonomy data base (2004), world checklist of selected families. In addition, IPNI (2020), a database on published names and bibliographical details of seed plants, ferns and fern allies can be of great help. These are some resources for checking the author citations of individual plant names and therefore becomes most useful resource for resolving the homonyms for medicinal plants if any. Only it cannot use for determining any homonyms of plant taxa. Over and above, UMC- KEW collaborations resulted in publication of WHO herbal dictionary which is of great importance. Analysis of the data sources available globally we can suggest to create link between herbal practitioners and products information at global level.

CONCLUSIONS

Any drug is mentioned in the ancient text of traditional Indian system of medicine that could be more explored and validated in association with the modern scientific technologies. Therapeutic efficacy of traditional and complementary medicine may be enhanced to high quality which can be achieved by evaluation of identity, purity, safety, stability, physical and biological properties. Chemoprofiling, standardization and biological study are very essential for the quality evaluation as well as to maintain scientific documentation for validation of AYUSH medicine. Ayurveda, siddha and Unani areself-sustaining system of traditional medicine. The importance of the traditional knowledge in drug discovery and healthcare is expanding ever since. As more and more scientific validation of this ancient medical system is

emerging, new avenues are opening up for scientific exploration. The integrated evidence based research on Ayurveda siddha and Unani thus provides opportunities for a better healthcare system serving millions of common man with a hope for an efficient and safe therapeutics.

REFERENCES

Brummitt, R.K., and Powell, C.E. 1992. Authors of plant names. Royal Botanic Gardens, Kew.

Cordell, G.A. 2011. Phytochemistry and traditional medicine – A revolution in process. *Phytochemistry Letters* 4(4): 391-398.

Farah, M.H., Olsson, S., Bate, J., Lindquist, M., Edwards, R., Simmonds, M.S., Leon, C., de Boer, H.J., and Thulin, M. 2006. Botanical nomenclature in pharmacovigilance and a recommendation for standardisation. *Drug safety* 29(11): 1023-1029.

IPNI. 2020. The International Plant Names Index. http://www.ipni.org [accessed 18 December 2020].

Mabberley, D.J. 2017. The plant book: A portable dictionary of the vascular plants. 2nd ed. Cambridge University Press, Cambridge.

Mukherjee, P.K., Harwansh, R.K., Bahadur, S., Banerjee, S., Kar, A., Chanda, J., Biswas, S., Ahmmed, S.M., and Katiyar, C.K. 2017. Development of Ayurveda – tradition to trend. *Journal of Ethnopharmacology* 197: 10-24.

Nandini, K., Vasantha, M., and Ganguly, N.K. 2013. Initiatives of Indian Council of Medical Research in scientific validation of traditional medicine. Department of Ayurveda Yoga Unani Siddha and Homeopathy and Council for Scientific and Industrial Research, New Delhi.

Nishteswar, K. 2014. Watermark of original Ayurveda: Is it fading away in current clinical practice and research?. *Ayu* 35(3): 219-220.

Patwardhan, B., and Vaidya, A.D. 2009. Ayurveda: Scientific research and publications. *Current Science* 97: 1117–1121.

Turland, N. 2019. The code decoded: A user's guide to the International Code of Nomenclature for algae, fungi, and plants. Advanced Books.

Uppsala Monitoring Centre. 2005. WHO drug dictionary and WHO herbal dictionary. Uppsala Monitoring Centre, Uppsala.

USDA ARS. 2004. National Genetic Resources Program: Germplasm Information Network - (GRIN). https://www.ars-grin.gov/ [accessed 20 December 2020].

WHO. 2018. Programme 2018. http://who.umc.org [accessed 17 August 2018].

World Checklist of Selected Plant Families. 2006. The Board of Trustees of the Royal Botanic Gardens, Kew. http://www.kew.org/wcsp/ [accessed 20 December 2020].

World Health Organization. 2004. WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems. WHO, Geneva.

Zhu, Q. 2021. Difficulties in research in traditional medicine (TM). *Journal of Traditional Medicine and Clinical Naturopathy* S7: e002.

P-ISSN 1693-6892
E-ISSN 2722-0257

Journal of Tropical Ethnobiology

VOLUME V NUMBER 1 JANUARY 2022

CONTENTS

Recommendation for Standardization of Botanical Nomenclature in Traditional and Complementary Medicinal Systems
Vinay M. RAOLE, and Vaidehi V. RAOLE ……..... 1-7

Ethnobotany of *Bedaka*: Face Brightening Concoction from Sahu Tribe, West Halmahera, Indonesia
Anisatu Z. WAKHIDAH …….....… 8-18

Antidesma bunius (L.) Spreng. (Foodstuffs and Its Bioactivity)
Marina SILALAHI, Endang C. PURBA, I. G. A. Rai SAWITRI, Riska S. WAHYUNINGTYAS, and Novika SITEPU ……..... 19-29

Ethnozoology in Traditional Marriage Ceremony of Mandailing Tribe in North Sumatra
Jamilah NASUTION ...…….. 30-35

Quantitative Evaluation of Ethnobotanicals from Dang District, South Gujarat
Kavi K. OZA, Ankita THORAT, Sandhya K. GARGE, and Vinay M. RAOLE …… 36-46

Notes on Trade in *Varanus macraei* in response to (Arida et al., 2021): 'The Hunt for the Blue tree monitor on Batanta Island, Indonesia: Subsistence on a Treasure?'
Chris R. SHEPHERD ……..……..... 47-51

ISSN 1693-6892