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TYPE CONCEPT AND ITS IMPORTANCE IN PLANT NOMENCLATURE

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Abstract

Plant nomenclature that concerns naming plants for uniformity, stability and universal applicability is an important aspect of systematic studies and has evolved over 150 years once Alphonse de Candolle proposed *Lois de la Nomenclature Botanique* in 1867 to the present day ICN (International Code of Nomenclature for Algae, Fungi and Plants) through ICBN (International Code of Botanical Nomenclature). The 'Type Concept' along with priority is a major principle on which the botanical code rests. The importance and relevance of this concept, various types and development of the thought is briefly presented in the paper. Application of important Articles in the Code concerning type concept are explained, with suitable examples.

Keywords: Type specimen; Typification; Plant nomenclature; Code; ICN

Introduction

Floristic, monographic and revisionary studies are important aspects of taxonomy and involve formidable exercise on nomenclature. Taxonomy and nomenclature are undoubtedly interdependent but complement each other to make studies complete and scientific. Taxonomy is the science of classification, orderly arrangement of phenomenon, to facilitate the efforts of mind to understand them (Fosberg & Sachet, 1965) whereas Nomenclature is the process of determining the correct names for units according to Code, rules framed by international community for uniformity, universal applicability and stability. The need of nomenclature and its relationship to taxonomy was rightly expressed by

Davis & Heywood (1963): "biologists must know what organisms they are working with before they can pass on information about them to other people – a function of taxonomy which makes stability of nomenclature an important consideration". The importance of nomenclature is well emphasized in the preface of the *International Code of Botanical Nomenclature*, St. Louis Botanical Congress (Greuter *et al.*, 2000) in the following words, "Biological nomenclature is the means of channeling the outputs of systematic research for general consumption. It is not only the taxonomists' concern but is of relevance for all those who need to communicate about organisms". While taxonomy plays an important role in rendering information on patterns of biodiversity, nomenclature is a mechanism for unambiguous communication about the elements of taxonomy. Nomenclature aims for one correct name (identifier) for each taxonomic group (taxon: refers to any one element in a rank or collectively a group belonging to one rank) accepted worldwide, in other words, one taxon will have one correct name and one name should refer to one particular taxon.

The International Code of Nomenclature for algae, fungi and plants (ICN or simply Code; previously known as ICBN– International Code of Botanical Nomenclature), had developed and refined since the formulation of *Lois de la Nomenclature Botanique* (Laws of Botanical Nomenclature) in 1867, 150 years ago by Alphonse de Candolle after every International Botanical Congress (IBC). It prescribes rules, which are accepted internationally for naming taxa based on two major principles, *viz.* Type concept and Priority.

Type concept or typification, the process of prescribing type, is an important aspect of nomenclature, treated as one of the six principles of the Code. The concept originated from America when the taxonomists there faced difficulties to interpret and name genus when split. They laid emphasis on 'type species', referred to as

* **Note:** As per the guidelines for all the Designated Repositories issued by the National Biodiversity Authority "Any person, who discovers a new taxon of biological resources occurring in India, is required to notify it to the relevant Designated Repository and deposit its holotype/isotype/paratype there [Section 39(3) of the Biological Diversity Act, 2002]"

standard species, to define and delimit genus and pave way for stabilization of names of species by evolving type concept in the Rochester Code of 1892. The concept gained further recognition and accepted as fundamental principle in the American Code of 1907 (Hitchcock, 1921) and this Code was considered as type based Code. These two Codes were by taxonomists of New world and not of international taxonomists though later led to the inclusion of the concept as a recommendation to indicate carefully the type while publishing a novelty in the third International Botanical Congress 1910 at Brussels (Belgium). This recommendation was incorporated in the Code published in ICBN, 1935 based on International Botanical Congress (IBC), 1930, and accepted by the American botanists and thereby the schism ended. In the VI IBC at Amsterdam (The Netherlands), the principle, that application of names of taxonomic groups is determined by means of nomenclatural types, was adduced. The concept was well established and guidance provided, for determining the various types in VII IBC held at Stockholm, Sweden, 1950.

According to Shenzhen Code (Turland *et al.*, 2018) and contemporary understanding, the application of names of taxonomic groups is determined by means of nomenclatural types. A type (*typus*) in biological nomenclature is that element to which that name of a taxon is permanently attached (Article 7.2). In other words, type is “an authentic or standard specimen” and is the objective basis to which a given name is permanently linked. It is relevant to note that type does not change with classification and nomenclature does not imply circumscription but type method helps in correct application of name(s) to taxa. The type of name of a species or intraspecific taxa will be specimen(s) or illustration prior to 1.1.2007, of a genus is type of the name of a species, and of a family is the name of a genus.

The various types recognized in the Shenzhen Code are: holotype, isotype, paratype, syntype, lectotype, neotype, epitype, isosyntype, isolectotype, isoneotype and isoepitype.

Holotype of a name of a species or infraspecific taxon is the one specimen or illustration either (a) indicated by the author(s) as the nomenclatural type or (b) used by the author(s) when no type was indicated (Article 9.1). It is always singular and should be a single specimen. Illustration or drawing is not accepted as type except in case of microscopic organisms from first of January, 2007. **Isotype** is any duplicate specimen of holotype, that is from a single gathering (made at one time) of the holotype (Article 9.5). Any specimen(s) other than holotype or isotype included in the protologue is **paratype(s)** (Article 9.7). **Syntype** is any specimen(s)

cited when no holotype was designated (Article 9.6). When no holotype was indicated by the author(s) at the time of publication or if it is missing, a **lectotype** is selected on basis of protologue or from the original material (Article Article 9.3). A **neotype** is selected to serve as a nomenclatural type when original material is extant or missing (Article 9.8). This will lose its importance once the original material is found. **Epitype** is a designated specimen or illustration selected to serve as interpretative type when type material (holo-, lecto- or neo-) is ambiguous or insufficient or inadequate for precise application or identification of the name (Article 9.9). Various types, with their level of importance, based on Seberg (1984), are presented in Table 1.

Lectoparatype is another term coined by Hansen & Seberg (1984) or paralectotype, which was in vogue and preferred by Brummit (1985). Paralectotype or lectoparatype are terms used by many to denote the remaining syntype specimens after selecting a lectotype but not included in the Code despite proposal to do so more than once. Attempts to add the term lectoparatype to the Code were made earlier but were rejected in Sydney Congress in the same year. According to Voster (1986), the term is not needed since the remaining syntypes after lectotypification have no typification value. But, again, recently Husain *et al.* (2016) have proposed to add the term to the Code which was not accepted in Shenzhen Congress.

There are two significant and noteworthy recommendations in ICN. Recommendation 9 A.2 is regarding the designation of a lectotype. Lectotypification should be undertaken in the light of good understanding of the concerned group. While choosing a lectotype, all aspects of the protologue should be considered as basic guide. Mechanical methods such as automatic selection of the first element cited or of a specimen collected by the person, after whom a species is named, should be avoided as these are unscientific and may produce possibly future confusion and further changes. The other recommendation is regarding the deposition and preservation of type material, especially holotype (7A.1). Accordingly, the type should be deposited in public herbarium and scrupulously conserved.

At times, the specimens get mixed up (admixture) while describing species or subordinate rank to species and cause difficulties in marking the type and thereby complicating the nomenclature and identity. To exemplify it, the type of *Thrixspermum luniferum* Rchb.f. (1868; basionym for *Chiloschista lunifera* (Rchb.f.) J. J. Sm.) contained two different specimens, one sent by M/s Veitch from Tenasserim and another by Rev. Parish from

Moulemain. The specimen in sheet 41550b with some inflorescence and coloured sketches is used for describing the species *Thrixspermum luniferum* (lectotypified, Seidenfaden, 1988). This is in accordance with ICN Rec.9A.4. The other specimen in the file of the author received from Parish was again described in 1874 as *Thrixspermum luniferum*, by the same author resulting in an illegitimate name. This was christened as *Chiloschista parishii* by Seidenfaden (1988) until which time the specimens of Andaman were mistaken for *C. lunifera* (Rchb. f.) J. J. Sm. (Vasudeva Rao, 2008).

Type in evaluating taxonomic situation can be seen in the example, where the monotypic genus *Jainia* N.P.Balakr. (1980) was sunk in *Coptophyllum* Korth. (Deb & Rout, 1991), on examination of type material and contradicting description rendered in protologue. This is a good example for situation that occasionally happens when the author of a new name provides a description that does not match the type specimen; it is the type specimen, not the description that determines what kind of plant is called by the name in question.

Tinomiscium nicobaricum N.P.Balakr. in New Bot. 7: 7, figs 2-9. 1982 (Menispermaceae; dioecious) was described on the basis of a specimen having male inflorescence and leaves and another specimen with female inflorescence. The former (male inflorescence excluding leaves) resolved to be *Tinomiscium petiolare* Hook. f. & Thomson and the Fig. 1 and leaves to be of *Fibraurea tinctoria* Lour. (Forman, 1985).

Having not seen the paper on *Diospyros ridleyi* Bakh., Ramesh & De Franceschi (1993) described a new species *Diospyros pyrrocarpoides*. This was included in the monograph on the genus by Singh (2005) who while making a subgeneric classification of the genus made a new section, *Pyrrocarpoides* keeping the name of the species as type of the new section. The synonymy of the species is resolved and the section is reduced to section *Campanulata* (Vasudeva Rao, 2007).

Type determines nature of synonymy. When a species name is based on more than one specimen (type) collected at different places and time, the resultant names are heterotypic synonyms or taxonomic synonyms. *Eulophia andamanensis* Rchb.f. was described in 1872 (specimen from Myanmar) and *Eulophia keithii* Ridl. in 1896 (specimen from Malayan Peninsula). These were resolved to be one and the same species and thereby these are heterotypic synonyms or taxonomic synonyms. *Rostellularia andamanica* Vasudeva Rao (Vasudeva Rao, 1985) was erroneously merged with *Justicia procumbens* L. and while doing so the merging author states wrong type of the name of the species of *Justicia* L. and that of *Rostellularia* Rchb. without referring to literature. Such blunders cause problems for other taxonomic workers. The species *Rostellularia andamanica* Vasudeva Rao was proved to be distinct and transferred to *Justicia*, i.e. *Justicia andamanica* (Vasudeva Rao) Vasudeva Rao (Vasudeva Rao, 1994)] and these two are homotypic synonyms or nomenclatural synonyms.

Table 1. Various types, their level of importance, based on Seberg (1984) and modified

	A	B	C	D
LEVEL	SINGLE SPECIMEN/ ELEMENT INDICATED	TWO OR MORE DESIGNATED	SPECIMEN CITED BUT HOLOTYPE NOT DESIGNATED	ALL CITED SPECIMENS LOST OR MISSING
PRIMARY	HOLOTYPE	SYNTYPE (in narrow sense)	SYNTYPE (in broad sense)	NEOTYPE
SECONDARY	ISOTYPE	LECTOTYPE ISOLECTOTYPE PARALECTOTYPE	ISOLECTOT-YPE PARALEC-TOTYPE	ISONEOTYPE
TERTIARY	PARATYPE	SYNTYPES MINUS LECTO- & ISOLECTOTYPE	SYNTYPES MINUS LECTO- & ISOLEC-TOTYPE	EPITYPE (when cited specimens ambiguous)- interpretative
QUARTERNARY				

It is necessary to know the dates prescribed in the Code for various actions regarding typification. From 1st January 1958, new taxon is valid only when the type is indicated (Art. 40.1). From 1st January 1990 onwards, indication of type should include the word 'typus' or 'holotypus' (Art. 40.6). Also designation of epitype is not effected unless the herbarium or institution where it is preserved is stated (Art. 9.21, 9.22). After 1st January 2001, while prescribing lectotype or neotype or epitype, the phrase 'designated here' or '*hic designatus*' or equivalent term must be included for purposes of priority (Art. 7.11). Prior to 1st of January 2007 illustration or drawing is acceptable as type but from 2007 onwards only specimen is acceptable as type (Art. 40.4).

It is pertinent to note that the type does not change with classification or change in circumscription of taxon. Article 7.2 of the ICN, explicitly states that the nomenclatural type is not necessarily the most typical or representative element of a taxon. It serves, in a very large way, to know what the author or proposer of the new taxon had in mind at the time of describing that new taxon.

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