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Typoid potential of cultivated introduced woody plants: A case study of the Wilson collections in Průhonice Park, Czech Republic

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Kirschner J. & Tábor I. 2016: Typoid potential of cultivated introduced woody plants: A case study of the Wilson collections in Průhonice Park, Czech Republic. *Acta Musei Moraviae, Scientiae biologicae* (Brno) **101(2):** 93–99. – Nomenclatural aspects of extant cultivated progenies of elements of original material, and specimens derived from them, are discussed. The current nomenclatural code gives a single comparable example, not applicable to the situation described. The term "pseudotype", previously coined for the specimens prepared from cultivated progeny of type specimens, may be useful, provided that its definition is extended. The typoid potential of specimens from the cultivated progenies of introduced woody plants is exemplified by the material (seed, specimens) collected by E.H. Wilson in China and cultivated in Průhonice Park, Czech Republic.

Key words: Plant nomenclature, type terminology, introduced woody plants, E.H. Wilson, Průhonice Park

Introduction

Plant name typification as described in the International Code of Nomenclature for algae, fungi, and plants (McNeill *et al.* 2012) in a complicated matter in the case of old names, particularly when protologues of the names do not give satisfactory information and/or the original material (in the sense of the Code) is not extant. When there is a total deficiency of material and data for the interpretation of the name, the Code (ibid.) offers various tools that make it possible to overcome the difficulties, mainly in the selection of neotype (Art. 9.7), and epitypification (Art. 9.8) when the type cannot be easily interpreted. In Art. 9.4, living material is explicitly excluded as a possible type (with the exception of immobilized, metabolically inactive, permanently stored strains of algae or microscopic fungi, acceptable as types).

This contribution seeks to elucidate the nomenclatural potential of the living material of vascular plants, particularly that of long-lived woody plants, trees or shrubs. Attention is focussed on certain introduced woody plants, cultivated in arboreta or parks and garden collections because these collections, when properly managed, are duly documented with respect to the time of introduction and the sources of the plants.

Possible relationships of living plants with the original material and their previous treatment in the literature

Living plant – original material relationships

Several matters should be taken into account when living plants are considered as a possible source of type material in the absence of original material to represent the name in question. Formally, according to the provisions of the Code, there is no obstacle to the use of any material as a source of neotypes or epitypes, provided that the plants (specimens) under consideration are not in conflict with the protologue of the name. However, it is advisable to evaluate all the circumstances carefully, particularly the geographical origin of plants, the possibility that the original author of the name, even after the date of its publication, revised and identified the material, or that the collector was close to the original author and, in all likelihood, interpreted the name in accordance with the author's original idea. There are therefore more suitable sources of typoid material, not formally recognized in the Code but in general use (the most important being "topotype", referring to specimens collected at the locality of the origin of the original holotype or other type plants). The code of zoological nomenclature (Ride *et al.* 1999, with later amendments, is more supportive of this term: it is not used in the body of the Code text, but is included in its glossary).

Primarily, this is a relationship between the original type and the living material. The closest relation is when the type specimen was taken from a known, identified plant (tree) still in cultivation today. In the absence of any element of the original material of the name, this is an obvious choice in the quest for a neotype or epitype.

Another possibility is a relationship based on shared parentage or on parent-progeny relations, which is quite common when introduced woody plants are to be considered. As will be shown below, woody plants have often been collected as seed or diaspore samples and documented by a herbarium specimen, most often coming from the source population of the seed sample.

In the latter case, the biological features of the relevant species must be considered, largely in terms of the character and extent of variation, paying particular attention to the reproduction system or systems. There is a wide range of possibilities (Záveská Drábková *et al.* 2009), from an agamospermous progeny with a very limited variation on the one hand to highly variable hybrid swarms on the other (Richards 1996, Richards *et al.* 1996).

Terms used for the typoids derived from living plants with a relationship to the original material of the name

In the literature, living plants as such have not been evaluated as a potential source of typoids. However, specimens, or even cultures coming from type specimen plants, have been considered as typoids. The first example comes from the Code itself (McNeill *et al.* 2012). One recommendation refers to permanently stored type strains of algae and fungi (metabolically inactive); when a culture is derived from the type strain, the following recommendations apply: "*8B.2. In cases where the type of a name is a culture permanently preserved in a metabolically inactive state (see Art. 8.4), any living isolates*

obtained from it should be referred to as "ex-type" (ex typo), "ex-holotype" (ex holotypo), "ex-isotype" (ex isotypo), etc., in order to make it clear they are derived from the type but are not themselves the nomenclatural type." Thus, there is a term with somewhat restricted usage but, beyond the framework of the Code, its meaning might be extended to vascular plants, to types and their living siblings or progenies. There is a problem that, strictly speaking, the term refers to living material derived from the type and not *vice versa*, and the extension should also involve specimens derived from ex-types.

Another case of the formal treatment of specimens derived from the cultivated progenies of types originally refers to the cultivation of plants from achenes present on type sheets of agamospermous parental plants (the genus *Taraxacum*, diplosporous apomicts, see KIRSCHNER & ŠTĚPÁNEK 1992, 1997). The term "pseudoisotype" was mentioned in the earlier work, and a more detailed discussion, with further terms coined, i.e. "pseudotype", "pseudoparatype", "pseudoneotype" and others, was provided in the latter. Pseudotype therefore denotes a typoid, a specimen prepared from the cultivated progeny of an agamospermous mother plant preserved as the type of the name. It should be mentioned that the majority of siblings originating in this way share the genotype with the mother plant. The term pseudotype may easily be extended to cover all the situations described in the previous section. However, in the meantime (since 1997), pseudotype has become occupied as an established term in virology (pseudotype, or pseudotyping, is used for the phenotypic mixing of retroviruses).

We therefore leave open the question of the correct term for the situations in which typoids are derived from cultivated plants in close relations to the type or other elements of the original material of the given name. Perhaps the separation between virology and plant nomenclature is so clear that the term pseudotype can be retained, particularly and advisably so when special type terms are used (the terms pseudoisotype, pseudoholotype, pseudoparatype and pseudosyntype are the most probable).

For the sake of completeness, we should mention that the term pseudotype (and derived terms) was once included in a proposal to amend the Code (SREEMADHAVAN 1968). It was meant as a descriptor of any duplicate of holotype or syntypes not seen by the author of the name typified (i.e., the term isotype would have been restricted to the duplicate of the holotype specimen demonstrably seen by the name author, while the other duplicates, those not studied by the name author would have been called pseudotypes). As the above proposal was not accepted nor did it take any effect, it is not regarded as relevant for the present discussion.

The connection between Wilson Collection plants (Plantae Wilsonianae) and Průhonice Park

It was TÁBOR (2014) who pointed out the importance of plants collected by E. H. Wilson in China, in an introduction to the history of Průhonice Park. Within the environs of Prague, the capital city of the Czech Republic, Průhonice Park was established by Count A. E. Silva-Tarouca in 1885. The park is protected as a UNESCO Heritage Site and a "monument of international importance". The Count was not only a skilled organizer

and garden architect, but also an outstanding dendrologist, collaborating with other contemporary personalities in this field. He purchased and exchanged hundreds of plant samples and cultivated them in the Park. The system of introduction became more scientific after the foundation of the Dendrological Society in Průhonice, with the participation of A. E. Silva-Tarouca and another prominent dendrologist, Camillo K. Schneider in 1908. A detailed registry of the plants acquired and distributed (primarily to Průhonice Park) by the Society shows that a great number of acquisitions were collected by E.H. Wilson in China and came from a number of sources to Průhonice under Wilson's original collection numbers. As a great proportion of Wilson's numbers were cited as types of newly published names, the Wilson plants were selected for this case study of the typoid potential of cultivated woody plants.

Ernest Henry Wilson (1876–1930), as a student of Royal College of Science, South Kensington, Britain, was chosen as a botanical collector to explore Hupeh and adjacent provinces of China and collect plants of horticultural value for James H. Veitch and his plant nursery. He spent several years in China (1899–1902, 1903) and when he returned, he was approached by C. S. Sargent of the Arnold Arboretum near Boston, and spent another three years, mostly in Sichuan (1907–1909, 1910). He collected over 1000 species of trees and shrubs, mostly as seed samples or cuttings, and prepared about 50,000 herbarium specimens. His diaries and a numbered list of samples are now available electronically at the Arnold Arboretum site, and it is obvious that he performed a gigantic task, only barely comparable with lesser exploration attempts in China. The majority of his plants were evaluated taxonomically in the massive *Plantae Wilsonianae* (Sargent 1911–1917). The seed samples or living plants or cuttings were distributed from Boston to other arboreta and commercial nurseries quite early on, probably in the same order as they arrived from China.

In 1909, the first of the Wilson plants started to appear in the registry of the Dendrological Society, (founded in 1908), but earlier acquisitions may have been made from Veitch or Sargent before the period of detailed documentation. The authors have carried out a detailed comparison between the digitised registry and Wilson's collection numbers published in *Plantae Wilsonianae* and found a number of gatherings that represented types and, at the same time, were cultivated in Průhonice Park and the garden of the Dendrological Society. A selection of these is presented below, taken from those that belong to names in current use or to names that are likely to become accepted names upon closer study; the selection was narrowed to acquisitions that either grow in the Průhonice Park or grew there and might have been replaced by new plants from the same source (by vegetative propagation or from seeds).

Comments on the Wilson plants of typoid potential plants cultivated in Průhonice Park

Introduction success, both at Průhonice and in the Arnold Arboretum, Massachusetts, was patchy. Losses in the 20th century were quite serious, mainly due to climatic differences between lowland or south-central China and the European and east American sites. In Tab. 1, the low survival rate after a century is striking in both cases.

In the preface to the third volume of *Plantae Wilsonianae*, C. S. Sargent summarized figures for the latter arboretum (SARGENT 1917). He stated (op. cit., p. vi and vii) that: "*From these [i.e. the 1193 species and varieties collected by Wilson] 918 species were successfully raised in the Arboretum. The seeds collected by Wilson were shared with the best cultivators in the United States and Europe; and plants of the 445 species and varieties raised here which cannot grow in Massachusetts have also been widely distributed [...]*".

The climatic limits proved to be even more pronounced in central Europe, with several harsh winters and sudden temperature drops, and only a fraction of plants introduced to Průhonice Park survived. A list appears below of those that represent original plants or their probable progenies to be found in there.

Table 1. A selection of the acquisitions listed in the Registry of Dendrological Society, Průhonice. They all meet the following criteria: They are described on the basis of the material of E. H. Wilson; they bear Wilson's original number in the Registry (TÁBOR 2014); they may be found in Průhonice Park today; and they may have a certain typoid potential. The Wilson plants cultivated under the same names in the Arnold Arboretum (received by kind courtesy of AA) are also cited. (**NR** = Number in the Registry; **WCN** = Wilson Collection Number; **CAA** = Currently also under cultivation at Arnold Arboretum; **TWN** = Type status of specimens with a Wilson number. IT = isotype, PT = paratype, ST = syntype.)

NR	Current Correct Name	Registry Name	WCN	CAA	TWN
2637	*Berberis atrocarpa* C. K. Schneid.	Berberis atrocarpa C. K. Schneid.	Wils. 1284*		
1032	*Berberis francisci-ferdinandi* C. K. Schneid.	Berberis Francisci-Ferdinandi C. S.	Wils. 1180*		
1071	*Berberis gagnepainii* C. K. Schneid.	Berberis gagnepainii C. S.	Wils. 1137*		
1038	*Berberis mouillacana* C. K. Schneid.	Berberis mouillacana C. S.	Wils. 1039*		
1057	*Berberis silva-taroucana* C. K. Schneid.	Berberis Silva Taroucana C. S.	Wils. 1012		PT
1086	*Berberis thibetica* C. K. Schneid.	Berberis thibetica C. S.	Wils. 1282*	Wils. 1038	
1026	*Buddleja stenostachya* Rehder & E. H. Wilson	Buddleia stenostachya R. et W.	Wils. 1351*		IT
1061	*Celastrus glaucophyllus* Rehder & E. H. Wilson	Celastrus glaucophylla Rehd.	Wils. 952*		IT
1069	*Clematis grata* var. *grandidentata* Rehder & E.H. Wilson	Clematis grata var.grandidentata R. et W.	Wils. 1100*		PT
1050	*Corylopsis platypetala* var. *laevis* Rehder & E. H. Wilson Rehder	Corylopsis platypetala var. laevis R. et W. var. purpurascens Koeh.	Wils. 1020*		IT

NR	Current Correct Name	Registry Name	WCN	CAA	TWN
1065	*Euonymus lanceifolius* (Loes.) Blakelock	Euonymus lancifolia Loes.	Wils. 1105		
1101	*Hydrangea sargentiana* Rehder	Hydrangea sargentiana Rehd.	Wils. 772		IT
1078	*Hydrangea xanthoneura* var. *wilsonii* Rehder	Hydrangea xanthoneura var. Wilsoni Rehd.	Wils. 1183*		
1082	*Lonicera mupinensis* Rehder	Lonicera moupinensis Rehd.	Wils. 861*		ST
1030	*Philadelphus purpurascens*	Philadelphus brachybotris	Wils. 1346*	Wils. *s. n.*	ST
89	*Prunus brachypoda* var. *pseudossiori* Koehne	Prunus brachypoda var. pseudossiori Koeh.	Wils. 899*		ST
1036	*Prunus lobulata* Koehne	Cerasus, Prunus lobulata	Wils. 978*		ST
1043	*Prunus pubigera* var. *potaninii* Koehne	Prunus pubigera var. potaninii Koeh.	Wils. 980*		ST
1066	*Rosa moyesii* Hemsl. & E.H. Wilson	Rosa moyesi Hemsl. et Wils.	Wils. 1056*		
1063	*Rosa moyesii* f. *rosea* Rehder & E. H. Wilson	Rosa moyesi f. rosea	Wils. 1123*		IT
1060	*Rosa multibracteata*	Rosa multibracteata Hemsl.	Wils. 1053*		
1074	*Rubus biflorus* var. *quinqueflorus* Focke	Rubus biflorus Haem. var.quinqueflorus	Wils. 832*		IT
63	*Rubus setchuenensis* Bureau & Franch.	Rubus clemens Focke	Wils. 871*	authentic specimen of *R. clemens*	
59	*Schisandra rubriflora* Rehder & E. H. Wilson	Schizandra rubriflora R. et W.	Wils. 921*		IT
1046	*Schisandra sphenanthera* Rehder & E. H. Wilson	Schizandra sphenanthera R. et W.	Wils. 869a		PT
1055	*Schizophragma integrifolium* var. *molle* Rehder	Schizophragma integrifolium var. molle Rehd.	Wils. 1183a*		
2641	*Sorbus caloneura* (Stapf) Rehder	Sorbus caloneura	Wils. 997*		
1073	*Sorbus megalocarpa* Rehder	Pyrus, Sorbus megalocarpa Rehd.	Wils. 956*		ST
1023	*Spiraea mollifolia* Rehder	Spiraea mollifolia Rehd.	Wils. 1158*	Wils. 4022	IT (1158)
3560	*Spiraea myrtilloides* Rehder	Spiraea myrtilloides Rehd.	Wils. 989*		IT
1010	*Spiraea sargentiana* Rehder	Spiraea sargentiana Rehd.	Wils. 1318a*		IT
81	*Styrax wilsonii* Rehder	Styrax Wilsonii Rehd.	Wils. 884*		IT
1076	*Viburnum foetidum* f. *rectangulatum* Rehder	Viburnum foetidum var. rectangulum	Wils. 1131*		
1035	*Viburnum henryi* Hemsl.	Viburnum henryi	Wils. 1035*		
1034	*Viburnum wilsonii* Rehder	Viburnum wilsonii Rehd.	Wils. 1120*		

*) Currently not located at the Průhonice Park, or the Wilsonian number not clearly equated with the cultivated material. It is due to the fact that some shrubby genera remain to be revised in the Průhonice Park (e.g., *Spiraea*, *Viburnum*, *Berberis*).

Conclusions

The above analysis and the data show that typification in the total absence of original material (in the meaning of the latter term in the Code) is a nomenclatural procedure requiring careful assessment of the sources for the type choice. The Code does not exclude any material meeting defined criteria. However, in the case of long-lived plants (trees, shrubs, clonal plants), there is an otherwise neglected source of plant material to be used for preparation of neotype and epitype specimens: living collections of introduced plants (arboreta, parks, formal gardens) where siblings or progenies of the elements of the original material may have survived.

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