Review

Problems Identifying Japanese Cedar Cultivated in the United States

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ADDITIONAL INDEX WORDS. conifer, gymnosperm, ornamental, Japanese cedar

SUMMARY. Japanese cedar [*Cryptomeria japonica* (Thun. ex L.f.) D. Don. (Taxodiaceae)] cultivars have become quite popular in the U.S. landscape and nursery industries. Their popularity is expected to increase as more attractive and adaptable horticultural selections gain recognition. Taxonomic problems include an inadequate inventory of selected variants cultivated in the United States, instability of names at the infraspecific taxonomic level, poor descriptions of the cultivars, and a lack of representative specimens and identification aids to help horticulturists identify unknown specimens. A study of *Cryptomeria japonica* cultivated in the United States is needed to address these problems.

Tripp (1993) reported that Japanese cedar (*Cryptomeria japonica*) cultivars are among the best-adapted conifers for the landscape and nursery industries in the southeastern United States, a region where successful ornamental conifer culture often proves difficult. *Cryptomeria* cultivars performed well in heavy red clay soils during prolonged dry and wet periods, exhibited remarkable tolerance to hot, humid, summer conditions, and are regarded

as nearly pest free (Tripp, 1993). Dirr (1990) noted that *Cryptomeria* cultivars are under used in the southern states and that, with proper cultivar selection, one can use a Japanese cedar in any landscape situation.

The importance of this species as Japan's number one forest tree has greatly added to the potential for new cultivars. Each year more than 200 million seedlings of *C. japonica* are grown, from which superior clones are selected for propagation. Nagao et al. (1989) reported that Japan has collected stands of superior phenotypes covering more than 4 million ha. Creech (1984) indicated that arboreta, such as the National Arboretum, continue to collect seed and cuttings from Japan to evaluate and distribute. Currently, there is a renewed interest in older selections with superior ornamental qualities that are being promoted by other arboreta.

Muto (1975) reported that there are distinct regional races of *Cryptom-*

eria in Japan. Creech (1984) reported that a number of these variants have been introduced into the United States as a result of recent plant collecting efforts. Krüssmann (1985) reported more than 200 races and geographical variants. As a result, there is an inadequate inventory of selected variants cultivated in the United States, a disorganized set of infraspecific plant names, poor descriptions of the variants, and a lack of representative specimens and identification aids to help one identify an unknown specimen.

The selected ornamental cultivars used in the United States nursery and landscape industries are recognized by taxonomists as the lowest rank in their hierarchical scheme of classification. However, historically, taxonomists may have assigned a cultivar a higher rank initially. To address the problems stated above, one must first determine the correct scientific name of the higher ranks. How many species are involved? Are there recognized varieties and forms? The answers are found by examining the literature for a historical perspective of taxonomist's classification of the plants involved.

Taxonomic history

International rules of nomenclature established the starting date for scientific names as 1 May 1753 (Greuter, 1994). The history of Japanese cedar precedes this date. Dallimore and Jackson (1948) reported that Kämpfer discovered the existence of *Cryptomeria* in Japan in 1692 and that Cunningham found it in China in 1702. They further stated that Captain Everard Hume introduced it into England in 1842. A brief synopsis of taxonomic history is presented to explain current taxonomic classification and some of the cultivar problems encountered.

AGE OF DISCOVERY—1775 TO 1941.

Taxonomic history of *Cryptomeria* begins with Carl Thunberg, a Swedish botanist who discovered a new plant species on a collecting trip to Japan. Thunberg wrote a description of the species and collected specimens. Stafleu and Cowan (1986) reported that Thunberg was in Japan in 1775 to 1776, in Ceylon in 1776 to 1777, and back in Sweden in 1779. They also reported that he was appointed botanical demonstrator of Uppsala University in 1777 under the direction of von Linnaeus *filius* (Linnaeus' son). von Linnaeus (1782) published

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Research Project NC0 6104 funded in part by the North Carolina Agricultural Research Service, Raleigh, NC 27695-7643. Use of nursery and trade names in this publication does not imply endorsement by the NCARS of the nurseries or the products mentioned nor criticism of similar ones not mentioned. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

Thunberg's description as *Cupressus japonica* Thunb. ex L.f. [see Stafleu and Cowan (1981) regarding publication date].

Brongniart (1833) reassigned Thunberg's plant to the genus *Taxodium* as *T. japonicum* (Thunb. ex L.f.) Brongn. Don (1839) proposed a new genus *Cryptomeria*, and then reassigned Thunberg's plant as *C. japonica* (Thunb. ex L.f.) D. Don.

von Billain (1853) described a new species from China as *C. fortunei*, named in honor of Robert Fortune, a British plant explorer who collected extensively in China. Miquel (1870) regarded the differences between *C. japonica* and *C. fortunei* as minimal. Therefore, he reduced Billain's species to *C. japonica* var. *sinensis* Miq.

von Billain (1853) also described another new species as *C. lobbiana*. den Ouden and Boom (1965) reported that this species was imported from Japan into the Bogor Botanic Garden (Indonesia) and then imported into Great Britain in 1853 by Theodore Lobb. Carrière (1855) changed the status of this species to *C. japonica* var. *lobbii* (Bill.) Carr. He changed the spelling of the name to represent Lobb as the discoverer of the plant. Dallimore and Jackson (1948) changed the status to cultivar as *C. japonica* 'Lobbii'.

Siebold (1856) discovered a plant in Japan with elongate, unbranched shoots, which he described as a new species, *C. araucarioides*. den Ouden and Boom (1965) reported that Siebold introduced the plant into the Netherlands in 1859. Gordon (1862) changed the status of this species to *C. japonica* var. *araucarioides* (Siebold) Gordon. Henkle and Hochstetter (1865) then changed the status to *C. japonica* f. *araucarioides* (Siebold) Henkle and W. Hochst.

Makoy (1864) described a new species with juvenile, linear leaves as *C. elegans*. Masters (1881) concluded that Makoy's species was a juvenile revision and, thus, treated it as *C. japonica* var. *elegans* (Makoy) Mast. Dallimore and Jackson (1948) changed the status to cultivar as *C. japonica* 'Elegans'.

Carrière (1870) described a new species as *C. nigricans* based on a plant he found growing in a bed of seedlings originating from Japan. den Ouden and Boom (1965) treated Carrière's species as *C. japonica* 'Nigricans' and reported that 'Nigricans' is no longer known in cultivation.

Krausse (1906) described the Japanese cedar commonly cultivated in Germany as *C. generalis*, citing *C. japonica* in synonymy. This name is superfluous, as when published it included the name *C. japonica*, which should have been adopted. Welch (1993) recognized this name as "an invalid name: probably representing the normal form, i.e. var. *japonica*."

Léveillé (1916) described a new species as *Cupressus mairei*, whereas Hayata (1917) described a similar plant as a new species, *Cryptomeria kawaii*. Beissner and Fitschen (1930) changed the status of the latter to *Cryptomeria japonica* var. *kawaii* (Hayata) Beissner and Fitschen. Nakai (1937) recognized Léveillé's species and transferred it to *Cryptomeria* as *C. mairei* (Léveillé) Nakai, with *Cupressus mairei* and *Cryptomeria kawaii* in synonymy. He stated "I can not agree with the opinion of many botanists who mix the Chinese *Cryptomeria* with the Japanese. The home of the Chinese *Cryptomeria* is too much detached from the Japanese, the southern most of the limit of the latter being the Island Yakushima located off the south end of Kyushu." Krüssmann (1985) recognized *C. japonica* var. *sinensis* with *C. kawaii* and *C. japonica* var. *kawaii* in synonymy.

Nakai (1941) described a new variety as *C. japonica* var. *radicans* and indicated that it had a distinct geographical range, variation in foliar morphology, and an increased potential to form adventitious roots compared to var. *japonica* or var. *sinensis*.

AGE OF INVENTORIES—1923 TO PRESENT. All modern publications of Japanese cedars are authored by Europeans and are included within books on gymnosperms. These inventories included many cultivars under *C. japonica*, the only recognized species of *Cryptomeria*. Early editions of books by Hornibrook (1923) and Dallimore and Jackson (1923) were the first inventories to name morphological variations within *C. japonica*, but these first editions are now out of print. Named cultivars were described as varieties, but the status of some was changed to cultivars in later book editions published by Hornibrook (1938) and Dallimore and Jackson (1948). The number of recognized varieties and cultivars fluctuated in more modern references (den Ouden and Boom, 1965; Krüssman, 1985; Welch, 1979).

Welch, the international registrar for gymnosperms, has the recognized authoritative reference (Welch, 1991), listing 48 cultivars, two varieties and one form, with additional names as probable synonyms. Descriptions are qualitative with limited quantitative characters for segregation. Welch (1991) also discussed nomenclatural problems with synonymy.

Tripp (1993) compiled the most recent inventory, describing 45 cultivars. Descriptions are qualitative also with limited quantitative characters. Three new cultivars are included. She reported nomenclatural problems that needed attention, such as the obvious discrepancies occurring between descriptions bearing the same cultivar name. Tripp's inventory is focused more on culture than taxonomy.

Welch (1993) published a world checklist of conifer names, including *Cryptomeria*. Recognized and invalid names are included. This authoritative source lacks descriptions, therefore it is not helpful to the horticultural community for identifying plant cultivars.

Taxonomic classification

GENUS. *Cryptomeria* (Taxodiaceae) is segregated from other genera by mature seed cones and vegetative morphology. Female cones are persistent with 20 to 30 woody scale-bracts with each bearing three to five seeds. Scale-bracts have three to six claw-like appendages (or processes) at their apex. Foliage is evergreen, spirally arranged in five ranks, and saber-like (triangular to quadrangular in cross-section). The two to four cotyledons are linear.

SPECIES. *Cryptomeria japonica* currently is the only recognized species in the genus. It is native to southern China (Yunnan) and Japan. Numata (1974) reported the original distribution of *C. japonica* in Japan as being from Akita and Aomori Prefecture in northeast Honshu to Yakushima island south of Kyushu. He further stated that Hokkaido island and the dry areas in southern Kyushu adjacent to the Seto inland sea are lacking in natural occurrences of *C. japonica*. This range covers most of the principle Japanese islands. Numata (1974) reported that Japanese cedar is the foremost used tree in man-made Japanese forest plantations. Therefore, forestry practices increased the natural range of *Cryptomeria* on the Japanese islands. Creech (1984) reported that Japanese

Table 1. Checklist of infraspecific taxa of *Cryptomeria japonica*.

Alba Variegata	Eisan-sugi	Jindai-sugi	Mucronata	Spiraliter Falcata
Albospica	Elegans	Juvenile	Mure-sugi	Taisho-tama
Albovariegata	Elegans Aurea	var. kawaii	Nana	Taisho-tamasugi
Alpina	Elegans Compacta	Kewensis	Nana Albospica	Tansu
Antique Gold	Elegans Gracilis	Kilmacurragh	Nana Albo-spicata	Tansu Sport
f. araucarioides	Elegans Nana	Kitayama-dai	Nankin-sugi	Tara
Araucarioides	Elegans Plumosa	Knptonensis	National Arboretum	Tashi
Archer's Greenbush	Elegans Variegata	Kohui	Witches Broom	Tateyama
Archer's Redbush	Elegans Viridis	Kokuryow	Nejire-sugi	Tenuifolia
Argenteospicata	f. elongata	Kokuryu	Nigricans	Tenzan
Argenteovariegata	Enko-sugi	Koshija-yatsubusa	Nochide	Tenzan-sugi
Aritaki	Ericoides	Koshiji	Nyewoods Form	Tenzan-yatsubusa
Ashio-sugi	Fasciata	Koshiju	Ogon	Tilford Gold
Athrotaxoides	Filifera	Koshyi	Ogon-sugi	Torta
Aurea	Fi-sugi	Kowby	Okina	To-sugi
Aureovariegata	Fuiri-banda	Koyo-sugi	Okina-sugi	Typica
Aurescens	f. generalis	Kukamiga	Osaka-tama	f. uncinata
Aya-sugi	Gigantea	f. kuro-sugi	Osaka Tama-sugi	Uncinata
Bandai-sugi	Giokumo	Kusari-sugi	Pendula	Unryu
Bandai-Tongi	Globes	Kyoto-ito-sugi	Pendulata	Ura-sugi
Bandi-sugi	Globosa	Little Diamond	Phoenix	Variegata
Barabits Gold	Globosa Compacta	Little Globe	Pickard's Gold	var. vera
Beaumont's Dwarf	Nana	Little Gnome	Pipo	Vilmorin Gold
f. beni-sugi	Globosa Nana	Littleworth Dwarf	Plumosa	Vilmoriniana
Benjamin Franklin	Globus	Littleworth Gnom	Pomona	Vilmorin Variegated
Bennie's Best	Gold	Lobbii	Pungens	Viminalis
Birodo-sugi	Gold Tip	Lobbii Compacta	Pungens Rubiginosa	Virgata
Black Dragon	Gracilis	Lobbii Nana	Pygmaea	Viridis
Bloomers Witches	Granny's Ringlets	Lobbii Nana Aurea	Pyramidalis	Vitellina
Broom	Green Pencil	Lycopodioides	Pyramidata	Winter Bronze
Broom	Gyokruya	Lynn's Ringlets	f. radicans	Winter Mint
Buckiscope	Gyokruyu	Macrocarpa	var. radicans	Wogon
Caespitosa	Gyokuryu	Macrocephala	Rasen	Wogon-sugi
Chabo-sugi	Haggo	Majiro	Rasen-sugi	Wood's Dwarf
Clark's Mossy	Ha-o-sugi	Majiro-sugi	Rein's Dense Jade	Yaku
f. clathrata	Hime	Manhishi	Rubiginosa	Yamamoto
Compacta	Hime-ikari-sugi	Manhismi-sugi	Ryoku	Yataduta
Compacta Nana	Hime-sugi	Mankichi	Sandersii	Yatsubasa
Compacta Nana	Hino-sugi	Mankichi-sugi	Satsamanka	Yawa-sugi
Glauc	f. honsugi	Mankitiana	Sekkan	Yellow Twig
Compactoglobosa	Hoo-o-sugi	Marj	Sekkan Dwarf	Yenko-sugi
Compressa	Howo-sugi	Midare	Sekkan-sugi	Yokohama
Crassifolia	f. huberiana	Midare-sugi	Sekka-sugi	Yore-sugi
Cristata	Husari-sugi	Midori	Sekkwia-sugi	Yoshino
Cristata Falcata	Ikari	Mitama-sugi	Selaginoides	Yuantouliusha
Cupressa	Ikari-sugi	Miyazima	Sennin-sugi	Zindai
Dacrydioides	Ikar-sugi	Monstrosa	Shishi-gashira	Zwerg Form
Dai-sugi	Ito-sugi	Monstrosa	var. sinensis	
Douglasii	var. japonica	Compacta	Spiralis	
Dutch Discovery	'Akita Strain'	Monstrosa Nana	Spiralis Elongata	

cedar is so highly planted in Japan that it is almost never out of sight.

VARIETIES. The taxonomic rank below a species is *varietas* or variety, a rank assigned to wild populations that are morphologically distinct variations of a species and often separated geographically. Three varieties (var.

japonica, var. *radicans*, var. *sinensis*) are recognized currently by most botanists. Environmental factors provided three geographical ranges, an important determinate of segregation of each variety.

Numata (1974) reported that the Japanese islands are formed by a volca-

nic mountain range rising more than 10,000 m above the ocean floor. Japanese vegetation can be divided into two types. Variety *japonica* is distributed in Japan in the Pacific-type range, limited to the eastern side of the mountain range and characterized as living under moderate temperatures with

snowfall only at higher elevations. The lower branches spread and are deciduous with age.

Variety *radicans* is distributed in Japan in the Sea of Japan-type range, limited to the western side of the mountain range and characterized as living under cooler temperatures and heavier snowfall. Variety *radicans* is characterized as morphologically similar to var. *japonica*; however, the lower branches persist, bending downward with age with adventitious roots borne when contact is made with soil. It also has a more vigorous growth rate and a denser crown. Krüssmann (1985) reported this variety as a very important timber tree in Japan.

Variety *sinensis* is distributed in the Yunnan Province of China. It is distinguished morphologically from the other two by more open branching, pendulous and slender shoots, and longer and thinner leaves. Cones have fewer than 20 scale-bracts with only two seeds per scale.

FORMS. The taxonomic rank below a variety is *forma*, a rank assigned to members of a population that share a distinct morphological variation. Two forms are currently recognized by botanists. Forma *japonica* has elongated primary shoots with prominent lateral shoots. Forma *araucarioides* originated as a seedling variant distinguishable by more elongated primary shoots that are either unbranched, or branched apically with tufts of short shoots. Welch (1991) encouraged the use of this name to help reduce nomenclatural confusion in cultivars. A number of cultivars of this form are found in public gardens only, thus they are not common in the trade.

Taxonomic problems

There are several taxonomic problems associated with the recent introduction of selected cultivars of *C. japonica* into cultivation in the United States.

INADEQUATE UNITED STATES INVENTORY. A thorough inventory of taxa of *C. japonica* cultivated in the United States is lacking. Modern references, as noted above, included taxa commonly cultivated in Europe. Welch (1993) cited a number of cultivars recently introduced into the United States' nursery and landscape industries with illegitimate names.

NOMENCLATURE INSTABILITY. There are nomenclatural questions that need

to be addressed for taxa at the infraspecific level to provide a modern stability of names. What is the correct name and synonym associated with each cultivar? Table 1 provides a compilation of potential names available from literature for taxa cultivated in the United States. Could this list be reduced when names are combined as synonyms according to recommendations in the recent literature (Dallimore and Jackson, 1948; den Ouden and Boom, 1965; Hornibrook 1938; Krüssmann, 1985; Welch, 1979; Welch, 1991)? Which names belong to taxa no longer in cultivation? Which names belong to taxa not found cultivated in the United States? Confusion still exists in the literature between a number of cultivars. For example, the name 'Spiraliter Falcata' is used to describe two distinct taxa, one with congested, spirally twisted shoots and the other with elongated, spirally twisted shoots. Are there other names currently applied to taxa that present problems and warrant further investigation?

POOR DESCRIPTIONS. Modern treatments have described taxa qualitatively with limited quantitative measurements, as noted above. Descriptions are brief and include characteristics that could apply to several selections. Relative terms are used that are misinterpreted often by readers and lead to misidentifications. Detailed descriptions, including measurements of those identifying characters, are lacking or incomplete in the literature. Quantitative descriptions rely on those macromorphological characters that can be measured (e.g., length of branches, leaves, and scale-bracts; widths of leaves, glaucous bands; and number of secondary and tertiary branches in a growing season) or characters interpreted consistently by users (e.g., leaf type, shape of leaves and scale-bracts, leaf orientation, and presence or absence of glaucous bands). These characters can be used to compare taxa and segregate and identify taxa.

Tripp (1993) reported a number of new introductions in the United States that have not been described in any European literature. These selections need to be examined, descriptions need to be written, and comparisons need to be made with existing taxa.

LACK OF IDENTIFICATION AIDS. Identification aids to cultivars of *C. japonica*

are scarce. Krüssmann (1985) provided some photocopied images of branchlets with black-and-white photos of growth form. Welch (1991) published photographs of the more common cultivars and van Gelderen and Hoey Smith (1986) published a photographic manual with 30 plates. Growth forms are similar in many cultivars, thus, photographs of different cultivars look similar. Line drawings of cultivars are lacking, as are taxonomic keys.

LACK OF REPRESENTATIVE SPECIMENS.

There is a lack of representative vouchers of cultivars deposited in herbaria. Botanical gardens and arboreta are important repositories for living germplasm collections. Unfortunately, many taxa are lacking in these collections.

Conclusions

Japanese cedar is increasing in popularity in the eastern United States. Taxonomically, there are several problems that need attention. A taxonomic publication is needed of *C. japonica* cultivated in the eastern United States, one that should include 1) an inventory of taxa, 2) correct scientific names and synonyms, 3) quantitative descriptions, 4) identification aids such as taxonomic keys for segregation of taxa, and 5) documentation of germplasm as a reference collection. A study is in progress at North Carolina State University to address these problems and provide a taxonomic contribution to cultivated *Cryptomeria*.

Literature cited

- Beissner, L. and J. Fitschen. 1930. Handbuch der nadelholzkunde. 3rd ed. Aufl., Berlin.
- Brongniart, A. 1833. Note sur quelques Conifères de la tribu des Cupressinées. Ann. Sci. Nat. (Paris) ser. 1, 30:176-191.
- Carrière, E.A. 1855. Traite general des conifères. By author, Paris.
- Carrière, E.A. 1870. *Cryptomeria nigricans*. Rev. Hort. 1870:119-120.
- Creech, J.L. 1984. *Cryptomeria* has many landscape uses. Amer. Nurseryman 159(5):46-47.
- Dallimore, W. and B.A. Jackson. 1923. A handbook of Coniferae including Ginkgoaceae. 1st ed. E. Arnold, London.
- Dallimore, W. and B.A. Jackson. 1948. A handbook of Coniferae including Ginkgoaceae. 3rd ed. E. Arnold, London.

- Den Ouden, P. and B.K. Boom. 1965. Manual of cultivated conifers hardy in the cold- and warm-temperate zone. Martinus Nijhoff, The Hague, Netherlands.
- Dirr, M.A. 1990. Manual of woody landscape plants: Their identification, ornamental characteristics, culture, propagation and uses. Stipes Publishing Co., Champaign, Ill.
- Don, D. 1839. Descriptions of the two new genera of the natural family of plants called Coniferae. Trans. Linn. Soc. London 18:163-179.
- Gordon, G. 1862. A supplement to Gordon's pinetum. Henry G. Bohn, London.
- Greuter, W. (ed.). 1994. International code of botanic nomenclature (Tokyo code). Koeltz Scientific Books, Königstein, Germany.
- Hayata, B. 1917. Some conifers from Tonkin and Yunnan. Bot. Mag. (Tokyo) 31:113-119.
- Henkel, J.B. and W. Hochstetter. 1865. Synopsis der nadelholzer. Stuttgart, Germany.
- Hornibrook, M. 1923. Dwarf and slow growing conifers. Country Life Limited, London.
- Hornibrook, M. 1938. Dwarf and slow growing conifers. Country Life Limited, London.
- Krausse, E.H.L. 1906. *Cryptomeria generalis*. In: J. Sturm (ed.). Flora von Deutschland 2nd ed. 1:23. Verlag von K. G. Lutz, Stuttgart, Germany.
- Krüssmann, G. 1985. Manual of cultivated conifers. Timber Press, Portland, Ore.
- Léveillé, A.A.H. 1916. Catalogue des plantes Yun-Nan. 4:49-64. A.A.H. Léveillé Publisher, LeMans, France.
- Makoy, D. 1864. *Cryptomeria*. Belgique Hort. 14:356.
- Masters, M. T. 1881. On the conifers of Japan. *Cryptomeria*. J. Linn. Soc. Bot. London 18:497-498.
- Miquel, F.A.W. 1870. Coniferales. In: P.F. von Siebold and J.G. Zuccarini (eds.). Flora Japonica 2:45-89. Apud auctorem, Leiden, The Netherlands.
- Muto, A. 1975. Needle variation in natural populations of *Cryptomeria japonica* D. Don., Bul. Gov. For. Expt. Sta. 227:21-40.
- Nagao, A., R. Pharis, and S. Sasaki. 1989. Handbook of flowering, vol. 6. CRC Press, Boca Raton, Fla.
- Nakai, T. 1937. Notulae ad plantas Asiae Orientalis. I. J. Jpn. Bot. 13:393-406.
- Nakai, T. 1941. Iconographia plantarum Asiae orientalis, vol. 4. Shunyodu Soten, Tokyo.
- Numata, E.M. 1974. The flora and vegetation of Japan. Kodansha Limited, Tokyo.
- Siebold, P.F. 1856. Catalogue raisonne. Henry and Cohen, Leide and Bohn.
- Stafleu, F.A. and R.S. Cowan. 1981. Taxonomic literature. vol. 3: Lh-O. Bohn, Scheltema, and Holkema, Utrecht, The Netherlands.
- Stafleu, F.A. and R.S. Cowan. 1986. Taxonomic literature. volume 6. Sti-Vuy. Bohn, Scheltema, and Holkema, Utrecht, The Netherlands.
- Tripp, K.E. 1993. Sugi: The ancient Japanese cedar finds new life in a profusion of outstanding cultivar forms. Amer. Nurseryman 178(7):26-39.
- van Gelderen, D.M. and van J.R.P. Hoey Smith. 1986. Conifers 2nd ed. Timber Press, Portland, Ore.
- von Billain, B. 1853. *Cryptomeria fortunei*; *Cryptomeria lobbiana*. In: C.E. Otto and A.G. Dietrich (eds.). Allg. Gartenzeitung 21:233-234.
- von Linnaeus, C. *filius*. 1782. Supplementum plantarum. Impensis orphanotrophei, Braunschweig, Germany. p. 421.
- Welch, H.J. 1979. Manual of dwarf conifers. Theophrastus, Little Compton, R.I.
- Welch, H.J. 1991. The conifer manual. Kluwer Academic Press, Boston.
- Welch, H.J. 1993. The world checklist of conifers. Landsman's Bookshop Ltd., Herefordshire, England.