



<https://doi.org/10.15407/ukrbotj80.06.439>

RESEARCH ARTICLE

The genus *Artemisia* (*Asteraceae*) in the historical collection of W.S.J.G. Besser (KW-BESS) at the National Herbarium of Ukraine (KW)

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Abstract. Our herbarium inventory revealed that the collection of specimens of the genus *Artemisia* (*Asteraceae*) in the memorial collection of W.S.J.G. Besser (KW-BESS) at the National Herbarium of Ukraine (KW) contains at least 1186 herbarium sheets. The collection of specimens of *Artemisia* is stored in folders Nos. 234–249 of the Besser herbarium. Each folder contains individual paper folders (here termed taxon covers). In total, there are 217 individual taxon folders. Our analysis of protologues and herbarium labels demonstrated that the KW-BESS collection contains types and/or other original specimens in 118 taxon folders, but much more actual types of species-rank and infraspecific names. Additional analysis of their possible type status is needed for specimens in 28 taxon folders. The KW-BESS collection contains authentic and historical specimens of such famous researchers and collectors of the 19th century as A. Bunge, L.K.A. Chamisso, A.P. de Candolle, D. Douglas, J.F.G. Eschscholtz, F.E.L. Fischer, J.É. Gay, A. Gray, J.D. Hooker, V.V. Jacquemont, G.S. Karelin and I.P. Kirilov, K.F. Ledebour, A.F. Marschall von Bieberstein, C.A. Meyer, T. Nuttall, J.D. Prescott, Ch. Steven, N.S. Turczaninow, N. Wallich, etc. We present and discuss here some examples of labels written by Besser and several other famous botanists. Our preliminary assessment of this globally important collection established the foundations for further nomenclatural and taxonomic studies of *Artemisia*, in particular, those based on historical specimens at KW.

Keywords: *Artemisia*, Besser, herbarium, historical collection, KW, KW-BESS, taxonomy, Ukraine

Artemisia L. (*Asteraceae*) is an extremely diverse and economically and ecologically important genus, with many species used as medicinal, technical, aromatic, ornamental, fodder, and other useful plants. Medicinal properties of some species of *Artemisia* were widely known already in ancient Egypt, China, Greece, and Rome, and were reflected in early written sources and in traditional

knowledge (e.g., Pliny, 1966; Dybas, 2016; Wright, 2022, etc.). Many species have long been used in scientific, folk, and traditional medicine systems. At least some species are reported to contain antiviral components (see Boiko, 2001, and references therein). With the spread of the novel coronavirus COVID-19 in the world, research work with species of *Artemisia* intensified and it demonstrated

ARTICLE HISTORY. Submitted 28 October 2022. Revised 06 December 2023. Published 18 December 2023

CITATION. Boiko G.V., Antonenko S.I., Mosyakin S.L. 2023. The genus *Artemisia* (*Asteraceae*) in the historical herbarium collection of W.S.J.G. Besser (KW-BESS) at the National Herbarium of Ukraine (KW). *Ukrainian Botanical Journal*, 80(6): 439–452. <https://doi.org/10.15407/ukrbotj80.06.439>

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that they have great potential in medicine. Today, at the scientific portal ResearchGate the search for the keywords "Artemisia" + "COVID" (<https://www.researchgate.net/search.Search.html?query=Artemisia+sars+19&type=publication&limit=10&offset=20>) provides dozens of scientific articles devoted to the use of various compounds obtained from *Artemisia* in the treatment of COVID-19 and some other health problems. Species of *Artemisia* are also ecologically important as key components of many plant communities and ecosystems worldwide, particularly in arid regions where they are often dominant or subdominant taxa, playing a critical role in shaping habitats and providing ecosystem services (see Tutin et al., 1980; Shultz, 2006; Ling et al., 2011, etc.). Many species of *Artemisia* (such as *A. verlotiorum* Lamotte, *A. vulgaris* L., etc.) are also known as agricultural and/or environmental weeds and invasive aliens in many parts of the world outside their native ranges (see Barney, DiTommaso, 2003; Verloove, Andeweg, 2020; Verloove et al., 2021, and references therein).

Artemisia is considered to be one of the largest and taxonomically most complicated genera in the family *Asteraceae*. Species of that genus, which are commonly known under the names mugwort, wormwood, sagebrush, etc., are often characterized by their considerable infraspecific polymorphism and variability of many morphological characters. This sometimes leads to inconsistencies in the proper taxonomic understanding and circumscription of many taxa, so quite often it is even impossible to say with certainty which species was actually involved in some biochemical, molecular, ecological, agricultural or other studies. In order to ensure the reliability of scientific data and conclusions, we must have proper and reliable information about the taxonomy of the genus. In particular, all plant taxa studied by any methods and techniques should be reliably identified with correctly applied scientific names. The proper taxonomic application of scientific names of taxa (from the rank of family and below) is determined by their nomenclatural types (Art. 7.1 of the *International Code of Nomenclature for algae, fungi, and plants* — *ICN*; Turland et al., 2018). Consequently, proper type designations are crucially important for developing a reliable taxonomic scheme in *Artemisia*, especially in view of the ongoing attempts to build a concise phylogenetically based system of the genus (see Torrell et al., 1999; Watson et al., 2002; Jiao et al., 2023, and references therein).

Nomenclatural types of the names of taxa of *Artemisia* are now deposited in many herbarium collections of the world. Historical collections of the 18th and 19th centuries are particularly important in that regard because they contain the largest number of types and other original or representative specimens used by prominent botanists of the past who described numerous new taxa from all parts of the vast geographic range of *Artemisia*. In that respect, the historical herbarium collections currently preserved at the National Herbarium of Ukraine (KW — the Herbarium of the M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine; herbarium acronyms here and below follow *Index Herbariorum*: Thiers, 2008–onward; see also Shiyan, 2011) are especially important. A possible loss of such collections, the chances for which increased significantly during the ongoing aggressive war waged by Russia against Ukraine that affected Ukraine's historical and cultural heritage, including herbaria (see examples in Mosyakin, Shiyan, 2022; Mosyakin et al., 2023), would be irreplaceable for the global plant science and Ukraine's historical and cultural heritage.

Digitization of herbarium collections, which is aimed at preserving digital electronic analogues of specimens (including high-resolution images of specimens and associated information), is now a worldwide practice (e.g., Ryan, 2013, 2016; Smith, Figueiredo, 2014, etc.). Sending actual samples (especially types) for investigation from one herbarium to another also carries certain risks for the preservation of valuable specimens, so it is not so commonly practiced today as it used to be before. Since all plant taxa studied by any methods and techniques must be reliably identified and labeled with their correct (i.e., nomenclaturally legitimate and currently accepted) scientific names, taxonomic identification of specimens, transcription of labels, search and analysis of protologues, identification of type and other original and historical specimens of species of *Artemisia*, as well as the analysis of the obtained results, will significantly improve our understanding of the taxonomy and nomenclature of representatives of the genus around the world, and will also lay the foundations for any further taxonomic and other studies of *Artemisia* (Mosyakin et al., 2017, 2018).

The National Herbarium of Ukraine (KW, the Herbarium of the M.G. Kholodny Institute of Botany of the National Academy of Sciences of Ukraine)

is the largest and, undoubtedly, most important herbarium collection in Ukraine, currently holding more than 2,263,000 specimens (Shiyan, 2011; Mosyakin, Shiyan, 2021). It is listed in *Index Herbariorum* (Thiers, 2008–onward) as one of the most important herbaria in the world. According to the 2021 *Index Herbariorum Annual Report* (available at: https://sweetgum.nybg.org/science/wp-content/uploads/2022/02/The_Worlds_Herbaria_Jan_2022.pdf), the KW herbarium is ranked as the 29th collection in the world and the 21st herbarium in Europe in terms of the number of specimens (among, in total, 3,522 active herbaria registered in the world by the date of the *Report*).

Among its valuable collections and specimens, the KW Herbarium holds the memorial collection of W.S.J.G. Besser (KW-BESS), which includes more than 60,000 herbarium sheets. The collection is mostly formed by specimens collected by Besser himself and by some of his followers and/or associates, of whose the most prominent researcher was his student Antoni Andrzejowski (see Andrzejowski, 1823, 1830; Shevera et al., 2018), mainly in the territory of the Right-Bank region of Ukraine (the Ukrainian mainland west of the Dnipro [Dnieper] River), the Black Sea region of Ukraine, as well as herbarium specimens provided by many other collectors from various parts of Europe, Asia, Africa, the Americas, and Australia (see Trautvetter, 1843; Barbarych, 1960; Stafleu, Cowan, 1976; Shiyan, 2011, etc.). Most of these plant specimens are currently unmounted, they are preserved in folders made of coarse gray paper (ca. 40 × 25 cm), which are bound in larger folders or bundles containing 100 or more herbarium sheets each. There is no general catalog of the collection available yet (Shiyan, 2011).

Wilibald Swibert Josef Gottlieb von Besser (Innsbruck, Austria, 07 July 1784 — Kremenets, the former Russian Empire, now Ternopil Region, Ukraine, 23 October 1842) is known as an outstanding naturalist (botanist, entomologist, etc.), educator, public servant, and doctor. Since 1797 (when he lost his both parents), he was raised in the family of his godfather, Swibert Burkhart Schivereck, who was a professor of botany at Lviv University and whose influence determined the further life of Besser. After graduating from the Lviv Gymnasium, he studied first at the University of Lwów (now the Ivan Franko National University of Lviv), and then at the University of Kraków. In 1809 he moved to the town of Kremenets (also Kremine-

ts), where he became a teacher of zoology and botany and the director of a botanical garden at the Volhyn Gymnasium (Gimnazjum Wołyńskie; since 1818 a lyceum — Liceum Krzemienieckie or Liceum Wołyńskie). Under Besser's leadership, the Kremenets Botanical Garden became a well-known botanical institution with rich plant collections of about 12,000 species, varieties, and cultivars. Specimens of species cultivated in the botanical garden are also present in the KW-BESS herbarium collection (Fig. 1A). After the closure of the Kremenets Lyceum in the aftermath of the November Uprising of 1831 (also known as the Polish-Russian War of 1830–1831) and the subsequent foundation of Kyiv University [official name: the Saint Vladimir Imperial University of Kiev, now the Taras Shevchenko National University of Kyiv] in 1834, the collections and partly also plants from the botanical garden of the lyceum were transferred from Kremenets to the newly established university, and Besser was appointed to the Professor of Botany position at this university, which he held during 1834–1838 (Trautvetter, 1843; Lipschitz, 1947; Barbarych, 1960).

The KW-BESS herbarium contains a unique collection of herbarium specimens of *Artemisia*, a genus that was among the main scientific interests of Besser. This historical collection is amazingly rich in type specimens from all over the world; some of these specimens (however, only a small part of the whole collection) have already been properly identified as types, scanned, and added to databases during the implementation of projects of the Global Plants Initiative (see *JSTOR Global Plants*: <https://plants.jstor.org/>), but the vast majority of type specimens in that collection still remains in the general collection, pending proper identification, curation, and further research.

The contribution of Besser to studies of the genus *Artemisia* was considerable since he was one of the earliest monographers of the genus worldwide. In particular, Besser proposed probably the first natural subdivision of the genus into sections and other groups, which are still recognized today (of course, with proper modifications and often at different ranks, e.g. subgenera or taxa of other ranks). In total, Besser described and validated more than 200 new taxa of *Artemisia* at various ranks. His main contributions to taxonomy of the genus were published during 1829–1841 (Besser, 1829, 1832, 1834a, 1834b, 1835, 1836, 1841). He also contributed to the fundamental global overview of *Artemisia*

for the famous *Prodromus...* by A.-P. de Candolle (Candolle, 1837 [1838]). In his treatment of *Artemisia* in *Prodromus...*, de Candolle (1837) specially emphasized that he closely followed the taxonomic scheme proposed by Besser, and also used his unpublished manuscripts.

Many taxa described by Besser are widely and almost universally recognized in standard floras and taxonomic treatments since the mid-19th century until present (e.g., Hooker, 1833; Ledebour, 1845; Diels, 1912; Polyakov, 1961; Klokov, 1962; Tutin et al., 1980; Leonova, 1994; Filatova, 2003; Shultz, 2006; Ling et al., 2011; etc.).

The collection of specimens of *Artemisia* is stored in folders Nos. 234–249 of KW-BESS. Each folder contains individual paper folders (termed here taxon covers; see Bridson, Forman, 1992: 107), usually with names of taxa (species, varieties, sometimes also informal or provisional names) indicated on them (Fig. 1C). In total, there are 217 individual taxon folders/covers. There is also an additional individual folder with doubtfully identified and unidentified specimens ("Artemisiae species dubie determinatae et indeterminatae") and two unnamed folders (see Table 1). Ninety-four taxon covers contain one herbarium sheet each, while other such covers contain from two to 52 herbarium sheets, with numerous handwritten descriptions of infraspecific taxa, especially for morphologically variable and taxonomically complex species or species groups (e.g., taxon covers of *Artemisia campestris* L. sensu lato — 66 herbarium sheets, *A. vulgaris* L. sensu lato — 60, *A. desertorum* Willd. — 56, *A. maritima* L. — 55, etc.). Quite often taxon covers contain specimens newly identified and/or revised by Besser, and his revised identifications may not correspond to the taxon name initially indicated on a taxon folder. For example, the taxon folder entitled "*Artemisia arenaria* DC." also contains type specimens of *Artemisia trautvetteriana* Besser and *A. tschernieviana* Besser.

Our identification of specimens and analysis of protologues of taxa of *Artemisia* described by Besser (Besser, 1829, 1832, 1834a, 1834b, 1835, 1836, 1841; Candolle, 1837 [1838]) demonstrated rather confidently that the KW-BESS collection contains types and/or other original specimens in 118 taxon folders, but the actual number of type specimens of species-rank and infraspecific names is much higher. Additional analysis of their possible type status is needed for specimens in 28 taxon

folders, and this analysis will definitely reveal additional types. Apparently, some species-rank names present on sheets and labels have never been published by Besser or other authors and collectors; i.e., those are invalid names mentioned only on herbarium labels.

The herbarium collection of Besser began to be accumulated on the basis of the herbarium inherited from his mentor S.B. Schivereck (see above), his own collections in nature and samples of plants cultivated in Kremenets, and later with additions of collections sent to him by amateur and professional botanists, and also numerous specimens collected by his student A.L. Andrzejowski (Trautvetter, 1843; Barbarych, 1960; Shevera et al., 2018). A significant part of the collection consists of specimens received (as exchange, purchase, or gifts) by Besser from fellow botanists, many of whom he mentioned in introductory paragraphs of his publications (Besser, 1829, 1832, 1834a, 1834b, 1835, 1836, 1841). In the 19th century both professional and amateur botanists and naturalists maintained quite an active exchange of herbarium specimens, and because of that many duplicate specimens of prominent collectors of that period are available in many, or at least several, world herbaria. A search for specimens collected by Besser performed at the JSTOR Global Plants (<https://plants.jstor.org/>) on 23 October 2023 resulted in 465 records of digitized specimens from numerous herbaria, especially K (174 specimens) and G-DC (167 specimens). The Geneva Herbaria Catalogue (<https://www.ville-ge.ch/musinfo/bd/cjb/chg/index.php?lang=en>) currently holds information about 239 specimens collected (or provided) by Besser that are present in collections at G (including G-DC, see above). Lanjou and Stafleu (1954) list 18 herbaria (B, BR, BP (210), CGE, CW, FI, G (300), G-DC, K, KW, L, LE, LZ, M, MO, OXF, P (338), WAG), in which herbarium specimens of Besser are known to be deposited, and this list is most probably still incomplete.

Our assessment has demonstrated that KW-BESS contains original and other historical specimens of such well-known researchers of the 19th century as A. Bunge, L.K.A. Chamisso, A.P. de Candolle, D. Douglas, J.F.G. Eschscholtz, F.E.L. [F.B.] Fischer, J.É. Gay, A. Gray, J.D. Hooker, V.V. Jacquemont, G.S. Karelin and I.P. Kirilov, K.F. Ledebour, A.F. Marshall von Bieberstein, C.A. Meyer, T. Nuttall, J.D. Prescott, Ch. Steven, N.S. Turczaninow, N. Wallich, and many others.

Table 1. **Inventory of the collection of specimens of *Artemisia* in the memorial collection of W.S.J.G. Besser (KW-BESS)**
 Currently unplaced and presumably invalid taxon names are marked with the * sign; + indicates taxon folders with types and/or other original specimens; – indicates taxon folders in which original material is absent; ? — additional evaluation is needed

Taxon folders (exactly as originally written on folders)	Number of herbarium sheets in a taxon folder	Type or other original specimens	Taxon folders (exactly as originally written on folders)	Number of herbarium sheets in a taxon folder	Type or other original specimens
<i>Artemisia Abrotanum</i> L.	4	–	<i>Artemisia canariensis</i> Bess.	2	?
<i>Artemisia Absinthium</i> L.	24	+	<i>Artemisia canescens</i>	1	–
<i>Artemisia acetica</i> Jacquem.	1	?	<i>Artemisia capillifolia</i>	1	–
<i>Artemisia achilleoides</i> Turcz.	1	+	<i>Artemisia carvifolia</i> Wall.	2	+
<i>Artemisia Adamsii</i> Bess.	3	+	<i>Artemisia Caucasica</i> Willd.	1	–
<i>Artemisia afra</i> Jacq.	1	–	<i>Artemisia caudata</i> Mich.	2	–
<i>Artemisia altaica</i> Fisch.	1	?	<i>Artemisia chamemaelifolia</i> Vill.	12	+
<i>Artemisia ambigua</i>	1	–	<i>Artemisia Chamissoniana</i> Bess.	2	+
<i>Artemisia anethifolia</i> Stechm.	4	–	<i>Artemisia chinensis</i> L.	2	+
<i>Artemisia annua</i> L.	23	+	<i>Artemisia coarctata</i>	1	+
<i>Artemisia aprica</i> Ledeb.	2	–	<i>Artemisia coerulescens</i> L.	9	+
<i>Artemisia arborescens</i>	6	–	<i>Artemisia commutata</i> Bess.	18	+
<i>Artemisia arctica</i>	3	+	[<i>Artemisia compacta</i>]	5	+
<i>Artemisia arenaria</i> DC.	7	+	* <i>Artemisia corymbosa</i> Vill.	3	+
<i>Artemisia argentea</i>	3	–	<i>Artemisia crithmifolia</i> L.	4	+
<i>Artemisia argyrophylla</i> Led.	1	–	<i>Artemisia curilensis</i>	1	?
<i>Artemisia armeniaca</i> Lam.	10	+	<i>Artemisia Deliliana</i>	1	+
<i>Artemisia arragonensis</i> Lam.	5	+	<i>Artemisia densiflora</i> Viv.	1	?
<i>Artemisia atrata</i> Lam.	1	–	<i>Artemisia desertorum</i> W.	48	+
<i>Artemisia atropurpurea</i>	1	+	<i>Artemisia desertorum</i> var.		
<i>Artemisia austriaca</i>	29	+	<i>Sprengeliana</i>	8	+
<i>Artemisia Barrelieri</i> Bess.	1	+	<i>Artemisia discolor</i>	1	?
<i>Artemisia Baumgarteni</i> Bess.	1	–	<i>Artemisia divaricata</i>	3	+
<i>Artemisia biennis</i>	6	–	<i>Artemisia Douglasiana</i>	1	+
<i>Artemisia Billardieriana</i> Bess.	1	+	<i>Artemisia Dracunculus</i>	4	+
<i>Artemisia Bocconi</i> All.	1	–	<i>Artemisia Eschscholtziana</i>	1	+
<i>Artemisia borealis</i>	17	+	<i>Artemisia fasciculata</i>	10	+
<i>Artemisia brevifolia</i> Wall.	1	?	<i>Artemisia Fischeriana</i> Besser	4	+
<i>Artemisia caespitosa</i>	1	?	<i>Artemisia foetida</i> Jacquem.	1	+
<i>Artemisia californica</i>	1	+	<i>Artemisia Fontanesiana</i> Bess.	1	?
<i>Artemisia campestris</i> L.	28	+	<i>Artemisia frigida</i>	29	+
<i>Artemisia campestris</i> L. var.	30	+	<i>Artemisia frigida</i> var. <i>Gmeliniana</i>	2	+
<i>Artemisia campestris</i> L. var.			<i>Artemisia frigida</i> var. <i>Steveniana</i>	1	+
<i>Steveniana</i> Bess.	3	+	<i>Artemisia gallica</i>	11	–
<i>Artemisia campestris</i> L. var.			<i>Artemisia glabrata</i> Wall.	1	+
<i>Linnaeana</i> Bess.	3	+	<i>Artemisia glacialis</i>	5	–
<i>Artemisia campestris</i> L. var.			<i>Artemisia glauca</i>	9	+
<i>Gmeliniana</i> Bess.	2	+	<i>Artemisia globularia</i> Chamiss.	1	+
<i>Artemisia camphorata</i> Vill.	39	+	<i>Artemisia glomerata</i> Led.	1	–
<i>Artemisia cana</i> Pursh.	2	–	<i>Artemisia glomerata</i> Sieb.	1	–
<i>Artemisia canadensis</i> Michx.	1	+			

Table 1 (continued)

Taxon folders (exactly as originally written on folders)	Number of herbarium sheets in a taxon folder	Type or other original specimens	Taxon folders (exactly as originally written on folders)	Number of herbarium sheets in a taxon folder	Type or other original specimens
<i>Artemisia glutinosa</i> J.Gay	2	?	<i>Artemisia macrophylla</i> Fisch	2	?
<i>Artemisia Gmelini</i>	14	+	<i>Artemisia maritima</i> L.	14	+
<i>Artemisia gnaphalodes</i> Nutt.	1	?	<i>Artemisia maritima</i> L. δ <i>Blumiana</i> Bess.	7	+
<i>Artemisia granatensis</i> Boiss.	1	-	<i>Artemisia maritima</i> L. μ <i>Boschniakiana</i> Bess.	5	+
* <i>Artemisia grandiflora</i> M.B.	1	?	<i>Artemisia maritima</i> L. γ <i>Eriwanica</i> Bess.	3	+
<i>Artemisia grata</i> Wall.	1	+	<i>Artemisia maritima</i> L. — <i>Hanseniana</i> Bess.	1	+
<i>Artemisia Halodendron</i> Turcz.	1	+	<i>Artemisia maritima</i> L. π <i>Hablitziana</i> Bess.	3	+
<i>Artemisia herbacea</i> Ehrh.	2	-	<i>Artemisia maritima</i> L. — <i>Kitaibelliana</i> Bess.	4	+
<i>Artemisia heterophylla</i>	2	+	<i>Artemisia maritima</i> L. ϵ <i>Lamarckiana</i> Bess.	1	+
<i>Artemisia hirsuta</i> Rottler	1	-	<i>Artemisia maritima</i> L. — <i>Taurica</i> (W.)	1	+
<i>Artemisia hispanica</i> Lam.	1	-	<i>Artemisia maritima</i> L. — <i>Lercheana</i> (Stechm.)	7	+
<i>Artemisia hololeuca</i>	5	+	<i>Artemisia maritima</i> L. ϵ <i>Linnaeana</i> Bess.	3	+
<i>Artemisia Hookeri</i>	1	+	<i>Artemisia maritima</i> L. — <i>Willdenowiana</i> Bess.	2	+
<i>Artemisia inculta</i> Delil.	1	-	<i>Artemisia maritima</i> L. — <i>Gmeliniana</i> Bess.	3	+
<i>Artemisia indica</i>	21	+	<i>Artemisia maritima</i> L. — <i>Szovitsiana</i>	6	+
<i>Artemisia inodora</i> M.B.	8	+	<i>Artemisia Messerschmidiana</i> Bess.	2	+
<i>Artemisia insipida</i>	2	-	<i>Artemisia mexicana</i>	4	+
<i>Artemisia integrifolia</i> L.	2	-	<i>Artemisia Michauxiana</i>	1	+
<i>Artemisia involucrata</i> Turcz.	1	+	<i>Artemisia mollis</i>	2	?
<i>Artemisia Jacquemontiana</i> Bess.	2	+	<i>Artemisia monogyna</i> Waldst. & Kit.	11	-
<i>Artemisia japonica</i> Thunb.	2	?	<i>Artemisia monosperma</i> Delil.	2	?
<i>Artemisia Judaica</i> L.	4	-	<i>Artemisia montevidensis</i>	1	?
<i>Artemisia Jussieana</i> Gay	1	+	<i>Artemisia Moxa</i> Bess.	1	+
* <i>Artemisia Kareliniana</i> Bess.	1	+	<i>Artemisia multicaulis</i> Led.	1	?
[<i>Artemisia Kotzebuensis</i>]	1	+	<i>Artemisia mutellina</i>	5	-
<i>Artemisia Krascheninikoviana</i> Bess.	2	+	<i>Artemisia myriantha</i> Wall.	1	+
<i>Artemisia laciniata</i>	28	+	<i>Artemisia nana</i> Gaud.	3	-
<i>Artemisia lagopus</i> Fisch.	1	+	<i>Artemisia naronitana</i> Vis.	1	-
<i>Artemisia lanata</i> (<i>A. alpina</i> Pall.)	12	-	* <i>Artemisia nilob</i>	1	?
<i>Artemisia latifolia</i> Led.	6	+	<i>Artemisia nitens</i>	4	-
<i>Artemisia Ledebouriana</i> Bess.	1	+	<i>Artemisia nitida</i>	1	-
<i>Artemisia Leontopodioides</i> Fisch.	1	-	<i>Artemisia nitrosa</i> Stechm.	1	-
<i>Artemisia Lessingiana</i> Bess.	1	+			
<i>Artemisia leucanthemifolia</i>	1	-			
<i>Artemisia Lindleyana</i>	1	+			
<i>Artemisia lithophila</i> Turcz.	2	+			
<i>Artemisia longepedunculata</i>	1	-			
<i>Artemisia longifolia</i>	1	?			
<i>Artemisia Ludoviciana</i> Nutt.	1	+			
<i>Artemisia macrantha</i> Led.	6	?			
<i>Artemisia macrobotrys</i> Led.	7	+			
<i>Artemisia macrocephala</i> Jacq.	1	+			

Table 1 (continued)

Taxon folders (exactly as originally written on folders)	Number of herbarium sheets in a taxon folder	Type or other original specimens	Taxon folders (exactly as originally written on folders)	Number of herbarium sheets in a taxon folder	Type or other original specimens
<i>Artemisia nivea</i>	4	–	<i>Artemisia Seriphium</i> Wallr.	9	+
<i>Artemisia norvegica</i> Fr.	2	–	<i>Artemisia Sieversiana</i>		
<i>Artemisia nutans</i> Willd.	8	+	[<i>Artemisia sieversiana</i> Willd.]	28	?
<i>Artemisia Oliveriana</i>	1	+	<i>Artemisia songorica</i> Schrenk	1	–
<i>Artemisia orientalis</i> W.	4	–	<i>Artemisia spicata</i>	9	–
<i>Artemisia obtusiloba</i> Ledeb.	9	?	<i>Artemisia splendens</i> Willd.	1	–
<i>Artemisia odoratissima</i> Desf.	1	?	<i>Artemisia Steichmanniana</i> Bess.	2	+
<i>Artemisia pallens</i> Wall.	1	+	<i>Artemisia Stelleri</i>	1	–
<i>Artemisia palmata</i> Lam.	3	–	<i>Artemisia Stelleriana</i> Bess.	1	+
<i>Artemisia palustris</i>	7	–	<i>Artemisia Steveniana</i> Bess.	1	+
<i>Artemisia paniculata</i> Lam.	2	–	* <i>Artemisia striata</i> Link.	1	?
<i>Artemisia pauciflora</i> Stech.	7	–	<i>Artemisia stricta</i>	1	+
<i>Artemisia pectinata</i>	6	–	<i>Artemisia succulenta</i> Ledeb.	2	?
<i>Artemisia peduncularis</i>	2	?	<i>Artemisia tanacetifolia</i> All.	3	–
<i>Artemisia petraea</i> Turcz.	3	+	<i>Artemisia tenuiflora</i> Jacquem.	1	+
<i>Artemisia peucedanifolia</i> Juss.	1	–	<i>Artemisia tenuifolia</i> W.	1	–
<i>Artemisia pontica</i> L.	15	–	<i>Artemisia Tilesii</i> Ledeb.	4	+
<i>Artemisia procera</i> Willd.	38	+	<i>Artemisia Tournefortiana</i> Rchb.	7	–
<i>Artemisia pubescens</i> Ledeb.	1	?	<i>Artemisia trifurcata</i> Steph.	1	–
<i>Artemisia purshii</i>	1	+	<i>Artemisia Triniana</i> Bess.	1	+
<i>Artemisia pycnorhiza</i>	1	–	<i>Artemisia Turczaninoviana</i> Bess.	5	+
<i>Artemisia Redowskii</i> Led.	3	–	<i>Artemisia vallentina</i>	1	–
<i>Artemisia Roxburghiana</i>	2	+	<i>Artemisia Valesiaca</i> All.	2	–
<i>Artemisia rupestris</i>	19	+	<i>Artemisia variabilis</i> Ten.	10	+
<i>Artemisia rutaefolia</i>	1	–	<i>Artemisia vestita</i> Wall.	4	+
<i>Artemisia sachalinensis</i>	1	–	<i>Artemisia violacea</i> Desf.	2	?
<i>Artemisia sacrorum</i>	10	+	* <i>Artemisia viridiflora</i>	2	–
<i>Artemisia salina</i>	1	–	<i>Artemisia viridifolia</i>	1	–
<i>Artemisia salsoloides</i>	10	+	<i>Artemisia viridis</i>	1	–
<i>Artemisia samamistica</i> Bess.	2	+	<i>Artemisia vulgaris</i> L.	60	+
<i>Artemisia saxatilis</i> Waldst. & Kit.	4	–	<i>Artemisia Wallichiana</i> Bess.	1	+
<i>Artemisia scoparia</i> W. & K.	44	–	Artemisiae species dubie		
<i>Artemisia selengensis</i> Turcz.	2	+	determinatae et indeterminatae	39	?
<i>Artemisia senecionis</i> Jacquem.	2	+	Untitled folders (two)	12	?
<i>Artemisia Senjavinensis</i> Bess.	1	+			
<i>Artemisia sericea</i>	16	+	Total	1186	

All specimens of *Artemisia* are mounted on herbarium sheets (in contrast to the main part of the Besser herbarium, which remains mainly unmounted). One (Fig. 1A) or several specimens can be mounted on one herbarium sheet, often representing different gatherings by different collectors

(see an example: Fig. 1B). The labels are mostly handwritten. Since botanists in those days did not adhere to certain rules for recording information on labels, the content of labels varies significantly. However, certain label rules and standards were followed by Besser himself. Almost all original labels



Fig. 1. Examples of herbarium sheets and a taxon folder. A: a specimen of *Artemisia annua* L. from KW-BESS. The label indicated that the plant was cultivated at the Kremenets Botanical Garden. A herbarium sheet with one specimen (gathering); B: a herbarium sheet with several herbarium specimens, one received from Hooker in 1830, another obtained from Gebler in 1833, and identifications and notes by Besser; C: a sample of the inscription on a taxon folder

of specimens obtained by Besser from other collectors and colleagues, the year of addition / acquisition, and a name (usually a surname or its abbreviation) of a researcher from whom the material was obtained are added. The fact that these data are related to the year of shipment of specimens is evident from the presence on some labels of a name of the collector and an actual date of collection, which does not coincide with the date / year of shipment or addition of that specimen to Besser's herbarium. Quite often the collector and the sender (or a previous owner) of the sent specimen is the same person. When describing a new taxon or providing a new

identification, Besser usually added the new taxon name to the original label (Fig. 2A). Sometimes a label carries only basic information, such as the species name and the place of collection (Fig. 2B). Not infrequently the collection contains labels with morphological descriptions of the plants, written in Besser's hand (Fig. 2C).

The identification of handwritings of collectors and botanists who provided or annotated the specimens is crucially important and often time-consuming while working with authentic materials and for typification of plant names. Therefore, the samples of reliably identified autographs are also



Fig. 2. Samples of labels. A: the label originally written by Gay, on which Besser indicated that the specimen from the Jacquemont herbarium, was obtained from Gay, initially from the collection of Muséum d'Histoire naturelle, Paris (see the abbreviated name of Adrien Henri Laurent de Jussieu indicated in the bottom left corner of the label); it also contains the name of a new variety proposed by Besser; B: a label written by Besser, with the name of the species and other information; C: example of a label with morphological descriptions, drawings, and notes by Besser

important. In Fig. 3, we present samples of labels written by several famous botanists of the 19th century. When identifying or attributing the authorship, we first of all analyzed the information available on the label: the matching of the hand of the text and

the signature (if available), Besser's reference to the sender of the collection (Besser, 1829, 1832, 1834a, 1834b, 1835, 1836, 1841), etc. Also, the hand in other labels with the same signature was compared, and samples of texts with the properly attributed



Fig. 3. Examples of labels by famous botanists of the 19th century (specimens of *Artemisia* at KW-BESS). Initials and surnames of persons are indicated under the images (A: J.D. Hooker; B: A. Bunge; C: N. Wallich; D: F.E.L. Fischer; E: K.F. Ledebour; F: C.A. Meyer; G: N.S. Turczaninow; H: J.É. Gay)

authorship were studied (https://plants.jstor.org/search?filter=name&so=ps_group_by_genus_species+asc&Query=Artemisia), and already available printed materials with botanists' author inscriptions were used (Lipschitz, Vassilchenko, 1968).

Our preliminary assessment of the *Artemisia* collection at KW-BESS presented here provides the basis for our further research and digitization of specimens, which is especially important for preservation of digital images and associated information of specimens deposited in this globally important collection, the threats to which are increasing under the present wartime circumstances at KW.

Acknowledgement

We express our sincere gratitude to Dr. Natalia M. Shiyani, Head Curator of the National Herbarium of Ukraine (KW), for her kind help and support of our work at the herbarium.

Some historical specimens from KW mentioned in this article have been digitized with support from the Andrew W. Mellon Foundation (USA) in the course of implementation of three digitization and capacity building projects at the National Herbarium of Ukraine, and this generous support is gratefully acknowledged.

This work, within the framework of the joint project *Taxonomic assessment and digitization of*

Artemisia type specimens in the globally important herbarium of Ukraine, was partly supported by the Ministry of Education and Science of Ukraine (according to the Order of the Ministry of Education and Science of Ukraine No. 809 of 03.07.2023 "On financing the joint Ukrainian-Chinese research projects in 2023"). Dr. Gao Tiangang (State Laboratory of Plant Diversity and Specialty Crops, Institute of Botany, Chinese Academy of Sciences, Beijing, China) provided several valuable comments on an earlier version of our manuscript, and his cooperation is gratefully acknowledged, as well as comments of reviewers.

It is significant that the updated final version of this manuscript was finalized on 6 December 2023, the Day of the Armed Forces of Ukraine. The authors express their sincere gratitude to the Armed Forces of Ukraine for their protection, which allowed us to perform this research at the National Herbarium of Ukraine in Kyiv.

Ethics Declaration

The authors declare no conflict of interest.

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**Рід *Artemisia* (Asteraceae) в історичній колекції
В.Г. Бессера (KW-BESS) у Національному гербарії України (KW)**

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Реферат. Встановлено, що колекція зразків роду *Artemisia* (Asteraceae) у меморіальній колекції В.Г. Бессера (KW-BESS) у Національному гербарії України (KW) містить щонайменше 1186 гербарних аркушів. Колекція зберігається в папках № 234–249, у кожній з яких розміщуються окремі паперові обкладинки для певних таксонів. Загалом налічується 217 індивідуальних обкладинок. За результатами нашого аналізу протологів та етикеток гербарію KW-BESS встановлено, що у 118 обкладинках зберігаються типи та/або інші оригінальні зразки. Значна кількість обкладинок таксонів містить по декілька типових зразків різних видових і внутрішньовидових назв. Для зразків у 28 обкладинках необхідний додатковий аналіз їхнього можливого типового статусу. Встановлено, що у колекції KW-BESS зберігаються автентичні зразки таких відомих дослідників XIX століття, як А. Бунге, Н. Волліх, Ж.Е. Ге, Е. Грей, О.-П. де Кандолль, Д. Дуглас, И.Ф.Г. Ешшольц, В.В. Жакмон, Г.С. Карелін та І.П. Кирилов, К.Ф. Ледебур, А.Ф. Маршалл фон Біберштейн, К.А. Мейер, Т. Натгалл, Дж.Д. Прескотт, Х. Стевен, М.С. Турчанінов, Ф.Е.Л. Фішер, Л.Ш.А. Шаміссо, Дж.Д. Хукер тощо. Наведено приклади етикеток, написаних В.Г. Бессером та іншими відомими ботаніками. Проведені дослідження всесвітньо важливої колекції заклали основу для подальших номенклатурних і таксономічних досліджень роду *Artemisia*, зокрема, на основі історичних зразків з KW.

Ключові слова: *Artemisia*, Besser, KW, KW-BESS, гербарій, історична колекція, таксономія, Україна