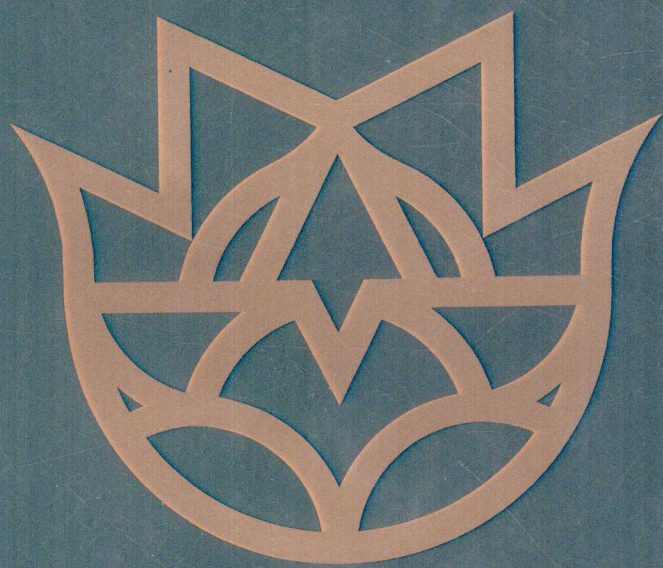


Flora of China



Poaceae

22

Flora of China



Poaceae



22

Flora of China

Poaceae

Wu Zhengyi (吴征镒) and **Peter H. Raven**
Co-chairs of the editorial committee

Hong Deyuan (洪德元)
Vice co-chair of the editorial committee



Science Press (*Beijing*)



Missouri Botanical Garden Press (*St. Louis*)

22

Flora of China

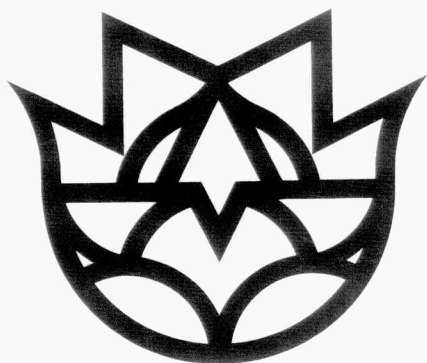
Volume 22

ISBN 7-03-017131-4/Q·1717

ISBN 1-930723-50-4 (V. 22)

ISBN 0-915279-34-7 (entire work)

Library of Congress Control Number: 95164893



The *Flora of China* logo (above) is a composite image, derived from the outlines of leaf shapes from genera of woody plants occurring in both China and the U.S.A., that symbolizes the collaboration between the two nations. It was designed by Charles P. Reay.

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Science Press (*Beijing*)

16 Donghuangchenggen North Street, Beijing 100717, China



Missouri Botanical Garden Press (*St. Louis*)

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This volume was published on June 16, 2006.

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***I**t is with great pleasure that we acknowledge the continued and generous financial support of the following:*

For Flora of China Volume 22:

Kadoorie Foundation

Parkview International London PLC

The Taylor Family

For the entire Flora of China project:

Chinese Academy of Sciences

National Natural Science Foundation of China

Starr Foundation

U.S. National Science Foundation

Alice C. Tyler Perpetual Trust

Arnold Arboretum

California Academy of Sciences

Dula Foundation

Edward K. Love Conservation Foundation

Harvard University Herbaria

Henry Luce Foundation

Hillsborough Garden Club

Lyle S. Woodcock Endowment

McDonnell Foundation

Merck and Company

Ministry of Science and Technology of China

Missouri Botanical Garden

Monsanto Company

Muséum National d'Histoire Naturelle, Paris

Natural History Museum, London

Quarryhill Botanical Garden

Royal Botanic Garden Edinburgh

Royal Botanic Gardens, Kew

Smithsonian Institution

Souer Charitable Trust

Spoehrer Fund

Stanley Smith Horticultural Trust

William Tao

Doctor Zhu Guanghua died on 2 November 2005. Based at the Missouri Botanical Garden, he was Co-director of the *Flora of China* project. He played a central role in the liaison between the Chinese and Western partners of the project and edited the *Flora of China Illustrations*. His research interests included the families Araceae, Orchidaceae, Poaceae, and Ranunculaceae. He also did much to advance understanding of the details of botanical nomenclature in China by translating the Saint Louis edition of the *International Code of Botanical Nomenclature* into Chinese. Altogether he published some 55 books, papers, and articles, including 20 new species. He is also remembered by *Philodendron zhuanum* Croat, a species of Araceae that he discovered in Panama with Dr. Thomas Croat.

Zhu Guanghua was born on 17 January 1964 in Manzhouli, Nei Mongol Autonomous Region. He gained a Bachelor's degree in botany at Inner Mongolia Normal University in 1985 and a Master's degree at the same University in 1988. In September 1990, he moved to St. Louis, Missouri, in order to join the Ph.D. program at the University of Missouri-St. Louis and the Missouri Botanical Garden. His thesis, on the systematics of *Dracontium*, was supervised by Dr. Thomas Croat, curator of Araceae at the Garden, and was successfully defended in September 1995. Immediately afterward, Dr. Zhu joined the staff at the Missouri Botanical Garden working on the *Flora of China* project, of which he became Co-director in 2001. On 8 October 1999, Dr. Zhu married Dr. Feng Yuxing, whom he had met at the Institute of Botany, Chinese Academy of Sciences, in Beijing. On 5 December 2000 their son, Yifu, was born.

Tragically, in the autumn of 2002, Dr. Zhu was diagnosed with lung cancer. After treatment, he gained over two years of remission, during which time he led a very active and productive life, but unfortunately he became ill again in the summer of 2005. He remained active almost to the end, returning from a visit to China only five weeks before he died.

In this volume Dr. Zhu was a co-author with Prof. Chen Shouliang on the account of the tribe *Triticeae*, in which the name *Elymus zhui* S. L. Chen is published in Dr. Zhu's honor. In November 2005, the Joint Editorial Committee unanimously decided to dedicate Volume 22 of the *Flora of China* to the memory of Dr. Zhu Guanghua.

IN MEMORIAM



DR. ZHU GUANGHUA (朱光华)
(17 January 1964 – 2 November 2005)

Preface

Volume 22 of the *Flora of China* is the 12th of a 25-volume work. It includes a single family, the Poaceae, which in China comprises 28 tribes, 226 genera, and 1795 species, among which seven genera and 809 species (45%) are endemic to China.

Volume 22 is formatted in the same manner as the first 11 volumes of the series: vol. 17 (1994), vol. 16 (1995), vol. 15 (1996), vol. 18 (1998), vol. 4 (1999), vol. 24 (2000), vol. 8 (2001), vol. 6 (2001), vol. 9 (2003), vol. 5 (2003), and vol. 14 (2005). The following ten accompanying volumes of the *Flora of China Illustrations* have been published to date: vol. 17 (1998), vol. 16 (1999), vol. 15 (2000), vol. 18 (2000), vol. 4 (2001), vol. 24 (2002), vol. 8 (2003), vol. 6 (2003), vol. 9 (2004), and vol. 5 (2004). Volume 14 is in production.

Michael G. Gilbert and Lynn G. Clark edited the *Bambuseae*, assisted by Anthony R. Brach. Nicholas J. Turland edited the *Triticeae*. Michael G. Gilbert and A. Michele Funston edited the remaining 26 tribes. Nicholas J. Turland, A. Michele Funston, and Michael G. Gilbert checked the nomenclature. Beth Parada, Diana Gunter, Nicholas J. Turland, Yang Qiner (杨亲二), Zeng Jianfei (曾建飞), and Han Xuezhe (韩学哲) proofread the volume. Nicholas J. Turland compiled the indexes. Rosemary Tanaka typeset the volume for publication.

The 13th and 14th volumes in the series (vols. 12 and 13) will contain 18 and 34 families, respectively, including the Araliaceae, Balsaminaceae, Begoniaceae, Melastomataceae, Myrtaceae, Rhamnaceae, Theaceae, Violaceae, and Vitaceae.

Wu Zhengyi (吴征镒)

Peter H. Raven

Hong Deyuan (洪德元)

Introduction

The *Flora of China* will be published in 25 volumes (including an introductory volume) and will account for all known vascular plants of China. The taxa treated in the Flora include all native and naturalized plants, as well as economically important exotics, such as crops or plantation plants. Each text volume will be followed by an accompanying volume of the *Flora of China Illustrations*, which together will provide detailed line drawings of approximately 60% of the species treated in the text volumes. A list of the volumes published to date is provided at the end of this book.

The Flora follows the same sequence of families as in *Flora Reipublicae Popularis Sinicae* (FRPS), i.e., a modified Englerian system that treats the monocotyledons after the dicotyledons. However, the circumscription of some families reflects the present understanding of groups. For example, the Menyanthaceae and Gentianaceae are both recognized, instead of combining them as the Gentianaceae. Genera and species are arranged taxonomically.

Taxonomic treatments are presented from the level of family to species and infraspecific ranks. Although intermediate ranks (e.g., subfamily, tribe, subgenus, section, series) are useful in the taxonomy of certain large families (e.g., Poaceae) and genera (e.g., *Poa*), they are used only sparingly. Families are given without authors or bibliographic citations. As for other accepted names, the authors, bibliographic citations, and synonyms are given. Each recognized taxon has a description, number of subordinate taxa, and distribution worldwide. For infraspecific taxa, either subspecies or varieties are recognized. Forms are not treated. All keys are dichotomous, indented, and generally artificial.

The synonymy given is based on close examination of accepted names and synonyms listed in major East Asian floras. At the generic level, synonyms widely used in the literature are included. At the specific and infraspecific levels, only the main synonyms, especially those listed in the floras of neighboring countries, are included. Names included in major East Asian and local Chinese floras due to misidentification are not treated as synonyms. Discussions relating to the misapplication of names and other significant misuse are dealt with as notes. Synonyms of taxa occurring outside of China and taxa whose status is uncertain are not included. The complete bibliographic citation of synonyms is given only for basionyms or replaced synonyms of accepted names, and only the authors' names are provided for other synonyms. The basionym of an accepted name is listed before other synonyms, which are arranged alphabetically by genus and species. As far as possible, the bibliographical citations of all recognized taxa and their basionyms have been verified. *Nomina nuda* and other invalid names are not included. Differences of opinion among authors in the circumscription of taxa are mentioned as notes.

Except where no material was available to authors and collaborators, all descriptions are based on Chinese plants. In general, the description of a given taxon does not exceed 130 words. Descriptions of families are followed by the number of genera and species, distribution, and usually other comments, including reference to FRPS accounts. If a species is represented in China by more than one infraspecific taxon, a full description is provided for the species, and only diagnostic features are listed under the infraspecific taxa. If only one infraspecific taxon of a species occurs in China, a full description is given under the infraspecific taxon. Flowering (fl.) and fruiting (fr.) times are often given by month using the first three letters of the month.

If a single measurement is used, it indicates length. When both length and width are used, the measurements are given as length \times width. A range of measurements is separated by an en-dash (–). Discontinuous

states within a taxon are separated by the word “or.” Exceptional measurements or character states are in parentheses ().

The distribution in China is given at the provincial level, listed alphabetically as follows: Anhui, Beijing, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanghai, Shanxi, Sichuan, Taiwan, Tianjin, Xinjiang, Xizang, Yunnan, and Zhejiang. Distributions may also include the special districts of Hong Kong and Macau, but only if the taxon is absent from Guangdong Province. The provincial map is provided on the front- and endpapers of this volume. The distributions are sometimes modified by using the directions C(entral), E(ast), N(orth), S(outh), W(est), or intermediate directions. A taxon endemic to China is marked with a bullet (●) at the beginning of the paragraph on habitat and distribution. Where a taxon is very local, the exact distribution may be given in parentheses. However, localities are not given below the level of *xian* (equivalent to county) or mountain. Elevations are rounded off to the nearest 100 m.

The distribution by country, continent, or area is given alphabetically in brackets [] for taxa extending beyond China. Only the countries adjacent to China are explicitly listed, as well as the other countries of tropical Asia from India eastward. These include Afghanistan, Bangladesh, Bhutan, Cambodia, India, Indonesia, Japan, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Laos, Malaysia, Mongolia, Myanmar (formerly Burma), Nepal, Pakistan, Papua New Guinea, the Philippines, Russia, Sikkim, Singapore, Sri Lanka, Tajikistan, Thailand, Turkmenistan, Uzbekistan, and Vietnam. When the distribution extends beyond these countries a generalized range (including Africa, SW Asia, Australia, Europe, North America, the Pacific Islands, and South America) is given.

Whenever available, somatic chromosome numbers are included at the end of descriptions of specific and infraspecific taxa; an asterisk (*) indicates counts made from Chinese material.

A question mark (?) placed immediately before a synonym, character state in a description, or territory within a distribution indicates that confirmation is required.

Each recognized taxon in the *Flora of China* has one Chinese name, followed by its pinyin transliteration. Three indexes are included at the end of each volume: one for Chinese plant names, another for the pinyin transliterations, and the third for scientific names.

Authors of botanical names are written out in full. When it is necessary to use initials to differentiate authors with the same last name, the initials of the abbreviation published by Brummitt and Powell in *Authors of Plant Names* (Royal Botanic Gardens, Kew, 1992) and its continuously updated on-line supplement (at <http://www.ipni.org/>) are used. The abbreviation “f.” is not used for the Latin *filius*, but the son’s initials are used (e.g., “J. D. Hooker” rather than “Hook. f.”), except when the names of the parent and descendant are identical (e.g., “Linnaeus” and “Linnaeus f.”).

Abbreviations of periodicals are according to Bridson’s *BPH-2 (Botanico-Periodicum-Huntianum)*, ed. 2; Pittsburgh: Hunt Institute for Botanical Documentation, 2004), and abbreviations for books follow Stafleu and Cowan’s *Taxonomic Literature*, ed. 2 (*TL-2*; Utrecht/Antwerpen: Bohn, Scheltema and Holkema; The Hague/Boston: dr. W. Junk b.v., 1976–1988) and its supplements. Books and periodicals not included in these two works are abbreviated according to the recommendations in the Appendix of *BPH-2*.

Acknowledgments

Grateful thanks are extended to the Kadoorie Foundation, Parkview International London PLC, and The Taylor Family, all of which provided substantial financial support for Sylvia M. Phillips and Chris Stapleton during the preparation of this volume. Partial funding of the *Flora of China* project as a whole has been provided by the U.S. National Science Foundation (grants BSR-8906215, BSR-9201378, DEB 9626806, DEB 0072682, DEB-0101991, DEB-0343439, DEB-0514279), the National Natural Science Foundation of China, the Starr Foundation, the Chinese Academy of Sciences, and the Ministry of Science and Technology of China.

The following botanists are warmly thanked for their reviews of the manuscripts: Mary E. Barkworth (UTC; *Triticeae*), Lynn G. Clark (ISC; *Bambuseae*), Ding Yulong (丁雨龙; NF; *Phyllostachys*), Mark Nesbitt (K; cereals), Peng Hua (彭华; KUN; tribes other than *Bambuseae*), Björn Salomon (Swedish University of Agricultural Sciences; *Triticeae*), Gabriel Sanchez-Ken (K; *Centothecae*), Neil Snow (GREE; *Leptochloa*), Yang Guangyao (杨光耀; JXAU; *Arundinaria*).

The regional advisors, Eona M. M. Aitken (E), Rudolf V. Kamelin (LE), Kai Larsen (AAU), Jin Murata (TI), Alexei K. Skvortsov (MHA), and Willem J. J. O. de Wilde (L), were asked to review the accounts in this volume. Valuable nomenclatural and distributional comments on taxa occurring in China and neighboring countries were received. Alisa E. Grabovskaya-Borodina (LE) and Ching-I Peng (彭镜毅; HAST) provided valuable assistance, and additional comments were received from Henry J. Noltie (E).

The directors, curators, and librarians of the following institutions are warmly thanked for their continued assistance in sending loans of specimens and/or providing library or herbarium facilities to the authors and editors of the *Flora of China*: A, B, BM, CANT, CAS, CDBI, E, F, GH, HAST, HIB, HNWP, IBSC, K, KUN, LE, MO, NAS, NY, P, PE, S, SCFI, SZ, TAI, TI, UPS, US, W, WU, XJA, XJU, and YUKU.

Victoria C. Hollowell, Beth Parada, Diana Gunter, and Barb Mack, of Missouri Botanical Garden Press, edited and facilitated publication of relevant preliminary papers in *Novon* and played an important role in finalizing the production of this volume. Amy McPherson served as Managing Editor for a number of the papers in *Novon*. Thanks are also due to Yang Qiner (杨亲二), Editor-in-Chief of *Acta Phytotaxonomica Sinica*, for editing and facilitating publication of relevant papers in that journal.

Liu Xintian (刘心恬; NAS) provided essential support throughout the preparation of the Poaceae account by liaising between Sylvia M. Phillips and Chen Shouliang (陈守良), and by giving freely of her time while Sylvia Phillips and Robert J. Soreng were in Nanjing. Sylvia Phillips also thanks Chen Wenli (陈文俐; PE) and Ma Haiying (马海英; KUN) for help with Chinese translations and herbarium queries. Generous assistance to Li Dezhu (李德铎) was received from Gao Lianming (高连明; KUN), Lu Jinmei (卢金梅; KUN), Peng Sheng (彭晟; KUN), Xue Chunying (薛春迎; KUN), Yang Hanqi (杨汉奇; KUN), and Zhang Shudong (张书东; KUN). Xia Nianhe would like to thank Feng Xuelin (冯学琳; IBSC) and Lin Rushun (林汝顺; IBSC).

Many other persons have helped at various stages of the project or contributed directly to the production of this volume. These include: Roy Gereau, Guo Youhao (郭友好), He Si (何思), Fred Keusenkothen, Robert Magill, Candy McCandliss, Olga Martha Montiel, Song Hong (宋宏), and Alain Touwaide. To all of these, the project is most grateful.

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POACEAE (GRAMINEAE)

禾本科 he ben ke

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Sun Bi-sin)⁷, Zhu Zhengde (朱政德 Chu Cheng-de)⁸, Xia Nianhe (夏念和)⁹, Jia Liangzhi (贾良智 Chia Liang-chih)⁹,
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Annual or perennial herbs, or tall woody bamboos. Flowering stems (culms) jointed, internodes hollow or solid; branches arising singly from nodes and subtended by a leaf sheath and 2-keeled prophyll, often fascicled in bamboos. Leaves arranged alternately in 2 ranks, differentiated into sheath, blade, and an adaxial erect appendage at sheath/blade junction (ligule); leaf sheath surrounding and supporting culm-internode, split to base or infrequently tubular with partially or completely fused margins, modified with reduced blade in bamboos (culm sheaths); leaf blades divergent, usually long, narrow and flat, but varying from inrolled and filiform to ovate, veins parallel, sometimes with cross-connecting veinlets (especially in bamboos); ligule membranous or a line of hairs. Inflorescence terminal or axillary, an open, contracted, or spike-like panicle, or composed of lax to spike-like racemes arranged along an elongate central axis, or digitate, paired, or occasionally solitary; axillary inflorescences often many, subtended by spatheoles (specialized bladeless leaf sheaths) and gathered into a leafy compound panicle; spikelets often aggregated into complex clusters in bamboos. Spikelets composed of distichous bracts arranged along a slender axis (rachilla); typically 2 lowest bracts (glumes) empty, subtending 1 to many florets; glumes often poorly differentiated from accompanying bracts in bamboos. Florets composed of 2 opposing bracts enclosing a single small flower, outer bract (lemma) clasping the more delicate, usually 2-keeled inner bract (palea); base of floret often with thickened prolongation articulated with rachilla (callus); lemma often with apical or dorsal bristle (awn), glumes also sometimes awned. Flowers bisexual or unisexual; lodicules (small scales representing perianth) 2, rarely 3 or absent, 3 to many in bamboos, hyaline or fleshy; stamens 3 rarely 1, 2, 6, or more in some bamboos, hypogynous, filaments capillary, anthers versatile; ovary 1-celled, styles (1 or) 2 (rarely 3), free or united at base, topped by feathery stigmas, exerted from sides or apex of floret. Fruit normally a dry indehiscent caryopsis with thin pericarp firmly adherent to seed, pericarp rarely free, fleshy in some bamboos; embryo small or large; hilum punctate to linear.

About 700 genera and 11,000 species: widely distributed in all regions of the world; 28 tribes, 226 genera (seven endemic), and 1795 species (809 endemic) in China.

Grasses are present throughout China, but the largest area of natural grassland lies in the northern part of the country, forming part of the temperate Eurasian steppe. Much of this area has now been converted from rangeland into farmland with wheat (*Triticum*) as the major food crop. The moister grasslands of northeast China support forest steppe, the dominant natural grasses being *Leymus chinensis* and *Stipa grandis*. The climate becomes progressively drier eastward, supporting steppe and semidesert steppe. Species of *Stipa* are dominant, with *Agropyron*, *Cleistogenes*, *Koeleria*, and *Leymus*. Common grasses of the dry alpine steppe of the high Xizang-Qinghai Plateau include species of *Elymus*, *Festuca*, *Leymus*, *Poa*, *Puccinellia*, and *Stipa*. Desert grasses of northwest China include sand-binding species of *Aeluropus*, *Cleistogenes*, and *Orinus*.

In warm, subtropical areas of southern China widespread tropical genera are well represented, including *Cymbopogon*, *Digitaria*, *Eulalia*, *Paspalum*, *Pennisetum*, and *Setaria*. The major food crop here is rice (*Oryza*). Other tropical genera with their center of distribution in southeast Asia extend into China, including *Arundinella*, *Isachne*, and *Microstegium*. Extensive pure stands of *Phacelurus latifolius* are found in coastal salt marshes, as are introduced species of *Spartina*. *Phragmites* species form large colonies in the shallow margins of inland lakes and rivers.

The subfamilies of Poaceae are not included here, as they are largely based on non-morphological characters that are not readily available for identification purposes. However, the traditional grass tribes, as broadly accepted over the last two decades, do mainly have a morphological expression, backed up by characteristics of anatomy, embryology, and other cryptic characters. With practice and increasing familiarity with the family, it is usually possible to assign an unknown grass to a tribe without undue difficulty. The tribe is therefore taken as the primary division here.

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Modern molecular systematic studies are providing new insights into grass relationships. This new information has been incorporated where it has proved possible to link it to morphology, mainly by the separation of *Danthonieae* from *Arundineae* and the repositioning of a few individual genera. However, where the new information leads to the redefinition of tribes, or the genera within them, on grounds not easily expressed morphologically, the traditional treatment has been retained. *Aveneae* are upheld as distinct from *Poeae*, and *Eragrostideae* as distinct from *Cynodonteae*, because they are usually easily recognizable and hence useful for identification. Grass taxonomy is at present undergoing a period of rapid modification. The incorporation of molecular data into the classification scheme is incomplete, alterations are ongoing, and a new system with overall acceptance has not yet emerged. The primary purpose of a Flora is to provide an identification guide, usually for the non-specialist, and it must therefore be based mainly on morphology. Those interested in the latest research and new ideas on grass relationships can find more detailed information in the taxonomic literature. The following is recommended: Columbus, J. T. et al., eds. 2006. *Monocots: comparative biology and evolution*. [Aliso, 2 volumes]. Rancho Santa Ana Botanic Garden, Claremont.

Extensive use has been made of *Genera Graminum* by Clayton and Renvoize (1986) during the preparation of this volume. In particular, Chen Shouliang and Sylvia Phillips have used the key to tribes and the tribal descriptions there as the basis for those in this volume.

The names of the Chinese agrostologists Sun Bixing and Liu Liang are abbreviated as “B. S. Sun” and “L. Liu” in this volume, but the alternative abbreviations “B. X. Sun” and “L. Liou” occur sometimes in other literature. The bamboo specialist Xue Jiru (Hsueh Chi-ju) is abbreviated as “Hsueh” in this volume because he always gave his name as “Hsueh” as the author of plant names, regardless of any different spelling used for him as the author of the works in which the names were published.

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Glossary of botanical terms used in the Poaceae

Adapted from the glossary in *Flora of Ethiopia and Eritrea*, vol. 7 (1995).

- aristate** – with an awn
- aristulate** – diminutive of aristate
- auricle** – an earlike lobe or appendage at the junction of leaf sheath and blade
- auriculate** – with an auricle
- awn** – a bristle arising from a spikelet part
- callus** – a hard projection at the base of a floret, spikelet, or inflorescence segment, indicating a disarticulation point
- caryopsis** – a specialized dry fruit characteristic of grasses, in which the seed and ovary wall have become united
- collar** – pale or purplish zone at the junction of leaf sheath and blade
- column** – the lower twisted portion of a geniculate awn, or the part below the awn branching-point in *Aristideae*
- compound** – referring to inflorescences made up of a number of small constituent inflorescences (as in some *Andropogoneae*), or a raceme with some secondary branching
- culm** – the flowering stem of a grass plant
- culm sheath** (bamboos) – modified, often non-photosynthetic, culm leaf with an expanded sheath and much reduced blade, usually deciduous as the culm matures
- diffuse** (bamboos) – culms arising singly from long slender rhizomes.
- extravaginal** – branching in which the young shoot breaks through the base of the leaf sheath
- floret** – the individual unit of a spikelet, comprising a lemma and palea with enclosed reproductive organs
- glume** – one of a pair of empty scales at the base of a grass spikelet
- heterogamous spikelets** – the paired spikelets found in most *Andropogoneae*, where one spikelet of the pair is sessile and produces a caryopsis, and the other spikelet is pedicelled, of different form, and staminate or sterile
- hilum** – the scar on the caryopsis marking the site of the attachment of the pericarp and testa, found on the opposite side from the embryo
- homogamous spikelets** – in *Andropogoneae* the paired spikelets sometimes present at the base of the raceme, of similar appearance and not producing any caryopses, often resembling the pedicelled spikelets or assuming a protective involucre function
- intravaginal** – branching in which the young shoot grows up inside the leaf sheath, emerging at the sheath mouth
- iterauctant** (bamboos) – inflorescence with pseudospikelets with glumes subtending axillary buds capable of partial or extensive spikelet ramification
- leaf blade** – the distal expanded part of a grass leaf
- leaf sheath** – the basal part of the grass leaf which normally encloses a culm internode
- lemma** – the lower of the two bracts enclosing the grass flower and together with the palea comprising a floret
- leptomorph** (bamboos) – rhizome monopodial, elongated, more slender than culms
- ligule** – a membrane or line of hairs on the inner (adaxial) side of the junction of the leaf sheath and leaf blade; bamboos sometimes have an external ligule on the abaxial side of the junction
- lodicule** – a small scale-like or fleshy structure at the base of the stamens in a grass floret, usually 2 in each floret (often 3 or more in bamboos); they swell at anthesis, causing the floret to gape open
- oral setae** – marginal setae inserted at junction of leaf sheath and blade, on the auricles when these are present
- pachymorph** (bamboos) – rhizome sympodial, thicker than culms
- palea** – the upper and inner scale of the grass floret which encloses the grass flower, usually 2-keeled
- panicle** – in grasses, an inflorescence in which the primary axis bears branched secondary axes with pedicellate spikelets
- pedicel** – in grasses, the stalk of a single spikelet within an inflorescence
- peduncle** – the stalk of a raceme or cluster of spikelets
- pluricaespitose** (bamboos) – culms arising in a series of clusters along a long slender rhizome
- prophyll** – in grasses, a 2-keeled, hyaline, modified leaf, placed within a leaf sheath on the adaxial side of a branch
- pseudopetiole** – the narrow basal portion of some leaf blades, resembling a petiole
- pseudospikelet** (bamboos) – spikelet in which the outer glumes or bracts subtend axillary buds which can develop to form lateral spikelets or branches
- raceme** – in grasses, an unbranched axis bearing spikelets; racemes may be solitary, digitate, or scattered
- raceme base** – short stalk beneath the individual racemes of a pair in some *Andropogoneae*

raceme pair – pairs of racemes supported by spatheoles in the compound panicles of some *Andropogoneae*
rachilla – the central axis of the spikelet which bears the florets
rachilla extension – a prolongation of the rachilla beyond the uppermost (or single) floret
rachis – the axis of a raceme
secondary spathe – spathe supporting a second tier of branching within the compound panicle of some *Andropogoneae*
semelauctant (bamboos) – inflorescence with glumes not subtending viable buds or branches
sinus – the space between two projecting lobes or teeth
spathate – with spathes

spathe – a bract or modified bladeless leaf subtending the inflorescence or part of it
spatheole – the uppermost spathe supporting the racemes within the compound inflorescence of some *Andropogoneae*
spikelet – the basic unit of a grass inflorescence; usually composed of two glumes and one or more florets on a rachilla
spikelet pair – the arrangement of one sessile and one pedicelled spikelet arising from the same node characteristic of the *Andropogoneae*
tiller – a leafy non-flowering shoot
triad – a group of three spikelets borne together
unicaespitose (bamboos) – culms all arising in a single clump from pachymorph rhizomes

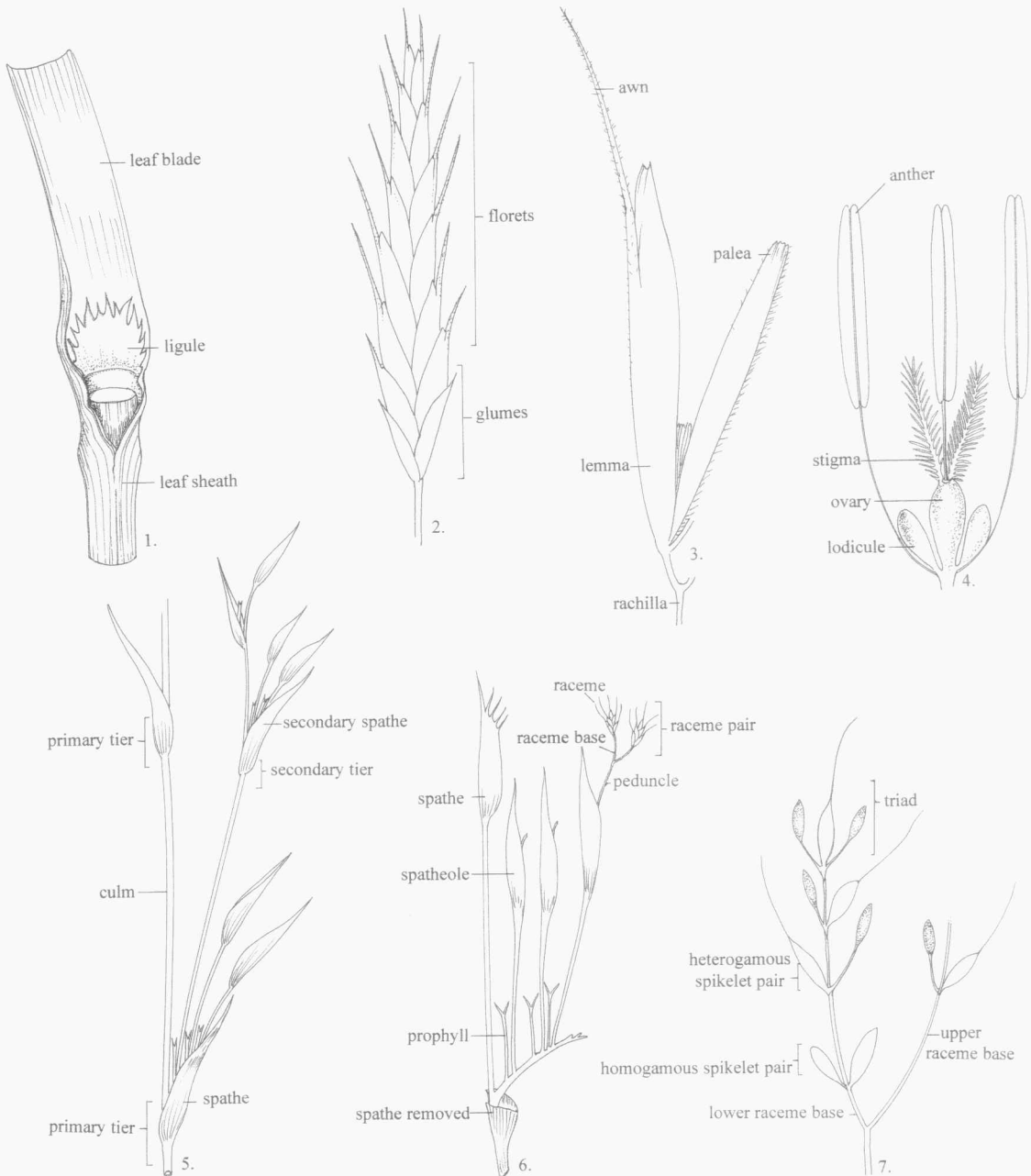


Figure 1. 1–4. Parts of a typical grass (based on *Bromus*). —1. Portion of leaf. —2. Spikelet. —3. Floret. —4. Flower. 5–7. Compound panicle and raceme pair structure in *Andropogoneae* (based on *Hyparrhenia*). —5. Compound panicle with primary and secondary tiers. —6. Compound panicle with primary tier showing raceme pair. —7. Diagram of raceme pair structure. Drawn by Yevonn Wilson-Ramsey.

Systematic list of tribes and genera

● indicates endemic genera

1. Bambuseae (p. 7)

1. *Bambusa*
2. *Thyrsostachys*
3. *Dendrocalamus*
4. *Gigantochloa*
5. *Melocalamus*
6. *Bonia*
7. *Schizostachyum*
8. *Cephalostachyum*
9. *Pseudostachyum*
10. *Melocanna*
11. *Neomicrocalamus*
12. *Yushania*
13. *Thamnocalamus*
14. *Fargesia*
15. *Drepanostachyum*
16. *Himalayacalamus*
17. *Ampelocalamus*
18. *Chimonocalamus*
19. ● *Gaoligongshania*
20. *Acidosasa*
21. *Sasa*
22. *Arundinaria*
23. *Pseudosasa*
24. *Pleioblastus*
25. ● *Oligostachyum*
26. ● *Gelidocalamus*
27. ● *Ferocalamus*
28. *Indocalamus*
29. *Indosasa*
30. *Sinobambusa*
31. *Semiarundinaria*
32. *Chimonobambusa*
33. ● *Shibataea*
34. *Phyllostachys*

2. Phareae (p. 180)

35. *Leptaspis*

3. Ehrharteae (p. 181)

36. *Ehrharta*

4. Oryzeae (p. 181)

37. *Oryza*
38. *Leersia*
39. *Chikusichloa*
40. *Hygroryza*
41. *Zizania*

5. Brachyelytreae (p. 187)

42. *Brachyelytrum*

6. Phaenospermateae (p. 187)

43. *Phaenosperma*

7. Stipeae (p. 188)

44. *Stephanachne*
45. *Trikeria*
46. ● *Sinochasea*
47. *Duthiea*
48. *Psammodochloa*
49. *Piptatherum*
50. *Stipa*
51. *Ptilagrostis*
52. *Achnatherum*
53. *Orthoraphium*

8. Brylkinieae (p. 212)

54. *Brylkinia*

9. Meliceae (p. 212)

55. *Glyceria*

56. *Melica*

57. *Schizachne*

10. Diarrheneae (p. 223)

58. *Diarrhena*

11. Poeae (p. 224)

59. *Festuca*
60. *Vulpia*
61. *Lolium*
62. *Scolochloa*
63. *Cynosurus*
64. *Puccinellia*
65. *Briza*
66. *Poa*
67. *Dactylis*
68. *Aniselytron*
69. *Milium*
70. *Colpodium*
71. *Catabrosa*
72. *Sclerochloa*
73. *Pseudosclerochloa*
74. *Parapholis*

12. Aveneae (p. 316)

75. *Helictotrichon*
76. *Arrhenatherum*
77. *Avena*
78. *Trisetum*
79. *Koeleria*
80. *Deschampsia*
81. *Holcus*
82. *Aira*
83. *Phalaris*
84. *Anthoxanthum*
85. *Coleanthus*
86. *Agrostis*
- 86a. × *Agropogon*
87. *Deyeuxia*
88. *Calamagrostis*
89. *Polypogon*
90. *Cinna*
91. *Cyathopus*
92. *Beckmannia*
93. *Alopecurus*
94. *Phleum*

13. Brachypodieae (p. 368)

95. *Brachypodium*

14. Bromeae (p. 370)

96. *Littledalea*
97. *Bromus*

15. Triticeae (p. 386)

98. *Leymus*
99. *Psathyrostachys*
100. *Hordeum*
101. *Hystrix*
102. *Elymus*
103. *Pseudoroegneria*
104. *Elytrigia*
105. *Kengyilia*
106. *Agropyron*
107. *Eremopyrum*
108. *Secale*
109. *Triticum*
110. *Aegilops*

16. Centotheceae (p. 444)

111. *Centotheca*

112. *Lophatherum*

17. Thysanolaeneae (p. 446)

113. *Thysanolaena*

18. Arundineae (p. 447)

114. *Molinia*
115. *Arundo*
116. *Phragmites*

19. Danthonieae (p. 449)

117. *Cortaderia*
118. *Elytrophorus*
119. *Danthonia*
120. *Schismus*

20. Aristideae (p. 452)

121. *Aristida*
122. *Stipagrostis*

21. Pappophoreae (p. 456)

123. *Enneapogon*

22. Eragrostideae (p. 457)

124. *Aeluropus*
125. *Neyraudia*
126. *Cleistogenes*
127. *Orinus*
128. *Tripogon*
129. *Leptochloa*
130. *Dinebra*
131. *Eragrostis*
132. *Eragrostiella*
133. *Harpachne*
134. *Desmostachya*
135. *Dactyloctenium*
136. *Acrachne*
137. *Eleusine*
138. *Sporobolus*
139. *Crypsis*
140. *Muhlenbergia*

23. Cynodonteae (p. 487)

141. *Lepturus*
142. *Chloris*
143. *Enteropogon*
144. *Eustachys*
145. *Microchloa*
146. *Cynodon*
147. *Spartina*
148. *Bouteloua*
149. *Buchloe*
150. *Tragus*
151. *Zoysia*
152. *Perotis*

24. Paniceae (p. 499)

153. *Pseudechinolaena*
154. *Oplismenus*
155. *Ichnanthus*
156. *Panicum*
157. *Hymenachne*
158. *Sacciolepis*
159. *Ottlochloa*
160. *Cyrtococcum*
161. ● *Setiopsis*
162. *Acroceras*
163. *Echinochloa*
164. *Alloteropsis*
165. *Brachiaria*
166. *Urochloa*

167. *Eriochloa*

168. *Thuarea*
169. *Paspalum*
170. *Axonopus*
171. *Setaria*
172. *Paspalidium*
173. *Stenotaphrum*
174. *Melinis*
175. *Digitaria*
176. *Pseudoraphis*
177. *Pennisetum*
178. *Cenchrus*
179. *Spinifex*

25. Isachneae (p. 554)

180. *Isachne*
181. *Coelachne*
182. *Sphaerocaryum*

26. Eriachneae (p. 561)

183. *Eriachne*

27. Arundinelleae (p. 561)

184. *Garnotia*
185. *Arundinella*

28. Andropogoneae (p. 570)

186. *Spodiopogon*
187. *Saccharum*
188. *Miscanthus*
189. *Imperata*
190. *Eulalia*
191. *Pseudopogonatherum*
192. *Pogonatherum*
193. *Eulaliopsis*
194. *Polytrias*
195. *Microstegium*
196. *Apocopis*
197. *Germainia*
198. *Sorghum*
199. *Pseudosorghum*
200. *Chrysopogon*
201. *Dichanthium*
202. *Capillipedium*
203. *Bothriochloa*
204. *Sehima*
205. *Ischaemum*
206. *Apluda*
207. *Dimeria*
208. *Arthraxon*
209. *Schizachyrium*
210. *Andropogon*
211. *Cymbopogon*
212. *Hyparrhenia*
213. *Themeda*
214. *Heteropogon*
215. *Pseudanthistria*
216. *Phacelurus*
217. *Hemarthria*
218. *Mnesithea*
219. *Rottboellia*
220. *Eremochloa*
221. *Hackelochloa*
222. *Ophiuros*
223. *Coix*
224. *Chionachne*
225. *Polytoca*
226. *Zea*

Keys to tribes

Key 1

- 1a. Bamboos, culms woody; lower culm sheaths broad with rudimentary blades 1. *Bambuseae* (p. 7)
- 1b. Herbs, occasionally reeds or culms canelike; lower culm sheaths with normal blades.
 - 2a. Spikelets arranged in pairs (rarely triads) on fragile racemes; raceme rachis breaking up into segments bearing a sessile and pedicelled spikelet Key 2
 - 2b. Spikelets arranged singly in panicles or racemes (occasionally raceme fragile but spikelets single; or spikelets paired but raceme tough).
 - 3a. Spikelets with strictly 2 florets and no rachilla extension; lower floret staminate or barren, sometimes reduced to an empty lemma, upper floret fertile Key 2
 - 3b. Spikelets with 1 to many florets (if 2 florets, then both fertile, or the lower fertile, or rachilla extension present).
 - 4a. Spikelets with 2 or more fertile florets Key 3
 - 4b. Spikelets with 1 fertile floret, sometimes with additional staminate or barren florets Key 4

Key 2

- 1a. Spikelets disarticulating at maturity above glumes.
 - 2a. Spikelets disarticulating above glumes; lemmas both orbicular to broadly elliptic, awnless; leaf blades lanceolate to ovate 25. *Isachneae* (p. 554)
 - 2b. Spikelets disarticulating below fertile (upper) floret; lower lemma resembling upper glume, persistent, upper lemma terete, often awned; leaf blades linear 27. *Arundinelleae* (p. 561)
- 1b. Spikelets falling entire at maturity, either singly or with other spikelets and inflorescence parts attached.
 - 3a. Spikelets single, or if paired both spikelets alike; glumes thinner than fertile floret, lower glume short or even suppressed; fertile floret papery to crustaceous or leathery, awnless 24. *Panicaceae* (p. 499)
 - 3b. Spikelets paired, usually one sessile and the other pedicelled, often dissimilar and arranged in fragile racemes; glumes as long as spikelet, tougher than and enclosing hyaline florets; fertile floret often with geniculate awn (spikelets rarely single or both pedicelled, but then either in fragile racemes or geniculately awned) 28. *Andropogoneae* (p. 570)

Key 3

- 1a. Inflorescence of one or more racemes.
 - 2a. Ligule a line of hairs; lemmas 1–3-veined 22. *Eragrostideae* (p. 457)
 - 2b. Ligule membranous; lemmas 5 or more veined.
 - 3a. Leaf sheaths tubular, margins joined for most or all of length 9. *Meliceae* (p. 212)
 - 3b. Leaf sheaths not tubular, margins free.
 - 4a. Spikelets placed broadside to rachis; both glumes present; ovary with hairy apical appendage.
 - 5a. Spikelets shortly pedicellate, usually terete or almost so; lemmas 7–9-veined 13. *Brachypodieae* (p. 368)
 - 5b. Spikelets sessile, laterally compressed (if rarely pedicellate, lemmas 5-veined) 15. *Triticeae* (p. 386)
 - 4b. Spikelets placed edgewise to rachis; lower glume absent (except terminal spikelet); ovary glabrous 11. *Poeae* (61. *Lolium*: p. 243)
- 1b. Inflorescence a panicle, open, contracted, or dense and spike-like.
 - 6a. Spikelets with 2 florets, rachilla extension absent; one or both florets usually indurated.
 - 7a. Lemmas entire, awnless, glabrous or puberulous 25. *Isachneae* (p. 554)
 - 7b. Lemmas 2-toothed, awned from sinus, densely hispid 26. *Eriachneae* (p. 561)
 - 6b. Spikelets with several florets, or if 2 then rachilla extension present.
 - 8a. Lemmas deeply cleft into 7–9 awns 21. *Pappophoreae* (p. 456)
 - 8b. Lemmas awnless or 1-awned.
 - 9a. Leaf sheaths tubular, the margins joined for most or all of length 9. *Meliceae* (p. 212)
 - 9b. Leaf sheaths not tubular, margins free.
 - 10a. Culms reedlike, usually tall; panicle large, plumose 18. *Arundineae* (p. 447)
 - 10b. Culms mostly slender, if tall then not reedlike; panicle not large and plumose (if plant a large tussock with serrate leaf blades and plumose panicle, see 113. *Cortaderia*).
 - 11a. Ligule a line of hairs.
 - 12a. Basal internodes swollen; leaf blades articulated with sheath 18. *Arundineae* (114. *Molinia*: p. 447)
 - 12b. Basal internodes not swollen; leaf blades persistent 22. *Eragrostideae* (p. 457)
 - 11b. Ligule membranous.
 - 13a. Pericarp thickened into a pale beak or knob at grain apex 10. *Diarrheneae* (p. 223)
 - 13b. Pericarp not thickened.
 - 14a. Leaf blades with obvious cross veins, broad 16. *Centothecaeae* (p. 444)