

# Introduction

## What is a succulent ?

It is probably impossible to define what constitutes a *succulent plant* – at least in view of the several competing definitions. For the purpose of this handbook, a pragmatic approach has been selected, and apart from the multitude of unambiguous succulents, many borderline cases are included as well, especially if the species in question are encountered in cultivation together with other succulents, and if they are native to more or less semi-arid regions and consequently show some degree of xerophytic adaptation. This, then, includes most of the caudex and pachycaul plants now popular in cultivation.

Other borderline cases included are a number of bulbous and rhizomatous monocotyledons, where examples from several genera are covered, as well as several weakly developed leaf succulents from the *Gesneriaceae* (e.g. *Columnnea*).

On the other hand, purely halophytic succulents (such as *Salicornia*) are omitted from these pages since they are as a whole neither adapted to climatically dry conditions nor encountered in collections devoted to succulent plants.

Finally, some families with undoubted claim to (xerophytic) succulence have been excluded from this set of volumes. This notably is the case for the *Cactaceae*, which will be treated elsewhere. In addition, the families *Bromeliaceae* and *Orchidaceae* are also excluded. Both count with a considerable number of mostly leaf succulents, but for both, vast specialist literature and numerous specialist societies are in existence, and this effort does not need to be duplicated here. For all these excluded families, however, a family description is included in the present volumes for the sake of completeness.

## How to use this handbook

Since all information is presented in strictly alphabetical sequence of families, genera and species (except that monocotyledons and dicotyledons are treated separately, and that the families *Aizoaceae*, *Asclepiadaceae* and *Crassulaceae* occupy their own volumes), it is easy to find the entry for a given species as long as its family placement is known.

An alternative way is to use the taxonomic cross-reference index supplied at the end of the

volume. This index contains all the names treated in the volume and for accepted names indicates the page where a treatment can be found, or in the case of synonyms gives the name of the accepted taxon and a page reference as above. For names merely mentioned in the text, the index gives the page reference and the name under which information can be found.

If a completely unknown plant is to be identified, the handbook supplies keys to the genera with succulent representatives for each family. Please note that these keys are designed to work for the succulent taxa treated, and do not necessarily include the total variation encountered in a genus. If the family is not known, the reader is referred to general botanical books that include keys to plant families. Rowley (1980) and Egli (1994) provided keys for flowering and non-flowering succulents, and Geesink & al. (1981) produced a well-known book of keys to all flowering plants worldwide.

## Scope of information presented

### Families

The family names adopted are always conforming to the standard form (ending in *-aceae*); alternative names (such as *Compositae* for *Asteraceae*) are not used.

Within each family, the genera are treated in alphabetical sequence, and the same applies to the sequence of species within genera. Some genera of minimal importance or with borderline succulence are only mentioned or at the most described, but no individual species are treated.

The following families are included as a whole, i.e. with all their component species: *Agavaceae*, *Aloaceae* and *Doryanthaceae* in the present volume covering the Monocotyledons, and the *Didiereaceae*, *Fouquieriaceae* and *Nolanaceae* in the Dicotyledons volume. The *Aizoaceae* and *Crassulaceae* are covered in their entirety in separate volumes within this series, and the succulent taxa of the *Asclepiadaceae* likewise occupy a separate volume of the Handbook.

The family description characterizes the family as a whole, which often includes much more variation than that observed amongst its succulent representatives.

This is followed by notes on the distribution, classification and economic importance of the family, and the occurrence of succulence if this is not a general feature of the family as a whole. Also, a key to genera with succulents is included, and special terminology used for genera and species descriptions is discussed.

The family concept adopted more or less follows Mabberley (1987), except for the monocotyledons, where Dahlgren & al. (1985) is used as a base, with a number of small modifications.

#### *Genera and species*

The entries for genera and species follow the same layout. Names of authors are given in full, with initials added where necessary according to Brummitt & Powell (1992). The literature reference of the original description or combination is followed by information on typification (where available, see below). In the case of genera, important literature is then cited. This is followed by information on geographical distribution (including notes on ecology where available) and an explanation of the etymology for generic names.

The main part of the entry is made up by the diagnostic description of the taxon, followed by a discussion of its variability, circumscription and/or application where necessary. It should be noted that these descriptions reflect major variability only, but do not include all the reported minor variations.

For larger genera, an outline of the accepted formal or informal classification is also given, with individual taxa or groups numbered in sequence. These sequence numbers are then given at the start of each taxon description to indicate its placement within the genus.

If recent conflicting classifications are available for a given group, this is shortly discussed and the classification adopted is indicated.

Minor spelling variants of epithets are not indicated; instead, the 'corrected' spelling is used throughout for accepted names and synonyms.

#### *Infraspecific taxa*

Infraspecific taxa are given in strict alphabetic order of rank and name (i.e. ranks in the sequence cv., fa., ssp., var.). This is due to the strict alphabetical sorting used when the output for the handbook was generated from a computerized database. It also means that the typical infraspecific taxon (i.e. the one repeating the species name) is not treated first as in many handbooks, but in its appropriate alphabetical sequence.

#### *Cultivars, hybrids*

Cultivars (rank abbreviated as cv.) are not included on an exhaustive base. Cultivars not associated

with a species are enumerated first, i.e. between the generic entry and the first species. Cultivars associated with a species name are included under that species, either as an entry of their own (and in the same form as subspecies etc.), or, in the case of cultivars of minor importance, in the form of a short mention in the species discussion. Cultivar nomenclature follows the guidelines of the ICBN.

Formally named hybrid genera are either included as 'genera' of their own, or dealt with in the discussion of their parent genera. The same applies to formally named hybrid species (incl. those named as cultivars). Hybrids only known with their hybrid formula are either discussed in the generic entry, or mentioned under one or the other of their parent species. No attempt has been made, however, to include all the numerous formally named hybrids.

#### *Descriptions*

The descriptions are as compact, concise and diagnostic as possible. Characters that do not vary for the group concerned are not repeated from the family or genus descriptions. In the case of genera further subdivided, information already presented in the group definitions is also not normally repeated in the descriptions of individual taxa.

#### *Measurements*

All measurements are given in metric units. Measurements without further qualifications *always refer to the long axis* of the organ described (i.e. length, height etc.); two measurements united with the  $\times$ -sign stand for length  $\times$  width.

#### *Terminology*

Special terms used in descriptions are explained when first used; other botanical terminology is not further explained, and the readers are referred to the numerous botanical glossaries, of which Stearn (1992) is cited by way of a most important and useful example.

#### *Typification*

This information is included for convenience when readily available, but is lacking in numerous cases. The type citations include the country and major administrative unit where the type was collected, the collector and collection number, and the herbaria where material is said or known to be deposited. The herbarium acronyms conform to *Index Herbariorum*, Ed. 8 (Holmgren & al. 1990). Where more than one herbarium acronym is given, the first relates to the holotype, the others to isotypes. Additional information on typification is sometimes added, especially in the case of lecto- or neotypes.

*Nomenclatural status of names*

For all taxa treated, every attempt has been made to use only valid and legitimate names, but this was not achievable in a small number of cases. In the synonym lists, the nomenclatural status (invalid, illegitimate, rejected) is indicated by citing the ICBN articles violated (following the numbering in the "Tokyo" Code). Spelling variants are considered as invalidly published according to ICBN Art. 61.

*Synonymies*

The synonymies given for genera and especially species are as exhaustive as possible and include all names recognized as synonyms. The first synonym(s) – if applicable – is/are the basionym and/or later combination(s) for the accepted name of the entry. All combinations of the same basionym are given in sequence of publication and are united with the =-sign to indicate that these are homotypic (nomenclatural) synonyms. Please note that the =-sign is only used for *combinations* based on the same basionym and does not indicate other homotypic synonyms (e.g. *nomina nova*). All other synonyms are headed with 'incl.' to indicate that they are, with the exception of *nomina nova* based on the same type, taxonomic synonyms (= heterotypic synonyms). Again, groups of combinations based on the same basionym are united with =-signs. Basionyms are given first and in chronological order.

*Geographical names*

Country names are listed roughly in a North to South and West to East sequence. Every attempt has been made to standardize geographical names (of countries, administrative units, regions, etc.) as far as possible, but there is a surprising amount of change relating to such names. This is specifically the case for the names of the RSA provinces, which have changed considerably during 1995, especially affecting the former Cape Province, which has been split up into 4 units (North-West Province, Northern Cape, Western Cape, Eastern Cape). We have tried as best as we could to provide the modern names in the distribution information included in the handbook, but it has been impossible to adjust all the data for type localities, where the name "Cape Prov." is still used in some cases. This results in some inconsistencies, but it is hoped that these are tolerable under the present circumstances.

Some difficulties were also encountered in a few cases where countries have been amalgamated (as in the case of the former North Yemen and South Yemen) or divided (e.g. Eritrea, formerly

part of Ethiopia). Full consistency in all these cases cannot be guaranteed.

In order to save space, geographical directions such as North, South, etc., are *always* abbreviated (N, S, etc.). Please note that *SW Africa* indicates 'southwestern Africa' and *not* the former Southwest-Africa (now Namibia). Similarly, *S Africa* indicates 'southern Africa' and *not* the Republic of South Africa, for which the abbreviation RSA is always used.

*Literature references*

Literature references are given for all accepted names. Normally, the publication is cited with a full abbreviation according to the standards defined in Eggle (1985) and Eggle (1998) for specialist succulent plant periodicals, or BPH (Lawrence & al. 1968) and BPH/S (Bridson & Smith 1991) for other periodicals, while TL2 of Stafleu & Cowan (1976-1988) and supplements (Stafleu & Mennega 1992-2000) are followed for book abbreviations (in both cases with some minor exceptions to conserve uniformity).

A number of frequently used titles of journals and books are further abbreviated to a short acronym, and a list of these acronyms follows the list of Abbreviations and symbols (page XI).

In the running text, literature is cited in the usual way (author and year, sometimes supplemented by a page reference), and full details can be found in the list of references at the end of the volume.

*Illustrations*

An attempt has been made to cite one readily accessible illustration for each species or infraspecific taxon when no illustrations are included in the literature reference for the accepted name. If the name used in the cited publication differs from the accepted name in the handbook, it is indicated (genus name abbreviated to first letter if identical, specific or infraspecific epithet omitted if identical to the accepted name).

Illustrations in the illustration section of this volume are given in bold print to distinguish them from other material cited.

*Indication of authorships*

For families, authorship is indicated at the end of the entry. For genera, authorship is given as a subheading after the genus heading. If more than one author has contributed species entries for a genus, each entry has its own indication of authorship as far as its authorship differs from the authorship given for the genus as a whole. It is thus possible to identify the author(s) of any entry in the handbook.