

SUCCULENT PLANT SPECIES FROM THE *CRASSULACEAE* FAMILY PRESENT IN THE GREENHOUSES OF THE BOTANICAL GARDEN

"AL. BUIA" FROM CRAIOVA

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Abstract

Dissemination of information regarding the existing plant collections in the Botanical Garden "Al. Buia" from Craiova is a necessity for knowing, understanding and appreciating its plant heritage at its fair value.

*Through the collections it holds, it can be said that the Botanical Garden effectively contributes to the conservation of plant diversity, as some rare and threatened species from Europe and other regions of the world are also present here. Also, an interesting group of plants grown in the greenhouses of the Craiova Botanical Garden is represented by succulent plants, with representatives from several families, of which species belonging to the *Crassulaceae* family are presented in this work.*

This family includes mostly herbaceous species, rarely frutescent plants with succulent leaves that grow spontaneously in dry, rocky, water-poor places in the warm and temperate regions of the globe.

*The *Crassulaceae* family is well represented in the greenhouse by species of the genera *Adromischus*, *Aeonium*, *Aichryson*, *Bryophyllum*, *Crassula*, *Echeveria*, *Kalanchoe*, *Monanthes*, *Pachyphytum*, *Sedum*, *Sinocrassula*, generally originating in the arid areas of South Africa. Some species are native to the Canary Islands, South America, Central America and Mexico, but all exhibit adaptations to xerophytism, such as covering with trichomes or a wax coating.*

Key words: *succulent plants, the *Crassulaceae* family, Greenhouses, Botanical Garden, Craiova*

INTRODUCTION

Today, botanical gardens are considered "institutions that house well-identified collections of living plants, used for the purpose of scientific research, conservation of plant diversity, information and education" (Sârbu Anca 2001).

Thus, in this context, it can be stated that the Botanical Garden "Al. Buia" from Craiova effectively contributes to the preservation of the diversity of plants

through the collections it owns. In the Botanical Garden plants with ornamental value and other plants various uses (pharmaceutical, food, textile, tinctorials etc.) are cultivated, as well as some rare and threatened species in various natural habitats. The cultivation of all these species mainly highlights the contribution of the Botanic Garden to the *ex situ* conservation in its living plant collections of a large number of species, which is one of

the frequent activities carried out in a botanic garden.

The dissemination of information in various forms (publications, symposia, exhibitions, access to collections etc.) regarding the heritage of a Botanical Garden, the value of the collections it houses, is a necessity for knowing, understanding and appreciating at its fair value for everything that such an institution owns (Sârbu Anca 2001).

The greenhouses of the Craiova Botanical Gardens contain a varied collection of plants from different regions of the world, an interesting group being constituted by succulent plants, with representatives from several families, of which species belonging to the *Crassulaceae* family are presented in this communication.

MATERIALS AND METHODS

The species of succulents from the *Crassulaceae* family, present in the greenhouse collection of the Botanical Garden "Al. Buia", were verified or identified with the help of specialized literature. These species have been obtained over time from the plant material (seeds or cuttings) received in exchange with other botanical gardens or institutions with similar concerns in the country and abroad. For each species, the updated scientific name is presented, according to the most recent taxonomic studies, the origin, life span and biological form, the conservation status (for the species that are endangered in the natural habitats, being included in different degrees of endangerment) and various observations (propagation, uses etc.).

RESULTS AND DISCUSSIONS

The *Crassulaceae* family includes mostly herbaceous species, rarely frutescent plants, with succulent leaves, which grow

spontaneously in dry, rocky, water-poor places in the warm and temperate regions of the globe. All species show adaptations to xerophytism, such as water-retaining plant organs, covering with hairs or a wax layer.

From this family, species originating generally from the arid areas of South Africa, but also from the Canary Islands, South America, Central America and Mexico are present in the greenhouse (Table 1).

The collection of succulent plants in the family *Crassulaceae* counts 45 taxa, of which 14 species are native to South Africa, 11 to Mexico, 8 to Madagascar and 7 to the Canary Islands. A few species are native to Asia, Central America, North America, Europe. Most are perennial plants, only one species is annual or mostly biennial (for example, *Aichryson laxum*).

Several species of *Crassulaceae* grown in the greenhouse are endemic to the regions of South Africa (eg *Adromischus cooperi*, *Crassula perforata*), Canary Islands (*Aichryson laxum*, *Aeonium arboreum*, *Aeonium canariense*, *Aeonium gomerense*, *Aeonium urbicum*), Madagascar (*Kalanchoe rhombopilosa*). Some taxa belong to a threatened category such as *Aeonium gomerense* (which has the conservation status: Endangered), mainly due to the continuous loss and fragmentation of natural habitats. Therefore, their protection *in situ*, i.e. in their natural habitats, must be of high priority. In addition, *ex situ* conservation is necessary, which involves the cultivation in botanical gardens of these species, mainly those that are endemic or endangered and that could disappear from their regions of origin. Cultivation in botanical gardens ensures the maintenance of the species

and possibly the repopulation of natural habitats should the species disappear. All these species are cultivated and traded mainly for their ornamental value. Some can cause skin irritation or are poisonous or toxic (eg *Sedum rubrotinctum*, *Kalanchoe blossfeldiana*, *Bryophyllum delagoense*, *Kalanchoe daigremontiana*). A few species can become invasive,

threatening natural ecosystems, especially in arid and semi-arid regions (*Kalanchoe daigremontiana* in South Africa and South America), in southern Australia (for example *Aeonium arboreum*) but they do not pose a danger to the flora and vegetation from Romania, being cultivated here as indoor plants.

Table 1. Collection of succulent plants from the *Crassulaceae* family, "Al. Buia" Botanic Garden

Family CRASSULACEAE				
Species	Origin	LS, BF	CS	Observations
<i>Adromischus cooperi</i> (Baker) A. Berger	EECSAf	P, subshrub		Succulent ornamental plant, by foliage or form; in natural habitats grows primarily in the subtropical biome(s).
<i>Aeonium arboreum</i> (L.) Webb & Berthel.	EWCI	P, subshrub		Succulent ornamental plant; In natural habitats grows in sunny or slightly shaded places on weathered volcanic soil. It is an invasive weed in places outside its natural distribution, for example southern Australia (Brodie & Reynolds, 2012).
<i>Aeonium canariense</i> (L.) Webb & Berthel.	ECI	Ch		Succulent ornamental plant; in natural habitats grows primarily in the subtropical biome(s); It is has environmental uses (Diazgranados et al., 2020).
<i>Aeonium gomerense</i> (Praeger) Praeger	ECI	P, subshrub	EN	Succulent ornamental plant; in natural habitats grows primarily in the subtropical biome(s).
<i>Aeonium glutinosum</i> (Aiton) Webb & Berthel.	EMal	P, subshrub		Succulent ornamental plant; in natural habitats grows primarily in the subtropical biome(s).
<i>Aeonium haworthii</i> Webb & Berthel.	CI and NAf	P, subshrub		Succulent ornamental plant; In natural habitats grows primarily in the subtropical biome(s).
<i>Aeonium urbicum</i> (C. Sm. ex Hornem.) Webb & Berthel.	ECI	P, subshrub		Succulent ornamental plant; is a monocarpic plant; The waxy, fleshy leaves tend to be bright green, but will turn a deep red hue at the tips when the plant is stressed- (https://plantcaretoday.com/aeonium-urbicum.html).
<i>Aichryson laxum</i> (Haw.) Bramwell	ECI	A. or mostly B.		Succulent ornamental plant, by foliage or form; in natural habitats grows primarily in the subtropical biome(s).
<i>Bryophyllum delagoense</i> (Eckl. & Zeyh.) Druce	Mad.	P, subshrub		Succulent ornamental plant; In natural habitats grows primarily in

(syn. <i>Kalanchoe delagoensis</i> Eckl. & Zeyh.)				the desert or dry shrubland biome(s); it is has environmental uses and as a poison (Hurrell & al., 2012).
<i>Crassula capitella</i> Thunb. subsp. <i>thyrsiflora</i> (Thunb.) Toelken	SAf	P, subshrub		Succulent ornamental plant.
<i>Crassula cordata</i> Thunb.	SAf	P		Succulent ornamental plant.
<i>Crassula expansa</i> subsp. <i>fragilis</i> (Baker) Toelken (syn. <i>C. browniana</i> Burt Davy)	SAf	P		Succulent ornamental plant; S, in natural habitats grows in humus-pockets in rock crevices, on termite mounds, in wet, shady situations in bush, tree savanna, riverine forests etc.
<i>Crassula lactea</i> Aiton	SAf	P		Succulent ornamental plant.
<i>Crassula multicava</i> Lem.	SAf	P		Succulent ornamental plant; Used as a groundcover, the plant is resistant to droughts and low temperatures above -3 °C (Powrie 1998).
<i>Crassula muscosa</i> L. (syn. <i>C. lycopodioides</i> Lam.)	SAf	P, subshrub		Succulent ornamental plant; The scientific and the common names refer to its appearance: <i>muscosa</i> derives from the Latin word <i>muscosus</i> , meaning "mossy". The specific epithet <i>lycopodioides</i> refers to the similarity with the moss of the genus <i>Lycopodium</i> , also known from the spontaneous flora of Romania.
<i>Crassula orbicularis</i> L.	SAf	P		Small succulent ornamental plant; in natural habitats usually grows in sheltered places, and often associated with rocky outcrops in forested areas.
<i>Crassula ovata</i> (Mill.) Druce (syn. <i>C. portulacea</i> Lam.)	SAf	P, subshrub or shrub		Succulent ornamental plant, by foliage or form; in natural habitats grows primarily in the subtropical biome(s).
<i>Crassula perfoliata</i> L. var. <i>falcata</i> (J. C. Wendl.) Toelken	SAf	P, subshrub		Succulent ornamental plant, by foliage or form; in natural habitats grows primarily in the subtropical biome(s).
<i>Crassula perforata</i> Thunb.	SAf	P		Succulent ornamental plant, by foliage or form; in natural habitats grows primarily in the subtropical biome(s).
<i>Crassula perforata</i> Thunb. subsp. <i>perforata</i> (syn. <i>C. conjuncta</i> N. E. Br.)	ESAf	P	LC	Succulent ornamental plant; in natural habitats grows in rock crevices, on rock faces, or among boulders in ravines.
<i>Crassula rupestris</i> L.f. subsp. <i>marnieriana</i> (Huber & Jacobsen) Toelken	SAf	P, subshrub		Succulent ornamental plant, by foliage or form; in natural habitats grows primarily in the subtropical biome(s).
<i>Crassula spathulata</i> Thunb. (syn. <i>C. cordata</i> Lodd)	SAf	P		Succulent ornamental plant.
<i>Echeveria amoena</i> De Smet ex E. Morren	Mexico	P, subshrub		Succulent ornamental plant; In natural habitats grows primarily in the desert or dry shrubland biome(s).
<i>Echeveria elegans</i> Rose	Mexico	P		Succulent ornamental plant.

<i>Echeveria pulvinata</i> Rose	Mexico	P, subshrub		Succulent ornamental plant. In natural habitats grows primarily in the desert or dry shrubland biome(s).
<i>Kalanchoe beharensis</i> Drake	S-W Mad.	P, subshrub		Succulent ornamental plant; In natural habitats grows in xerophyte forests on various soils.
<i>Kalanchoe blossfeldiana</i> Poelln.	Mad.	P		Succulent ornamental plant; Parts of <i>K. blossfeldiana</i> are poisonous if they are ingested (Diazgranados et al., 2020).
<i>Kalanchoe daigremontiana</i> Raym.-Hamet & H. Perrier	Mad.	P		Succulent ornamental plant; it can propagate vegetatively from plantlets that develop on its leaf margins, as well as through upshoots from lateral roots, and seeds. All parts of this species contain a very toxic steroid known as daigremontianin (Wagner et al., 1985; McKenzie et al., 1986). It can become an invasive plant and threaten natural ecosystems, especially in arid and semi-arid environments (South Africa and regions of South America for example), where it can inhibit native-plant recruitment (Herrera et al., 2016).
<i>Kalanchoe fedtschenkoi</i> Raym.-Hamet et H. Perrier	Mad.	P, subshrub		Succulent ornamental plant; In natural habitats grows primarily in the desert or dry shrubland biome(s).
<i>Kalanchoe millotii</i> Raym.-Hamet et H. Perrier	Mad.	P, subshrub		Small succulent ornamental plant.
<i>Kalanchoe rhombopilosa</i> Mannoni & Boiteau	EMad.	P		Succulent ornamental plant; In natural habitats grows primarily in the seasonally dry tropical biome(s).
<i>Kalanchoe tomentosa</i> Baker	Mad.	P, subshrub		Succulent ornamental plant; In natural habitats grows primarily in the seasonally dry tropical biome(s); it is has environmental uses.
<i>Monanthes polyphylla</i> (Aiton) Haw. subsp. <i>amydros</i> Svent.	ELG	P		Succulent ornamental plant.
<i>Monanthes muralis</i> Hook.f.	CI	P, shrub		Succulent ornamental plant.
<i>Pachyphytum compactum</i> Rose	Mexico	P		Succulent ornamental plant.
<i>Pachyphytum oviferum</i> Purpus	Mexico	P		Succulent ornamental plant.
<i>Sedum adolphii</i> Hamet	Mexico	P		Succulent ornamental plant.
<i>Sedum lineare</i> Thunb.	EAs.	P		Succulent ornamental plant.
<i>Sedum mexicanum</i> Britton	Mexico, the United States, Europe	P		Succulent ornamental plant.
<i>Sedum moranense</i> Kunth	CA, NA	P		Succulent ornamental plant.
<i>Sedum morganiatum</i> E. Walther	Mexico	P		Succulent ornamental plant.
<i>Sedum pachyphyllum</i> Rose	Mexico	P		Succulent ornamental plant.

<i>Sedum rubrotinctum</i> R. T. Clausen	Mexico	P, subshrub		Succulent ornamental plant; The leaves of <i>S. rubrotinctum</i> change colour from green to red during the summer months as a protective adaptation; is poisonous and may cause irritation when ingested (Clausen 1948).
<i>Sedum stahlii</i> Solms	Mexico	P		Succulent ornamental plant.
<i>Sinocrassula yunnanensis</i> (Franch.) A. Berger	China and Taiwan	P		Succulent ornamental plant; in natural habitats grows primarily in the temperate biome(s).

Note. LS = Life span: A. = annual, B. = biennial, P = perennial; BF = Biological form: Ch = chamaerophyte; CS (Conservation Status): EN = Endangered, LC = Least Concern; Origin (Geographical Distribution): CA = Central America, CI = Canary Islands, EAs. = East Asia, ESAf = Endemic to South Africa, EECSAf = Endemic to the Eastern Cape of South Africa, ECI = Endemic to Canary Islands, ELG = Endemic to la Gomera, EMad. = Endemic to Madagascar, EWCI = Endemic to the Western Canary Islands, EMal = Endemic to Madeira Island, Mad. = Madagascar, NA = North America, NAf = Northern Africa, SA = South America, SAf = South Africa, S-W Mad. = South-Western Madagascar; other abbreviations: S = saxicolous.

CONCLUSIONS

In the greenhouse plant collection, the *Crassulaceae* family is represented by 11 genera: *Adromischus*, *Aichryson*, *Bryophyllum*, *Sinocrassula* (each with one species), *Aeonium* (six species), *Crassula* (thirteen species), *Echeveria* (three species), *Kalanchoe* (seven species), *Monanthes* (two species), *Pachyphytum* (two species), *Sedum* (eight species).

The presented taxa multiply vegetatively and are mainly plants with ornamental value, some species can be toxic, they can have invasive potential in certain regions, and a few species are endangered in their natural habitats. For these endangered taxa a good conservation is ensured by cultivation in Botanical Garden.

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