EXSICCATA AND TYPES IN THE A. BERGER'S HERBARIUM AT LA MORTOLA (HMGBH)

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ABSTRACT
Alwin Berger (1871-1931) during his scientific activity at the Hanbury Botanical Gardens (1897-1915) and as succulent specialist have preserved more than 1,500 exsiccata and published more than 700 new taxa and combinations.
The Berger's succulent dry collection, preserved at the *Herbarium Mortolensis* [HMGBH] and characterized by approximately 1,400 *exsiccata* with 48 specimens potentially useful for typifications, and 59 genera is here presented and compared for the first time with the other collections deposited at the Smithsonian Institution of Washington [US], New York Botanical Garden [NY], and Royal Botanical Gardens, Kew [K].
Two projects focusing on the Berger's succulent herbaria conservation, study and revision now being carried out so to contribute to the promotion of the monumental history of the Hanbury Gardens and the Berger's systematic work on succulent families are presented.

KEY WORDS
Exsiccata, Typus, Succulents, Alwin Berger, Herbarium Mortolensis.

INTRODUCTION

Alwin Berger (1871-1931) was a German Botanist specialized in succulent plants. He was curator between 1897 and 1915 at La Mortola an alternative name for the famous Hanbury Botanical Gardens (GBH) located in Ventimiglia (NW Italy) near the French border, founded by Sir Thomas Hanbury in 1867.

During his curatorship he enriched and implemented both the living collection with the support of valuable collaborators as researchers and explorers in the Americas (Guiggi, 2016) and the *Herbarium Mortolensis* (HMGBH) (Fig. 1) preserving many of his new described and cultivated taxa. Historical information on this *Herbarium* is reported by Campodonico (2011): the main core of HMGBH consists of Alwin Berger's *exsiccata*, collected personally or obtained by its correspondents (*i.e.* Prof. J. Arechavaleta (Uruguay), Prof. C.F. Baker (Cuba), Mrs. Brandegee (USA), Prof. N.L. Britton (USA), Prof. Conzatti (Mexico), Mr. F. Eichlam (Guatemala), Dr. D. Griffiths (USA), Mr. C.A. Purpus (USA), Dr. J.N. Rose (USA), Dr. J. Söhrens (Chile), Prof. W. Trelease (USA), Dr. F.A.C. Weber (French), Mr. W. Weingart (Germany), Mr. W.C. Wercklé (Costa Rica), *cfr.* Guiggi, 2016). HMGBH also retains specimens collected by Dinter during his stay at Mortola as curator and by Clarence Bicknell in Val Roja.

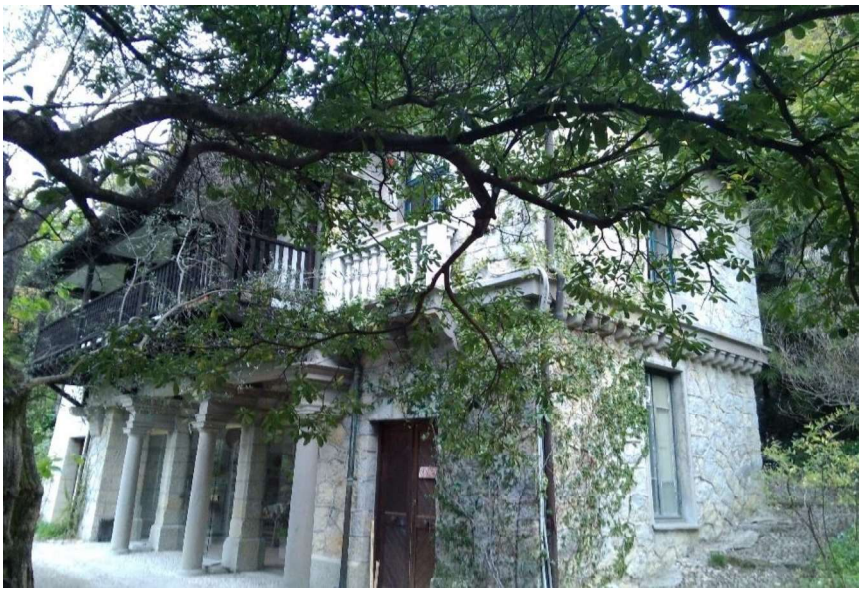

Fig. 1. Historic home of the *Herbarium Mortolensis* at the Hanbury Botanical Gardens. Photo. A. Guiggi

Berger's studies at La Mortola were focused in particular on the genus *Agave*, *Aloe*, *Cereus*, *Euphorbia*, *Mesembrianthemum*, etc, depositing more than 1,400 *exsiccata* and publishing more than 700 new taxa and combinations in succulent families during his scientific careers.

A type is a specimen, usually an *exsiccatum*, selected to serve as a reference point when a plant species is first named or revised. These specimens are extremely important to botanists who are attempting to determine the correct application of a name. There are several categories of types (e.g. holotype, isotype, syntype, paratype, lectotype, neotype, topotype, etc.) (sciweb.nybg.org). The typifications are frequently applied for the revision of historical taxa, particularly for those which the type designation was not obligatory before the 1959 (McNeill et al., 2012).

The object of this preliminary work is to highlight the importance of the Berger's *exsiccata* and the presence of types of taxa described by Berger himself that are kept in HMGBH.

METHODS

The Alwin Berger's succulent herbaria that include many types are studied and compared in HMGBH (Hanbury Botanical Gardens, La Mortola Italy), NY (The New York Botanical Garden, U.S.A., New York, Bronx), US (Smithsonian Institution, U.S.A., District of Columbia, Washington) and K (Royal Botanical Gardens, U.K., Kew, Richmond) together with the Berger's specialized literature (Berger, 1904, 1905, 1906, 1907, 1908, 1910, 1912, 1915, 1920, 1926, 1929).

Additional material not studied here that does not concern to succulents is also deposited at HMGBH (Flora Saxonica, etc) and at: B (Botanischer Garten und Botanisches Museum Berlin-Dahlem, Zentraleinrichtung der Freien Universität Berlin), BH Cornell University, U.S.A., New York, Ithaca), BR (Botanic Garden Meise, Belgium), DBN (National Botanic Gardens, Ireland, Dublin), G (Conservatoire et Jardin botaniques de la Ville de Genève, Switzerland), LZ (University of

Leipzig, Germany), M (Botanische Staatssammlung München, Germany), NY and US.

RESULTS

An accurate analysis of the preserved succulent material kept at HMGBH enabled to recognize 390 samples of Cactaceae, 10 useful for revision and typification of the Berger's taxa (Fig. 2), belonging to the following principal genera: *Cereus* s.l., *Echinocactus* s.l., *Echinocereus*, *Echinopsis*, *Epiphyllum*, *Mammillaria, Opuntia* s.l., *Pereskia*, *Pereskiopsis*, *Phyllocactus*, *Rhipsalis* s.l., etc.

Meanwhile other succulents are characterized by about 1,000 samples, 38 useful for typifications (Figs. 3-4), represented by the genus *Agave*, *Aloe*, *Caralluma, Cotyledon, Crassula, Dasylirion, Echeveria, Gasteria*, *Haworthia*, *Kalanchoe*, *Mesembryanthemum* s.l., *Pachyphytum, Sedum*, *Sempervivum* s.l., *Stapelia*, *Yucca,* etc.

A complementary study was carried out also with the material kept at US that includes 12 Cactaceae and 290 other succulents specimens with 6 designated types, at NY with 9 Cactaceae, 13 other succulents and 10 types, and at K with 3 Cactaceae, 8 other succulents and 2 types.

DISCUSSION AND CONCLUSIONS

The Berger's succulent *s.l.* herbarium at La Mortola [HMGBH] represents the most complete and representative piece of his scientific work. It includes a bulk of almost 1,400 specimens, 48 potentially useful for typification of the Berger's taxa and ca. 59 genera compared with the 302 specimens for 6 genera deposited at US, 21 spec. for 9 genera at NY, and 11 spec. for 6 genera at K. Nevertheless but contrarily to the US, NY and K material, it has never been the object of a specific study.

Currently, two different projects on the entire succulent herbarium in HMGBH are being carried out. The first one is aimed at the digitization of all the dry specimens, while the other one intends to carry out the study and revision of the material.

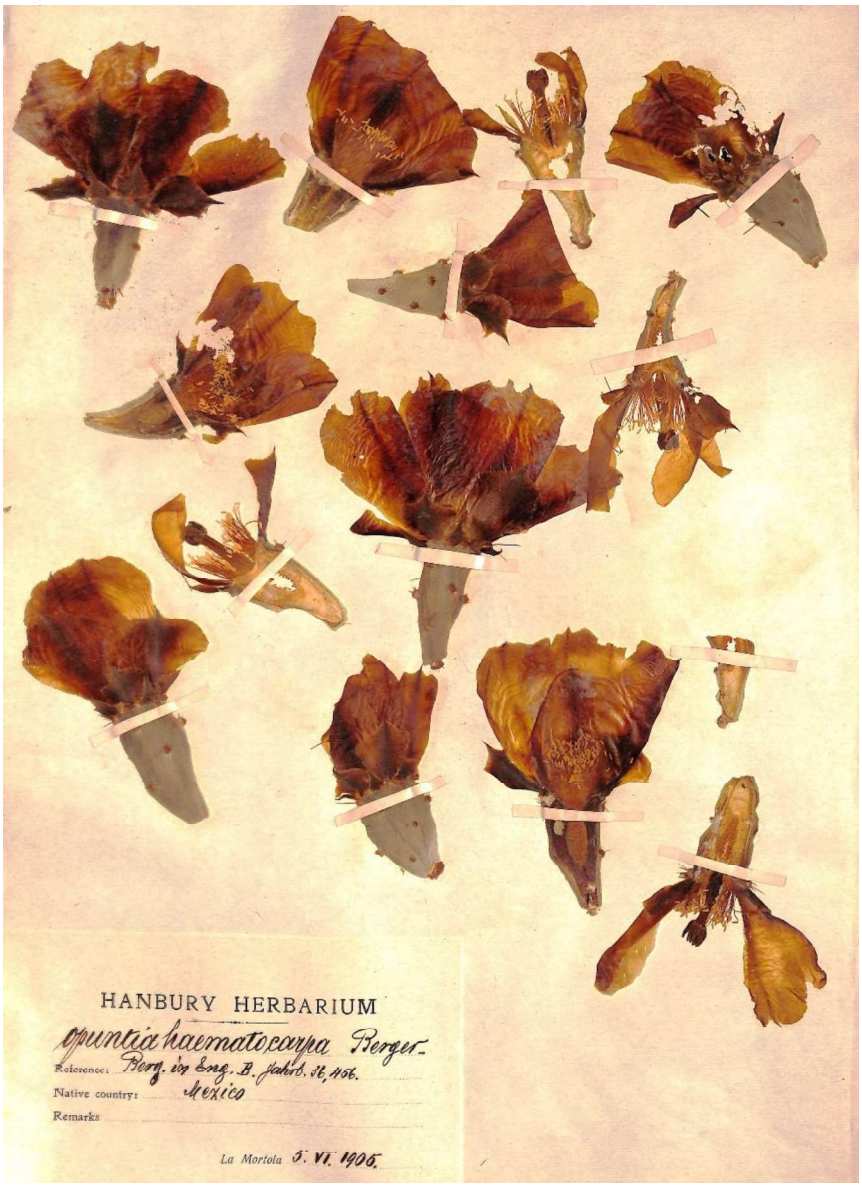

Fig. 2. Exsiccata of *Opuntia haematocarpa* A.Berger that includes several flower sections, deposited at the Herbarium of HMGBH. Photo. F. Pastor.

Fig. 3. Exsiccata of *Agave calodontha* A.Berger marked as Typus that includes a spined leaf, deposited at the Herbarium of HMGBH. Photo. A. Guiggi & F. Pastor.

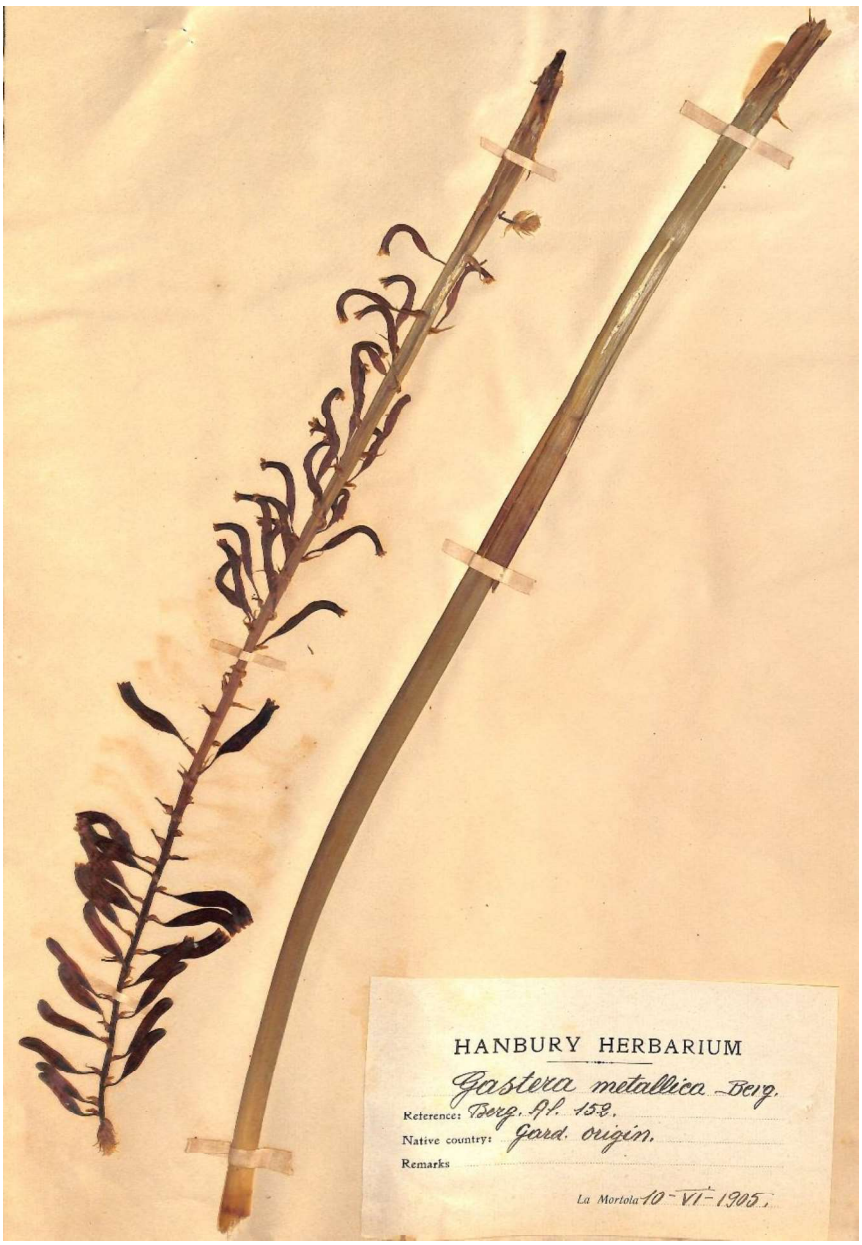

Fig. 4. Exsiccata of *Gasteria metallica* A.Berger including an inflorescence separated in two parts, deposited at the Herbarium of HMGBH. Photo. A. Guiggi & F. Pastor.

The first piece of work regarding the identification and typification of the Berger's Opuntias described at GBH which includes the recognition of 1 neotype, 5 lectotypes and 4 epitypes (Guiggi & Mariotti, 2017) is in press, while the other ones are in preparation.

The taxonomic work of Alwin Berger at La Mortola represented a milestone for the study of the succulent families and a valuable part of the history of the Hanbury Botanical Gardens. The revision of his herbarium is the first step to rediscovering, understanding and validating this scientific legacy, and a basis on which to build a future programme of research into the succulent plants at the Hanbury Botanical Gardens.

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