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## **German Gene Bank for Ornamentals: Focus on the Subnetwork *Pelargonium***

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# German Gene Bank for Ornamentals: Focus on the Subnetwork *Pelargonium*

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## Abstract

The German Gene Bank for Ornamentals, founded in 2009, conserves and documents plant collections to promote their use e.g. in breeding and research, by providing propagation material and descriptive data. It has been coordinated by the Federal Plant Variety Office since 2014 and currently comprises four crop-specific gene banks and the Plant Collection Network. Each gene bank is supported by the Federal Plant Variety Office, the Federal Office for Agriculture and Food, a coordinator together with partners responsible for collection and support. In some cases the latter form subnetworks specific to genera or tribus. Usually, supporting partners do not deposit plant material in a gene bank, but contribute valuable expert knowledge making them important partners. The Subnetwork *Pelargonium*, founded in 2017, has the highest number of partners (five collecting and four supporting partners).

## 1. Introduction

The German Gene Bank for Ornamentals, founded in 2009, currently includes four crop-specific gene banks (Roses, Rhododendrons, Vegetatively and Seed Propagated Ornamentals), and the Plant Collection Network. It has been coordinated by the Federal Plant Variety Office since 2014 (Fig. 1). The Federal Office for Agriculture and Food (specifically the Information and Coordination Centre) integrates the German Gene Bank for Ornamentals into a national and international network. This permits the information about plant genetic resources of the gene bank to be components of the National Inventory of Plant Genetic Resources. Furthermore, they are included in the search catalogue for European Plant Collections of the European Cooperative Programme for Plant Genetic Resources (ECPGR).

Each gene bank of the German Gene Bank for Ornamentals is coordinated by the Federal Plant Variety Office, the Federal Office for Agriculture and Food, together with designated coordinators and collecting and supporting partners. A subnetwork is specific to genera or tribus (the latter is the case for the Subnetwork *Ericaceae*, which comprises the genera of *Erica*, *Calluna* and *Daboecia*), and includes collecting and supporting partners. The plant material available in the inventory of the collecting partners forms the collection of the gene bank. Supporting partners are important contributors thanks to their expertise. However, their collections are not part of the gene bank inventory. The German Gene Bank for Ornamentals conserves and documents plant collections to promote their use, e.g. in breeding and research, by providing propagation material and plant data (Spellerberg 2017).

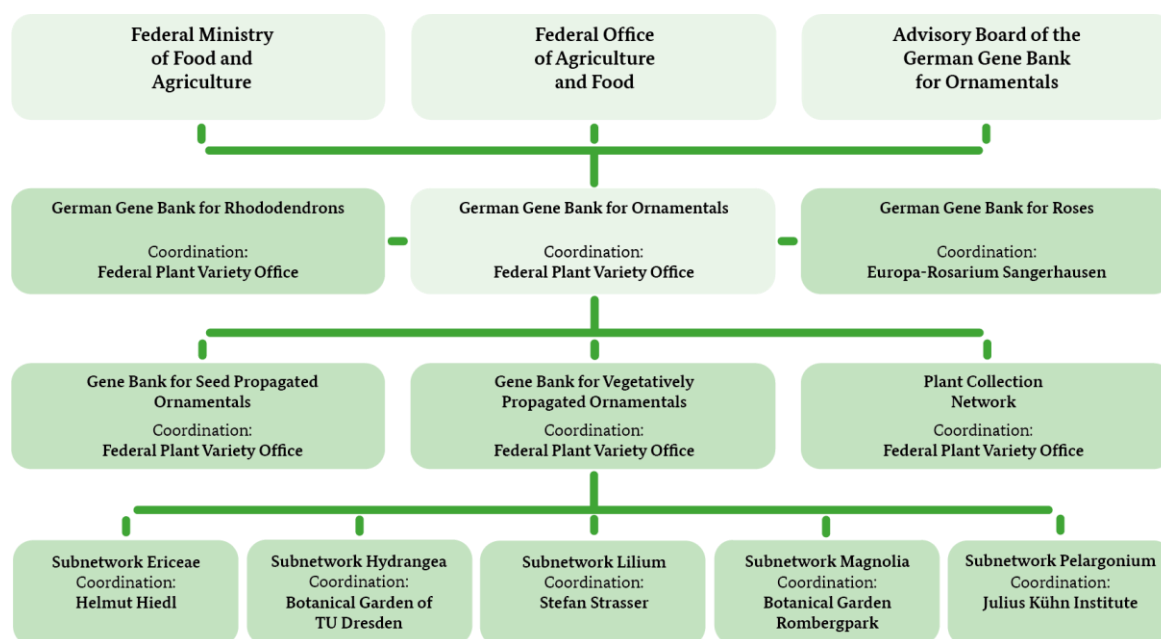


Figure 1: Organogram of the German Gene Bank for Ornamentals (dark green boxes represent the gene banks and the Plant Collection Network; light green boxes indicate coordinating elements) ([www.bundessortenamt.de](http://www.bundessortenamt.de)).

## 2. Approach and Results

### Gene Bank for Seed Propagated Ornamentals, Federal Plant Variety Office, Hannover

Since August 2011, the Federal Plant Variety Office has been responsible for establishing and coordinating the Gene Bank for Seed Propagated Ornamentals. One collecting and three supporting partners are currently involved. The central collection was established at the Federal Plant Variety Office in 2012. It contains almost 400 accessions from 84 species such as *Callistephus chinensis*, *Dianthus caryophyllus* and *Zinnia elegans*, three subspecies, e.g. *Clarkia amoena* subsp. *lindleyi* - in total 387 varieties. Since 2013, the founding year of this gene bank, accessions of the collection have been cultivated and stored at the testing stations in Hannover and Dachwig for propagation and description. The descriptions and photos are published in the German Gene Bank for Ornamentals database ([www.bundessortenamt.de](http://www.bundessortenamt.de)). Seed samples are provided to partners and interested parties every year. Addition of new accessions is possible, depending on demand.

### German Gene Bank for Rhododendrons, Federal Plant Variety Office, Hannover

The Federal Plant Variety Office has been coordinating the German Gene Bank for Rhododendrons since July 1, 2014. The origin for this gene bank is the model and demonstration project “Decentralized Rhododendron Gene Bank Network”, which was carried out by the Chamber of Agriculture in Lower Saxony and funded by the Federal Ministry for Food and Agriculture from September 2007 to June 2014. The gene bank was founded in 2010. It currently consists of 28 collecting partners with 15 public collections, e.g. botanical gardens and 13 private collections, such as tree nurseries or private gardens. In addition, 16 supporting partners are involved. The collecting partners hold about 370 *Rhododendron* species and subspecies and additionally about 4,100 *Rhododendron* varieties, including approximately 600 Indian Azalea varieties (approximately 11,600

accessions in total). Detailed information such as descriptions and photos are available in the Database of the German Gene Bank for Rhododendrons, which can be accessed via [www.bundessortenamt.de](http://www.bundessortenamt.de). Further development of the database is planned, e.g. the search function is to be improved by revising the search criteria and the data.

### **German Gene Bank for Roses, Europa-Rosarium Sangerhausen**

In 2009, the German Gene Bank for Ornamentals was established with the founding of the German Gene Bank for Roses. It is coordinated by the Europa-Rosarium Sangerhausen and consists of four collecting and 22 supporting partners. This gene bank preserves 4,186 accessions of 3,765 varieties and species. The accessions were verified, described and photographed. The information is publicly accessible in the database <https://datenbank.europa-rosarium.de/genbank.php>. The collection is gradually expanded, mainly through material from the Europa-Rosarium. The entire range of this collection currently consists of more than 8,750 varieties and species. Plant material is made available to partners, but also to research projects. For example, material has already been provided for two projects of the Leibniz University of Hannover: “Development of molecular markers for the efficient conservation and sustainable use of rose genetic resources” (funded by the Federal Ministry for Food and Agriculture) and the “Molecular analysis and visualization of adventitious root formation in rose” (funded by the Leibniz University Hannover).

### **Plant Collection Network, Federal Plant Variety Office, Hannover**

The Plant Collection Network is a platform to connect private and public collection partners as well as plant societies to share their knowledge and experience. It was founded in 2012 within the project “Developing a network of plant collections in the German Gene Bank for Ornamentals”, coordinated by the Deutsche Gartenbau-Gesellschaft 1822 e. V. and funded by the Federal Ministry for Food and Agriculture. Since June 1, 2017, the network has been coordinated by the Federal Plant Variety Office. There are currently 90 supporting partners in the network. They are involved in activities of the gene banks such as meetings of the subnetworks, exchange of plant material and information. The partners and the collections are accessible via a shared website ([www.netzwerkpflanzensammlungen.de](http://www.netzwerkpflanzensammlungen.de)), in a database ([www.bundessortenamt.de](http://www.bundessortenamt.de)), in 17 show gardens and advertising measures. Over 230 plant collectors have already registered on the network’s website and to present themselves and their collections. The database contains 15 collections with about 5,100 accessions. These collections are highly diverse and can be species-specific, such as the “Verdener *Hosta* collection” with 630 different varieties. In other cases, they comprise many different genera, such as the collection of woody ornamentals from the Park der Gärten with 171 different varieties of species from A as *Abies* to T as *Tsuga*. Expansion of the database is planned to facilitate integration of further collections from supporting partners. Plant material is provided on a case-by-case basis depending on the collection holder and propagation capacities. If necessary, the network supports the search for plant material or, in the case of an endangered collection, the search for new collection holders.

### **Gene Bank for Vegetatively Propagated Ornamentals, Federal Plant Variety Office, Hannover**

Since August 2012, the Federal Plant Variety Office has been responsible for establishing and coordinating the Gene Bank for Vegetatively Propagated Ornamentals, which was founded in 2015. This gene bank includes decentralized subnetworks of genus- or tribus-

specific collections and inventories of vegetatively propagated ornamentals. Up to date, there are five subnetworks with 19 collecting and 14 supporting partners, which are organized by different coordination offices (Fig. 1). There is the possibility to establish further subnetworks. Subnetworks vary in number of partners and accessions. Accession data of *Ericaceae*, *Hydrangea*, and *Pelargonium* are published in the common German Gene Bank for Ornamentals database ([www.bundessortenamt.de](http://www.bundessortenamt.de)). For example, descriptive data of 101 accessions from 58 species and 5 subspecies as well as 47 varieties from 26 different species in *Ericaceae* are available. In 2022 and 2023, plant material from the *Erica* collection was distributed by the Federal Plant Variety Office to partners and interested parties. In *Hydrangea*, all 360 accessions are varieties, specifically 282 varieties of nine species and two subspecies. Currently, data for *Lilium* and *Magnolia*'s is being processed. Within this gene bank, the Subnetwork *Pelargonium* is the largest in terms of partnerships, with five collecting and four supporting partners. It will be described in more detail below.

#### *Subnetwork Pelargonium, Julius Kühn Institute, Quedlinburg*

The Subnetwork *Pelargonium* was founded in 2017. Since October 1, 2019, the Julius Kühn Institute is coordinator and collection partner of this subnetwork. Other collection partners are Erfurter Garten- und Ausstellungen gGmbH (ega), Hochschule für Technik und Wirtschaft Dresden, Humboldt-Universität zu Berlin, and a private collection holder. In addition, the Botanical Garden of the Technische Universität Dresden, Landeshauptstadt Hannover, Fachbereich Herrenhäuser Gärten, the non-profit company ProSpecieRara Germany gGmbH, and a private collection holder are supporting partners. Objectives of the Subnetwork *Pelargonium* are the decentralized conservation of genetic resources as living collections of species and varieties, the verification of collections, and description of accessions including the documentation in the public database of the Federal Plant Variety Office. At present, the database has 186 entries for *Pelargonium* species from 14 sections, mainly *Ciconium* and *Pelargonium*, and cultivars ([www.bundessortenamt.de](http://www.bundessortenamt.de)). Of these, 177 accessions of seven species are already part of the gene bank inventory.

To describe and verify accessions of these collections, annual trials have been carried out at the testing station in Dachwig since 2019. For capacity reasons, each accession has so far only been grown in one year. If an accession is not homogeneous or does not correspond to the present description, it will be re-grown. At least one previously described accession is re-grown for comparison when new accessions of this species or variety are tested.

In the trial, about 30 morphological traits were recorded leaned on technical protocol CPVO/TP028/2 of the European variety approval (CPVO 2009). For instance, the color of the upper and lower surfaces of petals was determined using RHS colour charts (Royal Horticultural Society 2015). Other recorded traits are flower type (single, semi-double, double), growth type (upright, semi-upright, trailing), and leaf blade color including zone and variegation. Moreover, characterized accessions are documented with photos. Resistance traits are only included in the documentation if they have already been described elsewhere. Following the annual trials (2019-2023), plant material was supplied to the partners of the subnetwork and the Plant Collection Network.

In future, a core collection should be defined and developed. In addition, public outreach (lectures, publications, flyer, etc.) plays an important role in identifying additional partners. The Subnetwork *Pelargonium* is already well connected with the pelargonium group of the Deutsche Gartenbau-Gesellschaft 1822 e. V. and the *Pelargonium* enthusiasts of the Plant Collection Network. Following, the *Pelargonium* collections of the subnetwork are described.

### Plant collections of the Subnetwork *Pelargonium*

The collection at the Julius Kühn Institute in Quedlinburg comprises about 100 accessions of 60 species and 14 sections, with the horticulturally important sections *Ciconium* (11 species, 26 accessions) (Fig. 2) and *Pelargonium* (16 species, 25 accessions) as the focus. For *Pelargonium* species, one to six accessions are cultivated as clones. In addition, cultivars and unique primary hybrids, resulting from research, were collected. This collection is used for flow cytometric investigations (Plaschil et al. 2020, 2022), measuring genetic distance (Plaschil et al. 2017), enhancing genetic variability, polyploidization (Plaschil et al. 2021), interspecific hybridization (Kamlah et al. 2019, Plaschil et al. 2021), adaptation of in vitro methods such as embryo rescue (Plaschil et al. 2021), and somatic hybridization (Klocke et al. 2012, 2021). A portion of the collection is already part of the gene bank.



Figure 2: *Pelargonium tongaense* and *Pelargonium zonale*, © Federal Plant Variety Office.

The *Pelargonium* collection 'Kleiner Liebling' ('Little Darling') consists of 52 unique genotypes derived from mutation of *Pelargonium* × *hortorum* 'Kleiner Liebling' and its derivatives in F. Pohlheim's research group (Pohlheim et al. 1972, Pohlheim and Rössel 1989, Bölke et al. 2015, Jahn et al. 2015). These genotypes differ in flower colour (Fig. 3), leaf colour or pattern, habitus or ploidy level (Wiedemann et al. 2022). Many of them are chimeras. The collection was preserved by K. Olbricht, Dresden, and is also maintained at the Hochschule für Technik und Wirtschaft Dresden and Humboldt-Universität zu Berlin.



Figure 3: *Pelargonium* × *hortorum* 'Kleiner Liebling' and 'Weißer Liebling', © Federal Plant Variety Office.

The *Pelargonium* ega collection in Erfurt consists of a core assortment (134 accessions) of scented pelargoniums, old varieties, and *Pelargonium* species as well as a varying assortment of modern varieties. In 2022, a collection from a private holder with focus on regal and scented pelargoniums was given to the Förderverein Schloss & Park Herrnsheim e. V. (Worms). The future status of this collection in the subnetwork is still under development.

### 3. Conclusions

The German Gene Bank for Ornamentals and the Subnetwork *Pelargonium* make a valuable contribution to the conservation and use of plant genetic resources in Germany. The institutional structure guarantees stability in the organization and coordination of the collection holdings and collection activities. Apart from this security, there is no financing of the collections themselves except for third-party funded projects. The structure created is expandable and can organize the addition of individual plant collections to the gene banks. New subnetworks for specific genera or tribes can be founded, depending on demand.

### Literature

- Bölke N, Jahn W, Jugel W, Olbricht K, Pohlheim F (2015) Histogenetische Hintergründe im Variationsstammbaum *Pelargonium* × *hortorum* 'Kleiner Liebling'. BHGL-Tagungsband 31: 186
- CPVO – Community Plant Variety Office (2009) CPVO/TP028/2. [https://cpvo.europa.eu/en/applications-and-examinations/technical-examinations/technical-protocols/cpvo-technical-protocols?t=pelargonium&field\\_crop\\_sector\\_tid=All](https://cpvo.europa.eu/en/applications-and-examinations/technical-examinations/technical-protocols/cpvo-technical-protocols?t=pelargonium&field_crop_sector_tid=All)
- Jahn W, Bölke N, Rietze E, Olbricht K, Pohlheim F (2015) Variationsstammbaum *Pelargonium* × *hortorum* 'Kleiner Liebling'. BHGL-Tagungsband 31: 187
- Kamlah R, Pinker I, Plaschil S, Olbricht K (2019) Hybridization between *Pelargonium acetosum* L'Hér. and *Pelargonium* × *peltatum*. Journal of Applied Botany and Food Quality 92: 49-56. DOI: 10.5073/JABFQ.2019.092.007
- Klocke E, Budahn H, Richter K (2021) Somatic hybridisation as a potential tool for *Pelargonium* improvement. Acta Hort. 1324: 63-70. DOI: 10.17660/ActaHortic.2021.1324.9
- Klocke E, Weinzierl K, Abel S, Krüger H (2012) Protoplast fusion for the generation of unique *Pelargonium* plants. Acta Horticulturae 953: 119-127. DOI: 10.17660/ActaHortic.2012.953.16
- Plaschil S, Abel S, Klocke E (2020) Flow cytometric investigations on *Pelargonium* × *crispum*: an estimation of nuclear DNA contents with two different internal standards. Journal für Kulturpflanzen 72: 236242. DOI: 10.5073/JfK.2020.06.04
- Plaschil S, Abel S, Klocke E (2022) The variability of nuclear DNA content of different *Pelargonium* species estimated by flow cytometry. PLOS ONE 17. DOI: 10.1371/journal.pone.0267496
- Plaschil S, Budahn H, Wiedemann M, Olbricht K (2017) Genetic characterization of *Pelargonium* L'Hér. germplasm. Genetic Resources and Crop Evolution 64: 1051-1059. DOI: 10.1007/s10722-016-0424-x



Plaschil S, Budahn H, Klocke E, Wiedemann M, Olbricht K (2021) Spontaneous polyploidisation of interspecific and intersectional *Pelargonium* hybrids during embryo rescue. *Journal of Applied Botany and Food Quality* 94: 206-212.

DOI: 10.5073/JABFQ.2021.094.025

Pohlheim F, Pohlheim E, Günther G (1972) Die Haploide *Pelargonium zonale* 'Kleiner Liebling' als Testsystem für Mutagene. *Wissenschaftliche Zeitschrift der Pädagogischen Hochschule Potsdam* 16: 65-70

Pohlheim F, Rössel K (1989) Partnerinduktion bei chimärischen Blatt- und Blütenfarbmustern von *Pelargonium*. *Tagungsbericht der Akademie der Landwirtschaftswissenschaften der DDR, Berlin* 281: 107-115

Royal Horticultural Society (2015) RHS Colour Chart, 6th edition

Spellerberg B (2017) Aktuelle Entwicklungen bei der Deutschen Genbank Zierpflanzen. *Julius-Kühn-Archiv* 457: 15-17. DOI: 10.5073/jka.2017.457.001

Wiedemann F, Spiridonovska M, Plaschil S, Pinker I, Chen T-W (2022) Designing an optimal ploidy level in ornamental plants: An example in *Pelargonium x hortorum*. GPZ main bi-annual conference 2022, Breeding plants for tomorrow's world – challenges and solutions, 12.-14. September 2022, Heinrich-Heine-University Düsseldorf.

DOI: 10.5073/20220906-115225