



## Research Areas and Methods

- Evaluation of genetic resources and recent cultivars with respect to essential breeding traits as well as fungus and virus resistance
- Genetic analysis of important breeding traits
- Development of specific resistance tests and selection methods using plant organs (bioassays) or whole plants (greenhouse, open field)
- Establishment of reproducible methods for quantitative resistance assessment and differentiation; symptom score, digital image analysis, immunoassays
- Plant cell, tissue and organ culture, somatic hybridization, embryo rescue technology
- Mutagenesis and transformation
- Polyploidization *in vitro* and *in vivo* as well as determination of the ploidy level
- Development of molecular markers for marker assisted selection (MAS) and estimation of the genetic diversity
- Distance analysis, gene mapping, development of chromosome specific markers and QTL-analyses

### Head of the Quedlinburg division

Dr. Günter Schumann

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Julius Kühn-Institut, Federal Research Centre for Cultivated Plants  
Institute for Breeding Research on Horticultural and Fruit Crops –  
Quedlinburg

The institute holds research facilities in Quedlinburg and Dresden. While work in Quedlinburg involves vegetables, ornamentals, medicinal and aromatic plants, research in Dresden focuses on fruit crops.

### Location Quedlinburg

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### Travelling by car

Coming from the B6 (Bundesstraße = German federal road), take exit „Quedlinburg-Ost“ and continue on L66 towards Quedlinburg, after 2 km roundabout, follow signs to Gernrode/Ballenstedt, at the next roundabout (after 3 km), take 1<sup>st</sup> exit and continue on L242 towards Quedlinburg. When entering Quedlinburg, leave roundabout at the 1<sup>st</sup> exit (sign „Julius Kühn-Institute“) and immediately turn right into the JKI premises.

### Travelling by train

In front of the Quedlinburg railway station, you will find several bus stops. Take bus numbers 10, 31, 32 or 318 and get off at the stop Moorberg. Moorberg is a request stop, so indicate that you want to get off. Cross the road, turn right and you will find yourself at the entrance to the Julius Kühn Institute. You can buy tickets on the bus. Journey time is 5 minutes. If you prefer to walk, it will take you about 30 minutes.

### Editorial and Layout

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## Competence in Horticultural Plant Breeding

The Institute for Breeding Research on Horticultural and Fruit Crops is one of the 15 institutes of the Julius Kühn-Institut, Federal Research Centre for Cultivated Plants (JKI). It works in two locations - in Quedlinburg and Dresden-Pillnitz - with different crops.

In Quedlinburg, the Institute's core competence is vegetables, ornamentals, medicinal and aromatic plants. The Institute conducts state-of-the-art breeding research with the goal of evaluating and enlarging the genetic basis of plant genetic resources. Regarding agricultural policy, this work allows an effective contribution to achieving the goals set out for the advancement in horticultural crop breeding. For performing its tasks, the Institute is involved in numerous scientific networks at national and international levels. It works closely together with other JKI institutes as well as with research institutions and universities at home and abroad.

## Our Main Tasks

### Evaluation of Plant Genetic Resources and Enhancement of Genetic Diversity

The Quedlinburg division develops breeding methods for crop improvement. The insights gained provide a fact-based support for political and administrative decisions. In particular, the results are a valuable aid to promote agricultural policies directed at ecologically sound farming and a sustainable horticultural production of high-quality and healthy food. For this reason, breeding research carried out by the Institute is aimed at providing the conditions for an economically efficient plant breeding and an ecologically balanced horticulture. The Institute develops methods and strategies that help tap genetic resources for important horticultural crops, and thus increase biological diversity in horticulture. Besides current targets in crop breeding, the scientists also address the challenges of the future such as the adaptation to further climate changes.



## Vegetables

Vegetables possess a special importance due to their high vitamin, mineral and dietary fibre content. At the start of a consumer-oriented horticultural production chain, plants are necessary that ensure product quality and, above all, sufficient abiotic and biotic resistances. The Institute evaluates old and new cultivars, and wild species (plant genetic resources) with regard to „product quality“ and „healthy plant“. In carrot (*Daucus carota*), for instance, special focus is given to the variability embedded in the genes. New methods (molecular markers) are applied to select for and examine the resistance against distinct pathogens (e. g. *Alternaria*). In asparagus (*Asparagus officinalis*), an interspecific crossing program is aimed at improving the genetic basis of resistance to abiotic stress (e. g. dryness) and quality-determining compounds (e. g. flavour).

## Ornamental Plants

Within the plant types classified as horticultural crops, ornamentals by far represent the largest group of cultivated plants. In Europe, approximately 400 species assigned to some 250 genera are of economic importance. They encompass at least 100 different plant families. Ornamental plants are important genetic resources. Together with their native relatives they are an essential component of our ecological system.

Basis of ornamental research is the steady improvement of plant genetic resources through breeding. The Institute's main focus is currently on *Hydrangea*, and *Pelargonium*. The latter belongs to Germany's most important ornamentals. The present diversity of the cultivars is based on crosses of only a few wild species. However, sexual incompatibility between different *Pelargonium* species prevents improvement by crossing. Biotechnological methods like embryo rescue and somatic hybridization may be feasible alternatives to overcome these difficulties.



## Medicinal and Aromatic Plants

Medicinal and aromatic plant products provide a broad spectrum of desired effects due to special substances being generated in the secondary metabolism, and therefore find application in herbal remedies, spices, food additives, natural plant protecting and forage additives.

Current research focuses on the evaluation of the natural variability of important traits, for example for lemon balm (*Melissa officinalis*), and on the development of well adapted new genotypes. In the case of parsley (*Petroselinum crispum*), the transmission of *Septoria* resistance into highly productive varieties by crossings has been successful. By using modern marker assisted breeding strategies, associated studies for resistance and flavour carriers are being realised. This represents an important contribution to improving the cultivars and is therefore essential to enlarging the acreage with high-value crops.

