Plants
Agroscope Fact Sheet | No. 87 / 2018

Research for the Agroscope Plant Breeding Programmes

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July 2018

Disease-resistant plant varieties are meant to help reduce the use of plant-protection products in agriculture. Agroscope's Breeding Research group provides breeders with the basics for effective resistance breeding. In addition, the group investigates the opportunities and environmental risks of the prototypes created with the aid of new breeding technologies. All this takes place in the laboratory and greenhouse, and on the field of the so-called Protected Site.

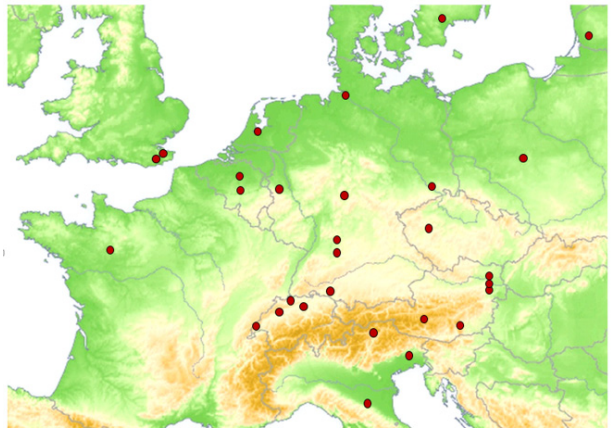
Resistant varieties: The cornerstone of successful and sustainable agriculture

Using disease-resistant cultivars is a sustainable approach to reducing the use of plant-protection products, the latter being increasingly requested because of environmental, political, social and market-based reasons. The aim of plant breeding is to make such cultivars available. However, the breeding of these interesting and market-relevant genotypes requires a long and complex selection process. Here, enhanced efficiency is achieved by modern breeding and selection technologies.

Comparison of a resistant and a susceptible wheat variety.

Molecular Tools and Know-how

In the Agroscope plant-breeding programmes for apple trees, wheat and grapes, marker-assisted selection (MAS) has become routine for a small number of traits/loci (mostly monogenetically controlled resistance to pathogens). Climate change causes new phytopathological or entomological problems, since pathogens increasingly overcome resistances during their evolution. We are developing the appropriate means of meeting such challenges, e.g. by identifying (new) sources of resistance, providing information on the occurrence of virulent strains, identifying molecular markers for new resistance genes, gaining an understanding of resistance mechanisms, etc.



Network of apple orchards of the Agroscope VINQUEST Initiative (www.vinquest.ch) for monitoring the resistance breakdown of apple-scab resistance genes.

Introduction of Modern Selection Technologies

Traditional MAS is ineffective when a trait is controlled by many genes, each with a small effect, and when reliable markers are lacking. In such a context, the modern selection method known as 'genomic selection' ('GS') could complement MAS. In cooperation with Agroscope breeders as well as both national and international partners, we conduct trials with the aim of establishing this method in our breeding programmes.

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Collection of apple accessions for the establishment of genomic selection for apple trees.

Testing New Breeding Technologies

New breeding technologies are developing at a breakneck pace. Varieties already established on the market could be improved efficiently by the application of these technologies, without altering their valued characteristics. The boundaries between the products of these new breeding methods and conventionally bred plants are growing increasingly fuzzy. We test the opportunities and environmental risks posed by the prototypes of these new breeding technologies in the laboratory, greenhouse, and, where appropriate, ultimately in the field. The results of this independent research are published in scientific journals, and are thus available as decision-making tools for policy-makers and for public discussion.

Comparison of the potato late blight-resistant cisgenic potato line H43-4k, with its initial variety 'Atlantic' and additional controls.

Research with GMPs on the Protected Site

Since 2014, Agroscope has run its so-called 'Protected Site' in order to study genetically modified plants (GMPs) in the field. Covering an area of approx. three hectares, the facility is double-fenced around its perimeter and subject to round-the-clock guarding and surveillance. Access is restricted to trained persons. We are responsible for the technical security of the facility, and ensure the technical and scientific coordination of the trials. The field is available to researchers from Switzerland for trials with GMPs.

For further information on the Protected Site and on current research projects in this field, see www.protectedsite.ch.

The Protected Site, where trials with genetically modified plants (GMPs) are conducted, in 2017.

Partners

We conduct our research in close collaboration with the Agroscope breeding programmes and other Agroscope groups (e.g. with the 'Biosafety' group), with national (e.g. Agroscope/ETHZ Chair in Molecular Plant Breeding) and international partners (e.g INRA Angers, France; Plant and Food Research, New Zealand; University of Wageningen, the Netherlands; Julius Kuhn Institute, Dresden, Germany; University of Bologna, and the Fondazione Edmund Mach, S. Michele a/A, Italy).

Masthead

Published by:	Agroscope Reckenholzstrasse 191 8046 Zurich www.agroscope.ch
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Photos:	Agroscope
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