



Potato Research at the Hutton

Potato@Hutton



The main aim of Potato@Hutton

- Coordinate approaches, methodologies and funding
- Establish a future strategy for potato research
- Increase coordination between research and commercial
- Promote more efficient communication within the institute
- Increase our external visibility for potato work



Potato Strategy Group

Coordinators



Glenn Bryan



Mark Taylor



Ingo Hein



Ian Toth



Jonathan Snape

Facilitators



Wayne Morris



Csaba Hornyik

Many people works on potato at the Hutton

A survey in Nov 2017 identified 107 people connected to potato research at the Hutton (Institute and Limited)

- Cell and Molecular Sciences
 - Potato Genetics and Molecular Physiology
 - Epidemiology and Disease Control
 - Plant-pathogen Interactions
 - Enabling Technologies
- Ecological Sciences
- Environmental and Biochemical Sciences
- Information and Computational Sciences
- Social, Economic and Geographical Sciences

- Biomathematics and Statistics Scotland
- James Hutton Limited
- Field and Glasshouse



Mayan Twilight (James Hutton Limited)

Potato@Hutton

- **Vision statement**

Potato@Hutton aims to be the leading centre for potato research & breeding to deliver global food security in a changing world.

- **Mission statement**

Potato@Hutton conducts excellent, innovative, and multidisciplinary science with national and global impacts on sustainable potato production.



Actions based on SWOT analysis

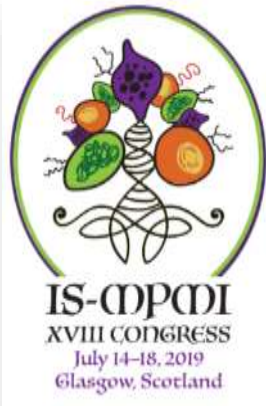
The following areas were identified with a number of action points

- Better understand our competition landscape
- Develop stronger commercial links
- Exploit new technologies
- Increase external funding
- Manage succession planning of staff
- Improve resilience to external factors
 - e.g. Brexit; CAP
- **Improve internal communications**
- **Raise awareness externally**



“Increase our internal / external visibility”

- Potato away day / industry meetings
- Closer links with James Hutton Limited commercial visitors
- New website (first draft is under construction)
- @PotatoHutton Twitter account
- Leaflets (based on web site)
- Visibility at major scientific and stakeholder events
- Leadership roles on external bodies, e.g., EAPR, SOL, MPMI, AHDB



Main areas of potato research and activities



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Quality and
development

Abiotic stress

Genetics &
Breeding

Biotic stress

Integrated
pest
management

Agronomy

Commercial
Services

Social Science

Tools

Resources

Knowledge
exchange

New website for Potato@Hutton to provide a single place for potato information

High-level summaries (100 words) with links to more detailed research

Opportunity for everyone to promote their work

Emphasise to external stakeholders our capabilities



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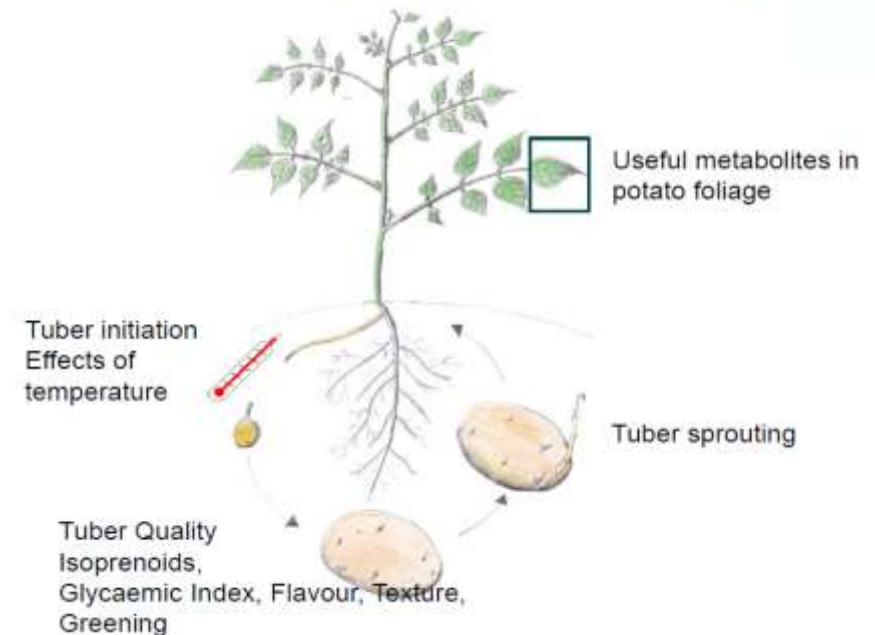
Potato Research Areas



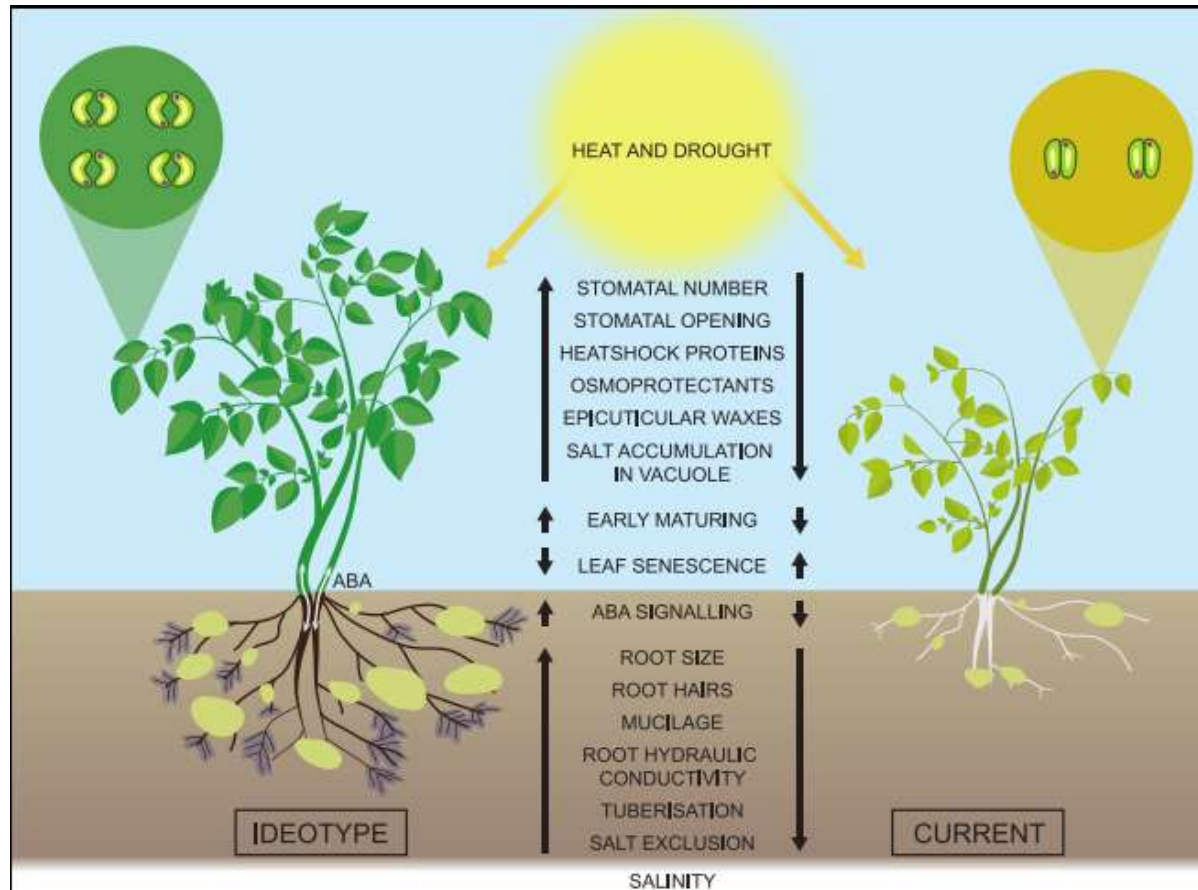
Quality and development

- **Investigation of key quality tuber traits:** flavour, texture, cooking time and nutritional content
- **Understanding the biological processes that control the tuber life cycle:** tuber initiation and dormancy control

Potato Development and Quality



Abiotic Stress



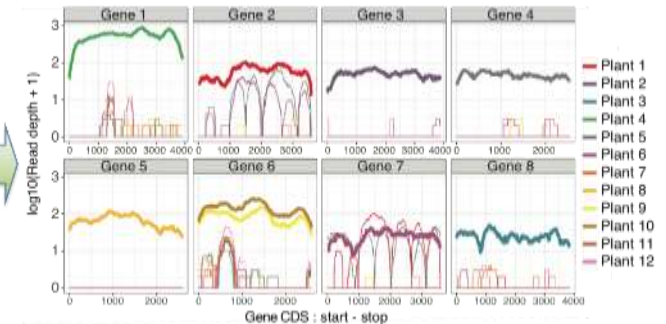
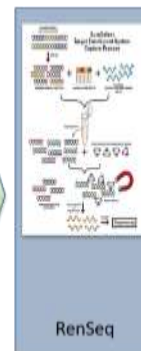
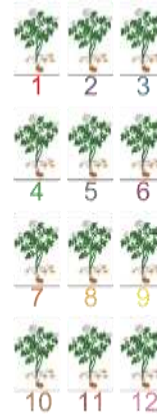
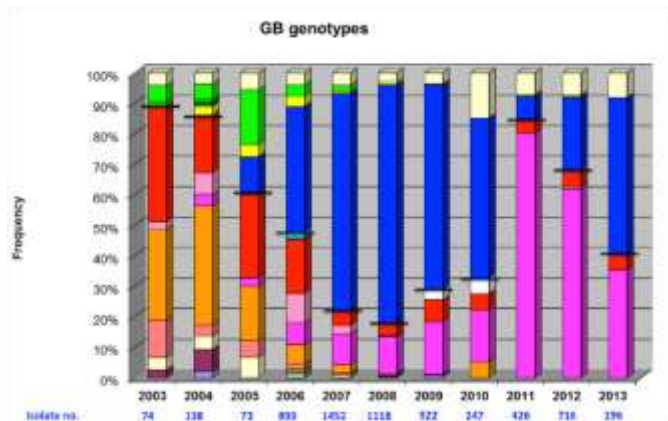
- Investigating combined heat, drought and salinity stress tolerance in the warmer dryer conditions predicted following climate change.

Biotic stress



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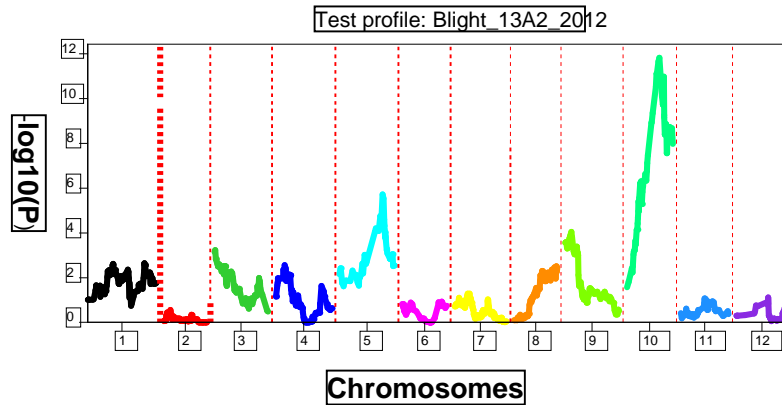
- Multidisciplinary approach to develop tools to better understand pests and their plant hosts
- Understand how pests attack their host (e.g. effectors)
- Identify, map and clone novel resistance genes (e.g. from the CPC)
- Inform the deployment of resistances through breeding



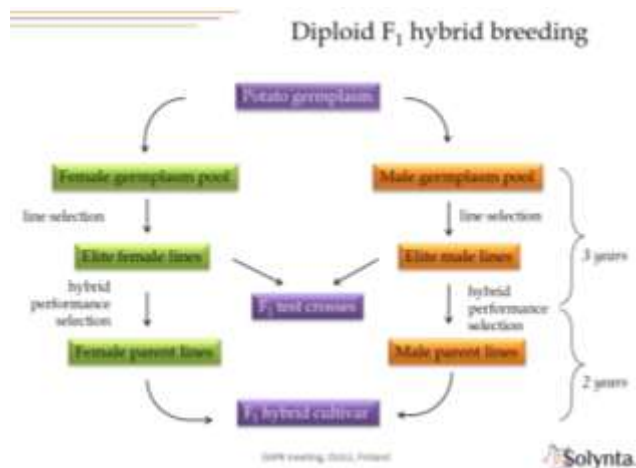
Genetics and Breeding



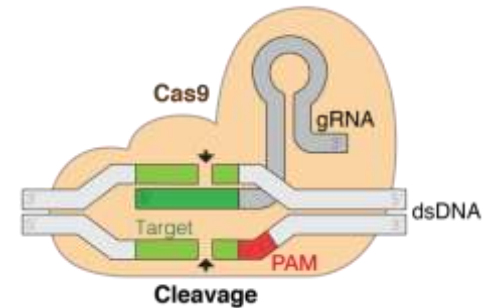
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Genetic analysis of potato traits



Conventional breeding including
some marker assisted breeding



Novel breeding methods

- Genomic selection
- Hybrid/diploid breeding

Gene editing – e.g. CRISPR-Cas

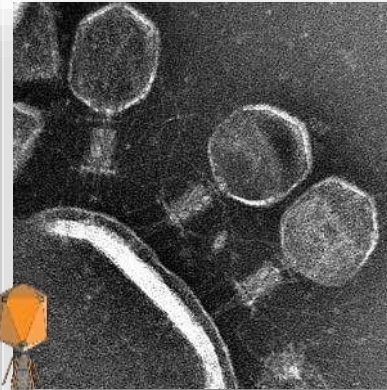
Integrated Pest Management



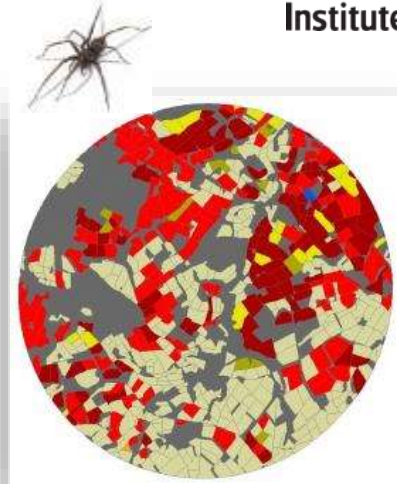
Resistance breeding



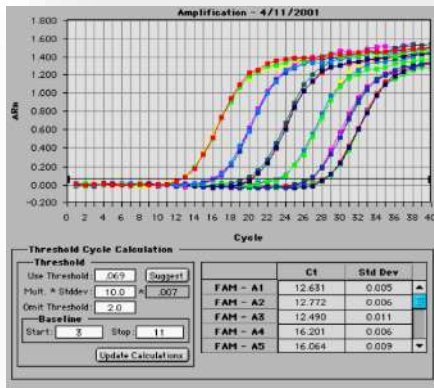
Pest monitoring



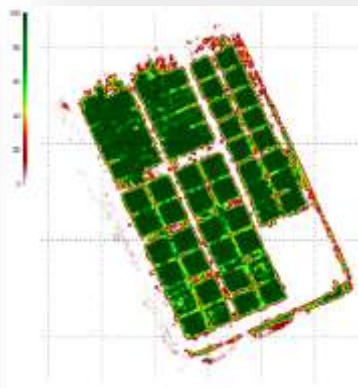
Biocontrol



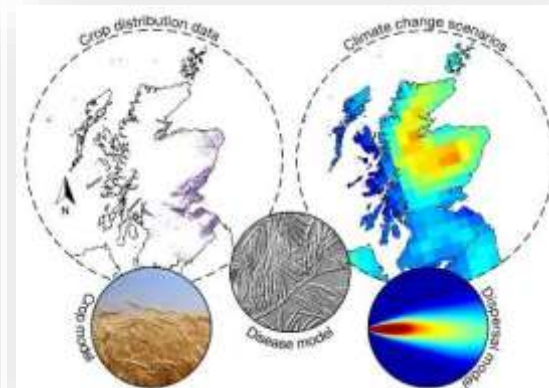
Landscape
modelling



Diagnostics



Optical imaging



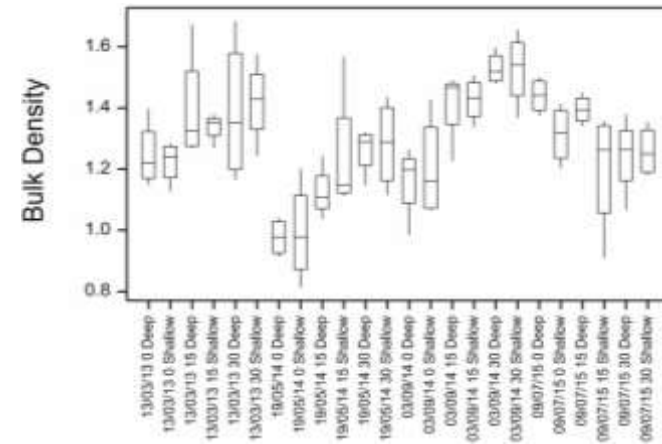
Disease forecasting

Agronomy & Soils



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- **Soil quality & health:** before, during and after potatoes. Modelling soil compaction
- **Cover crops:** benefits and problems under Scottish conditions
- **Fertilizer testing:** e.g. new products & soil conditioners
- **Biofortification:** links to improved human nutrition
- **Genotypes for P deficiency:** EU project with molecular diagnostics



Commercial Services

■ Potato breeding

- Breeding programmes for all market sectors
- Access to unique JHL parental lines
- Underpinned by JHI germplasm collections

Licensing

- Portfolio of varieties available for licensing in many parts of the world

■ Trialing

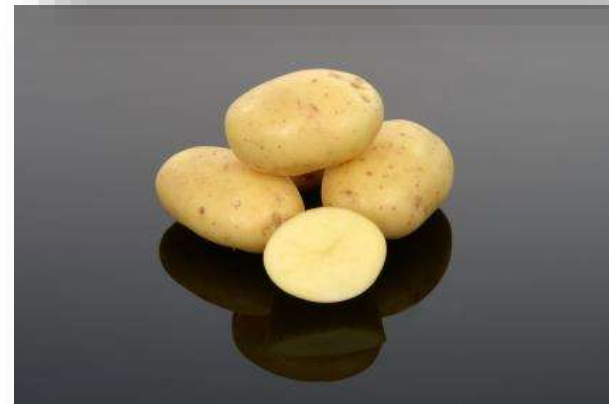
- Crop protection and crop nutrition products
- Experimental design and statistics
- Experienced field staff and access to trial sites

■ Molecular Diagnostics

- Validation of molecular markers
- Genotyping of germplasm
- Testing soil for Free Living Nematodes

■ Project management

- Linking research to commercial outcomes



Potatoes and society

Social science research on potato includes:

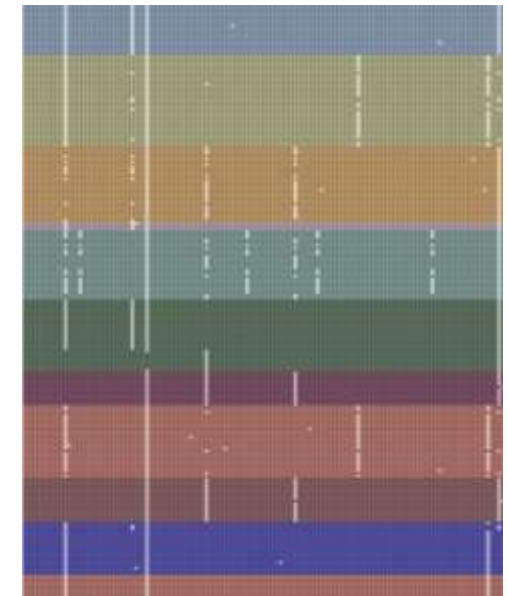
- **Economic relations** - shaped by markets in which potatoes are produced and sold
- **Socio-technical relations** – societies opinions on the use of technologies (e.g. GM)
- **Governance** - including regulation and subsidy (e.g. BREXIT)
- **Socio-cultural relations** - including food tastes, consumption (e.g. obesity) and farming
- **Pests and diseases** – social aspects relating to bio-security, bio-politics or bio-ethics



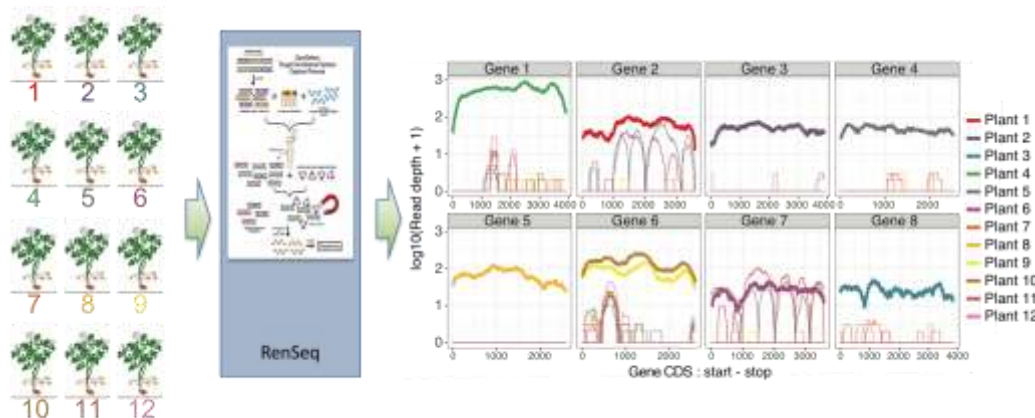
Tools

- Based on the availability of the potato genome, we have successfully developed novel genetic tools to understand complex traits:

- Whole Exome capture
- GenSeq (Generic gene enrichment Sequencing)
- RenSeq (Resistance gene enrichment Sequencing)
- Genotyping by Sequencing (GBS)
- SNP arrays (e.g. Illumina)
- Genome assemblies of wild species



GBS data



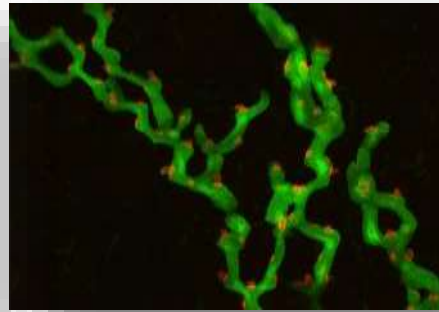
Resources



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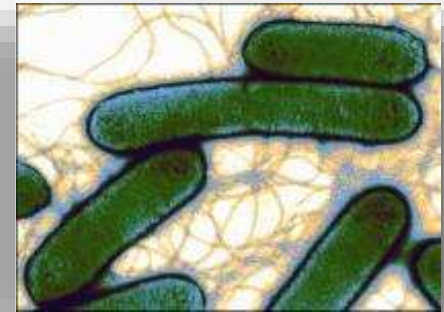
Field and glasshouse



Cell biology



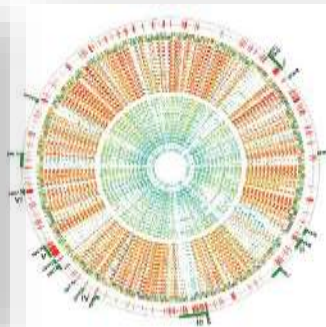
Commonwealth
Potato Collection



Pest / pathogen
collections



Genome facilities



Computational
biology



Potato
transformation



Centre for Sustainable
Cropping

Knowledge Exchange



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