Potatoes in Practice 2013

Results from 2013 event research trials and demonstrations

This summary has been produced to provide further information regarding the trials and demonstrations that took place at the 2013 Potatoes in Practice Event.

Potato Council, the James Hutton Institute, Scotland's Rural Colleges (SRUC), and Agrii held the 2013 Potatoes in Practice event in Dundee, supported by Potato Review magazine and hosted at the James Hutton Institute's Balruddery Farm.

This is the largest annual potato knowledge transfer event in Britain, with over 800 visitors in 2013. The event is a unique opportunity for farmers, advisors and others to view government and industry-supported research and new developments at a single site.

How to use this summary

The PiP Results Summary is produced in PDF format and is available to download from the following websites: www.potato.org.uk www.hutton.ac.uk www.sruc.ac.uk

If you have any questions regarding a specific trial or demonstration, please contact the relevant person responsible for it.

Date for your Diary: Potatoes in Practice 2014 will be held on **Thursday 7 August 2014** and will take place again at the James Hutton Institute's Balruddery Farm, by Dundee. For more details: www.potato.org.uk/events

Principal organisers (2013)

The James Hutton Institute: Pam Cassidy (Communications PA and Administrator), Euan Caldwell (Farm Manager) and Dr Finlay Dale (Research Scientist)

Potato Council: Sophie Lock (Communications Officer), Claire Hodge (Technical Executive)

Scotland's Rural Colleges (SRUC): Dr Daan Kiezebrink (Applied Potato pathologist)

Agrii: David Barclay (Agronomist)

Potato Council-sponsored research trials and demonstrations

Managed on behalf of Potato Council by SRUC

Trial/demonstration name: Bio-fumigant demonstration trial

Contact Details:

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Introduction

Potato cyst nematodes (PCN) continue to pose a major threat to the economic production of potatoes.

It is possible that some nematicides will be revoked in the near future due to evolving EU legislation.

The Potato Council have calculated that losses from PCN damage would rise from £25.9 million to £58.2 million per year if nematicides became unavailable.

Research is needed to develop effective alternative control measures to protect future potato crops from PCN.

Bio-fumigation is a strategy which exploits plants, mainly belonging to the *Brassica* family. When the tissues of these plants are damaged, glucosinolates become hydrolysed by an enzyme called myrosinase to release various volatile substances including isothiocynates (ITC's). ITC's are known to suppress numerous pest and disease organisms including PCN.

The bio-fumigation method involves growing glucosinolate producing plants as a cover crop between crops in the rotation. Bio-fumigant plants are macerated and incorporated in moist soils to induce the production of ITC's.

Bio-fumigant PCN control project

Potato Council is funding a three-year collaborative research project between SRUC, Harper Adams University and Barworth Agriculture Ltd. with the assistance and cooperation of growers

The project will assess the potential of bio-fumigation for PCN management by targeted research investigating:

- The potential of selected bio-fumigant species and cultivars in Northern and Southern Britain for reducing PCN levels
- The optimisation of the incorporation of bio-fumigants for optimal efficacy
- Determining optimal nitrogen and sulphur inputs for maximum ITC release

Greenhouse evaluations started in June 2013 at Harper Adams University and field trials will be conducted at three different sites in Great Britain during 2013-2016.

Image: Mustard and rocket

Image: Oil seed radish

Trial/demonstration name: Herbicide damage to potatoes

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Introduction

Herbicide damage can occur as a result of:

- Residual herbicides in manure or applied to previous crops
- Contamination of spray tanks
- Drift from applications to other crops
- Misuse of proprietary potato herbicides i.e. metribuzin

The following herbicides can cause damage in potatoes.Brief notes together with pictures of typical symptoms are provided.

Clopyralid and aminopyralid

- Clopyralid used in many crops, aminopyralid used in grassland.
- Residual on organic material.
- Restriction on use of FYM from animals grazed on or fed silage/hay from aminopyralid treated field.
- Binds to lignin and there may be a delayed effect when organic material gets broken down.

Images: Foliage and tuber damage due to aminopyralid/clopyralid

Metribuzin

- Some varieties are sensitive even when used pre-emergence (e.g. Innovator or Shepody).
- Some varieties are sensitive when used post-emergence.
- It is important to check varietal sensitivity.
- Metribuzin damage can have yield effects when severe.

Images: Leaf damage due to metribuzin

Sulfonylureas

- Examples of sulfonylurea herbicides in common use
  - Thifensulfuron methyl (e.g. Harmony M SX)
  - Metsulfuron methyl (e.g. Ally Max SX)
  - Sulfosulfuron (e.g. Monitor)
- Residue can persist in spray tank.
- Clean spray tank thoroughly.

Images: Tuber damage due to sulfonylureas

Glyphosate

- Affected plants can show a wide range of symptoms
  - No sprouting
  - Cauliflower sprouts
  - Poor emergence
  - Weak plants
  - Foliage effects
- Can cause damage to seed at low doses.
- Residue not always detectable through tuber tissue analysis.
- Glyphosate damage can lead to:
  - Poor seed quality
  - Compensation claims

Images: Tuber damage/malformations due to glyphosate

Trial/demonstration name: Volunteer control in spring barley

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Introduction

This trial demonstrates different herbicide programme options for the control of volunteer potatoes in spring barley.

Groundkeepers (volunteers) can be a persistent problem due to:

The potential downgrading of seed crops if volunteers are not adequately rogued

- Being a reservoir for pest and diseases and maintaining populations (i.e. Powdery Scab, PCN) across the rotation. A potential reservoir for virus.
- Causing problems in other crops in the rotation (i.e. peas, carrots)
- Affecting the suitability for renting out land to seed growers

A grower survey commissioned by Potato Council in 2011 and carried out by SAC (now SRUC) showed that:

- Of all respondents 71 % had land (own/rented) not used for seed production due to groundkeepers
- All respondents use chemicals to control groundkeepers.
- The extra cost of chemicals to control groundkeepers was on average £ 15/ha.
- 40% of respondents used mechanical control to control groundkeepers in other crops. The extra cost of this was on average £ 15/ha.

Treatments

Potato chats were planted at a density of 1/m^2 in plots that were late sown to spring barley.

All plots received a basal herbicide application of Optica (1l/Ha) + Oxytril CM (1l/ Ha).

Post-emergence of the barley (GS 32) the following treatments were applied:

Table 1: Volunteer control herbicides applied

	Treatment (l/ha or kg/ha)	Timing of application
1	Harmony M (0.1 kg/Ha) Galaxy (1l/Ha)	GS32
2	Harmony M (0.1 kg/Ha) Spitfire (0.75 l/Ha)	GS 32
3	Galaxy (1 l/Ha) Ally Max SX (42g/Ha)	GS 32
4	Untreated	N/A

Table 2: Active ingredients of products applied

Product	Active ingredient
Harmony M	Metsulfuron-methyl + thifensulfuron-methyl
Galaxy	Clopyralid + florasulam + fluroxypyr
Spitfire	Florasulam + fluroxypyr
Ally Max SX	Metsulfuron-methyl + tribenuron-methyl

Results/conclusions

All herbicide treatments gave good control of volunteer potatoes in spring barley. Although there was not a complete kill of volunteers in any of the herbicide treatments, there was no daughter tuber formation, thus preventing a build-up of a volunteer potato population in subsequent crops.

Table 3: Average tuber number and weight of potato volunteers 90 days after planting chats

	Treatment (l/ha or kg/ha)	Average number of tubers per plant	Average weight of tubers per plant
1	Harmony M (0.1 kg/Ha) Galaxy (1l/Ha)	0	0
2	Harmony M (0.1 kg/Ha) Spitfire (0.75 l/Ha)	0	0
3	Galaxy (1 l/Ha) Ally Max SX (42g/Ha)	0	0
4	Untreated	9.5	339.47

The James Hutton Institute's trials and demonstration results

Trial/demonstration name: New varieties for new markets

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Introduction

Genetics and breeding of potatoes at the James Hutton Institute uses modern methodology of gene discovery to identify the genes required for genetic improvement of the potato; and then uses efficient breeding methods to transfer these genes into potatoes that can be used as parents in the breeding of new cultivars in a number of breeding programmes. The advances and approaches to potato breeding and the importance and relevance of the potato genome information were discussed throughout the day with many visitors to the plots. The challenge of breeding for the many diverse markets was illustrated, including varieties for table, processing, salad, novel and baker use.

The breeding of cultivars is commercially funded and success requires producing new cultivars with the qualities demanded by diverse and increasingly discerning consumers, including processors and supermarkets. Potato breeding is changing as molecular markers developed for selection of several important disease resistance and quality traits in potato are routinely deployed at The James Hutton Institute. The importance and application of potato genome information and molecular markers associated with important commercial traits found in the exhibited varieties and lines was demonstrated.

Results

New material and a number of new varieties on display at PiP 2013 included:

'Jester' - a very high yielding second early baby potato variety that has performed well in both the UK and overseas. It has a very bright white skin finish and cream flesh. This promising new variety, recently added to the national list, is being developed and promoted by Greenvale AP.

'Mistay' - a new white variety, setting new standards as an early baker with good resistance to tuber blight, powdery scab, viruses Y A and Leaf Roll and a degree of resistance to G. *pallida*. This new variety with good storage attributes was recently added to the national list and is being developed and promoted by Taypack Ltd.

'Olympus' – a processing potato well suited to the demands of the crisping industry. It demonstrates strong resistance to common scab and G. *rostochiensis* and partial resistance to G. *pallida* cyst nematodes. It has a delicate waxy texture and excellent cooking qualities. This new variety is being developed and promoted by Higgins Agriculture Ltd.

Five further (as yet unnamed) lines progressing through national list trials were also discussed.

Image: Jester

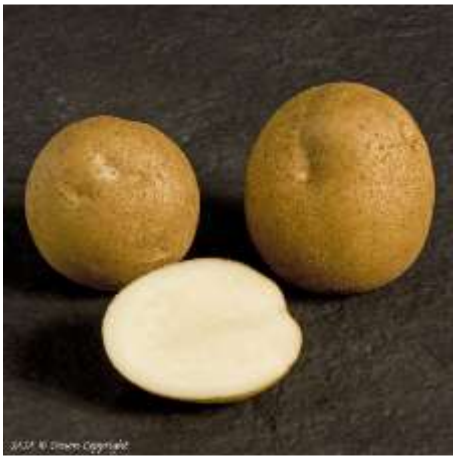

Image: Olympus

Trial/demonstration name: Genetic analysis of a large diploid potato population: mapping of tuber shape and eye depth

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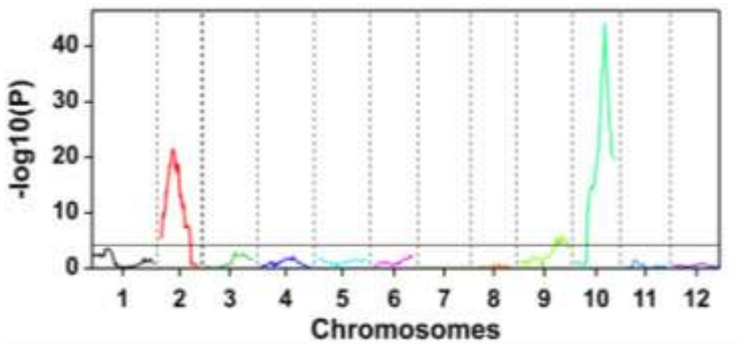
Introduction

Potato is the world's most important non-cereal food crop and consumed daily by more than a billion people. Of the many potato tuber traits important to breeders, tuber shape and eye depth are of particular importance, both for fresh market uses and to the potato processing industry. Poor or irregular shape and deep eyes contribute to higher costs for the processing industry due to significant peeling losses. Through this study, our findings will assist in the map-based isolation of genes determining tuber shape and eye-depth in potato and should also prove useful for marker assisted breeding.

Results/Conclusions

We have performed genetic analysis of the '06H1' population, which is derived from a cross between two highly heterozygous F1 hybrid clones each derived from a diploid Group Tuberosum x Group Phureja cross. This population segregates for several traits and we have performed three years of field trialling. An extensive amount of phenotypic data has been collected and a linkage map comprising ~2300 markers has been constructed. This map has been aligned to the DM potato genome assembly and exhibits a high level of collinearity with the most recent (v4.03) DM genome pseudomolecules. Quantitative trait locus (QTL) analysis has been performed for several of the assessed traits. Tuber shape and eye depth, two of the most eye-catching and commercially important potato traits, have been analysed in some detail on the 06H1 cross. Tuber shape varies from round to elongated and as a quantitative trait it was determined by the ratio of length to width (L/W) using a digital calliper. A more or less continuous range of L/W values is observed ranging from ~0.8 to ~2.7. QTL mapping reveals two major effect loci for shape on chromosomes 2 and 10, and both of these loci have been observed in previous mapping studies (Figure 1.). The locus on chromosome 10 maps to ~40.4cM and explains ~39% of the phenotypic variation for the trait in both years assessed, and the smaller QTL maps to ~18.6cM on chromosome 2, and explains ~21% of the phenotypic variation.

Figure 1. Tuber shape QTLs on chromosome 2 and 10 in 2010.



QTL analysis of the eye depth data scored on a 1-9 scale revealed a large effect QTL at ~40.4cM for eye depth that explains ~40% of the phenotypic variation, this QTL mapping to roughly the same position as the major shape locus. Our analysis suggests that longer tubers have a tendency to have more shallow eyes.

In order to assess when tuber shape is established in the developing tuber, we have performed staged observations of tuber formation. Our observations suggest that tuber shape is determined very early in tuber development (Figure 2.). There is a small but significant difference in mean LW between the compressed and round tubers throughout development, showing that the shape for these shape categories is well determined from an early time point of tuber initiation and development. Tubers originating from long tuber bearing clones always showed high LW ratio indicating that tuber shape for elongated tubers is also determined early during tuber formation.

Figure 2

LW ratio <1, compressed tubers

LW ratio ~1, round tubers

LW ratio ≥2.05, elongated tubers