QUIZ – Test your plant breeding knowledge

BSPB is offering a case of wine to the winner of our Spring quiz. All questions have a plant breeding theme – some may not be as straightforward as they seem!

To enter, simply write down your answers to the following 10 multiple choice questions together with your name and contact details. Please mark all entries SPRING QUIZ and send to BSPB by post, fax or e-mail using the contact details at the bottom of this page. Closing date for entries is 1 June 2009.

1 Humans have 35,000 genes, how many does a wheat plant have?

(a) Less than 5,000
(b) Around 10,000
(c) Around 40,000
(d) More than 80,000

2 How many different crop varieties are currently listed by the International Atomic Energy Authority as having been bred using nuclear radiation?

(a) Less than 10
(b) Around 100
(c) Around 1000
(d) More than 2500

3 Plant Breeders' Rights allow a royalty to be charged on improved new crop varieties. For cereals, how long do Plant Breeders' Rights remain enforceable?

(a) 10 years
(b) Indefinitely
(c) 30 years
(d) 25 years

4 What % varietal purity must conventional certified oilseed rape seed meet?

(a) 99% (b) 95%
(c) 99.7% (d) 100%

5 When were the first hybrid maize varieties marketed in the USA?

(a) 1930s (b) 1960s
(c) 1970s (d) 1980s

6 On average, what proportion of wheat varieties entered for National Listing end up on the Recommended List?

(a) 9% (b) 18%
(c) 27% (d) 45%

7 In which year was the Cambridge-based Plant Breeding Institute transferred from state ownership to the private sector?

(a) 1982 (b) 1987
(c) 1992 (d) 1998

8 Which of the following practices, involving protected crop varieties, is legal?

(a) Exchanging farm-saved seed with another farmer.
(b) Buying in uncertified grain then sowing it as seed.
(c) Replanting saved seed of a hybrid oilseed rape variety.
(d) None of the above.

9 What proportion of current winter wheat varieties grown by UK farmers were bred in the UK?

(a) 98% (b) 90%
(c) 100% (d) 75%

10 How many years of testing must a successful malting barley variety undergo from National List entry to full IBD approval?

(a) 3 years (b) 4 years
(c) 5 years (d) 6 years

Competition rules: This competition is open to all recipients of BSPB Plant Breeding Matters. Closing date for entries is 5pm on Monday 1 June 2009. All correct entries will be entered into a draw to take place on Tuesday 9 June 2009. The competition winner will be notified by post and will receive 12 bottles of selected wine.

Government report confirms UK plant breeding potential

An independent report recently prepared by ADAS for the Government's chief scientist, Professor John Beddington, has identified long-term prospects to double UK output of wheat and oilseed rape while also reducing greenhouse gas emissions and protecting biodiversity. Achieving these objectives will, however, depend on concerted public investment in UK crop science and plant breeding.

The report, entitled '*The potential to increase productivity of wheat and oilseed rape in the UK*', concludes that while UK production of wheat and oilseed rape could be increased by around 50% over the next five years or so, this could also damage the environment by increasing greenhouse gas emissions and reducing biodiversity. According to the report, most of these short-term gains would be achieved through increased cropping intensity and by bringing uncropped land and grassland into crop production.

Over the next 10-25 years, however, the report predicts that sustained research investment could lead to significant gains in crop productivity. Theoretical yield potentials for UK-grown wheat and oilseed rape are estimated at 19.2t/ha and 9.2t/ha respectively, assuming future research allows all targets to be met. While yields will in practice be lower, the report predicts that well-targeted investment in crop-based genetic research, characterisation and plant breeding offers significant scope to boost current output levels. A Defra review of yield potential estimated average yields for 2025 of 11.4t/ha for wheat and 4.1t/ha for oilseed rape. The ADAS report confirms that these yields 'seem readily achievable given significant investment in production research.'

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promoting innovation

Plant Breeding Matters

Information from the British Society of Plant Breeders

May 2009

BSPB establishes base in Scotland

The British Society of Plant Breeders (BSPB) is strengthening its operational presence in Scotland with the establishment of a permanent office near Perth.

Scotland and the north of England will now be covered by a dedicated, full-time BSPB staff member with specific responsibility for certified and farm-saved seed royalty collection and auditing.

BSPB auditor Henry Taylor (left), who was previously based at the Society's head office in Ely, Cambridgeshire, will now provide a local point of contact and advice for seed merchants, processors and farmers in Scotland and the north of England on all seed royalty and licensing issues.

A member of the BSPB audit team since 2005, Henry Taylor has a practical farming background. Brought up on a family farm in the Borders, he completed an HND in agriculture and holds a post-graduate qualification in farm business management. He previously worked for Simpsons Malt, based in Berwick-upon-Tweed.

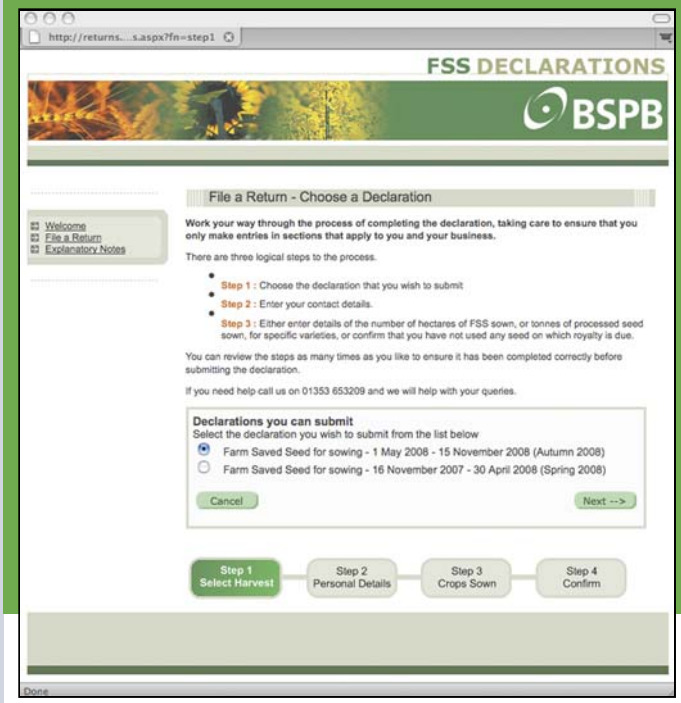
The audit team's role is to check that the seed royalty income collected by BSPB each year tallies with the amount of certified seed produced and sold by licensed seed merchants, and with the farm-saved seed declarations received from seed processors and individual farmers. This is vital to safeguard future investment in the new varieties farmers depend on for improved yields, quality and disease resistance, and to cope with future challenges such as climate change.

Henry Taylor can be contacted by telephone on 07747 567352 and by e-mail at henry.taylor@bspb.co.uk

FAIR PLAY ON FARM-SAVED SEED

UPDATE: More farmers declaring on-line

The number of growers completing their farm-saved seed declarations on-line has increased significantly over the past 12 months. Last year, BSPB developed a simpler, more user-friendly format for farmers wishing to submit their returns electronically. Several hundred growers are now taking advantage of this web-based option and BSPB is encouraging others to try it out.



Easy to use on-line FSS declaration

Sara Seekings, IP Enforcement Officer at BSPB, is pleased that the new on-line forms are proving successful. She is urging more growers to use the system, which has been re-designed to take a matter of minutes to register, complete and submit declarations, using drop down menus to select from on-screen lists of crop species, varieties and processors.

Simplified forms

"The simplified on-line forms offer an easy, four-step process to declaration, removing the need for paperwork, form-filling and postage. It also allows growers to keep electronic records of their returns."

"Since we introduced the new system last spring, the response from users has been positive and the number of farmers completing their farm-saved seed declarations on-line has increased significantly," says Sara.

Improved efficiency

"On-line declaration saves farmers time and effort, and also improves BSPB's own efficiency by allowing automated data entry and invoicing. Reducing the administration costs of the farm-saved seed payment system means as much of the income received as possible can be re-invested in future breeding programmes."

BSPB welcomes feedback from new and existing users of the on-line declaration forms, including suggestions of how the system can be further improved. On-line forms can be accessed via the farm-saved seed declarations section of the BSPB web-site at www.bspb.co.uk

Marker technology opens up new breeding opportunities

Advances in marker-based technology can help improve the accuracy and scope of current plant breeding programmes, and could offer vital solutions to long-term challenges of yield, end-use quality and resistance to intransigent pests and diseases. As BSPB Board Member Richard Summers explains, however, access to this exciting new knowledge base for the major UK crop species will require significant new investment in gene discovery and data handling.

BSPB Board Member Richard Summers

The constant aim of plant breeding is to improve the quality and performance of agricultural and horticultural crops. Traditionally this has involved crossing two selected parents and then selecting promising lines from their offspring. With increasing genetic knowledge and improved technology, breeders have developed ways to make this process faster and more precise.

For example, use of artificial growth rooms, and maintaining parallel selection programmes in northern and southern hemispheres, allow two or more generations of plants to be cultivated in a single year. Techniques such as single seed descent and double haploid breeding have helped reduce the lengthy process of self-pollination and selection otherwise required from initial cross to produce a generation of true-breeding plants.

Tracking desired characteristics

Marker-assisted selection, based on the use of Simple Sequence Repeat (SSR) markers, has also been in routine use for a number of years, and allows breeders to check whether certain desired characteristics are present. SSR marker systems have limitations, however, and are best suited to tracking single genetic entities, such as brown rust resistance in wheat. SSR markers provide an important tool to help breeders track these genes of interest from an early stage in the breeding process.

Many desired characteristics are controlled by the interaction of a combination of genes. These include major traits of significance such as productive yield, malting and breadmaking quality, and durable resistance to intransigent pests and diseases such as take-all in wheat.

The development of SNP (single-nucleotide polymorphism) or 'snip' markers is the next major breakthrough in marker technology. Based on progress in genomic research, this marker system offers a means of identifying and tracking more complex traits. Whereas SSR markers allow breeders to track a handful of single genes, 'snip' systems offer the potential to detect literally thousands of genes and gene sequences.

'Snip' markers are already in commercial use in international maize breeding programmes, but they are not yet available for key UK crop species such as wheat, and oilseed rape.

New investment required

A major programme of research is required, not only to sequence these crop species to produce the relevant 'snip' markers, but also to develop the mathematical programmes and models capable of handling and interpreting the vast amounts of data involved.

This new knowledge base offers major opportunities for plant breeders to develop crops with higher yields, improved climate resilience, and more consistent end-use quality. These are precisely the targets required to address the challenges of food security, climate change and resource conservation.

Increased recognition of plant breeding's role in meeting these challenges is welcome, but it must be matched by the public investment needed to exploit these opportunities. The limited income available to UK plant breeders from seed royalties has restricted private sector investment in long-term R&D targets, creating a hiatus between basic and near-market research. There is an urgent need to bridge this gap to ensure our rapidly expanding genetic knowledge can be translated into crops and products of value to UK farmers and consumers.

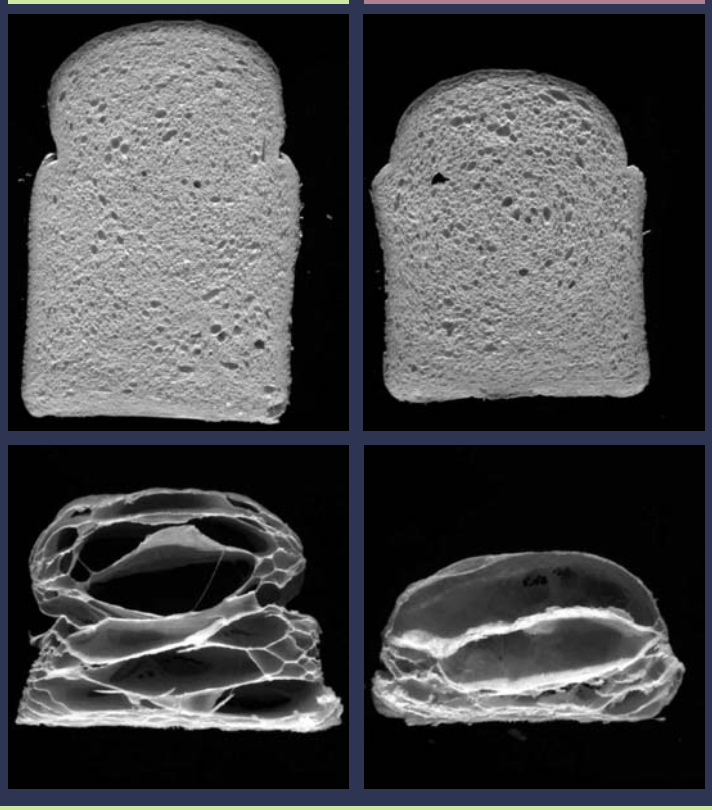
Dr Sam Millar, Head of Cereals and Milling at Campden BRI

Improved scientific understanding of the genetic factors controlling particular aspects of plant performance and end-use quality are opening up significant new opportunities for crop improvement. In this article Dr Sam Millar, Head of Cereals and Milling at Campden BRI, describes the positive outcome of recent collaborative research aimed at helping plant breeders identify and target specific quality and processing characteristics in UK wheat breeding programmes.

The project 'Investigating wheat functionality through breeding and end use' was funded through the LINK collaborative funding scheme (Project No. FQS 23) by Defra, BBSRC, AHDB-HGCA, the National Association of British and Irish Millers (nabim) and the Federation of Bakers. In kind contributions were received from Nickerson (UK) Ltd, RAGT Seeds Ltd, Syngenta Seeds Ltd and nabim (with practical work undertaken by ADM Milling Ltd, Allied Technical Centre Ltd and RHM Technology – Premier Foods Group Ltd). Academic input was provided by the John Innes Centre, Rothamsted Research and the University of East Anglia.

for improved wheat processing performance

Double haploid wheat plants



Bread and puff pastry images from C-Cell representing good and poor performance in baking trials for one of the populations generated

Dramatic changes have occurred within the UK wheat supply chain over the past 40 years with approximately 85% of the wheat currently used in flour milling being home-grown, double the proportion used in the 1970s. This change has been driven by progressive advances in wheat breeding, supported by improvements in agronomic practice. With current and future concerns over the impact of climate change, increasing pressure on land use and agricultural inputs allied to the need to feed a growing world population, continued and accelerated improvements in wheat crop agronomic and processing performance are of strategic importance.

A major Defra LINK–funded project, focused on identifying the genetic factors controlling wheat processing performance, was recently undertaken by a consortium led by Campden BRI, and including representatives from the UK academic, plant breeding, growing and processing sectors.

The project's overall aim was to determine and define the underpinning genetic controls of wheat functional quality. This was achieved through a number of key stages including:

- Generating three double haploid populations representing key variation in wheat processing quality;
- Developing genetic maps for the populations using advanced genetic marker technology;
- Developing and applying objective methods to analyse baked product quality – including C-Cell, an instrument which uses image analysis to assess product structure;
- Producing 25kg grain for the lines in each population over two harvest years (the total number of lines assessed was 548);
- Milling, baking and quality assessment carried out for each line for four different baked products (standard white bread, standard wholemeal bread, no time dough white bread and puff pastry);
- Identifying new quantitative trait loci (QTL) in wheat, based on traits identified through objective assessment. QTL are regions of DNA linked to particular traits or characteristics.

The project was highly successful and resulted in the identification of 606 QTL for key aspects of wheat processing behaviour. These direct outputs from the project are now being exploited in commercial wheat breeding programmes by individual plant breeders. More indirectly, the collaborative nature of the project consortium helped strengthen links not only between providers of basic and applied research but also along the supply chain. This was an important element behind the overall success of the project, and will also support the development of new routes and opportunities for the ongoing exploitation of the work.

Allied to this exploitation, the project was underpinned by high quality science with outputs that considerably extend other studies recently undertaken in France and Australia. As such, the work stands as a good example of how the right combination of industrial 'pull' and research 'push' can be used to successfully generate new science and technology in the food supply chain. The LINK structure has been a natural vehicle for projects of this type and has a clear track record of success. An ongoing challenge for government, industry and the broader research community is to generate the appropriate funding and collaborative structures to allow future research to meet the considerable challenges for food production in the 21st century.