PVR campaign launched to promote plant breeding and seed innovation

BSPB and AIC have jointly launched a new information campaign to highlight the critical role of plant breeding innovation and quality seed.

The campaign focuses on the importance of Plant Variety Rights (PVR) as a unique form of Intellectual Property (IP) to protect, stimulate and reward progress in crop improvement.

Central to the campaign is a new EU-registered PVR trademark which will appear across the seed industry on seed bags, stationery, invoices, websites, variety boards and marketing material.

More than 50 companies across the UK plant breeding and seeds sector have already signed up to use the trademark.

BSPB Chief Executive Dr Penny Maplestone said:

“Access to genetic innovation, delivered to the market through high-performing varieties and quality seed, is the foundation for successful crop production. The PVR campaign highlights the critical role of IP protection in supporting a dedicated process of investment, innovation and independent evaluation within the plant breeding and seeds sector, and the benefits this brings to farmers, food producers and their customers.”

AIC Seed Sector Chairman Paul Taylor said:

“Companies and organisations licensed to use the trademark are demonstrating their commitment to providing the best product, backed by science and delivered to the market through proven testing procedures. Users of the trademark are investors in R&D, committed to supplying high quality, innovative products to their customers.”

“At the PVR trademark will serve as a prominent reminder of the research, innovation and independent evaluation behind each new variety and bag of purchased seed, and the need for continued investment in plant breeding to support a competitive farming industry and a dynamic value chain.”

Visit www.plantvarietyrights.org to find out more.

Organisations across the food and farming industry are actively supporting the PVR campaign.

Andy Mitchell, Defra’s Lead for varieties and seeds policy, said: “The PVR campaign will help to increase awareness of the essential role of plant variety rights in sustaining investment in plant breeding. Defra supports continued innovation in plant varieties to increase the productivity and competitiveness of UK agriculture and our resilience to climate change.”

Jonathan Tipples, HGCA Chairman, said: “Maintaining investment in a vibrant plant breeding industry is of critical importance to the UK cereals sector. Access to continued genetic improvement and diversity will enable our farmers to remain competitive and profitable, and help to feed a growing world population. Plant variety rights support and protect that innovation process, and the HGCA fully endorses the PVR campaign in raising awareness of this vital issue.”

Colin West, Executive Director of MAGB said: “The competitiveness of the British malting industry depends on a thriving plant breeding sector to deliver improvements in the quality, performance and yield of home-grown malting barley varieties. Effective protection of plant breeders’ intellectual property rights is vital to maintain investment in plant breeding innovation, and MAGB fully supports the PVR campaign and its objectives.”

Alex Waugh, Director General of nabim said: “Advances in wheat breeding and breadmaking technology have enabled flour millers to use an increasing proportion of home-grown wheat in the grist, reversing the UK’s historical dependence on imported breadwheat. By stimulating and rewarding successful innovation in breeding, the PVR system supports access to a constant supply of new wheat varieties, delivering benefits not only in agronomic and yield terms but also through improved quality and consistency in milling and flour performance.”
Maintaining plant biodiversity is at the heart of the global food security challenge. Improving the yield and quality of our major food crops in the face of climate change, declining natural resources and new pest and disease threats depends critically on safeguarding access to novel sources of genetic variation and introducing them into commercial breeding programmes. That’s why plant breeders are keen to ensure that the gene pool from which desirable traits can be selected remains as extensive as possible.

The UK is host to a number of internationally significant initiatives to classify and conserve existing biodiversity. *Plant Breeding Matters* visited the John Innes Centre to find out more.

The seed bank collections at the John Innes Centre (JIC) in Norwich, supported by BBSRC and Defra, are key components of the UK's contribution to conserving global plant genetic resources. They include the BBSRC Small Grain Cereal Collections of wheat, barley and oats, and the John Innes Pisum Collection, the second largest collection of pea germplasm in Europe.

Facility. The unit’s internal atmosphere is controlled at a constant 1.5°C and 7-10% relative humidity to maintain the seed samples – each packaged in carefully categorised order – in optimum condition. Cereal seeds can be kept in medium-term storage such as this for up to 30 years, but samples must then be grown out and regenerated in the field and glasshouse to maintain the viability of each accession.

Alongside the work of conserving and renewing germplasm in the collections is the vital task of identifying and classifying the genetic diversity within the material as a resource for plant scientists and breeders, as Mike Ambrose, manager of the JIC Germplasm Resources Unit (GRU) explains:

“These working collections underpin progress in many areas of plant science. The GRU is embedded within a unique research environment at JIC, with strong links to the commercial breeding sector.

“Through active collaboration with scientists and breeders we are searching for key sources of genetic variation which will help to sustain and increase crop yields at a time of rapid environmental change and growing food demand.”

“Over the years, the material in the collections has been successfully screened, leading to the identification of new sources of disease resistance, tolerance to drought, salinity and aluminium.”

The collections include diverse germplasm, including cultivated material from all regions of the world in the form of landraces and cultivars dating back to the 1920s and beyond as well as specialist genetic stocks generated through research programmes. Collaboration with UK plant breeders ensures that the collection also includes the latest varieties available for commercial cultivation. Breeders routinely deposit samples of their UK National List entries in a special BSPB collection held at JIC.

These accessions, more than 20,000 in total, are housed in a 600m³ storage facility.
The Watkins Landrace Wheat Collection comprises some 1,200 selections of landrace wheats collected from 32 different countries in the late 1920s and early 1930s. It was initiated by the British botanist A E Watkins, who contacted British consulates around the world to source locally-adapted material and assemble what is now an irreplaceable record of the genetic diversity and geographical distribution of wheat prior to the advent of modern plant breeding and the Green Revolution.

The collection has not previously been used in wheat breeding programmes, and the research is generating particular interest as a potential source of beneficial traits such as disease resistance, climate resilience and nitrogen use efficiency.

Established in 2003, the collaborative WGIN programme arose directly from a realisation in the early 2000s that for two decades there had been a widening gap between commercial plant breeding activities and publicly funded plant and crop research. WGIN's aim is to support the development of new, improved wheat varieties by generating valuable sources of pre-breeding material for use by commercial breeders.

The programme combines underpinning work on molecular markers, genetic and genomic research, together with novel trait identification. WGIN is managed by a team including representatives of the key UK research groups and breeders. Currently funded partners are Rothamsted Research, the John Innes Centre and the University of Nottingham, who ensure that the programme and its outputs are communicated to the wider scientific and end user communities, via a website (www.WGIN.org.uk), an annual stakeholder forum, focused meetings and peer reviewed publications.

UK wheat breeders are actively involved in a programme of research with scientists at the John Innes Centre to screen a unique collection of landrace wheats for valuable sources of novel variation as part of the Defra-funded Wheat Genetic Improvement Network (WGIN).

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Exploring genetic diversity in the JIC wheat collection

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Harnessing wild genetic resources to help tackle climate change

Scientists from the Millennium Seed Bank Partnership, a global plant conservation programme led by the Royal Botanic Gardens Kew, are implementing a new global project to collect wild relatives of our major food crops for use in plant breeding programmes to adapt new crop varieties to the pressures of climate change.

Run in collaboration with the Global Crop Diversity Trust, the project will identify gaps in the global collections of crop wild relatives for 26 crop species of major importance for food security, including barley, carrot, oat, potato, pea, rye and wheat.

Ruth Eastwood, Crop Wild Relative Project Co-ordinator at the Millennium Seed Bank, says:

“Adapting agriculture to climate change is one of the most urgent challenges of our time. There is, quite simply, no more important step we can take than to ensure that new varieties of our major food crops are adapted to be productive in the new climates of the future.

“But our ability to breed these new varieties cannot be taken for granted. The greatest source of untapped diversity, and in particular the richest source of diversity for adaptive characteristics needed to confront the challenges of climate change, are the wild relatives of our major food crops.

“Not only are these genetic resources largely uncollected, and therefore unevaluated and unavailable to plant breeders, many are also at risk of extinction. This project will help ensure that we win the race to collect crop wild relatives, protect them, and adapt the material for use in plant breeding programmes.”

The MSB makes seed material available to researchers and breeders and its seed lists can be found online (http://data.kew.org/seedlist/index.html). All material collected through the “Adapting Agriculture to Climate Change” project will be made available to users through the standard material transfer agreement of the International Treaty for Plant Genetic Resources for Food and Agriculture.

Kew Garden’s Millennium Seed Bank at Wakehurst Place, West Sussex is the largest ex situ plant conservation project in the world with more than 30,000 wild plant species, representing around 10% of the world’s wild plant species.

The Genetic Resources Unit at IBERS in Aberystwyth houses around 2,000 grass and clover populations of the major UK agricultural species.

The Commonwealth Potato Collection at the James Hutton Institute in Dundee is the UK’s genebank of landrace and wild potatoes.

The Germplasm Resources Unit at the John Innes Centre in Norwich houses more than 20,000 accessions of wheat, oats, barley and peas.

The National Fruit Collection at Brogdale in Kent is the world’s largest collection of fruit trees and plants, comprising over 4,000 varieties of apples, pears, plums, cherries, cobnuts, currants and quinces.
Progress in potato breeding

The UK produces some 6 million tonnes of potatoes, with a retail value of over £3 billion. Globally the potato is one of the world’s most important food crops, with 330 million tonnes grown worldwide.

Significantly, the potato produces more nutritious food from less land and in a shorter time than any other food crop, providing a key source of carbohydrate, protein and beneficial vitamins and minerals. Advances in the development of improved potato varieties therefore contribute significantly to the world’s future food supply.

Traditionally, however, the rate of introduction of new potato varieties to the UK market has been slow, with a handful of older varieties dominating market share. Established varieties such as Maris Piper and Estima still account for around a fifth of the UK potato area, but more recently the development of varieties for specific markets – from baby new and salad types through to main crop varieties bred specifically for processing or fresh retail outlets – has seen steady growth in the uptake of newer cultivars.

The commercial success of new potato varieties depends critically on meeting the quality requirements of processors and supermarkets. The number of growers producing potatoes speculatively has reduced significantly, with an estimated 80% of ex-farm output now grown under contract.

For the processing sector, that means focusing on quality traits such as taste, fry colour, dry matter content and resistance to low-temperature sweetening to improve storage. For the retail sector attractive skin finish, flesh colour and texture, eye depth and resistance to after-cooking darkening are priority traits.

To meet the ‘sustainable intensification’ challenge of producing more from less in a changing climate, these quality attributes must be combined with high levels of marketable yield, durable pest and disease resistance, and resilience to abiotic stresses such as drought, frost and waterlogging.

Recent progress in adapting new potato varieties to address changing market and agronomic requirements has been built on enhanced genetic knowledge and use of germplasm resources, in particular through advances in pre-breeding, marker-assisted selection and the use of mini tuber production to speed the breeding cycle and multiplication of new varieties.

Pre-breeding aims to identify potentially valuable sources of genetic variation from a diverse range of related material. Central and South America are the centre of origin and diversity of the tuber-bearing *Solanum* species, and collecting expeditions during the 20th century helped establish an international network of germplasm collections.

The Commonwealth Potato Collection (CPC), held at the James Hutton Institute in Dundee, contains 1500 accessions of around 80 wild and cultivated potato species. Each accession traces back to a handful of berries or tubers from potato plants growing in Central or South America. This material is used extensively in potato improvement as a source of potentially valuable traits for pest and disease resistance, climate resilience and end-use quality.

Progress in DNA sequencing is further enhancing breeders’ ability to exploit the

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natural diversity in the potato plant, and to target specific genes of interest. The first molecular marker maps of the potato were produced in the late 1980s. These maps have been used to analyse a large number of potato traits impacting on tuber yield and quality, while genes for several disease resistance traits, mainly late blight and PCN resistance, have been identified and isolated.

Continued advances in gene mapping and sequencing technology will underpin the development of more efficient breeding methods and outcomes. In particular, collaborative international research to map the complete genome sequence of potato, through the Potato Genome Sequencing Consortium, will boost understanding of potato biology, and radically improve breeders’ ability to characterise and select for desired traits.

While the development of new potato cultivars through conventional breeding remains a laborious and time-consuming process for many reasons, the rapid advances taking place in molecular genetics and marker technology offer exciting opportunities to tailor the potato crop to the specific needs of growers, processors and consumers.

**Potato Farm-Saved Seed Agreement**

Royalties paid for licensed seed production and on farm-saved seed use of potato varieties protected by PVR provide breeders with the vital income they need to continue breeding and bringing new varieties to the market. BSPB collects those royalties for certain varieties on certified seed and for most UK-grown protected varieties on the use of FSS.

For selected potato varieties, a number of potato breeders are introducing the Potato FSS Agreement – or PFA – from Spring 2013.

BSPB will administer the PFA scheme on breeders’ behalf, acting as agent. The objective of the new scheme is to improve transparency and compliance in the collection of royalties on FSS in the potato sector, so protecting investment for the future development of improved potato varieties.

The PFA scheme provides an alternative option for breeders and growers, operating alongside the existing FSS collection system. Under the new scheme, growers wishing to purchase seed of PFA scheme varieties will be invited to sign a three-year agreement (PFA) and be assigned a unique and non-transferable grower code. This will entitle the grower to purchase seed of any PFA scheme variety, under the breeders’ individual PFA commercial terms and conditions for the variety.

Further information including a list of the varieties included in the scheme can be found at [http://www.bspb.co.uk/fssd/potatoes.html](http://www.bspb.co.uk/fssd/potatoes.html)