

# Eye on the past to create the future

“We’re turning back the genetic clock to mine characteristics which may have relevance for the future.”

## Wheat breeding

Most UK farmers associate DSV with oilseed rape varieties, but the company is causing a stir in cereals with its wheat and barley varieties. *CPM* visited DSV UK’s plant breeding station in North Oxfordshire to find out more about its approach.

By Lucy de la Pasture

**The characteristics of varieties have always been a pivotal factor when it comes to success or failure in a season. But the goalposts have changed in recent years and variety weaknesses can no longer be papered over with chemistry. Growers expect more from varieties and that has laid down the gauntlet to wheat breeders, charging them to come up with all round resilience.**

So how is plant breeder DSV responding to this challenge? According to the company’s UK wheat breeder Dr Matt Kerton, it’s laser focused on producing varieties fit for purpose, with its Oxfordshire-based wheat breeding programme set up to bring forward high yielding varieties with well-balanced

agronomic features and solid disease resistance.

And it doesn’t stop there, he adds, quality is also of paramount importance so good milling and baking qualities are also prerequisite, where appropriate.

“Wheat varieties tend not to travel particularly well between countries, so a key part of the thinking behind the UK base at Waddington is to breed varieties with agronomic and commercial characteristics which meet the requirements of UK farmers and end-users.”

### Maritime climate

Before the site opened in 2008, crosses of new wheat varieties produced by DSV’s plant breeders in Germany were evaluated in the UK, but the maritime climate made it difficult to achieve optimum results, he says. “Having a breeding station here makes it possible to accurately track what farmers want and reflect that in new varieties.”

That approach has paid off in spades. Despite being a relative newcomer to UK cereal breeding, the company has achieved several firsts. DSV Theodore is currently the UK’s cleanest wheat from a disease resistance perspective and DSV Champion is the highest yielding wheat on the 2022/23 AHDB Recommended List (RL).

Those achievements result from a particular approach to breeding, where DSV is using the very latest genomic technology, and through strategic

alliances with institutions such as the John Innes Foundation, NIAB and University of Nottingham, for example. Together they ensure its varieties are innovative and suited to future challenges, he claims.

“Given the current pressures on growers, and those likely to emerge due to factors such as climate change and increasing environmental constraints, we focus primarily on disease resistance and agronomic traits. Yield is secondary and we only build it into varieties which have a solid foundation of disease resistance rather than the other way around.

“That approach is very successful and helped by our more westerly location, where septoria and yellow rust pressures ▶



*Matt Kerton says yield is secondary and is only built into varieties which have a solid foundation of disease resistance rather than the other way around.*

# WHERE TO PATCH SPRAY



Patch spraying is a useful tool in the control of difficult weeds that have evaded the cultural and chemical controls used as part of an integrated management plan.

## KEY CONSIDERATIONS

### 1 WEED MANAGEMENT PLANNING

As part of a strategic weed management plan, patch spraying with a total herbicide can be a useful tool to help manage dense populations of difficult grass-weeds.

### 2 MANAGING SEED RETURN

By helping prevent significant seed return to the soil, the approach can relieve pressure on the selective chemistry, help reduce competition and secure yields of subsequent crops.

### 3 APPLY THE APPROPRIATE DOSE

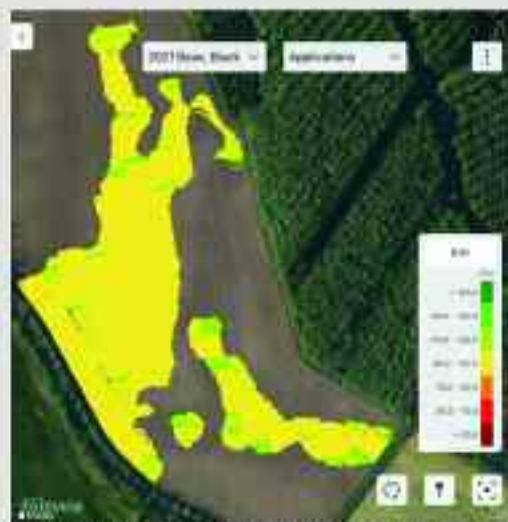
Ensure applications of an appropriate dose of glyphosate (1080g) are made before viable seeds are set; but do not treat during the stem extension phase of growth.

### 4 MAPPING SOFTWARE

Mapping software in FieldView™ can help identify patches for treatment and support creation of prescription maps for precise patch spraying with a GPS-enabled sprayer.



Dark areas where water flows did not establish and became infested with weeds.



A spray application map can be created to target the patches of infested weeds only.

## STEWARDSHIP

Ensure responsible use of glyphosate in the field to minimise the risk of resistance development. Information is available in the latest revision of the WRAG guidance. Visit <https://ahdb.org.uk/wrag>

For further information, visit [www.cropscience.bayer.co.uk/roundup](http://www.cropscience.bayer.co.uk/roundup), or call 0800 734 9122 for technical enquiries. Roundup is a registered trademark of the Bayer Group. Roundup contains Glyphosate. USE HERBICIDES SAFELY. ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE. © 2012 Bayer Group. All rights reserved.

► are higher. Three years ago we added another location in South Somerset, where septoria pressure is even greater.

"This allows us to breed and select from genetic material with very strong disease resistance from an early stage, providing a solid foundation for commercial varieties."

DSV's Sarah Hawthorne uses the company's current winter wheat varieties to illustrate Matt's point. DSV Theodore is a Group 4 hard wheat and the only one on the current RL with a 9 for septoria and yellow rust, 8 for brown rust and an untreated yield of 88%.

DSV Champion takes this a stage further, being the highest yielding wheat on the current RL and combining a similar comprehensive disease package to Theodore, with outstanding untreated yield and real-world versatility, she says.

The maritime focus of DSV's breeding efforts is supported by a Europe-wide breeding and trials programme in France and Germany, plus sites in Ireland, Denmark and the Netherlands, adds Matt.

"This gives us the opportunity to assess varieties in different growing conditions and build resilience into our material. It also provides greater genetic diversity to work with and allows material to be shared between programmes.

"Another key element in our breeding programme is accurate genomic prediction from a molecular laboratory at the DSV Thule breeding station in Germany."

But the science of creating the new DSV varieties is increasingly based on looking to the past, says Matt. "Like all plant breeders, DSV has focused on producing varieties that thrive in a certain climate, using specific management techniques and aided by easily available inputs. Following this route has meant that many genes which could be useful in helping to meet future growing challenges have been lost.

"Increasingly, we're turning back the genetic clock to mine characteristics



*Wheat blends being trialled at Waddington to get a better understanding of how they could deliver benefits to growers.*

which may have relevance for the future.

"For example, we may have lost some strong drought tolerance genes that could be very useful when combined with modern high yielding genetics, so we're looking at wild relatives and landrace varieties of wheat to see if we can identify some of these genes."

Synthetic wheats are one of the most exciting technologies going forward, he believes. "Around 10,000 years ago, durum tetraploid wheat crossed naturally with wild grass to produce the third genome — which gave rise to the hexaploid varieties that became the basis of all modern wheats."

## Synthetic wheats

"The thinking behind synthetic technology is to recreate this original cross and use modern molecular technology to recreate the evolution of wheat, combining modern traits with older genes to produce varieties which are more suited to future challenges," explains Matt.

"This approach is embedded in our breeding programmes and likely to become increasingly important," he says.

Whilst substantial changes in climate and food requirements are on the horizon, there's no point in breeding now for an event that is potentially 20 years away, believes Matt.

"Timescales are important and with a new variety taking five to 10 years to develop, some breeding aims take greater priority than others.

"One area that we're focussing on is nitrogen use efficiency, not just because of the current high price and restricted availability but also because of the environmental pressure to reduce its use in the long-term. So at DSV Waddington, we have trials looking at how efficiently different varieties turn each kg of nitrogen into biomass.

"Breeding for that is difficult if it's done conventionally, as a large area is required to accommodate the full range of different rates, so typically this work is done once varieties have been assessed as having good potential.

"This is the first year we've studied this characteristic, but already clear differences can be seen, which means the genetic make-up of some varieties allows them to use N better than others," he says.

"Of those which are good at taking up nitrogen, the question then is how the plant partition it within its tissues. For example, in milling wheat how much is directed towards biomass and how much



*Different seed rates and nitrogen applications of 100, 150 and 200kgN/ha are being evaluated on wheat at Waddington, says Sarah Hawthorne.*

to increasing protein?

"This is the first stage in identifying the genes controlling that process, but soon we'll be able to select specifically for this trait and breed varieties with reduced nitrogen requirements."

The current RL assumes 'best local practise' in terms of rates, adds Matt. "But as new varieties come forward, nitrogen use efficiency will be one of the factors shaping the RL and the work of breeders."

With summers likely to become hotter and drier, drought tolerance is another key area DSV is investigating and looking back to historic genes could be a significant part of this, he predicts.

"Drought tolerance is not a binary 'on/off' situation like resistance to Orange Wheat Blossom Midge, for example, but if we can push our varieties to become drought tolerant that is very positive.

"The John Innes Centre has produced two genetic markers for this trait, so knowing when those are present means that we don't have to test crosses for drought tolerance because we know that characteristic is present," explains Matt.

"While we don't want to rely on genetic markers for everything, they can be useful for determining certain traits. We're also using them to help improve the nutritional quality of wheat by discovering genes which control the accumulation of nutrients, such as calcium. So rather than adding it to the end product, flour millers will be able to claim that their products are 'naturally fortified' with it.

"For similar reasons we're also investigating the production of high fibre milling wheats, and it's developments such as these which will ensure that the future of wheat breeding in the UK is very exciting and holds much potential," he concludes. ■