

The future is ‘fully-loaded’

“When we started working with these traits, there was a trade-off for yield.”

Technical OSR agronomy

OSR is a crop beset with problems, but plant breeders are working hard to create new varieties which are more resilient. CPM finds out how traits are being bundled into hybrids to help growers manage risk.

By Lucy de la Pasture

While plant breeders are yet to come up with the answer to today’s most pressing pest problem, cabbage stem flea beetle, advances in breeding technologies have seen substantial progress in the introduction of traits to help reduce yield fluctuations.

For growers where OSR remains a viable option, the ‘bundling’ of risk management traits has been made possible by these precision breeding techniques. And Limagrain is using them to bring UK-specific varieties to market that can help growers mitigate seasonal yield variability, explains the company’s senior OSR breeder, Dr Vasilis Gegas.

“The definition of that variability is the gap between a variety’s genetic yield potential and the yield observed on farm at harvest, which can be influenced by a considerable number of factors.

“The environment is the first major influence; namely moisture and sunlight through the growing season. Secondly, the farm’s agronomic practices will also impact on how much of the theoretical yield potential is achieved.

Genetic potential

“When these two are in the grower’s favour, with good weather allowing all inputs to be carried out in the correct and timely manner, actual performance should be close to genetic potential. But extremes in weather that hinder crop development or the timeliness of operations, and the pressure from pests and diseases can widen that gap considerably,” he says.

This in-field variability can be exacerbated by fluctuations in commodity prices and input costs, so when yields and prices are low and costs are high, profitability can be slashed.

“Farmers are really concerned about this variability and there are two ways that we are helping to control it through our breeding programme,” he adds.

The first of these solutions is selecting

varieties adapted to local environmental conditions at the earliest stage, so a variety spends many years — from the beginning of the breeding cycle, all the way to National List trials — in the UK. Limagrain has a network of trial sites around the country for screening, making its varieties inherently more stable under UK conditions, he believes. ▶



Vasilis Gegas says that screening allows them to weed out varieties that go up and down like a yoyo under UK conditions.

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TuYV resistance is one of the traits that will be bundled with several other traits as standard in new varieties.

► “It allows us to weed out varieties that go up and down like a yoyo, and ensures we only place the most stable into the National List trials and subsequently into the market,” explains Vasilis.

“The second area where breeders can help growers tackle yield instability is introducing genetics that make a variety

more resilient to environmental and agronomic pressures, across different seasons,” he comments.

One example of employing genetics to increase resilience is pod shatter resistance, which is now standard in all the company’s hybrids.

Inclement weather

“Although the risk of untimely pod shatter won’t be high every year, this trait will provide good insurance if inclement weather does strike before the crop is safely in the shed, and also protects from losses during harvest (as the header hits the crop), as well as reducing the number of volunteers,” he comments.

Similarly, Turnip yellows virus (TuYV) spread by *Myzus persicae* is not endemic every season. “But when aphid pressure is high and prolonged during the season, infection is difficult to prevent with foliar insecticides alone because of the current level of resistance to pyrethroids in the virus-carrying aphid population, and then the virus can significantly penalise OSR yields.”

From introducing the trait in the variety Amelie in 2014 — which was less than 100% of controls on the AHDB Recommended List (RL) — the trait is now standard in all Limagrain hybrids, and is



The Clearfield trait means growers can reliably spray out any volunteers in the autumn, says Sarah Middleton.

included in RL Candidates, Aurelia and Ambassador, at 110% of controls.

“When we started working with these traits, there was a trade-off for yield — which essentially they were suppressing. Within five years, we moved from the bottom of the list with a TuYV resistant variety, to the top by a country mile,” he explains.

Other traits built into the breeding programme include the *Rlm7* phoma resistance gene, which provides stable resistance scores of 7 or 8. Limagrain is also working towards better resistance to light leaf spot and don’t offer varieties with a resistance rating of below 6.

Vasilis notes that phoma can be easily controlled with available chemistry, but

Traits in practice

For growers looking to make a real difference to their costs of production, choosing a trait-loaded, high-yielding variety is the best way to protect the genetic high yield potential — which means the variety is less likely to lose yields unnecessarily, bringing the costs of production down, says Beckii Gibbs, seed manager at United Oilseeds.

The restored hybrid Aurelia sits in pole position at the top of the AHDB Candidate List (CL) for 2019/20 and is an outstanding trait-loaded variety, she believes.

This next generation variety sets a new benchmark for hybrid OSR performance — it’s the highest yielding hybrid on the CL, with an east/west gross output of 109%, and a UK gross output of 107%. It also has a very high oil content of 45.1%.

“Aurelia has TuYV resistance, *Rlm7* phoma resistance and gene specific pod shatter resistance, which protects against seed losses up to and during harvest and helps reduce volunteer pressure in future crops,” comments Beckii.

“In the field, the newcomer demonstrates very



Beckii Gibbs says candidate variety Aurelia is loaded with agronomic traits and has good autumn vigour, which may make it popular.

strong autumn and spring vigour, which is important in getting up and away from pest attack. At 154cm, its short height and good stem stiffness means it will stand up to adverse wind and weather conditions, making it easier to combine. All of this means that Aurelia offers growers the highest agronomic rating of any OSR variety,” she concludes.



Low seed rates mean that when volunteers emerge in the field, they become a significant part of the crop.

light leaf spot resistance is becoming increasingly important as fungicide efficacy and choice declines.

This, along with pod shatter and TuYV resistance all in one place, provides an agronomic insurance built into their varieties, with inherently stable genetic yield potential for UK conditions.

“Examples include Aurelia and Ambassador, which are our first hybrids that really show the benefits of such a breeding strategy — inherently, very high yield potential coupled with a bundle of

traits that ensures growers shouldn't lose yield in unfavourable conditions,” he adds.

Looking ahead, Limagrain is focussed on bringing clubroot and verticillium wilt resistance into its varieties. A variety with high yield that incorporates pod shatter, TuYV and clubroot resistance is expected within the next year.

“Already, some of our hybrids are good on verticillium wilt, but we are working to develop traits that we can really call ‘resistance’, which are about 2-3 years away,” he adds. ■



It doesn't take many high erucic acid seeds from volunteer OSR plants to push levels up in the sample.

Clearfield trait helps tackle high erucic acid

Over the past three years, higher than expected levels of erucic acid have been found in OSR seed which has been grown from double-low varieties. This has resulted in growers incurring penalties on consignments, or having consignments rejected.

With the announcement by the European Standing Committee on Plants, Animals Food and Feed on 8 Feb this year that the legal limit for erucic acid (EA) in rapeseed oil is to be reduced from the current 5% to 2%, there is real concern that the number of loads rejected due to EA contamination will increase.

A recently concluded NIAB project, funded by AHDB, looked into where the contamination was coming from and identified the main source to be OSR volunteers with high, or elevated, erucic acid levels.

Simon Kightley, who led the project, says the problem is coming from OSR volunteers from seeds in the soil which may have been present for a long time, in some cases. These aren't necessarily dormant but regenerating every time that OSR comes back into that field.

“The volunteer seed germinates when the new crop is planted. These volunteers are virtually indistinguishable from the sown crop and will grow and set seed which is harvested with the crop.

“Volunteers also cross pollinate with the farmed crop. This happens all the time in OSR crops, but if the volunteers are high EA then the seeds that they produce will also be high EA. This means a proportion of seed in the farm crop will be high EA, which will have an immediate impact on its levels in the sample.”

Seed rates today are much lower than they were historically, with growers now targeting populations as low as 40 plants/m². “These populations are fine, but it does mean that when volunteers emerge in the field, they become a significant part of the crop.

“Put very simply one fully high erucic acid seed at 50% erucic acid, in 50 seeds at harvest

can raise the level in the sample by 1%, and broadly speaking, one high erucic plant/m² will do the same,” he explains.

It's imperative that growers control their volunteers, adds Simon, especially if there's a background of high erucic oilseed rape (HEAR) cropping. “Volunteers can be minimised by three main approaches — direct drilling to minimise soil disturbance, creating stale seedbeds and the removal of volunteers before the crop is drilled and growing Clearfield and spraying off the volunteers once the crop is established.

Oil-bearing and potentially high erucic weed seeds were looked for in the AHDB-funded project, but weed seeds weren't found at levels that could have caused significantly elevated erucic acid levels. Tests on individual weed seeds, did confirm the high-erucic status of some species.

“I don't think for a moment that it is just volunteers causing this problem, there's always the threat of poorly controlled brassica weeds like charlock, which has 42% EA. You don't need many seeds in a hundred to suddenly start pushing up to the limit,” he comments.

Clearfield varieties and the chemistry used with them provide a solution to both parts of this problem,” adds Simon.

Sarah Middleton, BASF campaign manager for OSR says Clearfield is the only weed control system that controls volunteers within the OSR. “For growers with serious problems with EA volunteers, the Clearfield system can give confidence to continue to grow OSR in those fields, knowing that volunteers will be sprayed out in the autumn.

“When growing Clearfield hybrids, the field must be treated with the correct herbicide, either Cleranda (imazamox+ metazachlor) or Cleravo (imazamox+ quinmerac) to gain the full benefit of weed and volunteer control.

“Knowing the history of fields where OSR is planned helps to identify areas which could be EA hotspots; if HEAR was previously grown then



Simon Kightley says volunteer OSR has been found to be the main culprit where there have been problems with high erucic acid.

this knowledge can inform the choice of variety and the husbandry of the crop.”

Most double low (00) varieties have levels of EA less than 0.1%, which are virtually undetectable, and the project found crops grown from hybrid seed, and from Clearfield varieties in particular, had the lowest EA values.

Simon points out that farm-saved seed can be a source of the problem. “Many growers use farm-saved seed successfully, but the big problem comes when growers save their own seed with no real knowledge of the problems they might be generating.

“If you have land where a good proportion of the volunteers are high EA then it is just plain wrong to save the seed from that field. Farm-saved seed will undoubtedly make problems worse and help to spread that problem around the farm.”

His advice is to get any farm-saved seed tested to confirm its EA content before planting. “Get it tested to establish the EA levels are 1% or less. I'd suggest asking for a gas chromatography test, as this is the most accurate test available.”