



It seems only yesterday that I was penning the introduction to the previous issue of the newsletter, talking about getting spring crops in the ground...and here we are now, harvest imminent. Time flies by with a demanding schedule; this year, as the world mobilises again post-pandemic, everyone seems keen to make up for lost time and opportunities.

Our team's no exception: we have been busy supporting our distributors with field days and demonstrations across Europe; attending Congress with the International Seed Federation; expanding production capacity at our UK base; getting to grips with long-awaited new biostimulant regulations; and analysing results from some exciting new trials. More follows on all these stories, plus an introduction to the three new team members who've joined us to help make it all happen. We are growing!

Do get in touch about any of our stories if you'd like more information or have further questions. In the meantime, here's to the success of the 2022 harvest - especially for our friends in Ukraine, who've indisputably had one of the toughest-ever farming years - and all the hard work, effort and commitment that helps us with our most important mission: feeding the world.

Bruce Knight, CEO, Legume Technology

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FROM THE LAB



We're coming out of a busy period in the lab, writes Technical Officer Mike Thomas.

With the production team concentrating on building up stocks to meet orders for spring planting, we've been equally occupied in focusing lab resources on quality control, monitoring and testing. Quality, consistency and product performance, plus the availability of technical

support, are the differentiators frequently cited by customers, so it's essential we have procedures in place to check that products contain the correct strains of bacteria, in the expected concentrations..

It's all about confidence - our confidence in a product when it leaves the production site, and giving our customers confidence that a product will perform as stated.

But with that production phase completed, we've had time to get excited about - and started to prepare



for – the installation of a new, 10,000-litre fermenter later this year. Ten times bigger than our previous fermenter (which we'll keep), the new apparatus will hugely increase our throughput and efficiency. As with most manufacturing processes, it's less efficient to make smaller quantities; fewer, larger batches will also improve overall consistency. What's more, it means we can reserve the existing 1,000-litre fermenter for development and trial work, without interfering with day-to-day production.

Meanwhile, out in the field, we've had some very pleasing results from trials using the reformulated RootFiX, our bacillus product. Its four distinct bacterial strains have each been selected for their individual characteristics and the benefit they deliver; now that we've got it into trials, it's behaving as well – if not better – than we expected.

On this particular crop, RootFiX-treated plants are 17% taller than the control and show 33% more pods per plant. Plant density increased by **an astonishing 80% in this field**.

These factors combined have significant potential to increase the overall yield output, so we're excitedly awaiting the final numbers from the farmer and will bring you more information in the next edition!

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Improving seed viability is one of our ongoing projects, one of our commitments to continuous development. There's no denying that biological crop protection inputs can be less robust than their conventional agrochemical cousins – they are natural, live organisms, after all – but we're working hard to improve not only shelf life but also how the product performs after application

Seed-based inoculants have usually been applied on-farm, minimising the interval between application and drilling, and preserving performance. Many growers have seen great results, but not everyone has sufficient time or the necessary equipment. Consistency can also be an issue, so there's been a trend towards earlier applications, and sending out pre-treated seed to farms.

With this in mind, our research has focused on how we can keep bacteria viable on the seed surface for longer, thereby extending the storage interval between treatment, delivery and drilling. Being able to crack this problem will boost confidence in biological treatments throughout the supply chain.

OUT IN THE FIELD?

For readers in the northern hemisphere, crops will be maturing and moving towards harvest (if not already). So if you're out in the field inspecting your crop, it's worth taking a quick look at a few plants to check and understand the extent and quality of nodulation, says Bruce Knight.

In any crop, it's always fascinating to have a closer look at the roots. They're the interface between plant and soil: a sophisticated interface by any account, processing water and nutrients, producing complicated exudates, communicating with other plants, providing physical support and, of course, the site of an incredible relationship between the plant and microbes such as rhizobacteria, bacillus and mycorrhiza.

Rhizobacteria, of course, is the species responsible for the root nodules on legumes such as soybeans, peas and beans. I've always described the root system as a historical map – careful inspection will reveal when the growing root tip encountered the bacteria and when nodule formation began.

When you're looking at the roots, check out how high up on the root the nodule occurs. The higher it is, the earlier the nodulation – and the more effective the inoculation will have been.

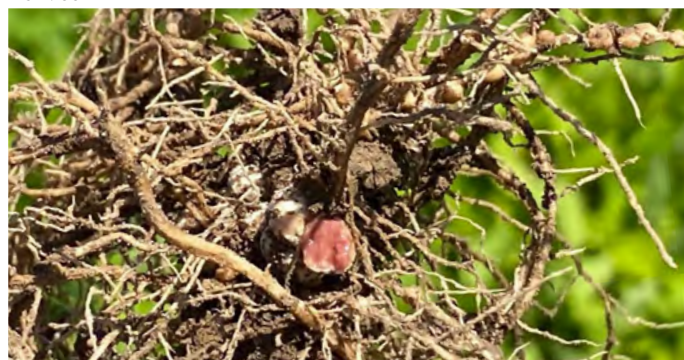
It's at around this time, however, that nodules start to die off and senesce. If you find grey, white or or green nodules at this point, it's nothing to be worried about, just the next stage in the crop life cycle. Hot weather and low rainfall across Europe will have brought forward senescence in many crops

and the characteristic red colour of the nodules may already be fading. It's a classic sign of crop maturity and should go hand-in-hand with a healthy crop canopy and pods starting to fill.

Sometimes the nodules will be green earlier in the season; it's a classic sign of trace element deficiency, the culprits being molybdenum and cobalt. That's why we have MolyFiX in our line-up as a simple but effective molybdenum supplement.

A final word of reassurance: nodulation is never uniform throughout a crop! There are so many factors involved – the above-mentioned deficiencies, soil properties, compaction, water availability, even the presence of other bacteria. There may also be nitrogen-rich pockets remaining from the previous crop, which can influence individual plants to forgo nodulation in favour of direct nitrogen absorption.

If the crop's looking good up top, then – irrespective of what some plants might display – all's bound to be well under the soil surface, and you can look forward to a healthy yield at harvest.



FROM OUR EUROPEAN TRAVELS...



Climate scientists have been suggesting for some time that the first noticeable effects of climate change would be a greater incidence of weather-event extremes, such as sustained high temperatures and heavy rainfall.

That's certainly been our experience as we've taken in field days across the European continent this summer. From our UK site, where just a few miles away the UK's highest-ever temperature of 40.3°C was recorded in July, to the sustained heatwave affecting Polish soybean crops and the almost biblical rainstorms that drenched us while reviewing Danish pea crops, there's no doubt that the swings in weather patterns are becoming more evident.

If these phenomena persist, crop production - never an easy task at the best of times - is going to become more difficult still.

But we will adapt, just as agriculture always has. This time we have better tools at our disposal to ease the transition - our inoculants being a prime example. What's been hugely apparent from our observations as we've inspected crops during our travels and field days has been the ability of inoculated crops - soybeans, peas, lupins - to stand up to these weather extremes.

Those observations have not gone unnoticed: good quality, high-performance inoculants are attracting attention. On our travels, it's been a pleasure to discuss new distribution opportunities with some leading lights in the European seed industry. Soy, naturally, remains one of the strongest markets for our products but we're seeing increasing demand for their use in peas and lupins. That's driven by the renewed interest in these crops to help support the rapidly growing 'alternative protein' market. Another previously niche crop, chickpeas, is also expanding its European acreage.

Legume Technology's portfolio, strong in crops ranging from maize and other cereals to 'traditional' inoculant targets such as soybeans, is just the ticket for seed houses and crop input distributors seeking a strong brand to add value to their operations. Expanding the scope and reach of our products is an ambitious objective, but a key element in our new collaborative plan with Green Universe.

International Seed Federation Congress

If you were in Barcelona in May, perhaps you visited our stand!

We were thrilled to be out and about again at an event, for the first time in nearly three years. Nothing beats meeting customers and answering questions face-to-face. Virtual meetings and conferences are a poor substitute for the real thing; many of you will no doubt agree, as your own national and regional shows have restarted after the pandemic.



NEW FACES JOIN THE LT TEAM

If you've been reading earlier newsletters, you'll know our business is growing – and a growing business needs to build its team. We're delighted to welcome three new members to Legume Technology: read all about them!



Nigel Lever is our new **Production Specialist**. Nigel brings to the team more than 15 years of experience in manufacturing, including several years as a licensed pharmaceutical manufacturer. His knowledge of managing and operating specialist, high-tech production equipment will be invaluable in ensuring the increased demand for our products is addressed with quality, consistent output.



Working closely with Nigel will be our new **Plant Manager, David Hosking**. Previously with Lallemand as a fermentation manager, David will be responsible for ensuring all our customer production needs are met. He has the perfect skillset to carry and build on the legacy of his predecessor, John Godliman, who is retiring.



Meanwhile, we welcome **Heather Beestall** to our office team. As **Office Manager**, Heather will manage and oversee administrative duties such as account management, responding to enquiries and – if you should have to call or email the office – you'll probably find Heather dealing with your query, efficiently and quickly. Heather's arrival will allow technical support to focus on what they do best, particularly logistics. Transport has its own well-documented issues currently, but as our customer base grows so too does the incidence of issues and their need for resolution.

It gives us a real buzz to expand the team with new talent and personalities; please join us in our welcome.

It's the first step in a long-term expansion plan to invest in capacity, and the first fruit borne by our new collaboration with Green Universe, as announced in the last newsletter. Watch this space!

HARMONISATION FOR BIOSTIMULANTS AT LAST

Regulations and legislation aren't always the most interesting topic. Thankfully we have Technical Officer Mike Thomas to keep us up-to-date.

It's not often you see the words 'regulation' and 'exciting' in the same sentence, but on July 17th they were comfortably applied to a new European Union directive that will address and regulate the rapidly growing biostimulants sector.

Biostimulants were previously considered as Plant Protection Products, so it's a massive step forward to finally have them recognised in their own right. It's formal recognition that biostimulants have an important role to play in crop production, based on a growing body of evidence.

Officially, they will be classified as fertilisers – the new directive, 2019/1009, is the 'Fertilising Products Regulation, or FPR – but it moves them away from products used specifically for crop protection and, more importantly, ensures every EU member state now shares the same definition of an agricultural biostimulant.

From my own point of view, as a regulatory officer here at Legume Technology, it's going to make my own job much simpler. No longer will I have to ensure our products meet the individual requirements of each of the EU27. Instead, we can distribute products like LIQUIFiX and LEGUMEFiX under one, single standard.

But it's our distributors and customers who really benefit from this development. The new directive sets a relatively high bar and will undoubtedly lift standards across the sector, ensuring that the only products that make it to market are of high quality, carry accurate descriptions, and are supported by robust technical advice. Biostimulants have occupied something of a grey area until now, enabling some questionable products to reach the market. FPR is a good starting point in remedying some of the damage to biostimulants' perception amongst advisers and end-users.

The EU is the first jurisdiction anywhere in the world to enact such legislation, so there's every chance that the European model can be adopted by other regulatory bodies – particularly in light of analysis from EBIC, the European Biostimulants Industry Council, that the European market accounts for nearly half the global biostimulants market.

Both factors will help to raise the game in this fast-developing sector, increasing grower confidence in the adoption, use and performance of these products. They are an essential ingredient and a vital grower tool in our transition towards a more sustainable agriculture and we're delighted, as a company that's been involved in biostimulants for more than 20 years, to support the implementation of this significant new regulation.

Mike is happy to answer readers' queries about the new legislation: info@legumetechnology.co.uk