



**Bioscience
in practice**

Outstanding oats

Could a signalling compound help milling oat growers to meet quality expectations and maximise the crop's value? CPM takes a look at the science.

By Janine Adamson

In the words of English philosopher John Ruskin: "Quality is never an accident; it's always the result of intelligent effort." A phrase worthy of being applied to most areas of life, certainly when it comes to the art of growing great oats.

Their high nutritional value means UK consumer demand is increasing, posing an opportunity for growers. But at the same time, according to the AHDB, the UK oat area has reduced for 2023, with the estimated crop between 817Kt and 987Kt.

To maximise the value of what's been planted, growers aiming for the consumer market will have to meet the stringent quality expectations of milling contracts — a careful balance between grain protein percentage, size (thousand grain weight) and specific weight.

As with other cereal crops, many factors influence the quality of oats, including

variety, soil type, the use of crop protection products and weather conditions during the season. So despite being low cost in supermarkets, oats undoubtedly require a Ruskin type approach.

For Agrovista agronomist Phil Warham, this includes exploring the use of a foliar biostimulant treatment which he believes can support growers in achieving milling quality standards. "Millers expect a specific weight above 50kg/hl, which indicates the individual grain density. This is determined by both genetics and the grain filling period," he says.

Carbohydrate redistribution

"Although genetics depend on the specific variety, growers can influence grain fill through ensuring good photosynthesis levels and the redistribution of carbohydrate reserves up the plant. What's made a difference for my growers is using 3ALO T6P biostimulant at the panicle growth stage (GS59). It essentially pushes carbohydrates through the crop and gives improved support during that all important grain filling period," says Phil.

He believes this is key because as well as specific weight, grain filling also impacts the final dry grain weight and appearance. With most oat mill products being whole grain such as rolled oats, steel-cut groats and flakes, maximising these attributes is important.

According to Phil, with big yields hoped ▶

“It could easily be the difference between making milling quality standards or not.”



Phil Warham advises growers to use 3ALO T6P biostimulant at the panicle growth stage in oats.



The longer the grain fill period, the larger the oat grain size is likely to be, says Nigel Grech.

► for this season, it'll pay for growers to invest in boosting quality. "Being realistic, as with all biostimulants, it won't work in every scenario across every farm. But, for those who I've recommended it to, 3ALO T6P is having a very real impact on specific weights and the quality of oats. It could easily be the difference between making milling quality standards or not.

"Of course, it's important to not neglect other areas of crop management, such as optimising nutrition and managing lodging through PGRs, which can be a particular issue for spring-sown crops. Oat screenings should also be avoided, which includes small and broken grains as well as crop debris."

So what's 3ALO T6P? As alluded to in April's issue of *CPM* (page 41), it's a signalling compound based on a

precursor of the sugar T6P — trehalose-6-phosphate. The molecule regulates metabolic and developmental processes within plants, including carbon fixation and balancing the concentration of carbohydrates, particularly sucrose. As the main fuel generated by photosynthesis, sucrose is key to the development of cereal grain.

Research interest

Peer-reviewed academic research is what attracted Unium Bioscience's Dr Nigel Grech to the compound and as a result, 3ALO T6P was born. "Maximising the relocation of carbon into yield as carbohydrates or oil, is an area of crop physiology that's attracted a lot of interest in the last few years. In this instance, not only does T6P help grain development, but it also demonstrates overall improved crop performance under both ideal and stressed conditions.

"For oats, as soon as pollination occurs the embryo and endosperm begin to develop and the plant redirects photosynthates, along with stored starch and protein, into the developing grain. The longer the period of grain fill, the larger the oat grain size is likely to be, which is why T6P has such an impact," says Nigel.

The recommendation is to apply 3ALO T6P in oats at GS51-59. This is because oat grains develop in a panicle, with each having a number of branches radiating in whorls from the central rachis (the stem within the panicle that bears the rachillas

and spikelets). The spikelets contain two or three florets, which can each produce a grain.

The number of grains per panicle is mainly influenced by variety, however, as with specific weight, this can also be influenced by crop management.

For farmer Matt Fuller of Heathcote Farms, crop management is all about keeping plants healthy. Using 3ALO T6P helps to address not only quality specifications, but also fits with a wider commitment to sustainable crop production.

As well as spring oats, the 1000ha farm in Bedfordshire grows a range of combinable crops including milling wheat, winter feed barley, oilseed rape and winter beans. "We focus on nutrition as a basis for good crop management, including the use of biostimulants in pretty much every tank mix. For two to three years, 3ALO T6P has been our go-to biostimulant for later stage sprays."

Matt was first introduced to the product through Crop Management Information (now Green Crop Information, a branch of Dyson Farming) and engaged with an on-farm trial around four years ago. Seeing the results first-hand gave him the confidence to take the plunge at a commercial level. "We engage with various on-farm trials because it's important to see how products such as biostimulants perform within your own unique environment," he says.

This is because he acknowledges the

Wheat seed crop market

Based on evidence that 3ALO T6P is boosting specific weights and the quality of grain, could it be of benefit to seed crops, in particular? To investigate, Unium Bioscience sent grain samples for analysis, which confirmed the initial hunch. The results show an increase in wheat grain nutrient content across the full suite as a result of the product being applied at T3.

This makes for an intriguing hypothesis for seed priming — treating a 'mother' seed crop with 3ALO T6P should result in a more nutrient-dense 'daughter', for planting the following autumn, according to the company.

A Unium Bioscience trial has since shown the resulting crop demonstrates greater vigour and improved establishment compared with seed from a non-treated mother crop. According to the company, this effect is inclusive of the yield increase the seed grower would expect from applying 3ALO T6P.

Agrovista's seed specialist Stuart Cree

acknowledges the logic behind the theory and hopes to investigate it further. "This is a concept I can appreciate but believe for the wheat market there needs to be some form of contractual agreement to reward growers for achieving these sorts of benefits."

Nonetheless, he says he already has a grower who's applying it to home-saved seed crops because of the grain quality benefits 3ALO T6P offers. "We're all on board in believing this product works, it's logical — the seed should come out healthier at the end. But I think the tipping point in uptake would be incentivising farmers to use it."

Stuart supports the product's use in milling oats because the system is already in place to reward such uplifts. He also wants more trials. "To robustly support the claims for a seed crop, farmers would need to see further evidence. This would include observing how 3ALO T6P treated and non-treated grain behaves when



Stuart Cree says the benefits associated with applying 3ALO T6P to seed crops need to be rewarded.

stored for periods of time.

"Viability can tail off when seed is stored long-term, such as with spring-drilling varieties which are held in store through to January onwards. If by being more nutrient-dense the seed remains viable for longer, then this could be a game-changer for seed merchants across species."



According to Andrew Cromie, new carbohydrate management signalling compounds are in development.

influence of external variables on product performance. However, he believes the future lies in biologicals. “The farm has to make a living and each crop has to make a profit in isolation. But it’s also important to futureproof the business and reduce the reliance on synthetic chemistry, while addressing the bigger picture through reducing soil disturbance. We’re committed to using 3ALO T6P now, it works for us as part of a sustainable approach,” says Matt.

He’s also seen positive results from applying 3ALO T6P to peas during the flowering stage. This was with the aim of helping the crop to overcome a dry spring by reducing stress and keeping it greener for longer. Despite pressured conditions, the crop yielded 6t/ha which Matt says was pleasantly surprising.

Looking towards the future, Unium Bioscience continues to screen for novel biostimulant and biological technologies. A large-scale screening process



3ALO T6P has also shown promise when applied to peas during the flowering stage to help overcome stress.

undertaken by Nottingham University last year highlighted new pathways which the company hopes to take forward to the next stage.

Commenting on this explorative work, Unium Bioscience’s Andrew Cromie says they’ve seen promising results in other carbohydrate management signalling compounds to extend the ‘trehalose pathway’ pipeline.

He explains the company’s also investigating formulation optimisation and alternative delivery mechanisms, including overcoming the challenges associated with seed treatment application. “A new graphite-based seed treatment has shown a lot of promise and has progressed into the final stages of development,” says Andrew.

Versatile formulation

“During discussions with breeders, it became apparent that traditional liquid biostimulant seed treatments aren’t always feasible. This can be due to the properties of the seed, different species in one bag causing difficulties, and processing machinery not being equipped to apply a liquid seed treatment,” he adds.

According to Andrew, being a graphite-based formulation means the new pipeline product can be easily added to the mixing process for solutions such as cover crop mixtures, companion crops, grass seed blends and stewardship mixes. He also says that through experience on his own farm in Cambridgeshire, he understands the challenges that can be



For Matt Fuller, crop management is all about keeping plants healthy, including the use of biostimulants.

involved when establishing a late cover crop or stewardship mix.

“For the farm’s latest Mid-Tier application, we worked closely with stewardship specialists Oakbank, to review yield maps and highlight underperforming areas of the farm which could be taken out of production,” says Andrew.

“Of course, this presents the challenge of establishing what can often be quite small seeds, within difficult soil types. We hope this new graphite-form biostimulant will improve the overall establishment of such environmental-focused seed mixes in an easy and cost-effective manner,” he concludes. ■

Bioscience in practice

As the chemistry toolbox continues to shrink, an array of new bio-solutions are coming to market, offering a range of benefits and complementary additions. Evaluating just how effective they are, and where they’re best placed can be tricky, however.

This series of articles opens a window on the science behind these innovations. CPM has teamed up with Unium BioScience to explore the background, unravel the physiological processes and provide analysis on the results of trials. Above all, these articles give the grower an inside view on some of the exciting opportunities biosolutions offer in the field.

T6P (trehalose-6-phosphate) is a central signalling compound in plants responsible for regulating sucrose and the way it’s allocated to crop growth, development and to different locations in the plant. Two of the key benefits

are increased yield of the sink component e.g. grain, or improved recovery from drought stress.

T6P regulates seed filling through increasing cell differentiation and starch accumulation, maximising the efficient transfer of sucrose into storage starch and/or oils.

The compound has been well recognised as a signalling molecule in the key trehalose metabolic pathway for many years, but it’s only recently that Unium Bioscience has been able to identify, develop and manufacture it to formulate the product — 3ALO T6P.

Learn more by joining the Unium Bioscience technical group <https://www.uniumbioscience.com/unium-technical-group>

