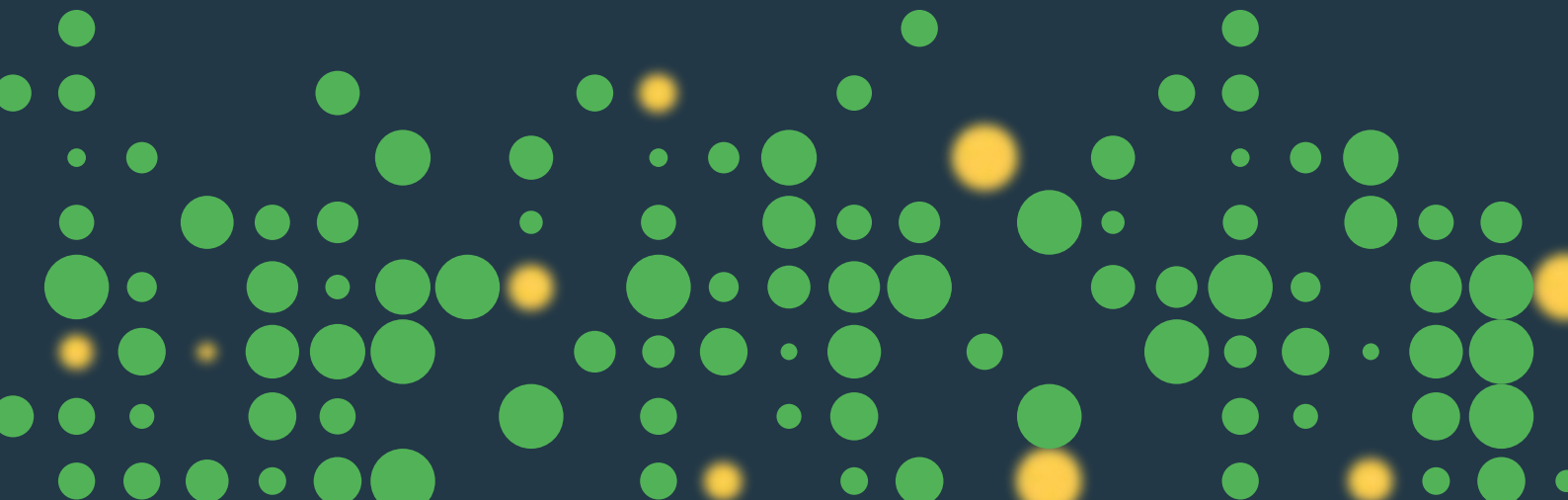




ProAqueous  
Agricultural  
Solutions

Plant  
Booster



# What is ProAqueous Plant Booster?

**Plant Booster** is a new foliar feed comprised of a slow-release nitrogen source coupled with fulvic, humic and amino acids, i.e. bio-stimulants.

Bio-stimulants work with a plant's endogenous processes to boost growth responses and increase resistance to stress and pest/disease damage, while nitrogen is a key nutrient required for protein synthesis. **Plant Booster** also contains innovative, patented surfactant technology to drive uptake by the plant, maximising its impact on a growing crop. A variety of foliar feeds are available that either contain a high nitrogen content or are marketed as a biostimulant, but none contain this unique combination.

**Plant Booster**, whilst extremely effective on plants grown in all soil types, is particularly suited for crops that are grown on sandy soils as the biostimulant activity is liable to promote root development, increasing nutrient uptake and promoting resilience to water stress. It is also suitable for higher-value foliar crops such as leafy salads or brassicas where leaf colour and condition (and the ability to maintain this after harvest) is key.



# Proaqueous Plant Booster – A New Approach to Foliar Fertilisation

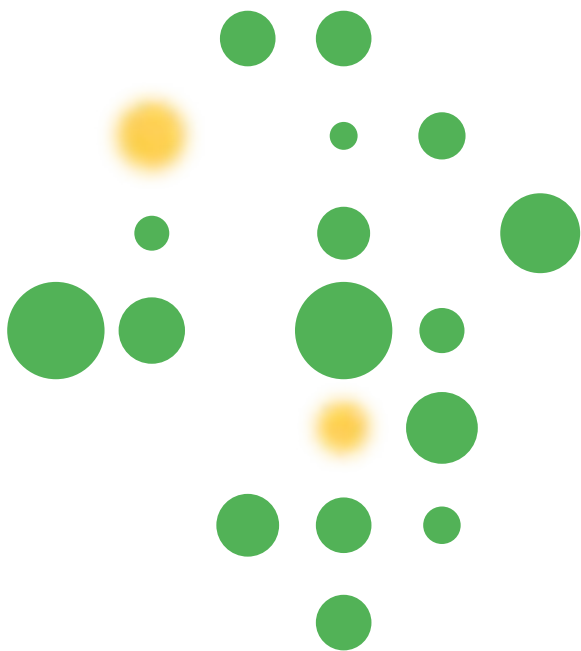
The UK horticulture sector is targeted towards the production of high quality fresh produce that is marketed to UK consumers against competition from cheaper, lower quality international imports.

To address this demand growers are continually seeking new ways to maximise the value of their production by boosting yield or reducing wastage due to pest/disease damage, unmarketable produce or post-harvest losses to maintain their competitiveness.

**Plant Booster** is a foliar product comprised primarily of a nitrogen source (urea) in combination with humic, fulvic and amino acids, all of which are bio-stimulants along with the patented surfactant. A biostimulant is a material that contains substances which stimulate endogenous processes in plants to improve nutrient uptake and use. This drives targeted growth and improves the crops ability to withstand stress (rather than acting as a conventional fertiliser). The surfactant increases the wettability of the product, increasing contact with the leaf and promoting uptake. This unique combination places it at the interface between two distinct market areas: foliar feeds and biostimulants whilst exploiting the benefits of the surfactant technology.

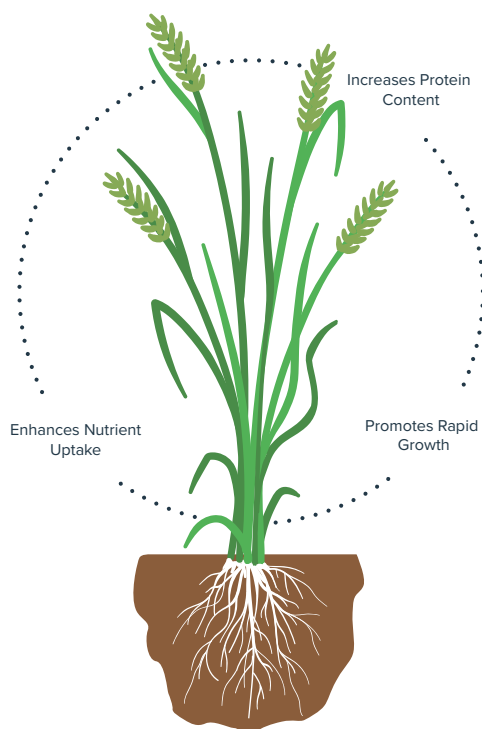
Foliar application of nutrients and other materials is a well-established practice for targeted provision of nutrients to a growing crop to ensure that optimum crop conditions are achieved, giving maximal yield quality and volume.



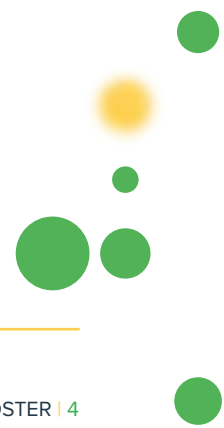


**Plant Booster** utilises urea as a slow-release nitrogen source for the crop. This is a general purpose nutrient required for protein synthesis, an integral process for crop growth. By providing a nitrogen source in the canopy, **Plant Booster** gives the plant an essential nutrient right at the site where it is going to be absorbed and utilised to produce new protein. This is in contrast to more common foliar applications of micronutrients, for example, foliar applications of calcium are commonly utilised to ensure that suitable levels are achieved in growing (e.g. tomato or apple) to prevent the development of blossom end rot, a fungal infection of the flower scar in the fruit that can develop after harvest. However, by providing a slow-release nitrogen source **Plant Booster** acts to provide a general macronutrient to ensure that the crop is not limiting its potential as a result of poor uptake of nitrogen from the soil. Foliar applications of nitrogen are also considerably more efficient than soil applications as reduced proportions of loss to the environment through leaching or through microbial activity before the nutrients can be taken up by the plant are seen. This means positive results are seen in the crop on a much shorter timescale (1/2 days compared with a week or more for conventional fertilisers). By targeting nutrient applications higher levels of nutrient use efficiency can be achieved, offering savings for the grower, reducing the environmental impact of cultivation and ensuring peak crop condition. The impact of a foliar feed can be directly linked to crop condition, application method and timing, and the starting soil/fertility condition of the crop.

## Nitrogen Nutrient Information



Outside of conventional fertilisers a range of products are marked as “bio-stimulants”, and **Plant Booster** contains fulvic acid which





is generally placed in this category of substances which stimulate natural processes in the plant to enhance nutrient uptake/use or enhance the crop's ability to tolerate environmental stresses. These are typically natural extracts (e.g. seaweeds) or non-specific nutrients (e.g. silicon) that are applied to a crop to stimulate growth and conversion of yield. Fulvic acid is part of a wider group of humic substances that are produced from the decay of plant or organic material, either in the soil or from processing of minerals such as lignite. These products do not address a specific requirement of the crop but through impact on endogenous processes stimulate growth in the crop. Many components of bio-stimulants are subject to limited processing/purification from their natural sources and may contain a wide range of chemicals so identifying a specific mode of action can be difficult, although some pathways have been suggested (e.g. through a synergistic interaction with growth regulators). Bio-stimulants may contain significant levels of mineral fertilisers, either through breakdown of the feed material or through direct formulation. This provides a background to ensure that biostimulant impact can be maximised by ensuring the crop is in peak nutritional status to support increased vigour. Fulvic acid has a wide variety of benefits (as discussed below) which can be exploited to drive growth and yield outputs. The presence of fulvic acid means that **Plant Booster** can offer

much more to growers than a simple nitrogen foliar fertiliser – it will work with the crop to promote nutrient uptake and use, improve root structure and drive yields further.

Lastly, **Plant Booster** contains the patented surfactant. This increases the wettability and spreadability of the product when it is applied to the leaf – rather than forming compact round droplets, the product spreads out to coat the leaf surface maximising the contact of the product with the leaf itself, promoting uptake. This is also essential in promoting the uptake of the foliar-applied products into the leaf – the use of the surfactant promotes penetration into the tiny pores in the leaf, the stomata, allowing the product to penetrate into the leaf for active uptake and absorption. The wetting effect of the surfactant ensures that the chemicals present in **Plant Booster** are rapidly taken up by the plant to maximise the potential of the product to be utilised before it is washed off by rain or runs off into the soil.

These three components make a truly unique product for the UK market.



# ProAqueous Plant Booster How does it work?

By applying nitrogen sources to the leaf, ammonium (formed from the breakdown of urea) is readily available for conversion into amino acids and ultimately into proteins such as enzymes, components of cell used for producing new biomass, essential biochemicals such as chlorophyll or metabolites that give flavour and colour to harvested plant organs.

Providing the nitrogen source at the leaf, it is closest to the site of sugar production through photosynthesis and of nitrogen metabolism in the chloroplast. This means it can be actively taken up and used for protein synthesis rather than requiring length transport up from the roots. Root absorbance and transport of nitrogen is greatly impacted by plant water status and past root development, so plants that are stressed are less likely to uptake nitrogen as efficiently as a healthy crop, further impacting their growth. Therefore, foliar nitrogen application can act as a “tonic” helping plants that would otherwise have restricted access to soil-bound nitrogen or to promote the fast recovery of plants that are suffering from stress.

Fulvic acid is a humic substance produced by the decay of plant and animal material by microbes, and is typically a highly heterogeneous mixture of aromatic acids alongside chelated ion complexes with magnesium and calcium.



Fulvic acid is widely described as a “biostimulant” with the potential to increase plant growth and dry matter accumulation to promote yield outputs. Fulvic acid has been shown to have an ability to regulate plant growth, and may act in a similar fashion to the plant growth regulator auxin, potentially explaining why foliar applications are able to promote root zone development through impacts on whole-plant auxin transport. The stimulant effect of fulvic acid also enhances the plant’s ability to mitigate abiotic stress such as drought and soil toxicity by sustaining chlorophyll content, increasing antioxidant levels and maintaining photosynthetic gas exchange. Even in plants grown in optimum conditions foliar application of humic substances can have a positive influence on photosynthetic gas exchange, with applications increasing net photosynthetic by more than 70% in tomato.

There may also be benefits of using fulvic acid to control disease development in the crop as fulvic acid has been suggested to significantly impact the incidence of downy and powdery mildew in cucumber alongside increases in plant growth and yield outputs. It was also shown to induce resistance to Botrytis mould in grape and humic substance application also reduced fungal mould development in strawberry.





# What are the Benefits of using ProAqueous Plant Booster?



Plant Booster offers growers a new way of providing a targeted stimulus to their crops. The unique combination of a biostimulant and a nitrogenous feed, delivered to the crop through the use of a high-penetration surfactant creates a product that can be utilised in a wide variety of settings.

The use of a high-penetration foliar fertiliser during propagation benefits crops where strong development of seedlings prior to transplantation is crucial in boosting establishment and crop uniformity such as field-grown Brassicas.

The use of **Plant Booster** will also benefit material that is vegetative propagated, particularly in the ornamentals sector, with early plant growth facilitated by providing an early nitrogen source before the root zone has been developed. The effect of **Plant Booster** to drive root development through activity of the fulvic acid (acting in a proposed role as a mimic of the plant growth regulator auxin) is also of significant benefit in propagation. With a number of key ornamental species propagated as vegetative cuttings and with increasing restrictions on the use of plant regulators restricting the ability of growers to promote rooting in newly planting material **Plant Booster** provides a solution. The fulvic acid content of **Plant Booster** will drive rooting of new cuttings, promoting establishment

and reducing losses in a labour-intensive process to provide cost savings to the grower.

Furthermore, use of **Plant Booster** will assist in the hardening off of transplants prior to plants (e.g. Brassica). Once placed in the field new transplants are at risk of drought stress until a strong root system has developed, so the use of **Plant Booster** to promote root development may improve establishment in the field – the additional nitrogen boost may also stimulate early plant growth – increasing the establishment of new crops.

A nitrogen source provided directly to the leaves is also a benefit in crops where leaf condition is a key indicator of quality – leafy brassicas such as kale, field-grown herbs such as mint or leafy salad crops will demonstrate an increase in product quality as a result of **Plant Booster** use, e.g. increased nitrogen availability will boost foliar chlorophyll levels, giving a greater depth of green to fresh cut salads.

The presence of fulvic acid also makes the product particularly suitable to crops grown in sandy soils with a poor organic content. The application of supplement humic substances replaces that missing from sandy soils, as well as stimulating root development to improve nutrient uptake from the soil and increase crop resistance to drought stress. Crops such as carrot or onion are typically grown in sandy soils and therefore benefit from the fulvic-acid component of **Plant Booster**. As these crops require the strong development of the root or hypocotyl section the bio-stimulant activity in the root zone will directly target the harvest proportions.





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For more information please visit [www.proaqueous.com](http://www.proaqueous.com)

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