THE BEERLESS RANGE

Targeted nutrition for turf

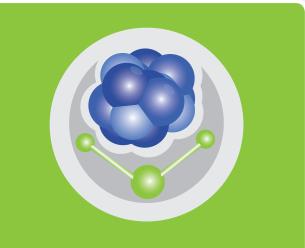


Biorational • Specially created for tank mixing • Nutritionally optimised formulations
• Natural organic chelate technology • Zero chloride formulations



The Maxwell Bullet range of turf nutrition products has been specifically formulated to the highest of standards by our experienced technical team and qualified plant bio-chemists. It is designed to place the Turf Manager in control of secondary macro and micronutrient application. This allows considered application at times when there is concern over environmental or pest induced stress, or in response to a requirement for enhanced visual presentation.

By understanding the role of nutritional elements within the plant, turf managers can utilise the Maxwell Bullet range to elicit a specific plant stimulating effect or overcome soil nutritional deficiencies via foliar application of the optimised formulations. Furthermore, each product has been developed to deliver the primary nutrient alongside accompanying synergistic nutritional elements for maximum efficacy. The Maxwell Bullet range is formulated different to many other micro-nutrient ranges by featuring natural carboxylic acid chelating technology to ensure efficient and safe delivery of nutrients into the plant. Natural carboxylic acid is bio-degradable and therefore prevents persistency in the environment that occurs with more common chelates.



What is a chelate?

Chelate – pronounced "Key-late" – is derived from the Greek word $x\eta\lambda\dot{\eta}$, (chēlē) meaning claw because the chelating molecule lies around the central molecule like the claws of a lobster.

Practically, a chelating agent is an organic molecule which in simple terms encapsulates a plant nutrition molecule, protecting it from precipitation which would make the nutrient unavailable. Ions encapsulated within a chelating agent are far more likely to be absorbed into the plant via the roots and leaf tissue due to changes to the chelated molecules surface properties. It is this which results in greater efficiency of the applied nutrient.



Secondary macro and micronutrients

Although they are not required within plants in the same quantities as the essential plant elements of carbon, oxygen and hydrogen, or the essential plant macronutrients of nitrogen, phosphorus or potassium, the secondary macronutrients and micronutrients are essential for efficient and healthy plant function.

It should also be noted that "micro" in this context refers to the total quantity within the system, not the relative importance of one elemental nutrient over the other.

In this regard, an important point of understanding is, for example; a sufficient quantity of manganese is equally important as a sufficient quantity of nitrogen, it is just that nitrogen is required in a greater quantity. By the same token, a deficiency in manganese is just as detrimental to a plant's health as a deficiency of nitrogen.





		Essential Elements within a Plant's System
Essential Non Nutritional Elemo	ents	Role within plant
Carbon Oxygen Hydrogen	С О Н	Primarily sourced from water and carbon dioxide which are then reacted with light energy to produce plant food in the form of carbohydrates. Water and oxygen are also produced as by-products. This process is called oxygenic photosynthesis.
Essential Nutritional Eleme	ents	
Primary Macro	onutri	ents
Nitrogen	N	Necessary for plant cell division, nitrogen is used for the growth of leaves, stems and roots. A major component of chlorophyll, nitrogen plays a direct role in photosynthesis, carbohydrate production and energy reactions. Nitrogen is also a component of plant vitamins and amino acids.
Phosphorus	Р	Required for photosynthesis, respiration, processing of organic compounds, energy processing reactions (ATP), cell division, cell enlargement and genetic transfer. Phosphorus promotes early root formation, growth and maturity.
Potassium	к	Plays an important role in photosynthesis, metabolic regulation, activates enzymes, metabolises carbohydrates, and stabilises plant pH. Potassium also enables the opening and closing of stomata, which is essential for water and nutrient transport and plant cooling. Responsible for protein synthesis, root growth and disease resistance.
Secondary Ma	cronu	itrients
Magnesium	Mg	The central atom in the chlorophyll molecule, it is vital within the process of photosynthesis. Synthesises amino acids and cell proteins, regulates vitamin concentrations, assists stress tolerance, builds enzymes, forms plant oils and fats, and increases iron utilisation.
Calcium	Ca	Used within the structure of the plant cell wall, it is vital to the healthy development and growth of new tissue. It increases resistance to abiotic and biotic stress and contributes to normal root development. It plays a major role in hormone regulation and protein stimulation, leading to increased uptake of other nutrients. Improves function of stomata, enhancing water efficiency and resistance to heat stress. Calcium is often limited in dry soils or if the plant is growing rapidly.
Sulphur	S	Primarily used in the formation of amino acids. Sulphur is also necessary for chlorophyll formation and plays a role in the active metabolisation of nitrogen. Important in food, enzyme and chlorophyll production. Increasingly deficient due to clean air laws reducing the amount of sulphur in the atmosphere, which would have been carried into soils as acid rain.
Essential Micr	onutri	ients
Zinc	Zn	Plays an important role in hormone production, particularly auxins. Zinc is necessary for starch formation, root development, internode elongation and the formation of chlorophyll and carbohydrates. Zinc is also involved in mechanisms supporting cold temperature tolerance. Zinc deficiencies are difficult to diagnose, leading to 'hidden hunger'.
Manganese	Mn	Plays a major role in photosynthesis through the assimilation of carbon dioxide and electron transport required to split water molecules. Manganese plays a role in respiration, nitrogen assimilation, root cell elongation and resistance to root pathogens.
Copper	Cu	Copper activates enzymes required for lignin synthesis. It is also required for electron transport in photosynthesis, mitochondrial respiration, stress response, hormone signalling, iron mobilisation, the metabolization and transport of carbohydrates and proteins.
Iron	Fe	Iron is involved in the synthesis of chlorophyll and is essential for chloroplast and mitochondrial function due to its role within the electron transport chain. Thus, it is required for a wide range of biological functions including enzyme activation and plant respiration.
Boron	В	Contributes towards cell wall strength, membrane function, cell division, antioxidants and metabolic pathways involved in sugar transportation and hormone development. Boron is also co-related to functions associated with nitrogen, phosphorous, potassium and calcium.
Molybdenum	Мо	Required in very small quantities, molybdenum is an essential plant nutrient required as a component of nitrogenase and nitrate reductase, two enzymes which convert nitrate into nitrite and then into ammonia, which is is then synthesised into sulphur containing amino acids and sugars. Molybdenum is also essential for the conversion of inorganic phosphorous into organic forms. Unusually for a plant nutrient, molybdenum becomes unavailable as soil pH decreases.
Silicon	Si	Silicon is a biologically active element which associates with and triggers enzymes and proteins involved in plant defence mechanisms increasing tolerance to biotic and abiotic stresses as well as micronutrient toxicities. Silicon associates with cell wall components increasing stem strength. Leaves containing good levels of silicon are known to have higher resistance to attack by pests and disease.

Biotic stress

Is stress that occurs as a result of damage done to plants by other living organisms.

Abiotic stress Is stress which occurs as a result of environmental factors such as drought, waterlogging, extremes of temperature, salinity and mineral toxicity.

Chelated Iron

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Available in: 5 L, 200 L & 1000 L



Whilst other products often describe themselves as chelated, Bullet Chelated Iron is a 100% chelated iron. Furthermore, it is formulated from 100% carboxylic acid using our in-house technology. The chelated formula prevents 'lock-up' with other elements in soils and significantly reduces the incidence of iron oxidization which can lead to soil panning.

Over the decades it has been claimed that plants fertilised with iron will produce thicker cell walls that protect against stress and pathogens. This is not the case, and in fact acidic iron sulphate products will act to strip plant cell walls of calcium leading to a weakening. Instead Bullet Chelated Iron uses a pH neutral chelated iron that is not acidic and thus protects the cell wall from degradation.

Further to this, Bullet Chelated Iron has been formulated to protect the epidermal cells and associated beneficial microbes from harmful ultra violet radiation; this means that there is a strong biological protection in place against pest and disease attack.

Due to the low sulphate content (13%) and gentler pH, Bullet Chelated Iron has a low level of antagonism to the soil microflora which breakdown thatch.

Instantly bioavailable, Bullet Chelated Iron provides rapid take-up and outstanding presentational green-up of turf areas.

Phosphite

Available in: 5 L



A super-concentrated form of stabilised phosphite (PO_3) derived from a blend of ammonium and potassium phosphate which is taken up quickly and mobilised around the whole plant. Bullet Phosphite provides protection for new and existing growth by assisting the plant in periods of stress, thereby aiding disease resistance via the induction of beneficial metabolic responses to pathogens. Also a potent stimulator of plant root growth.

Unlike cheaper phosphites, this formulation contains zero aluminium phosphite.

Potassium Silicate

Available in: 5 L



A super-concentrated form of silicate. Potassium silicate is a readily absorbable and stable, plant available form of silicon. It will be deposited in cell walls where it increases turgidity, making cells more resilient to environmental stress, pests, turf diseases and improved stimp speeds. Silicon is one of the most abundant chemical elements in any soil but the vast majority is not available to plants. Silicon is particularly useful for grass plants, the addition of Potassium Silicate to turf crops can have a dramatically positive effect on growth and health.

The silicon to carbon ratio (S:C) is extremely important to a grass's ability to resist pathogens and drought stress. With increasing levels of CO_2 in the air, this ratio has been compromised. Silicon is also now known to be key to resisting stresses related to urban locations, particularly ozone and heavy metal stresses which are common in built up or industrial areas. Bullet Potassium Silicate can be used to raise soil pH similar to liming with the additional benefits of crop protection.

Silicon treatments are protective, not curative, so need to be applied before the plant becomes stressed/attacked.

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Trace Element Complete

Available in: 5 L



Bullet Trace Element Complete contains six essential plant micronutrients supplemented with nitrogen and sulphur. It is purposely formulated in balanced ratios for optimal grass growth and organically chelated with carboxylic acids to maximise rapid uptake and translocation in plants.

Use to correct trace element deficiency's or supplement element uptake for maximum turf quality.

The specialised chelating agents used will also assist the plant in accessing bound nutrients already in the soil and act as metabolic shortcuts to assist with establishing healthy growth, particularly in the spring.

BULLE

RANGE



Bullet Liquid Iron is optimally formulated to lessen the potential effects of sulphuric acid formation in soils associated with many similar products.

Use as a turf colour enhancer and hardening agent on lawns, greens, golf tees, approaches, fairways and sports pitches.

Warning: When applied at higher rates may cause detrimental effects to moss populations. May stain hard standing areas.



Bullet Calcium is a super-concentrated form of calcium, unique in that the calcium is chelated with carboxylic acids, it is also balanced with boron which improves calcium uptake.

Bullet Calcium is in a form which is rapidly absorbed by the growing points of the plant. It enters actively growing cells where it is needed in large amounts to prevent damage caused by deficiencies in dry or acid soils.

Use calcium to improve cell wall strength, growth rates, and thus improve resistance to pests and turf diseases. Not designed to amend soil pH.

Magnesium

Available in: 5 L

& 1000 L



A highly complexed and concentrated formulation of magnesium. Purposely created to encourage rapid leaf uptake and maximise availability to the plant. Magnesium is important within the process of photosynthesis and enzyme production.

Use magnesium, the central element of the chlorophyll pigment, to provide green-up in situations where there is already ample iron, in acidic soils where the grass is exhibiting signs of magnesium deficiency, or where demand for magnesium has been increased i.e. potassium levels have been raised or a pH amendment has been applied.

Manganese

ACAT AREA TO AN ON THE A

Available in: 5 L



A highly-complexed formulation of manganese purposely formulated to encourage rapid leaf uptake and plant availability. Manganese is an essential plant micronutrient important as an activator of over 35 plant enzymes involved in several processes, particularly photosynthesis.

Because manganese is involved in substances affecting a broad range of plant metabolic function, sufficient levels increase tolerance against environmental stress, such as cold and drought, and increase plant resistance to pathogen attack; particularly the disease Take-all Patch Gaeumannomyces graminis, as part of an integrated turf management approach.

Bullet Liquid Tai

		Maxwell Bullet									Maxwe
		Calcium	Chelated Iron	Liquid Iron	Magnesium	Manganese	Phosphite	Potassium Silicate	TE Complete	5-4-20	10-0-12
6	Calcium										
8	Chelated Iron										
	Liquid Iron										
Bullet	Magnesium										
ā	Manganese										
	Phosphite										
	Potassium Silicate										
	TE Complete										
	A Stand	3	in the se	1					all some the		
	5-4-20									1	
Green Solutions	10-0-12										
solut	12-0-9										
sen S	15-0-6										
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_	24-8-12										
ontr	26-0-26										
SolControl	12-5-40										
	13-0-39										
_											
s S	SeaAction										
Biostimulants	HumiMax										
ostim	Biomass Sugar										
Bi	Turf Hardener						2				
			-								
	Amendments								1		
	Balance										

Tank mixing undertake at 4% concentration. Actual results may vary depending on local variances. Best practice dictates jug compatibility testing at the desired concentration ratios should be undertaken prior to creating a mix for the first time at any given site. Jug tests should be left for a minimum of two hours to assess for precipitation, cloudiness and colour change which are indicators of incompatibility.

Always enable tank agitation on your sprayer when undertaking mixing.



nk Mixing Guide

l Green Solutions				SolC	ontrol			Maxwel	ts	Amendments		
9	15-0-6	18-9-9	37-0-0	24-8-12	26-0-26	12-5-40	13-0-39	SeaAction	HumiMax	Biomass Sugar	Turf Hardener	Balance
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	Companson onart											
	Maxwell Bullet Liquid											
	Product	Chelated Iron	Phosphite	TE Complete	Manganese	Magnesium	Potassium Silicate	Calcium	Liquid Iron			
	Cutting Height	All Turf	All Turf	All Turf	All Turf	All Turf	All Turf	All Turf	All Turf			
	Pack Size	5 L	5 L	5 L	5 L	5 L	5 L	5 L	20 L, 200 L, 1,000L			
	рН	7.7 – 8.3	3.0 – 5.0	5.0 - 7.0	3.5 – 4.5	3.5 – 4.5	>10	5.0 - 6.0	1.0 - 3.0			
<u>v</u>	Specific Gravity	1.25	1.27	1.23	1.35	1.24	1.53	1.189	1.185			
Details	App Rate (L/ha)	20	2.5 – 5	2.5 – 5	2.5 – 5	5	2.5 – 5	10 – 20	30 – 100			
	Water Volume (L/ha)	300 – 800	200 - 400	200	200	200	200	500	500 - 600			
	Coverage of smallest pack (m²)	2,500	20,000 - 10,000	20,000 - 10,000	20,000 - 10,000	10,000	20,000 - 10,000	5,000 – 2,500	6,666 – 2,000			
	Use Period	Jan – Dec	Jan – Dec	Jan – Dec	Jan – Dec	Jan – Dec	Jan – Dec	Jan – Dec	Jan – Dec			
	Longevity	4 – 6 weeks	4 – 6 weeks	4 – 6 weeks	4 – 6 weeks	4 – 6 weeks	4 – 6 weeks	4 – 6 weeks	4 – 6 weeks			
	Nitrate (NO3)	0	0	0	0	2.20	0	4.41	0			
	Ammonium (NH4)	2.48	5.20	3.28	0	0	0	0	0			
	Urea (CO(NH2)2)	0	0	0	0	0	0	0	0			
	Phosphorus (P2O5)	0	33.10	0	0	0	0	0	0			
	Potassium (K2O)	0	7.80	0	0	0	22.00	0	0			
	Magnesium (MgO)	0	0	0	0	5.00	0	0	0			
Nutrition (%)	Calcium (CaO)	0	0	0	0	0	0	15.09	0			
itio	Sulphur (SO3)	13.60	0	11.81	24.98	0	0	0	17.44			
Nutr	Iron (Fe)	7.52	0	3.48	0	0	0	0	6.10			
	Manganese (Mn)	0	0	2.65	17.10	0	0	0	0.26			
	Zinc (Zn)	0	0	0.76	0	0	0	0	0			
	Copper (Cu)	0	0	0.50	0	0	0	0	0			
	Boron (B)	0	0	0.72	0	0	0	2.70	0			
	Molybdenum (Mo)	0	0	0.31	0	0	0	0	0			
	Silicate (SiO2)	0	0	0	0	0	31.00	0	0			
g	Nitrogen (N)	0.16	0.33	0.20	0	0.14	0	0.26	0			
5 L/ha	Phosphorus (P2O5)	0	2.10	0	0	0	0	0	0			
	Potassium (K2O)	0	0.50	0	0	0	1.68	0	0			
	Magnesium (MgO)	0	0	0	0	0.310	0	0	0			
licat	Calcium (CaO)	0	0	0	0	0	0	0.897	0			
App	Sulphur (SO3)	0.850	0	0.726	1.686	0	0	0	1.033			
a) (Iron (Fe)	0.4700	0	0.2140	0	0	0	0	0.3614			
g/ha	Manganese (Mn)	0	0	0.1630	1.1543	0	0	0	0.0154			
ad (k	Zinc (Zn)	0	0	0.0467	0	0	0	0	0			
Nutrition Applied (kg/ha) @ Application Rate	Copper (Cu)	0	0	0.0308	0	0	0	0	0			
on A	Boron (B)	0	0	0.0443	0	0	0	0.1605	0			
utrit	Molybdenum (Mo)	0	0	0	0	0	0	0	0			
ž	Silicate (SiO2)	0	0	0	0	0	2.3715	0	0			
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Comparison Chart

Soluble Iron



Available in: 20 kg

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Maxwell Bullet Soluble Iron is a free-flowing, dry, powdered iron formulation that is highly soluble for easy mixing and an even application.

Soluble iron may also be referred to as iron sulphate, sulphate of iron or ferrous sulphate. Soluble iron contains significant levels of the secondary macronutrient sulphur, which can help lower soil pH.

Produces a rapid green-up of turf, without producing growth which can increase susceptibility to turf disease.

Warning: When applied at higher rates may cause detrimental effects to moss populations. May stain hard standing areas..



A 100% Potassium Nitrate granular fertiliser containing zero sulphur. Ideal for use over winter or in the early spring when the soil temperatures are still low. The formulation of 13% nitrate is available to the plant very quickly, enabling turf to be 'spoon-fed' as and when nutrient is required because of the very low application rates (15-30 g/m²).

This product can be used effectively on turf that contains a high thatch content or where the turf is waterlogged and the presence of sulphur may exacerbate high sulphur levels, potentially leading to black layer when the presence of sulphur degrading bacteria coincides with a heavy metal such as iron.

The even granulation provides a good spread pattern enabling this to be a spreadable Potassium Nitrate even at lower application rates.

Maxwell Bullet Granular and Maxwell Bullet Soluble

In addition to the liquid range of secondary macro and micronutrients, the Maxwell Bullet range extends to granular and soluble products each designed to promote a specific effect on turf areas.



A supremely formulated specialist fertiliser that can be used all year round. The formulation has 65% of the iron derived from iron sucrate, so performance and longevity can last up to 3 months. Improves the appearance of greens, golf tees and approaches, high value lawns and sports pitches.

Iron sulphate gives the initial colour, iron sucrate gives a gentle and consistent release making iron available to the plant over several months to ensure turf remains a brilliant green.

Duragreen is low in both nitrogen and sulphur but contains high potassium and an additional 9.9% calcium to harden the turf. Duragreen is ideal for application to turf areas as a treatment before the onset of winter, or as an early season starter. Will stimulate plant colour and improve hardiness without stimulating excessive growth.

Soluble Comparison Chart									
	Maxwel	l Bullet Granular							
	Product	Potassium Nitrate 13-0-46	Duragreen 4-0-10+10%Fe	Soluble Iron 0-0-0+20%Fe					
	Cutting Height	All Turf	All Turf	All Turf					
	Pack Size	20 kg	20 kg	20 kg					
Details	App Rate (g/m²)	15 - 30	35 - 50	25 - 50					
Det	Water Volume (L/ha)	N/A	N/A	400 - 900					
	Coverage (m²)	1333 - 667	571 - 400	571 - 133					
	Use Period	Oct - Mar	Oct - Mar	All Year					
	Longevity	7 - 10 Days	10 - 12 weeks	2 - 3 weeks					
	Granule Size	1.0 - 1.25 mm	0.8 - 1.8 mm	N/A					
	Nitrate	13.00	0	0					
	Ammonium (NH4)	0	4.00	0					
	Urea (CO(NH2)2)	0	0	0					
	Phosphorus (P2O5)	0	0	0					
	Potassium (K2O)	46.00	10.00	0					
	Magnesium (MgO)	0	0	1.16					
	Calcium (CaO)	0	1.40	0.42					
Nutrition (%)	Sulphur (SO3)	0	21.30	29.97					
ition	Iron (Fe)	0	10.00	20.00					
Nutr	Manganese (Mn)	0	2.60	0.040					
	Zinc (Zn)	0	0.488	0					
	Copper (Cu)	0	0.163	0					
	Boron (B)	0	0.146	0					
	Sodium (Na2O)	0	0	0					
	Molybdenum (Mo)	0	0	0					
	Chlorine (Cl)	0	0	0					
	Cobalt Co	0	0	0					
	Nitrogen (N)	39.00	12.00	0					
	Phosphorus (P2O5)	0.00	0	0					
	Potassium (K2O)	138.00	30.00	0					
/m ²	Magnesium (MgO)	0	0.000	3.480					
30 g	Calcium (CaO)	0	4.200	1.260					
0	Sulphur (SO3)	0	63.900	89.910					
g/ha	Iron (Fe)	0	30.0000	60.0000					
d (K	Manganese (Mn)	0	7.8000	0.1200					
plied	Zinc (Zn)	0	1.4640	0					
in Ap	Copper (Cu)	0	0.4890	0					
Nutrition Applied (Kg/ha) @ 30 g/m²	Boron (B)	0	0.4380	0					
Nu	Sodium (Na2O)	0	0	0					
	Molybdenum (Mo)	0	0	0					
	Chlorine (Cl)	0	0	0					
	Cobalt Co	0	0	0					

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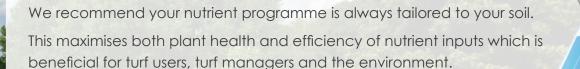
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