



Turf & Landscape

Fertiliser & Plant Protection Guide
2016/17



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Driven by innovation Inspired by nature

As part of the ICL Group, we strive to bring you the most technically advanced specialty fertilisers, nutrition programmes and plant protection products to help you meet the demands of modern day turf and amenity management.

We take great pride in the integrity and value of our dynamic world-class product portfolios and in the provision of dedicated technical support, available to you from the team at ICL.

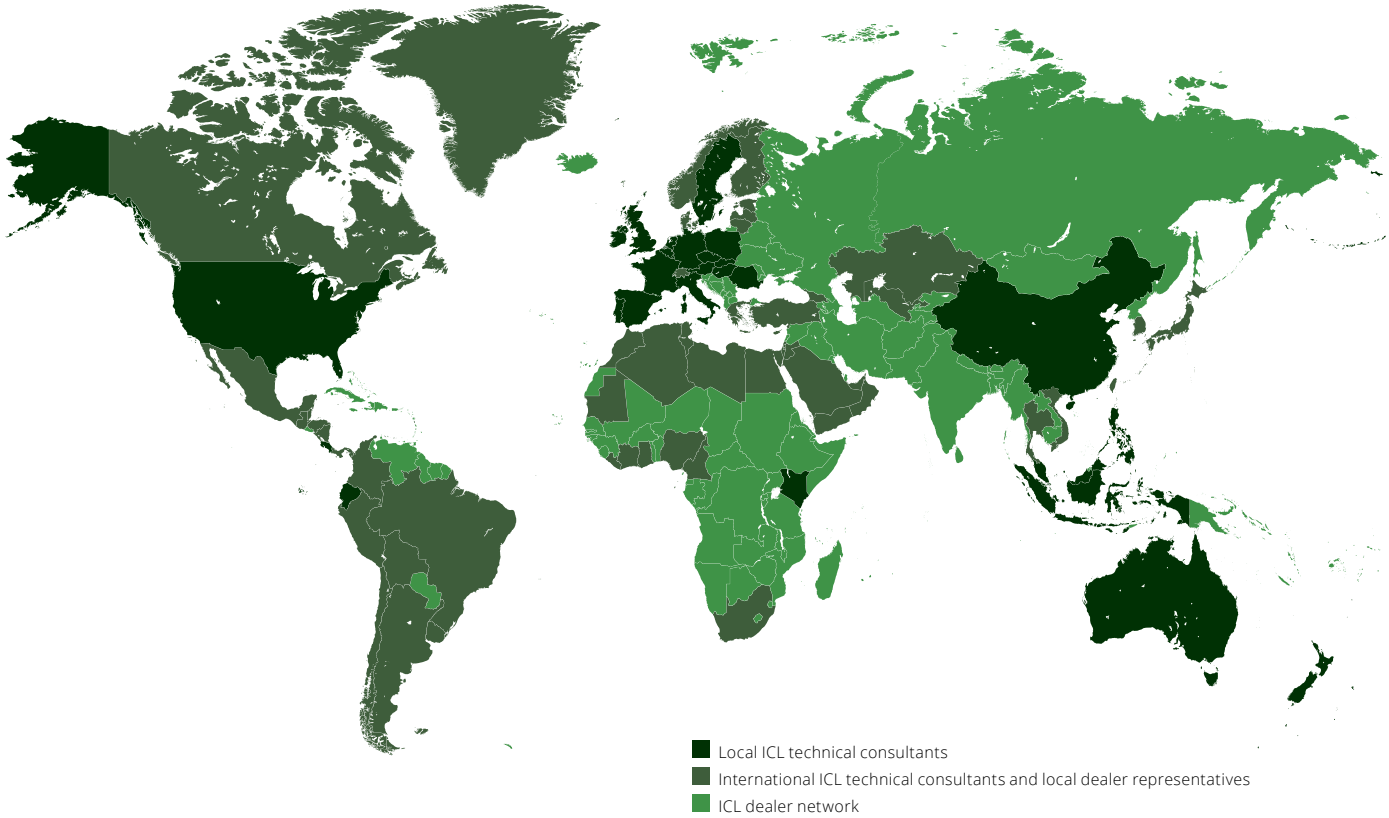
Through our product technologies, our ongoing support of end-user education, and through iTurf, our integrated turf management programme, we continue to advocate best practice in turf management and sound environmental stewardship.

With market leading fertiliser brands – including SierraPlus, SierraformGT and Greenmaster – and a wealth of knowledge in both our Turf & Amenity technical team and our network of distributors, we look forward to working with you and supporting you in all aspects of your turf and amenity management.



**Integrated Turf Management:
Stronger and healthier turf with
lower inputs**

- Controlled release fertilisers
- Slow release fertilisers
- Plant protection products
- Speciality products



About ICL

ICL is a global fertiliser and specialty chemicals company with more than 11,000 employees and operations on six continents. We are differentiated by our direct access to plentiful sources of minerals, our extensive product range, the vertical integration of our manufacturing activities, and the global presence of our manufacturing, logistics, R&D, sales and customer service capabilities.

From the source to a solution



We continually invest in new products and have some of the most advanced Research and Development facilities in the world. Yet we are also committed to sustainability, to help maintain our environment in an efficient and responsible way.

From raw materials through to finished product, we are dedicated to producing the finest range of fertiliser and plant protection technologies, all backed up by first-class customer service. Turf managers at some of the world's finest sporting venues, trust our technologies to help them produce high-quality turf surfaces for sports and amenity use.



As well as fertilisers and plant protection products, ICL offers expertise and solutions to a range of turf problems, which we bring together in our unique programme of integrated turf practices and treatments.

Integrated turf management (ITM) focuses on using the best products in the most efficient and responsible way. ICL is championing ITM through iTurf in order to provide turf managers with an easy way of meeting their environmental responsibilities and complying with increasing rules and regulations regarding chemical application. It also helps them maintain healthy turf through long-term sustainable management.

Precision Nutrition

Our nutrition delivery technology is designed to help you maximise turf performance, minimise fertiliser inputs and eliminate waste.

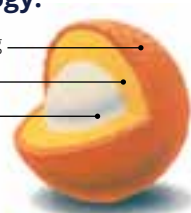
Poly-S Coated granule technology



Polymer and Sulphur coating regulates Nitrogen release to suit plant demand

Poly-S technology:

Outer polymer coating
Inner sulphur coating
Urea nutrient core



Nitrogen granules are coated first with sulphur (a plant nutrient in itself) and then a unique polymer membrane, which is degradable. Once moisture permeates this outer polymer membrane and sulphur coating, Nitrogen is released. Depending on the thickness of the coating, this can last up to 6 months. Major increases in soil temperature and/or moisture do not create severe fluctuations in this release pattern, ensuring that Poly-S provides non-surge growth and a healthy, green turf even in warm, wet conditions. Because nutrient uptake is so efficient, the risk of leaching is reduced.

PACE Resin coated technology



Resin coating of NPK and trace elements to provide tailored release patterns



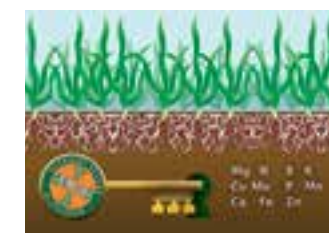
Nutrient is combined within each granule

PACE is a controlled release technology fertiliser that contains more than one nutrient. Our unique vegetable-based resin membrane ensures the plant receives a steady dose of Nitrogen, Potassium and Phosphorus. Depending on the thickness of the coating, nutrients are released over different lengths of time – from 2-3 months up to 8-9 months. When applied, pressure starts to build up within the granule, forcing nutrients through the semi-permeable vegetable coating. The release is not influenced by soil moisture levels, pH or bacterial activity, so remains consistent over a wide range of environmental conditions.

TMax technology



Improve nutrient uptake by the plant, both through the roots and the leaves



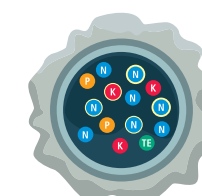
TMax is a cutting-edge agent that enables nutrient uptake by the plant both through the roots and the leaves

TMax is a nutrient uptake activator that improves the efficiency of liquid applied fertilisers. It contains a mix of ingredients to improve foliar uptake including spreaders, stickers and penetrants. TMax also contains technologies to improve root uptake, including wetting agents and natural chelating agents that increase nutrient availability from the fertiliser and of nutrients previously locked up within the soil. By maximising leaf and root nutrient uptake, the risk of leaching is decreased and turf health is enhanced.

MU₂ Extended Nitrogen release in microfine granules



Slow release Nitrogen that can be incorporated with a combination of quality nutrient sources



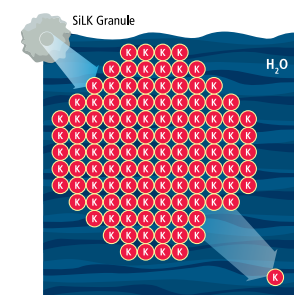
SierraformGT contains the correct and most effective combination of nutrients for the grass plant. Every granule has an identical composition. The result is even growth and an even colour all over the entire turf area.

MU₂ technology ensures the fertiliser provides a uniform distribution of these nutrients when applied, which results in an even and slow growth pattern across the whole grass area, creating a dense sward and a strong rooting system. Fertilisers that contain MU₂ technology are very safe to use. They have extremely low salt levels so the turf plant is not burnt or damaged. The result is increased longevity of up to 8 weeks (dependent on environmental conditions).

SiLK Slow release Potassium



Key ingredient of premium formulations to extend release and minimise leaching loss



Slow release Potassium has been shown in trial work to improve drought tolerance.

Nutrients are released over a period of approximately 8 weeks. Potassium is important for water regulation, protein synthesis, storage of starch and meristematic growth in plants as well as activating enzymes. With SiLK, a larger bank of Potassium remains in the rootzone available for plant uptake. Silica improves the structure and strength of cells, which helps protect the plant from disease. Excessive soil moisture does not affect the release mechanism.

Pro-Lite technology



Improves the Cation Exchange Capacity of the soil



3D cage framework of Pro-Lite technology

Pro-Lite technology improves the Cation Exchange Capacity of the soil – i.e. the capacity for soils to hold nutrients such as Potassium, Calcium and Magnesium. It increases the porosity of the soil leading to improved water retention, infiltration and drainage. This extends the longevity and improves the performance of the fertiliser.

DewSmart technology



Reduces and prevents the formation of dew on turf foliage

Designed to reduce and prevent the formation of dew on the grass leaf, DewSmart technology combines selected sticking and spreading surfactants that bond to the leaf surface and prevent moisture droplets from forming. If dew is allowed to linger undisturbed it often increases the ability of the spores of fungus to travel from one plant to another thus spreading the disease more rapidly. DewSmart is ideal for use on greens as part of a Turf Management approach to minimise the risk of disease outbreaks and improve turf health and quality.

Polyhalite

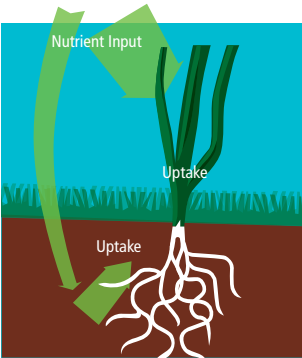


A high-performing natural source of Potassium, Magnesium and Calcium

Polyhalite is a unique, naturally occurring mineral salt comprised of Potassium, Magnesium, Calcium and Sulphur – essential nutrients for healthy, disease resistant turf. As a natural product with no chemical processing, Polyhalite is suitable as an organic source of nutrients. Extensive trials confirm Polyhalite's natural nutrients are fully available to the plant, performing with the same plant-efficiency as standard individual sources. Low in chlorine, Polyhalite is suitable for use with chlorine-sensitive turf.

Premium conventional sources

ICL include premium quality ingredients in all formulations



The choice of nutrient source is essential for effective uptake and longevity.

ICL only uses Urea and ammoniacal Nitrogen sources (primarily from Ammonium Sulphate) in the Greenmaster Pro-Lite range. We deliberately avoid the use of nitrate Nitrogen, which can leach easily or increase the risk of damaging disease outbreaks. At ICL all of our ingredients are considered to be crucial for our clients to achieve optimal results.



All England Lawn Tennis and Croquet Club, Wimbledon

As the world's leading manufacturer of turf fertiliser,

ICL's comprehensive range of turf and amenity fertilisers deliver outstanding results.

Turf managers across the globe trust our cutting edge technologies to provide high quality nutrition for optimum health, performance, resilience and visual appearance. Our unique controlled-release fertilisers put you firmly in control, delivering nutrients accurately and efficiently when your turf needs them.

Internationally, fertiliser analyses are expressed in both oxide and elemental form. In Australia & New Zealand we express analyses in elemental, declaring the element content of a fertiliser. In Europe and the USA they declare Phosphorus & Potassium in oxide form. The elemental declaration is always a lower number, this is purely a difference in expression, the nutrient content is exactly the same.

Our ANZ materials express all analyses in elemental form but you can view the oxide analyses on our website.

Fertiliser Index



Sierraform[®] GT



RECOMMENDED USAGE:
✓ Greens ✓ Sports Fields
✓ Tees ✓ Amenity
✓ Fairways

Fertilisers

Product range	Height of cut	Turf use					Application method	Technology	Longevity	Page
		Greens	Tees	Fairways	Sports Fields	Amenity				
Granular										
SierraformGT		✓✓	✓	✓	✓	✓	Spreader			p9
Greenmaster Pro-Lite		✓✓	✓	✓	✓	✓	Spreader			p14
STEP Hi-Mag		✓✓	✓✓	✓	✓✓	✓	Spreader	Special Trace Element Package		p16
ProTurf		✗	✓✓	✓✓	✓✓	✓✓	Spreader			p18
Sportsmaster CRF		✗	✗	✓✓	✓✓	✓✓	Spreader			p20
SierrablenPlus		✗	✓✓	✓✓	✓✓	✓✓	Spreader			p22
Sierrablen		✗	✓	✓✓	✓✓	✓	Spreader			p26
Liquid										
Greenmaster Liquid		✓✓	✓	✓	✓	✓	Sprayer			p30
Sportsmaster WSF		✓✓	✓✓	✓✓	✓✓	✓✓	Sprayer			p34
Sportsmaster WSF Seaweed		✓✓	✓✓	✓✓	✓✓	✓✓	Sprayer			p36

✓✓ Very suitable ✓ Suitable ✗ Not suitable

High performance micro-granular fertilisers that deliver slow release Nitrogen, Potassium and Silica with trace elements for sustained performance.

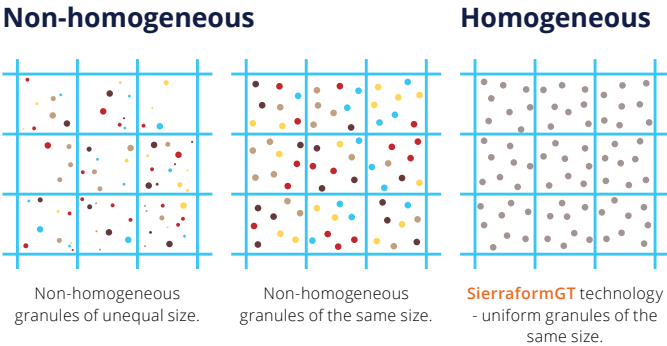
SierraformGT is a high performance range designed for use on fine turf throughout the year. Each granule contains conventional and slow release technology to provide a consistent and sustained release pattern. The slow release Nitrogen and Potassium sources bring real benefits for root development and stress tolerance. The granules are formulated to allow even distribution at low rates of application. SierraformGT is the default fertiliser range for high quality fine turf.

SierraformGT Benefits

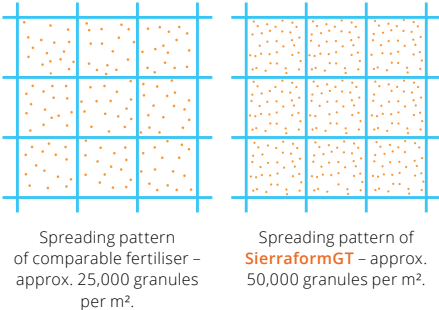
- Slow release Nitrogen and Potassium for sustained performance
- Even spread at ultra-low application rates (20g/m²)
- Granules break down and disperse quickly

Granule distribution

SierraformGT Granule Distribution

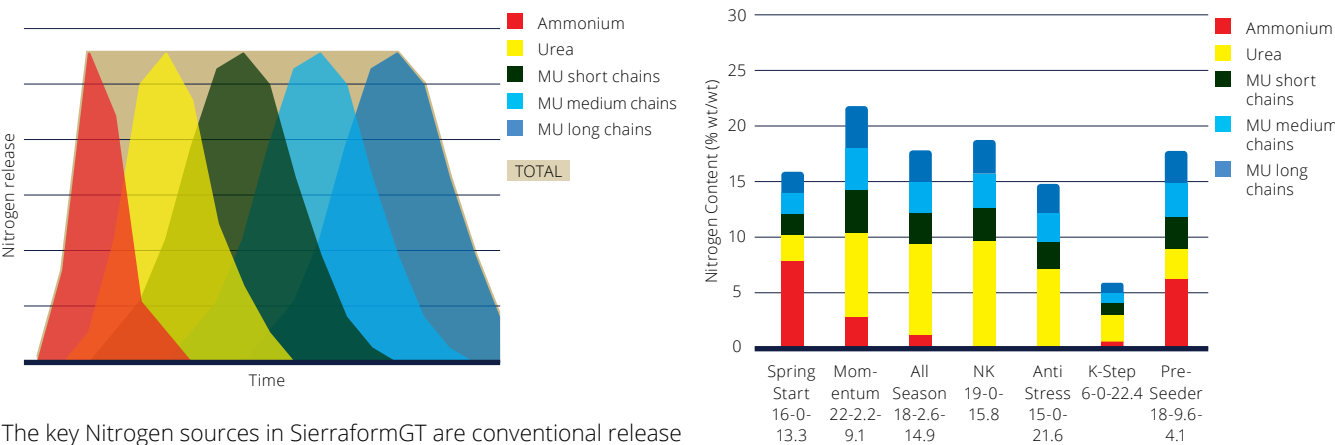


Large Granules Small Granules



The delivery of Nitrogen for sustained release

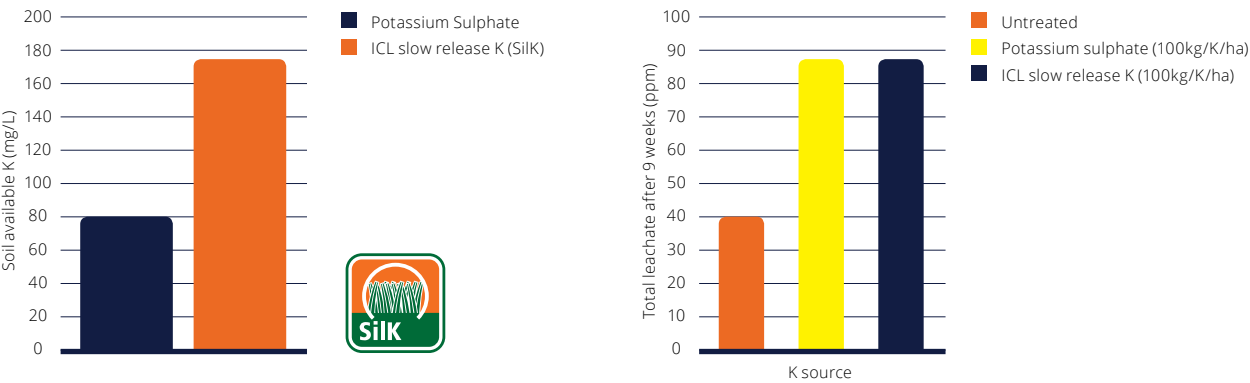
It's important to know which Nitrogen sources make up your fertiliser.
Different sources release nutrients over differing lengths of time.



The key Nitrogen sources in SierraformGT are conventional release ammoniacal Nitrogen (from ammonium sulphate) and Urea along with slow release short, medium and long chain Methylene Urea, (MU). MU₂ extends the longevity of the application over conventional Ammonium and Urea-based conventional fertilisers, which release most of their nutrients immediately. It also produces reliable, consistent results.

Slow-release Potassium & Silica

Increased soil-available Potassium with ICL slow-release K



Silk – slow release Potassium and Silica matrix – is a technology developed by ICL and unique to SierraformGT that delivers Potassium and Silica in a controlled way. It reduces the loss of Potassium through leaching and helps maintain a continuous supply of Potassium and Silica to the grass plant. Research has shown that as a result, turf is better able to tolerate wear stress, drought conditions and disease pressure.

The slow release Potassium source in SierraformGT provides a gradual release of Potassium over time. This means that Potassium losses are limited in terms of leaching and excessive uptake by the plant, therefore there is more available in the soil for the plant at a later date. As the Potassium is continuously released over time, it has the effect of spoon feeding the turf the correct level of K without the risk of over or under feeding or lock up within the soil.

It is only recently that chemistry developments have enabled production of a slow release potassium in a plant-available form, ensuring a bank of available potassium in the soil profile for an extended time.

Thus for turf professionals in the past, the application of K presented problems of leaching and raised salinity in its present form K₂SO₄ particularly in low CEC profiles.

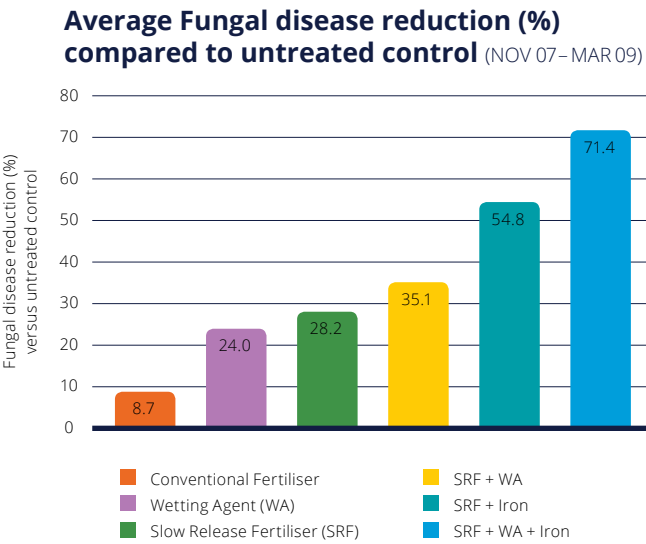
SierraformGT has solved that problem.

SierraformGT granule

Using integrated turf management to reduce disease pressure

Trials with a combination of SierraformGT, Greenmaster Iron Effect FE and Hydraflo have shown over 70% reduction in disease incidence.

A replicated trial at STRI, UK (Nov 07 – Mar 09) showed the following results.



Conventional fertiliser



SierraformGT with Slow Release N, Slow Release K, Slow Release Si and Trace Elements



SierraformGT plus Hydraflo

Trials focused on fungal disease control

Fungal attacks are among the most costly and damaging issues confronting a greenkeeper. With this in mind, ICL conducted research with STRI in the UK to trial and assess individual and combined approaches to fungal disease control over a 16-month period.

The trials were laid out in a randomised factorial design with 3 replicates per treatment. The grass was fescue on a pure sand profile. Assessments were over a 6 month period. The main disease present was Microdochium Patch, *Microdochium nivale* (formerly known as Fusarium Patch).

Trial results summarised

As per the graph to the left, the combination of SierraformGT Slow Release Fertiliser, Hydraflo L Wetting Agent and Greenmaster Effect Iron FE resulted in a 71.4% reduction in disease incidence.

This was in contrast to an 8.7% reduction in disease incidence using only conventional fertiliser.

While the application of SierraformGT alone reduced incidence by 28.2%, the additional combined treatment of Hydraflo L Wetting Agent and Greenmaster Effect Iron FE both provided greater benefits and improved results.

Highlighting the benefits of ITM

The research highlighted the benefits of an Integrated Turf Management approach in reducing disease pressure through a combination of enhanced turf health and the creation of conditions less conducive to disease development. In addition, the lowering of disease pressures can enable a fungicide to work more effectively.

What the nutritional optimisation also lead to was a noticeably better playing surface.

The complete SierraformGT range

Product name Elemental analysis	Technology/ Longevity	Product notes	Nutrient breakdown														Bag sizes (kg)	Application rate (g/m²)	Nutrient levels applied (kg/ha)			Bag coverage (m²) per	*Recommended period of use														
			Nitrogen					Total P	Total K	S	Mg	Cu	Fe		Mn	Mo			Zn	Si	N														P	K	
			Total N	N-NO ₃	N-NH ₄	N-Urea	N-MU ₂																														
Spring Start 16-0-13.3 +Fe +Mn	  6-8 Weeks	Quick reaction in cooler conditions is ideal for spring application.	16		7.9	2.4	5.7	0	13.3	14.9			1		0.3			1.5	20	20 25 30	32 40 48	0 0 0	26.6 33.3 39.9	1,000 800 667	J	F	M	A	M	J	J	A	S	O	N	D	
Momentum 22-2.2-9.1 +1.2Mg +TE	  6-8 Weeks	For use in spring and summer with Magnesium and TE for turf colour.	22		3	7.5	11.5	2.2	9.1	5.1	1.2	0.02	0.5		0.1	0.001	0.02	1.5	20	20 25 30	44 55 66	4.4 5.5 6.6	18.2 22.8 27.3	1,000 800 667	J	F	M	A	M	J	J	A	S	O	N	D	
All Season 18-2.6-14.9 +1.2Mg +TE	  6-8 Weeks	Ideal for use after aeration to stimulate root growth.	18		1.3	8.2	8.5	2.6	14.9	5.7	1.2	0.02	0.5		0.1	0.001	0.02	2.6	20	20 25 30	36 45 54	5.2 6.5 7.8	29.8 37.3 44.9	1,000 800 667	J	F	M	A	M	J	J	A	S	O	N	D	
NK 19-0-15.8 +1.2Mg +TE	  6-8 Weeks	Balanced NK fertiliser for use from spring to autumn.	19			9.8	9.2	0	15.8	6	1.2	0.02	0.5		0.1	0.001	0.02	2.6	20	20 25 30	38 48 57	0 0 0	31.6 39.5 47.4	1,000 800 667	J	F	M	A	M	J	J	A	S	O	N	D	
Anti-Stress 15-0-21.6 +Fe	  6-8 Weeks	High Potassium content to harden turf in stressful summer or autumn conditions.	15			7.2	7.8	0	21.6	8.6			1						4.0	20	20 25 30	30 38 45	0 0 0	43.2 54 64.8	1,000 800 667	J	F	M	A	M	J	J	A	S	O	N	D
K-Step 6-0-22.4 +1.2Mg +TE	  6-8 Weeks	High Potassium content to harden turf in autumn and winter.	6		0.7		5.3	0	22.4	9.4	1.2	0.02	0.7		0.1	0.001	0.02	3.9	20	20 25 30	12 15 18	0 0 0	44.8 56 67.2	1,000 800 667	J	F	M	A	M	J	J	A	S	O	N	D	
Pre-Seeder 18-9.6-4.1	  6-8 Weeks	Ideal during over-seeding period or when laying turf.	18		6.4	2.7	8.9	9.6	4.1	3								0.9	20	20 25 30	36 45 54	19.2 24 28.8	8.2 10.3 12.3	1,000 800 667	J	F	M	A	M	J	J	A	S	O	N	D	

* Recommended period of use is only a guide, request a turf management program for your specific situation. Tropical and Sub Tropical areas may vary.



Directions For Use

- Apply to dry foliage and irrigate after 1-2 days if no rain has fallen. Irrigation will aid dispersion and minimise any risk of mower pick-up on close mown surfaces.
- Avoid applications during frosty or drought conditions.
- Delay verti-cutting and/or grooming for 3 days after application to allow the granules to disperse.
- Nitrogen release is significantly slowed down when soil temperatures are less than 10°C.
- Watering-in after application will minimise foot printing risk.

Greenwich Park,
London 2012 Olympic venue

Spreader Settings

Rate (g/ m²)	Rotary spreader (AccuPro 2000, SR 2000)				Drop spreader (SS-1, SS-2)		
	Cone setting	Spread width	Single pass @ Full rate	Double pass @ Half rate	Spread width	Single pass @ Full rate	Double pass @ Half rate
20	6	3.7m	L	I ½	0.91m	4 ½	3 ¼
25	6	3.7m	M	J ½	0.91m	4 ¾	3 ½
30	6	3.7m	M ½	K	0.91m	5 ¼	3 ¾



- MU2 is proven to enhance root development when compared to other forms of Nitrogen
- Slow release Potassium improves drought tolerance
- Improved slow release delivery of nutrients reduces losses and will allow a reduction in inputs

Performance*

Granule dispersal: 2-3 days
Turf response: 7 days
Longevity: 6-8 weeks

* depending on environmental factors



Greenmaster Pro-Lite®

Outstanding micro-granular fertiliser range for high quality fine turf nutrition.

The Greenmaster Pro-Lite range are conventional release, finely granulated homogeneous fertilisers for use on fine turf areas. The range contains various analyses that are designed to optimise turf health throughout the year. The micro-granular particles disperse evenly and quickly to provide an immediate and consistent turf response. Each granule contains naturally occurring Zeolite (clinoptilolite) to improve performance, longevity and colour response. This range has established itself over the years as being the professionals choice.



- RECOMMENDED USAGE:**
- ✓ Greens
 - ✓ Sports Fields
 - ✓ Tees
 - ✓ Amenity
 - ✓ Fairways

Greenmaster Pro-Lite Benefits

- The micro-granule formulation allows even distribution even at low rates of application
- Release pattern gives reliable results
- High quality ingredients provide performance

Directions For Use

- Apply to dry foliage and irrigate after 1-2 days if no rain has fallen.
- Irrigation will aid dispersion and minimise any risk of mower pick-up on mown surfaces.
- Avoid applications during frosty or drought conditions.
- Delay verti-cutting and/or grooming for 3 days after application to allow the granules to disperse.

The principles of Pro-Lite technology

Pro-Lite has a three dimensional cage framework of Silica alumina and other molecules that act as a microscopic sponge due to the number of spaces and channels.

Excess oxygen in the framework creates a strong negative charge, meaning it has a very high attraction for positively charged ions (cations) such as NH_4^+ , Mg^{++} , Ca^{++} etc.

Due to this strong negative charge, Pro-Lite has a Cation Exchange Capacity (CEC) of around 180meq/100g.

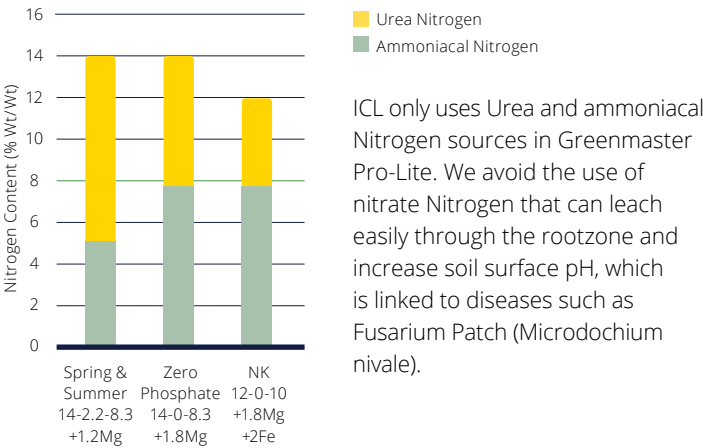
Pro-Lite is able to hold onto cationic nutrients and water molecules until they are needed by the plant.



3D cage framework of Pro-Lite technology.

Quality nutrients count

Nitrogen Content



- The source of Nitrogen can significantly influence the sward composition
- The risk of disease will be reduced by optimising turf health
- Low N, high K plus Fe turf hardeners can be especially helpful through the autumn period

Spreader Settings

Rate (g/m²)	Rotary spreader (AccuPro 2000, SR 2000)				Drop spreader (SS-1, SS-2)		
	Cone setting	Spread width	Single pass @ Full rate	Double pass @ Half rate	Spread width	Single Pass @ Full Rate	Double pass @ Half rate
30	6	3.7m	M	J ½	0.91m	5 ¼	4
35	6	3.7m	N	K ½	0.91m	5 ½	4 ¼

Performance*

Granule dispersal: 3-4 days
Turf response: 7 days
Longevity: 6 weeks

* depending on environmental factors

The complete Greenmaster Pro-Lite range

Product name Elemental analysis	Technology/ Longevity	Product notes	Nutrient breakdown											Bag sizes (kg)	Applica- tion rate (g/m²)	Nutrient levels applied (kg/ha)			Bag coverage (m²) per	*Recommended period of use											
			Nitrogen					Total P	Total K	S		Mg	Fe			N	P	K													
			Total N	N-NO ₃	N-NH ₄	N-Urea	N-MU ₂																								
Spring & Summer 14-2.2-8.3 +1.2Mg	 6 Weeks	Maintains strong growth levels and enhances turf colour during the spring and summer.	14		5.1	8.9		2.2	8.3	13		1.2		25	30 35	42 49	6.6 7.7	24.9 29.1	833 714	J	F	M	A	M	J	J	A	S	O	N	D
Zero Phosphate 14-0-8.3 +2.1Mg	 6 Weeks	Maintains turf health during periods of growth. Magnesium added to improve turf colour and stress tolerance.	14		7.8	6.2		0	8.3	13.3		2.1		25	30 35	42 49	0 0	24.9 29.1	833 714	J	F	M	A	M	J	J	A	S	O	N	D
NK 12-0-10 +1.8Mg +2Fe	 6 Weeks	Ideal for use from spring through to late summer to maintain Potassium levels.	12		4.1	7.9		0	10	12.4		1.8	2	25	30 35	36 42	0 0	30 35	833 714	J	F	M	A	M	J	J	A	S	O	N	D

* Recommended period of use is only a guide, request a turf management program for your specific situation. Tropical and Sub Tropical areas may vary.



STEP[®] Hi-Mag

Unique granular trace element supplement.

Premium granular trace element supplement. STEP Hi-Mag contains all the necessary micro nutrients required for healthy turf growth. This is especially useful to prevent deficiencies in sand-based constructions. The Magnesium content really enhances turf health and colour for an immediate response.

STEP Hi-Mag Benefits

- Helps prevent nutrient deficiencies in sand-based constructions
- Contains a high proportion of Magnesium to enhance turf health and colour
- Proven benefits against the development of Take-All Patch disease



RECOMMENDED USAGE:

✓✓ Greens

✓✓ Sports Fields

✓✓ Tees

✓✓ Amenity

✓ Fairways

STEP Hi-Mag

Product name Elemental analysis	Product notes	Nutrient breakdown						Bag sizes (kg)	Application rate (g/m ²)	Nutrient levels applied (kg/ha)					Bag coverage (m ²) per 20kg bag	*Recommended period of use
		S	Mg	Cu	Fe	Mn	Zn			Mg	Cu	Fe	Mn	Zn		
STEP Hi-Mag	Prevents trace element deficiencies and contains Magnesium for turf health and colour.	7.9	12	0.50	8	3	1	20	7 11	8.4 13.2	0.4 0.6	5.6 8.8	2.1 3.3	0.7 1.1	2,857 1,818	J F M A M J J A S O N D

* Recommended period of use is only a guide, request a turf management program for your specific situation. Tropical and Sub Tropical areas may vary.



Directions For Use

- Apply to dry foliage and irrigate after 1-2 days if no rain has fallen.
- Irrigation will aid dispersion and minimise any risk of mower pick-up on close mown surfaces.
- Avoid applications during frosty or drought conditions.
- Watering-in after application will minimise foot printing risk.
- If spilt on paving slabs, concrete, clothes etc. brush off immediately, as product may cause discolouration.
- Delay verti-cutting and/or grooming for 3 days after application to allow the granules to disperse.
- The treatment can be applied at six week intervals.

Trace elements for disease management

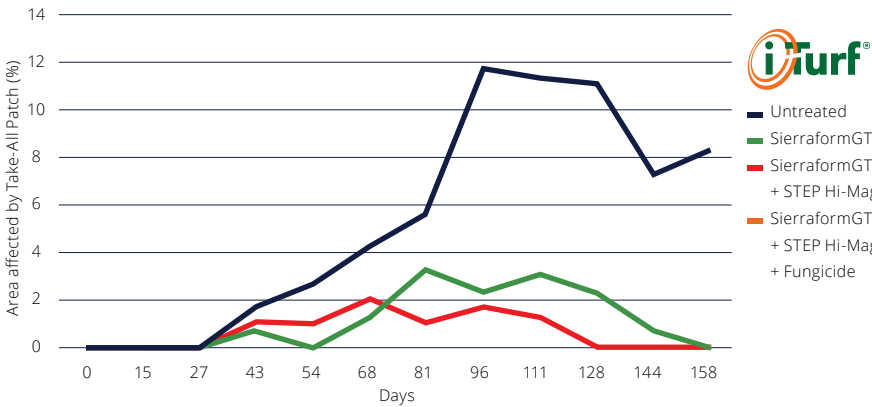
STEP Hi-Mag has been proven to reduce disease pressure in turf when used as part of an iTurf programme.

Manganese plays an important role in managing Take-All Patch disease. If this nutrient can be made available to the turf in an efficient manner, it can help minimise the occurrence of this disease.



An STRI trial showed that by combining the high Manganese contained in STEP Hi-Mag with a slow release SierraformGT programme, the level of Take-All Patch is maintained at an acceptable level of under 2% cover. Combining this nutritional programme with a fungicide programme totally eradicated the disease from the turf.

Take-All Patch Trial



Product characteristics

Bag size: 20kg
Application Rate: 7-11g/m²
Bag coverage: 1,818-2,857m²
Particle size: 0.25-2.5mm (95%)
Granule count: 1,900 granules/g

Performance*

Granule dispersal: 4-5 days
Turf response: 7 days
Longevity: 6 weeks

* depending on environmental factors

- Use to maintain turf health based on soil analysis results
- Should be incorporated into an iTurf programme if there is a risk of Take-All Patch disease



ProTurf®



RECOMMENDED USAGE:
✓✓ Tees ✓✓ Sports Fields
✓✓ Fairways ✓✓ Amenity

New high impact fertilisers designed for use on tees, surrounds, fairways, sports fields and lawns.

ProTurf contains a combination of Poly-S controlled release fertiliser technology, readily available urea Nitrogen and a unique multi-nutrient compound fertiliser. The controlled release Poly-S leads to consistent, regular growth over a 2-3 month period without growth peaks. The uncoated Nitrogen portion of this fertiliser allows an immediate response of the turf, even in cooler conditions. The multi-nutrient compound fertiliser component contains four macro-nutrients (K, Mg, Ca & S) all in one granule.



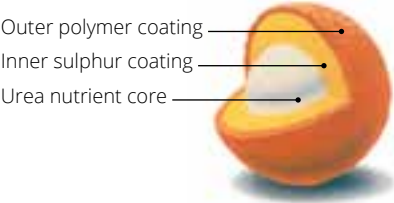
ICL group Boulby mine (Cleveland, UK)

Poly-S

Poly-S is a controlled release Nitrogen source that delivers nutrients gradually over the required longevity. Nutrient release is primed by moisture permeating through the outer polymer channels, through micro-channels in the sulphur layer and into the nutrient core where the urea is solubilised.

Once the urea is solubilised, it then travels back through the same pathways where it is released and made available for plant uptake.

Poly-S technology:



Introducing Polyhalite

Polyhalite is a component part of the ProTurf range. Polyhalite is a new naturally occurring mineral fertiliser containing Potassium, Magnesium and Calcium. Deposited over 200 million years ago it is a complex crystal product which has been discovered at a depth of 1300 metres in the Cleveland Potash mine in the UK. Polyhalite is certainly an exciting new addition to our fertiliser portfolio.

Extensive trial work has confirmed that the principal nutrients of Potash, Magnesium and Calcium in Polyhalite are fully available to the plant, performing in trials with the same plant-efficiency as standard individual sources of Potassium and Magnesium sulphate.

Polyhalite has these minimum contents of:

- Potassium 11.6% K as from Potassium sulphate
- Magnesium 3.6% Mg as from Magnesium sulphate
- Calcium 12.1% Ca as from Calcium sulphate

Polyhalite is a low chloride fertiliser, and being a natural product with no chemical processing makes it suitable as an organic source of nutrients.

The complete ProTurf range

Product name Elemental analysis	Technology/ Longevity	Product notes	Nutrient breakdown								
			Nitrogen				Total P	Total K	S	Ca	Mg
			Total N (% coated)	N-NO ₃	N-NH ₄	N-Urea					
Hi N 20-0-5.8+2.1Ca+1.8Mg	 	Strong initial boost coupled with longevity is ideal for in-season applications.	20 (25%)			20	0	5.8	11.6	2.1	1.8
Hi K 12-2.2-16.6+1.4Ca+1.2Mg	 	Designed to sustain, strengthen and harden turf through the autumn and winter.	12 (25%)		1.3	10.7	2.2	16.6	8.4	1.4	1.2
NPK 15-2.2-12.4+1.4Ca+1.2Mg	 	Delivers a quick reaction, promotes healthy, balanced growth at start of the season and it improves turf colour.	15 (25%)		1.3	13.7	2.2	12.4	9.2	1.4	1.2

Product name Elemental analysis	Bag sizes (kg)	Application rate (g/m ²)	Nutrient levels applied (kg/ha)			Bag coverage (m ²) per 25kg bag	*Recommended period of use									
			N	P	K											
Hi N 20-0-5.8+2.1Ca+1.8Mg	25 500	20 25 30 35	40 50 60 70	0 0 0 0	11.6 14.5 17.4 20.3	1,250 1,000 833 714	J F M A M J J A S O N D									
Hi K 12-2.2-16.6+1.4Ca+1.2Mg	25 500	20 25 30 35	24 30 36 42	4.4 5.5 6.6 7.7	33.2 41.5 49.8 58.1	1,250 1,000 833 714	J F M A M J J A S O N D									
NPK 15-2.2-12.4+1.4Ca+1.2Mg	25 500	20 25 30 35	30 37.5 45 52.5	4.4 5.5 6.6 7.7	24.8 31 37.2 43.4	1,250 1,000 833 714	J F M A M J J A S O N D									

* Recommended period of use is only a guide, request a turf management program for your specific situation. Tropical and Sub Tropical areas may vary.

Product characteristics

Bag size: 25kg
Application Rate: 20-35g/m²
Bag coverage: 714-1,250g/m²
Particle size: 1.3-2.5mm

Performance*

Granule dispersal: 8 days (visually dispersed from surface)
Turf response: 7 days
Longevity: 2-3 month

* depending on environmental factors

ProTurf Benefits

- Quick release gives immediate response
- Controlled nutrient delivery sustains growth for 2-3 months
- High quality blend in a cost effective formulation
- Contains Polyhalite, a unique organic source of K, Ca and Mg

“ The visual effect of using ProTurf on our tees was immense. Within a week of application the turf was transformed in terms of colour and growth. After 4 weeks it was noticeable that growth had slowed down but the turf colour and vigour were still superb.”

Eddie Mills, Course Manager,
Edgbaston Golf Club



Edgbaston Golf Course, Birmingham



Sportsmaster[®] CRF

High quality combination fertiliser, ideal first application

Sportsmaster CRF High N 2-3 months is a combination of controlled release technology and compound granular fertilisers, providing even growth with no surges. Part of the fertiliser is uncoated allowing for an immediate response. Equipped with ICL's patented Poly-S and PACE coating technologies, it is perfect as the first controlled release fertiliser of the season.

Sportsmaster CRF Benefits

- Ideal first CRF application of the season
- High Nitrogen levels deliver quick response even in low temperatures
- Promotes a healthy, balanced growth at start of the season
- Added Magnesium content enhances turf colour



RECOMMENDED USAGE:

✓✓ Tees

✓ Sports Fields

✓ Fairways

✓ Amenity

The complete Sportsmaster CRF

Product name Elemental analysis	Tech	Product notes	Nutrient breakdown				Nutrient breakdown									Bag sizes (kg)	Application rate (g/m²)	Nutrient levels applied (kg/ha)			Bag coverage (m²) per	*Recommended period of use											
			Total N (% coated)	Nitrogen			Total P (% coated)	Total K (% coated)	S	Mg	Cu	Fe	Mn	Zn	N			P	K	25kg bag													
				N-NO ₃	N-NH ₄	N-Urea																											
High N (2-3 months) 26-2.2-9.1-1.2Mg +TE		Combined CRF & compound granular fertiliser. Ideal first CRF application of the season	26 (30%)	1	2	23		2.2 (30%)	9.1 (30%)	6.4	1.2	0.01	0.15	0.05	0.015	25	20 25 30	52 65 78	4.4 5.5 6.6	18.2 22.8 27.3	1,250 1,000 833	J	F	M	A	M	J	J	A	S	O	N	D

* Recommended period of use is only a guide, request a turf management program for your specific situation. Tropical and Sub Tropical areas may vary.



Performance*

Granule dispersal: 10 days

(visually dispersed from surface)

Turf response: 7 days

Longevity: 2-3 month

* depending on environmental factors

Sportsmaster granule



Sierrablen[®] Plus



Premium technology controlled release mini-prill fertilisers.

The SierrablenPlus range blends Poly-S and resin-coated PACE technology with conventional N-sources to provide optimal long-term nutrient release patterns. The mini granular formulation allows even coverage at low application rates. A number of the analyses contain coated P and K to extend the longevity and quality of performance.

SierrablenPlus Benefits

- The mini-granular formulation allows application even at low rates
- 3 month to 4-5 month longevity available
- Extremely cost effective at low application rates

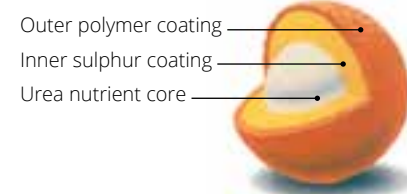
SierrablenPlus granule

Poly-S

Poly-S is a controlled release Nitrogen source that delivers nutrients gradually over the required longevity. Nutrient release is primed by moisture permeating through the outer polymer channels, through micro-channels in the sulphur layer and into the nutrient core where the urea is solubilised.

Once the urea is solubilised, it then travels back through the same pathways where it is released and made available for plant uptake.

Poly-S technology:



PACE Resin

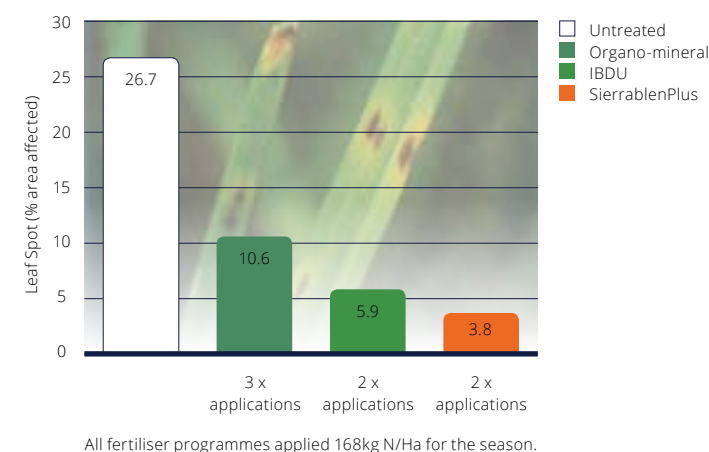
PACE resin coated fertilisers rely on soil temperature as their sole mechanism of nutrient release. Upon application to turf, the granules absorb moisture from their environment, gradually dissolving the enclosed nutrients. When soil temperatures are above 6°C, pressure begins to build within the granule forcing nutrients through the semi-permeable resin coating. The length of release is determined by the resin type and thickness of the coating surrounding the granule. The thicker the coating, the slower the daily release rate and the longer the product lasts. Nutrients are accurately released and matched exactly to turf growth requirements. The release is not influenced by soil moisture levels, pH or bacterial activity and remains consistent over a wide range of environmental conditions. In dry or cold conditions, nutrient release will slow or cease.

PACE technology:



Nutrient is combined within each granule

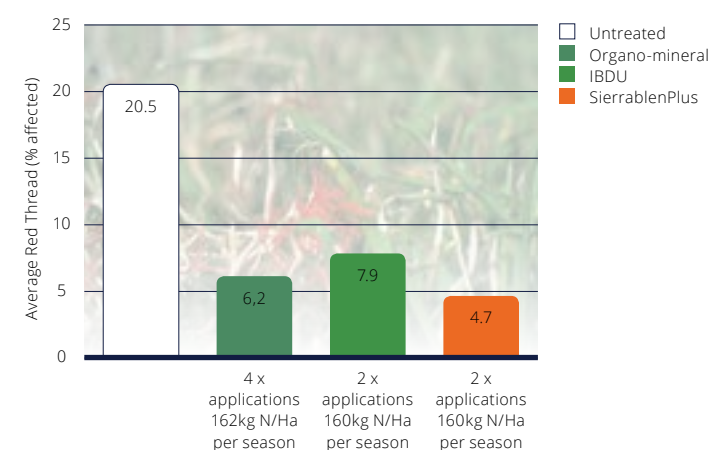
Prevention of Leaf Spot in managed turf



Research conducted at STRI in 2010 observed the prevalence of Leaf Spot in *Poa pratensis* turf managed at 20-25mm over a period of six months.

The effects of SierrablenPlus were measured in comparison to Organo-mineral and IBDU fertilisers, applied at 168kg N/Ha, versus untreated turf. SierrablenPlus, utilising Poly-S and PACE Resin CRF technologies, gave the most consistent delivery of nutrient in the trial, creating a stronger turf that was more resilient to Leaf Spot compared to Organo-mineral and IBDU slow release fertilisers.

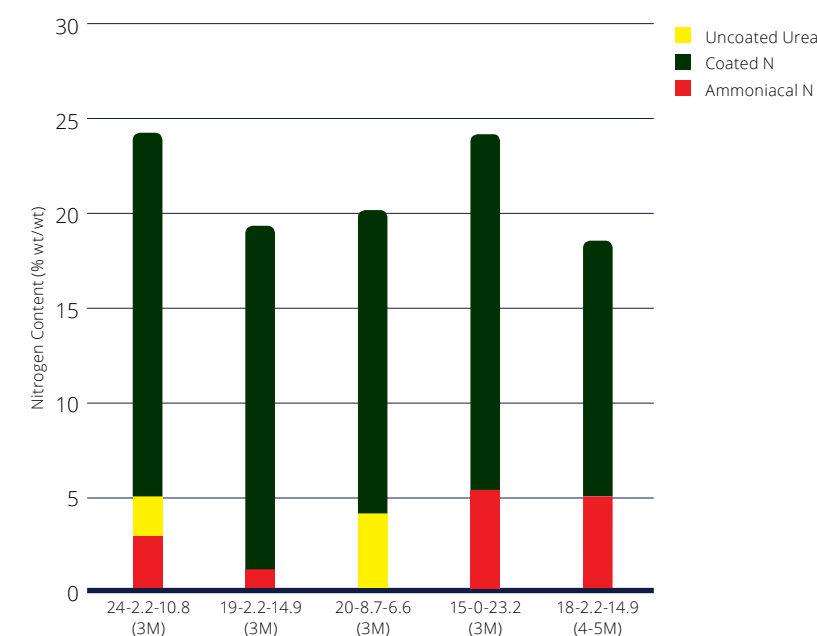
Prevention of Red Thread in managed turf



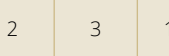
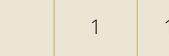
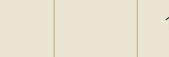
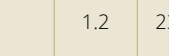
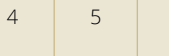
Research conducted at STRI in 2009 observed the prevalence of Red Thread in turf managed at 15mm over a period of six months.

The effects of SierrablenPlus were measured in comparison to Organo-mineral and IBDU slow-release fertilisers, applied at 160kg N/Ha, versus untreated turf. Red Thread is known to be more common on turf with low fertility. Increasing available Nitrogen can successfully reduce disease incidence. All fertiliser programmes reduced disease pressure versus the unfertilised, however, SierrablenPlus was the most successful in reducing Red Thread. This demonstrates that SierrablenPlus gave the most consistent supply of Nitrogen with only two applications.

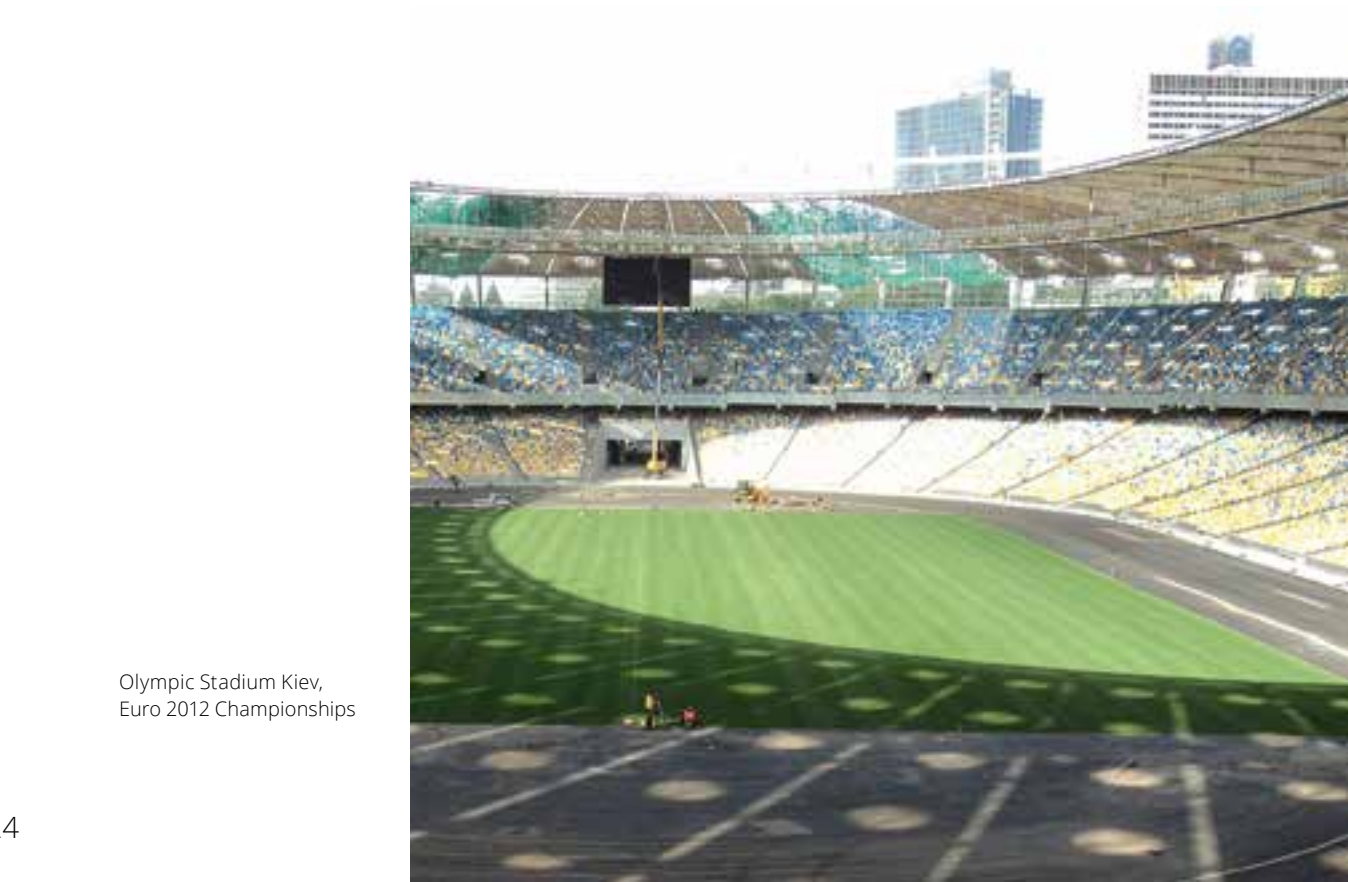
Nitrogen content in SierrablenPlus



The complete SierrablenPlus range

Product name Elemental analysis	Technology/ Longevity	Product notes	Nutrient breakdown									Bag sizes (kg)	Application rate (g/m²)	Nutrient levels applied (kg/ha)			Bag coverage (m²) per	*Recommended period of use											
			Nitrogen				Total P (% coated)	Total K (% coated)	S	Mg				N	P	K													
			Total N (% coated)	N-NO ₃	N-NH ₄	N-Urea											25kg bag												
Spring Starter 24-2.2-10.8		Encourages healthy balanced growth at start of season.	24 (79%)	2	3	19	2.2	10.8 (27%)	10.8		25	25 30 35	60 72 84	5.5 6.6 7.7	27 32.4 37.8	1,000 833 714	J	F	M	A	M	J	J	A	S	O	N	D	
Active 19-2.2-14.9 +1.2Mg +TE		Full trace element package to enhance turf health and Magnesium to improve turf colour.	19 (95%)		1	18	2.2	14.9	12	1.2	25	25 30 35	47.5 57 66.5	5.5 6.6 7.7	37.3 44.7 52.2	1,000 833 714	J	F	M	A	M	J	J	A	S	O	N	D	
Renovator 20-8.7-6.6		Controlled release base feed that is ideal for new stadia constructions to give fast re-establishment.	20 (80%)		4	16	8.7	6.6	8.4		25	25 30 35	50 60 70	21.8 26.1 30.5	16.5 19.8 23.1	1,000 833 714	J	F	M	A	M	J	J	A	S	O	N	D	
Stress Control 15-0-23.2 +1.2Mg		High potassium content strengthens cell walls and aids water regulation in plant.	15 (100%)			15	0	23.2	13.6	1.2	25	25 30 35	37.5 45 52.5	0 0 0	58 69.6 81.2	1,000 833 714	J	F	M	A	M	J	J	A	S	O	N	D	
Mini NPK 25-2.2-10		Rapid visual response with fewer applications.	25		1.2	23.8	2.2	10	6.8		25	20 25 30	50 62.5 75	4.4 5.5 6.6	20 25 30	1,250 1,000 833	J	F	M	A	M	J	J	A	S	O	N	D	
Mini Hi K 0-0-30.7		Hardens the turf and makes the plant more resistant to stresses.	0				0	30.7	12.3		25	20 25 30	0 0 0	0 0 0	61.4 76.8 92.1	1,250 1,000 833	J	F	M	A	M	J	J	A	S	O	N	D	
Active 18-2.2-14.9 +1.2Mg		Balanced NK fertiliser with P for use from spring to autumn. Magnesium to improve turf colour.	18 (74%)	4	5	9	2.2 (35%)	14.9 (17%)	9.6	1.2	25	30 35 40 45	54 63 72 81	6.6 7.7 8.8 9.9	44.7 52.2 59.6 67.1	833 714 625 556	J	F	M	A	M	J	J	A	S	O	N	D	

* Recommended period of use is only a guide, request a turf management program for your specific situation. Tropical and Sub Tropical areas may vary.



Olympic Stadium Kiev,
Euro 2012 Championships

Spreader Settings

Rate (g/m ²)	Rotary spreader (AccuPro 2000, SR 2000)			
	Cone setting	Spread width	Single pass @ Full rate	Double pass @ Half rate
25	4	4.8m	O	L
30	4	4.8m	P	M
35	4	4.8m	R	M ½
40	4	4.8m	S	N
45	4	4.8m	T	N ½

Performance*

Granule dispersal: 7 days (visually dispersed from surface)
Turf response: 7 days
Longevity: 2-3 months, 3 month, 3-4 months and 4-5 months

* depending on environmental factors



- Appropriate nutrition can radically reduce the level of disease incidence
- Wear tolerance depends on effective nutrient delivery



Sierrablen®

Premium quality controlled release fertilisers for tees and outfields.

The Sierrablen range of blended fertilisers contain Poly-S and Resin coated controlled release fertiliser granules. The coating technology provides nutrient delivery from 2-3 months to 8-9 months to suit individual requirements. The blends are free flowing and provide good even spread characteristics making them ideal for turf mown higher than 12mm. The analyses and release patterns are designed to optimise turf nutrition throughout the year and in a wide range of situations. The coatings are durable and they minimise the risk of any scorch or leaching problems.



2-3

4-5

12mm

8-9

RECOMMENDED USAGE:
✓ Tees ✓ Sports Fields
✓ Fairways ✓ Amenity

Sierrablen Benefits

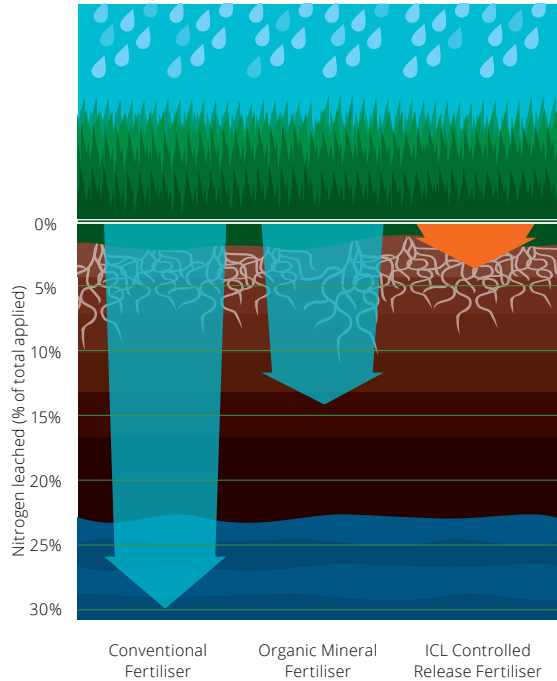
- The premier brand of controlled release nutrition in amenity turf
- The coated granules provide extended longevity
- Consistent nutrient release pattern



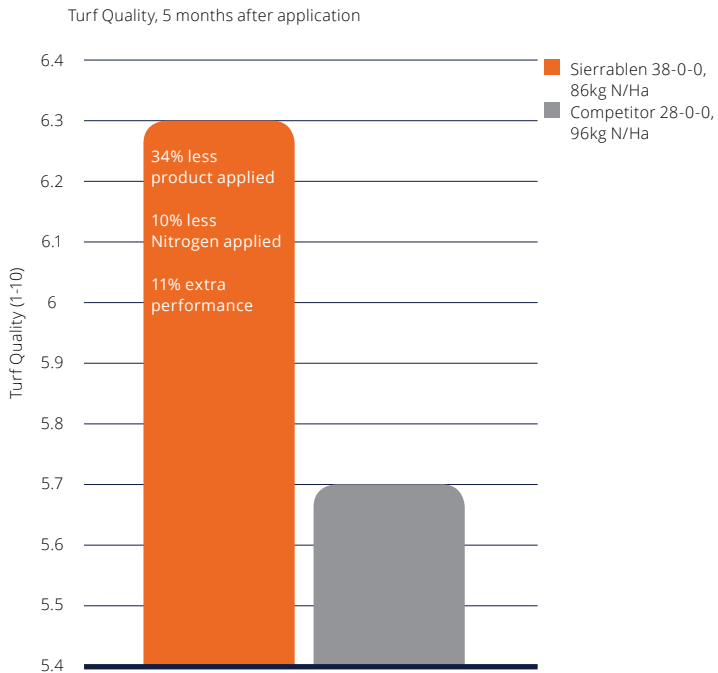
Reduce leaching and improve turf quality

Research conducted at the NMI in The Netherlands, at Levington Research Station in the UK and at INRA in France has shown that controlled release fertiliser significantly reduces leaching losses versus conventional and organic fertilisers. The use of Sierrablen resulted in more Nitrogen being available for plant growth.

Affect of fertiliser type on leaching



Coated N components vary, Sierrablen N component is a 38-0-0



Not all controlled release fertilisers are the same! The quality of the coating used and the percentage of nutrients that are coated all affect a fertiliser's reliability and performance. An STRI trial showed that Sierrablen 38-0-0 with 4-5 month longevity delivered superior turf quality with less Nitrogen and at a lower application rate than a competitor 28-0-0, 5 months longevity product.

The complete Sierrablen range

Product name Elemental analysis	Technology/ Longevity	Product notes	Nutrient breakdown								Bag sizes (kg)		Application rate (g/m²)	Nutrient levels applied (kg/ha)			Bag coverage (m²) per	*Recommended period of use	
			Nitrogen					Total P (% coated)	Total K (% coated)	S				Fe	N	P			K
			Total N (% coated)	N-NO ₃	N-NH ₄	N-Urea	N-MU ₂										25kg bag		
Turf Starter 16-10.9-10	 	Ideal when laying new turf or over-seeding.	16 (100%)		6	10		10.9	10	6.8	25		30	48	32.7	30	833	J F M A M J J A S O N D	
													35	56	38.2	35	714		
													40	64	43.6	40	625		
													45	72	49.1	45	556		
Sportsturf + Fe 24-2.2-8.3 +2Fe	 	Controlled released Nitrogen matches plant requirements to give continuous growth over 4-5 months.	24 (100%)		1	24		2.2	8.3	13	2	25		30	75	3.9	24.9	833	J F M A M J J A S O N D
														35	87.5	4.6	29.1	714	
														40	100	5.2	33.2	625	
														45	112.5	5.9	37.4	556	

* Recommended period of use is only a guide, request a turf management program for your specific situation. Tropical and Sub Tropical areas may vary.

Performance*

Granule dispersal: 10 days (visually dispersed from surface)
Turf response: 10 days
Longevity: 2-3, 4-5 and 8-9 months depending on product

* depending on environmental factors



- Controlled release nutrition can help maintain year-round turf health and wear tolerance with:
 - less applications
 - less nutrients
 - less cost

Spreader Settings

Rate (g/m²)	Rotary spreader (AccuPro 2000, SR 2000)			
	Cone setting	Spread width	Single pass @ Full rate	Double pass @ Half rate
30	4	4.7m	R ½	N
35	4	4.7m	T ½	O
40	4	4.7m	V	O ½
45	4	4.7m	X	P

Rate (g/m²)	Rotary spreader (AccuPro 2000, SR 2000)			
	Cone setting	Spread width	Single pass @ Full rate	Double pass @ Half rate
50	4	4.7m	n/a	Q
55	4	4.7m	n/a	R
60	4	4.7m	n/a	R ½

Sierrablen granule



Getting the most from your foliar feeding

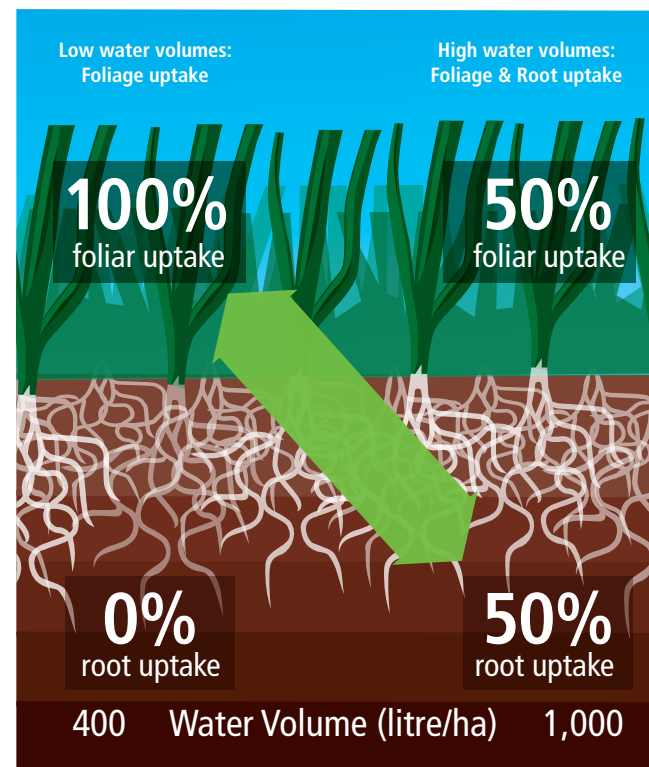
Foliar feeding can be extremely beneficial but it does need to be carried out correctly.

To maximise the quantity of nutrients that can be taken up by the leaf, the nutrients need to remain dissolved as long as possible on the leaf surface.

The following spraying tips can optimise the foliar uptake of nutrients:

- Spray in cool conditions (less than 26°C)
- Spray on overcast days
- Early morning or evening sprays are preferable as stomata are more likely to be open
- Spray should contain small amounts of Nitrogen, which acts as a nutrient absorption enhancer
- Foliar uptake of phosphate by the turf provides for balanced nutrition. TMax in the Greenmaster Liquid range enhances the ability of nutrients to be taken up by the foliage
- The pH of the final mixture should be as near neutral as possible
- Spray as fine a mist as possible whilst avoiding any potential drift
- Use low water volumes to keep more of the spray solution on the target area
- Spreaders contained in TMax are important because the spray will spread out, preventing beads of water which act as prisms, concentrating heat from the sun's rays
- Do not mow or irrigate within 3 hours of application to optimise foliar nutrient uptake

The importance of water volume when foliar feeding

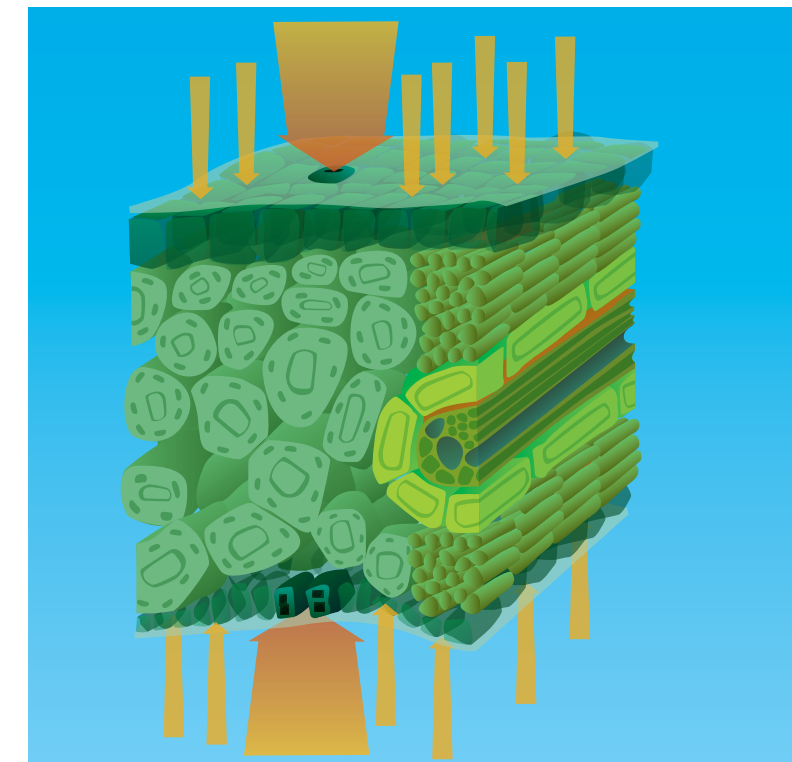


Nutrients can enter the plant via the leaf surface in the following ways:

- Via the stomata of the leaf
- By diffusing through cuticle and into the cell wall

Stomata are large and allow easy movement of nutrients into the leaf. However, there are less of these compared to transcuticular openings and they are not open all of the time.

Transcuticular pores are small but they are always open and there are many of them. Quality nutrients as in Greenmaster Liquids are able to access the leaf via these very small openings, so enhancing foliar uptake.



Foliar feeding can be used to provide a quick growth response and it can also achieve nutrient uptake without a reliance on the root system.

Products such as Greenmaster Liquid or Sportsmaster WSF.



Greenmaster[®] Liquid

Liquid fertilisers with foliar and root uptake for quick reaction and then sustained release.

TMax technology enables quick uptake even at low temperatures. The formulations are designed for foliar and root uptake to maximise nutrient capture and turf response. The Greenmaster Liquids offer a range of nutrient analyses which are compatible with a large number of supporting products. Greenmaster Liquids are more than just liquid feeds.



RECOMMENDED USAGE:
 ✓ Greens ✓ Sports Fields
 ✓ Tees ✓ Amenity
 ✓ Fairways

Greenmaster Liquid Benefits

- TMax “nutrient uptake activator” for foliar and root uptake
- Foliar feeding is available at lower water rates
- Compatible with Hydraflo L wetting agents and most plant growth regulators and plant protection products.

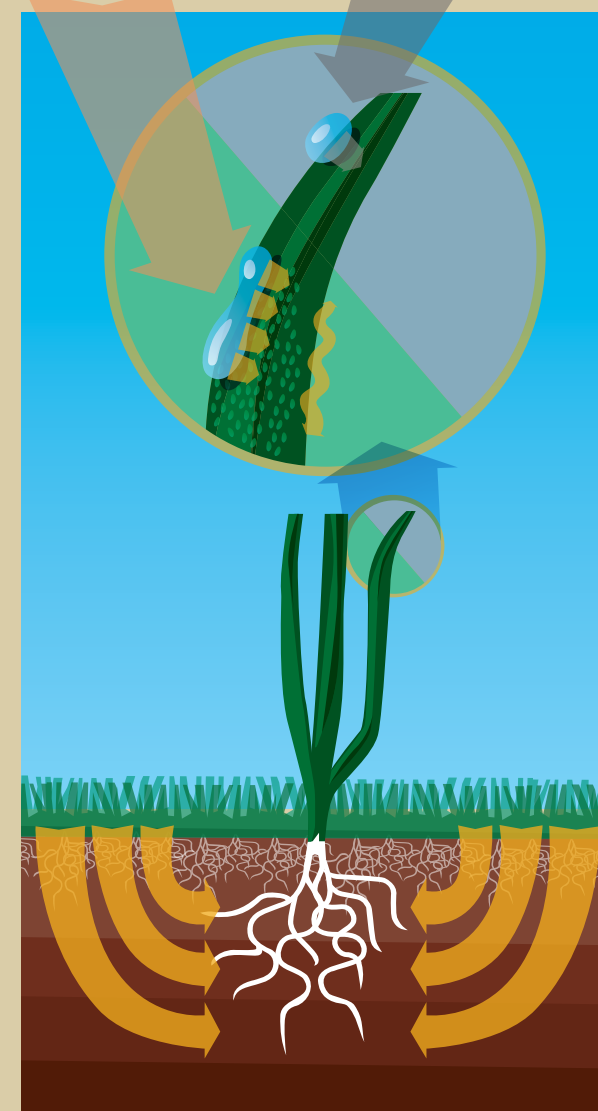
All England Lawn Tennis and Croquet Club, Wimbledon



TMax liquid fertilisers: How they work

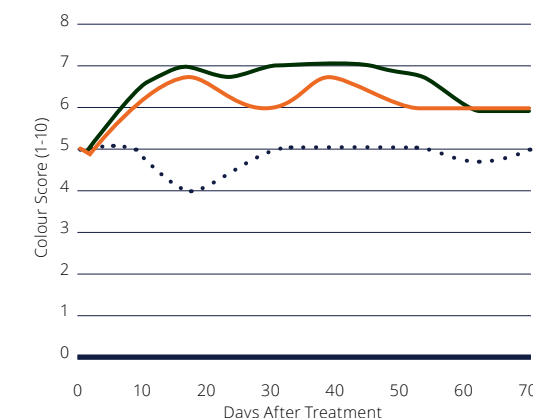
TMax ensures that the liquid application spreads out and sticks to the leaves to maximise the leaf area for nutrient uptake. Once in the leaf, nutrients can move more easily throughout the plant.

Without TMax, liquid fertiliser droplets do not spread out and are more susceptible to run-off.

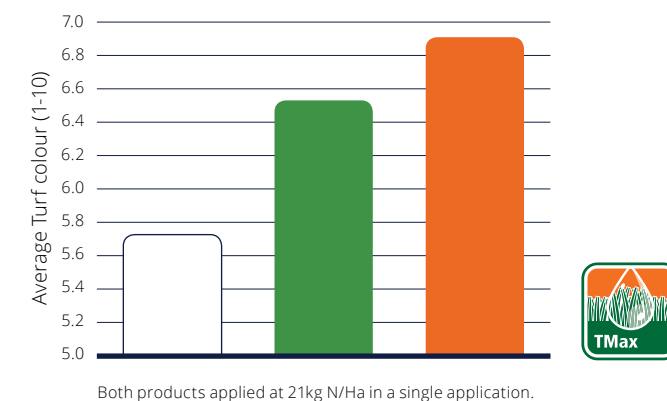


TMax enables nutrients to move through the soil profile to the sites of root nutrient uptake. Whilst in the soil, TMax makes previously locked-up nutrients available to the plant.

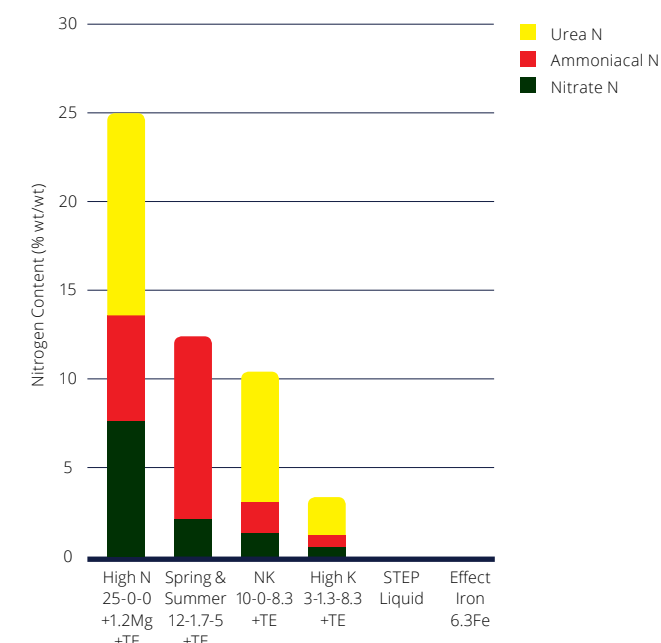
Extended turf response from Greenmaster Liquid



TMax effect on turf colour (average over 50 days)



Nitrogen content in Greenmaster Liquid

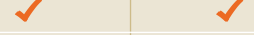
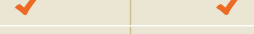


The complete Greenmaster Liquid range

Product name Elemental analysis	Technology/ Longevity	Product notes	Nutrient breakdown															Specific gravity (kg/L)	Pack size (L)	Application rate (L/Ha)	Water volume (L/Ha)	Nutrient levels applied (kg/ha)			Pack coverage (m² per 10L pack)	*Recommended period of use															
			Nitrogen				Total P	Total K	Ca	Mg	B	Cu	Fe	Mn	Mo	Zn						N	P	K																	
			Total N	N-NO ₃	N-NH ₄	N-Urea																																			
High N 25-0-0 +1.2Mg +TE		Mixed Nitrogen sources to optimise plant uptake. Magnesium and Trace Elements to enhance turf health.	25	7.3	5.9	11.8	0	0	n/a	1.2	0.01	0.004	n/a	0.01	0.001	0.004		1.31	10 200	40 80	400-600 (Foliar)	13.1 26.2	0.0 0.0	0.0 0.0	2,500 1,250	J	F	M	A	M	J	J	A	S	O	N	D				
																				100 120	600-1,000 (Root)	32.8 39.3	0.0 0.0	0.0 0.0																	
Spring & Summer 12-1.7-5 +TE		Complete NPK formula for main season feeding without excess growth.	12	0.8	11.2		1.7	5			0.01	0.004		0.01	0.001	0.004		1.18	10 200	40 80	400-600 (Foliar)	5.7 11.3	0.8 1.6	2.4 4.7	2,500 1,250	J	F	M	A	M	J	J	A	S	O	N	D				
																				100 120	600-1,000 (Root)	14.2 17.0	2 2.4	5.9 7.1																	
High NK 10-0-8.3 +TE		The N:K ratio balances growth and toughens the sward. Trace Elements to enhance turf health.	10	0.7	0.7	8.6	0	8.3			0.01	0.004		0.01	0.001	0.004		1.23	10 200	40 80	400-600 (Foliar)	4.9 9.8	0.0 0.0	4.1 8.2	2,500 1,250	J	F	M	A	M	J	J	A	S	O	N	D				
																				100 120	600-1,000 (Root)	12.3 14.8	0.0 0.0	10.2 12.3																	
High K 3-1.3-8.3 +TE		Designed to apply prior to stressful periods. Trace Elements to enhance turf health.	3	0.3	0.3	2.4	1.3	8.3			0.01	0.004		0.01	0.001	0.004		1.18	10 200	40 80	400-600 (Foliar)	1.4 2.8	0.6 1.2	3.9 7.8	2,500 1,250	J	F	M	A	M	J	J	A	S	O	N	D				
																				100 120	600-1,000 (Root)	3.5 4.2	1.5 1.8	9.8 11.8																	
Effect Iron FE 6.3Fe		For use throughout growing season to give green-up within 3 hours.											6.3					1.25	10 200	10 20	400-600 (Foliar)	0.0 0.0	0.0 0.0	0.0 0.0	10,000 5,000	J	F	M	A	M	J	J	A	S	O	N	D				
																				30 30	600-1,000 (Root)	0.0 0.0	0.0 0.0	0.0 0.0																	
Step Chelated Trace Elements		Contains chelated trace elements to maximise nutrient delivery and to prevent soil lock-up.									0.200	1.000		1.500	0.100	1.000		1.15	10	20 40	400-600 (Foliar)	0.0 0.0	0.0 0.0	0.0 0.0	5,000 2,500	J	F	M	A	M	J	J	A	S	O	N	D				
																				60 60	600-1,000 (Root)	0.0 0.0	0.0 0.0	0.0 0.0																	

* Recommended period of use is only a guide, request a turf management program for your specific situation. Tropical and Sub Tropical areas may vary.

Sprayer advice

Spray quality	Size of droplets	Retention on leaf surface	Potential drift hazard*	Foliar applications	Root applications
Very Fine	 Fine	Good	High		
Fine	 Fine	Good			
Medium	 Medium	Good			
Coarse	 Coarse	Moderate			
Very Coarse	 Very Coarse	Poor	Very Low		

 Very suitable  Suitable  Not suitable

* Spray drift can be minimised by using a spray indicator.

Performance*

Granule dispersal: immediate
Turf response: < 24 hours
Longevity: 2-6 weeks (depending on rate)

* depending on environmental factors

Directions For Use

- To optimise foliar uptake avoid high temperatures and sunny conditions.
- Avoid applications during frosty or drought conditions.
- Greenmaster Liquid products are tank-mixable with other products within the range.
- Can be tankmixed with Hydraflo L wetting agent.
- The water volume used to apply Greenmaster Liquids will affect how nutrients are taken up by the plant:
 - At low water volumes (400L/ha) the majority of nutrients are taken up by the foliage.
 - At high water volumes (1,000L/ha) the majority of nutrients are taken up by the roots.



- Used as part of an iTurf programme Greenmaster liquids have been shown to help radically reduce disease incidence
- Foliar feeding can provide plant nutrition when root uptake is restricted
- Mix with a spray indicator to aid spraying and minimise spray drift



Sportsmaster[®] WSF



RECOMMENDED USAGE:

- ✓ Greens
- ✓ Tees
- ✓ Fairways
- ✓ Sports Fields
- ✓ Amenity

High performance ultra soluble fertilisers for cost effective treatment of large turf areas.

The WSF Range of soluble fertilisers contains TMax to enhance nutrient uptake. The foliar and root uptake gives a rapid response that is then sustained for a number of weeks. The wide range of analyses are designed for use throughout the year. The WSF range provides excellent value for the treatment of large areas, especially golf fairways. Compatible with registered turf growth regulators (PGRs).

Sportsmaster WSF Benefits

- Cost effective fertiliser treatment for large areas of turf
- TMax enhances nutrient uptake
- Low scorch risk

The complete Sportsmaster WSF range

Product name Elemental analysis	Tech	Product notes	Nutrient breakdown										Bag sizes (kg)	Appli- cation rate (kg/ha)	Water volume (L/ha)	Nutrient levels applied (kg/ha)			Bag cover- age (m²) per bag	*Recommended period of use														
			Total N	Nitrogen				Total P	Total K	B	Cu	Fe				MN	Mo	Zn														N	P	K
				N-NO ₃	N-NH ₄	N-Urea	N-MU ₂																											
High N 35-0-11.6 +Fe		Nitrogen boost with Potassium content providing balanced growth and stronger turf.	35	4.3		30.7		0	11.6			0.13			15	15 30	300-600 (Foliar)	5.3 10.5	0 0	1.7 3.5	10,000 5,000	J	F	M	A	M	J	J	A	S	O	N	D	
																45 60	600-1,000 (Root)	15.8 21.0	0 0	5.2 7.0	3,333 2,500													
High K 15-0-35.7 +Fe		The low Nitrogen to high Potassium ratio ensures maximum turf hardening and stress conditioning.	15	12.7		2.3		0	35.7			0.13			15	15 30	300-600 (Foliar)	2.3 4.5	0 0	6.5 12.9	10,000 5,000	J	F	M	A	M	J	J	A	S	O	N	D	
																45 60	600-1,000 (Root)	6.8 9.0	0 0	19.4 25.8	3,333 2,500													
Seaweed 4-0-12.4		A soluble seaweed concentrate proven to significantly improve turf colour and quality.	4		4			0	12.4			0.13	0.06	0.01	0.016	8x1	1	300-800	0.04	0	0.124	8 x 10,000	J	F	M	A	M	J	J	A	S	O	N	D

Sprayer advice

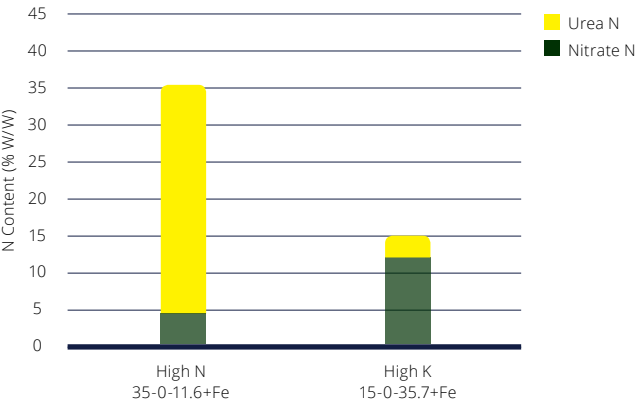
Spray quality	Size of droplets	Retention on leaf surface	Potential drift hazard*	Foliar applications	Root applications
Very Fine	Fine	Good	High	✓✓	✗
Fine		Good		✓	✗
Medium		Good		✓	✓
Coarse		Moderate		✓	✓
Very Coarse	Coarse	Poor	Very Low	✗	✓✓

✓✓ Very suitable ✓ Suitable ✗ Not suitable * Spray drift can be minimised by using a spray indicator.

Directions For Use

- Sportsmaster WSF**
- Tank-mixable with Hydraflo liquid wetting agent.
 - To ensure that this product dissolves completely: all products should be mixed by adding quantity required to a half full spray tank and agitating for 10-15 minutes. Bring to total volume with water. Water temperature will affect dissolution rate.
 - Avoid applications during frosty or drought conditions.
 - The water volume used to apply Sportsmaster WSF will affect how nutrients are taken up by the plant:
 - For foliar applications use low water volumes (300-600L/ha) and to optimise uptake avoid high temperatures and sunny conditions.
 - For root uptake applications use high water volumes (600-1,000L/ha) and follow immediately with a minimum of 2-3 minutes irrigation to provide the necessary water volume and to reduce the risk of turf injury.
- Sportsmaster WSF Seaweed**
- Do not mix with any pure Iron products.
 - Avoid applications during frosty or drought conditions.

Nitrogen content



Performance*

Granule dispersal: immediate
Turf response: < 24 hours
Longevity: 2-4 weeks (depending on rate)

* depending on environmental factors



- Compatible with turf registered PGR's to make ideal for use as part of an iTurf programme
- Maintain turf health with the appropriate use of fertiliser
- Mix with a spray pattern indicator to aid spraying and to minimise spray drift



Sportsmaster[®] WSF Seaweed

Containing seaweed and TMax technology, Sportsmaster WSF Seaweed is a premium water soluble fertiliser designed to enhance foliar and root nutrient uptake and improve plant health.

Ideal for use on greens, tees, fairways and sports fields, Sportsmaster WSF Seaweed is best used in a tank mix with liquid and foliar nutrition or to compliment a granular fertiliser program.

- Premium high density Atlantic *Ascophyllum nodosum* seaweed extract with proven plant benefits.
- Sustainably harvested seaweed from renewable resources.
- 75% active seaweed content for maximum application efficiency.
- Feeds soil microbes, providing healthy environment for root development.



RECOMMENDED USAGE:

- ✓ Greens
- ✓ Tees
- ✓ Fairways
- ✓ Sports Fields
- ✓ Amenity

Directions For Use

- Do not mix with any pure Iron products.
- Avoid applications during frosty or drought conditions.
- Sportsmaster WSF Seaweed is tank-mixable with products in the Sportsmaster WSF range.
- Tank-mixable with products in the Greenmaster Liquid range, with the exception of any pure Iron products.
- To ensure Sportsmaster WSF Seaweed dissolves completely, products should be mixed by adding the quantity required to a half-full spray tank and agitating for 10-15 minutes, then filling with water to full tank. Water temperature will affect dissolution rate.
- The water volume used to apply Sportsmaster WSF will affect how nutrients are taken up by the plant:
 - For foliar applications use low water volumes (300-600L/Ha) and to optimise uptake avoid high temperatures and sunny conditions.
 - For root uptake applications use high water volumes (600-1,000L/Ha) and follow immediately with a minimum of 2-3 minutes irrigation to provide the necessary water volume and to reduce the risk of turf injury.
- For sprayer advice, refer to Sportsmaster WSF on page 35.



Dew Dispersants & Wetting Agents

Water.

An essential element in producing premium quality turf, water is also one of our most precious commodities. Our range of wetting agents contain unique chemistries to help turf managers tackle the problem of water repellency and dry patch, which affect turf health, playability and appearance.

Product name Elemental analysis	Technology	Product notes	Nutrient breakdown												
			Nitrogen					Total P	Total K	B	Cu	Fe	MN	Mo	Zn
			Total N	N-NO ₃	N-NH ₄	N-Urea	N-MU ₂								
Sportsmaster WSF Seaweed 4-0-12.4		A soluble seaweed concentrate proven to significantly improve turf colour & quality.	4		4			0	12.4			1.3	0.06	0.01	0.016

Product name Elemental analysis	Bag sizes	Application rate	Water volume (L/Ha)	Nutrient levels applied (kg/Ha)			Bag coverage (m²) per bag	*Recommended period of use											
				N	P	K													
Sportsmaster WSF Seaweed 4-0-12.4	8 × 1kg	1kg/Ha	300-800	0.04	0	0.124	8 × 10,000	J	F	M	A	M	J	J	A	S	O	N	D

* Recommended period of use is only a guide, request a turf management program for your specific situation. Tropical and Sub Tropical areas may vary.

H₂Pro DewSmart

Dew dispersant

H₂Pro DewSmart is a newly formulated dew dispersant product for turf grass areas.

Designed to prevent or reduce the formation of dew on the grass leaf, the formulation contains selected sticking and spreading surfactants that bond to the leaf surface and prevent moisture droplets from forming.

DewSmart is ideal for use on greens as part of a Turf Management approach to minimising the risk of disease outbreaks and improving turf health and quality.



Hydraflo 2

Granular wetting agent

Easy-to-use granules with no mixing required. The dual-action formulation delivers immediate benefits as a topdress or when incorporated in soils and potting mixes.

Hydraflo 2 aids soil absorption and rewetting of dried soils, enhances water retention and promotes free drainage for healthier turf. Decreasing water surface tension assists in rewetting of dried soils and free drainage of water-logged soils.



Hydraflo L

Liquid wetting agent

As safe for use on delicate ornamental flowering plants as it is on turfgrass greens, sportsfields and lawns, Hydraflo L is a liquid soil wetting agent that delivers immediate benefits.

It aids rewetting of soils in dry summer periods, eliminating localised dry spots and increasing uniformity of wetting throughout the soil profile. By encouraging free drainage from water-logged soils Hydraflo L assists in inhibiting surface moss, algae growth and soil borne pathogens.



H₂Pro[®]
DewSmart



RECOMMENDED USAGE:

- ✓ Greens
- ✓ Tees
- ✓ Fairways
- ✓ Sports Fields
- ✓ Amenity

H₂Pro DewSmart is a newly formulated dew dispersant product for turf grass areas.

H₂Pro DewSmart is designed to prevent or reduce the formation of dew on the grass leaf. The formulation contains specifically selected sticking and spreading surfactants that bond to the leaf surface and prevent moisture droplets from forming. DewSmart is ideal for use on greens as part of an iTurf approach to help minimise the risk of disease outbreaks and improve turf health and quality.

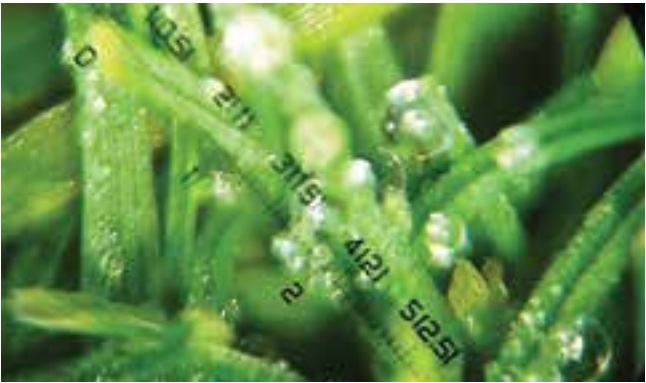


The removal of dew from greens has been advised for more than half a century.

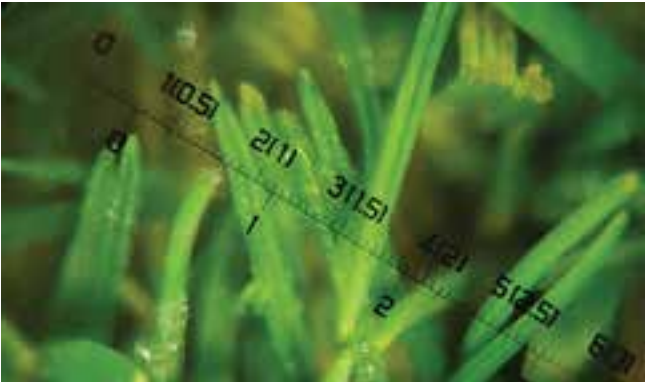
We think you would be best advised to continue to remove the dew from the greens each morning with a brush or switch since if dew is allowed to linger undisturbed it very often increases the incidence of the spores of fungus to travel more easily from one plant to another and the disease can thus spread more rapidly.

STRI advice from the 1950s





UK trial during winter. Without DewSmart.



UK trial during winter. With DewSmart (26 days after treatment)

H₂Pro Dew Smart Benefits

- When used as part of an integrated disease management programme DewSmart can help reduce the risk of disease attack
- Dew removal has been found to help promote higher levels of turf vigour
- Reduces the need for regular early morning switching of dew from greens
- Greens can be clear of dew for a cleaner cut and for the early morning golfer
- Simple to apply with a standard boom sprayer
- Specially formulated to avoid scorch
- Longevity depends on environmental conditions. Trials in the UK have shown benefits for up to 4 weeks. A combination of frequency of mowing, rain fall, temperature, light and other factors may influence longevity to as low as a few days.

Why is dew a problem?

The dew forming on grass blades can be problematic because it provides very good conditions for the spread and expansion of fungal diseases. It is no coincidence that the times of year with high disease pressure, autumn, warm winter days and early spring, are also the times of year with the greatest number of 'dew days'. The moisture coating the leaf allows easy spread of fungal spores and the water droplets can combine with 'guttation' water to provide food for fungal pathogens.

A single application of DewSmart can prevent dew forming for an extended time period (under optimum conditions), which reduces the need to switch/brush the greens on a daily basis, thus saving staff time. It will also provide protection over the weekend when switching might not take place. There is also the added benefit of having the greens dew-free for the early morning golfer. With DewSmart the surface will be drier for cutting which should enable a cleaner cut.



Directions For Use

- The best performance is achieved when applied under optimum conditions
- Cut or brush grass before product application
- Use nozzles suitable for foliar applications
- Apply mixed with a maximum of 400L water per hectare
- H2Pro DewSmart should not be tank mixed with any other product
- H2Pro DewSmart should be applied to a dry turf surface, application to a wet surface will reduce efficacy
- Turf should remain dry for 4 hours following application
- Application can be made with a standard boom sprayer
- Reducing the mowing frequency will increase the longevity of dew dispersal



Dew Dispersants & Wetting Agents

Sprayer advice

Spray quality	Size of droplets		Retention on leaf surface	Potential drift hazard*					Foliar applications	Root applications	
Very Fine		Fine	Good	High						✓✓	✗
Fine			Good							✓	✗
Medium			Good							✓	✓
Coarse			Moderate							✓	✓
Very Coarse		Coarse	Poor	Very Low						✗	✓✓

✓✓ Very suitable ✓ Suitable ✗ Not suitable

* Spray drift can be minimised by using a spray indicator.

Product characteristics

Bag size: 2 x 10L
Application Rate: 10L/HA
Bag coverage: 2 x 10,000m²
Water volume: 400L (max)

Performance*

Granule dispersal: immediate
Turf response: <24 hours
Longevity: 2 days – 4 weeks

* depending on environmental factors



Hydraflo®

Advanced dual action technology

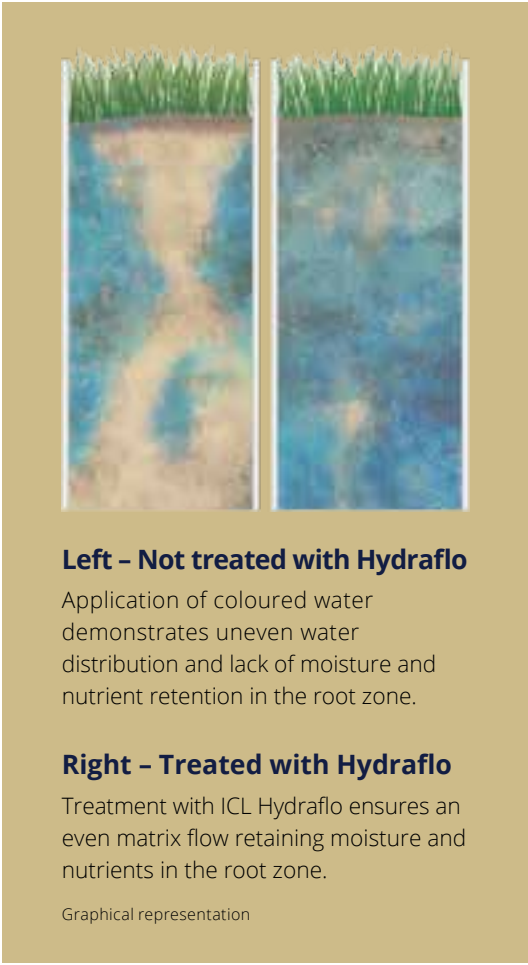
A new generation wetting agent in granular and liquid form for better turf and landscape results

The improved dual-action formulation of Hydraflo 2 and the easy-to-use granules deliver immediate action as a topdress application and improved efficacy incorporated in soils and potting mixes over a longer period of time. Hydraflo L is a liquid soil wetting agent that is as safe for use on delicate ornamental flowering plants as it is on turfgrass greens, sportsfields and lawns.

Hydraflo effectively decreases water surface tension aiding the successful rewetting of soils in dry summer periods, eliminating localised dry spots and increasing the uniformity of wetting throughout the soil profile. By allowing for better water penetration and absorption, Hydraflo helps grow deeper stronger roots.

Hydraflo encourages free drainage from water logged soils in winter and during heavy rainfall. This inhibits surface moss, algae growth and soil borne pathogens. When water logged soils drain, air is allowed into the root zone enabling the plant to take up valuable nutrients.

Hydraflo 2 can offer real help for overcoming extremes in weather, as well as hydrophobic soil conditions.



Hydraflo L Benefits

- **Liquid soil wetting agent**
 - Uniform wetting to avoid summer dry patch
 - Long term performance enables rewetting of dry soils
 - Aids infiltration and drainage for deeper stronger roots
 - Safe for use on all ornamental plants including turfgrasses
 - Very high concentration gives long lasting, cost effective control.
 - Available in 5L, 20L and 200L

Hydraflo L application rates		
Situation	Rate	Application frequency
Greens and fine turf, lawns and landscapes	125-375 mL /100m ²	3 months or as required
Fairways, sports turf, lawn turf and landscapes	375-625 mL /100m ²	8 months or as required



Apply in advance of expected dry patch formation. Hydraflo L is a polymeric wetting agent that rewets readily after treated soil has been dry for extended periods. Application through boom spray should use a minimum dilution of 1 part Hydraflo L to 200 parts water (1.0 litre of Hydraflo L in 200 litres of water). Additional irrigation (3 - 6mm) should be applied to ensure the Hydraflo L is thoroughly watered into the soil profile.

Hydraflo 2 Benefits

- **Granular soil wetting agent**
 - Easy to apply as a topdress or to incorporate in soil mix
- **Complete formula**
 - No mixing required, minimises risk of application mistakes
 - Safe for use in any season
- **Improved active ingredient**
 - Improves soil drainage
 - Greater efficiency of irrigation
 - No dry spots
 - Encourages deeper, stronger roots
 - Inhibits the growth of moss, algae and soil borne pathogens
 - Can increase water retention without decreasing air filled porosity
 - Improves Cation Exchange Capacity (CEC) of soilless potting mixes
 - Low rate of use significantly reduces cost per cubic metre
 - Available in 20 kg

Hydraflo 2 application rates		
Application timing	Application rate (per m ²)	Water
Season long	20-25g/m ²	4-6mm
Bi-monthly	10-15g/m ²	4-6mm





Plant Protection & Control

MaxGuard 2G
Granular Insecticide

Sierraron G
Pre-emergent Herbicide

Rout
Ornamental Herbicide

MaxGuard 2G
Granular Insecticide

MaxGuard delivers fast acting, contact pyrethroid insecticide for immediate control of problem insects, such as Lawn armyworm, Sod webworm, Argentine stem weevil adults, African black beetle adults, Billbug adults, Cutworms and Ants, including Stinging ants.



Sierraron G
Pre-emergent Herbicide

Sierraron is a proven pre-emergent weed controller that continues working for up to six months. Sierraron is recommended for use on such areas as fence lines, paths, driveways, and field, park & production area perimeters.



Rout
Ornamental Herbicide

Rout combines the action of two proven herbicides in one granule. This unique combination results in broader spectrum pre-emergent weed control of both broadleaf and grassy weeds, controlling five times as many weed species as its main competitor. One application controls sixty five weeds for up to three months.





MaxGuard[®] 2G



Fast acting, contact insecticide in a granular formulation

The most advanced weapon in the fight against surface feeding insects

MaxGuard delivers fast acting, contact pyrethroid insecticide for immediate control of problem insects, such as Lawn armyworm, Sod webworm, Argentine stem weevil adults, African black beetle adults, Billbug adults, Cutworms and Ants, including Stinging ants.

MaxGuard is a cost effective alternative to preventative systemic insecticides that enables you to monitor pest populations, identify a damage threshold and deliver a targeted treatment that works immediately. Always keep MaxGuard handy when emergency treatment is required to act quickly.

MaxGuard 2G is not a scheduled poison. With minimal contact when applying the granular formulation, it is extremely safe for users. Additionally, there are no restrictions on transport and storage as MaxGuard is not classified as a dangerous good on land.

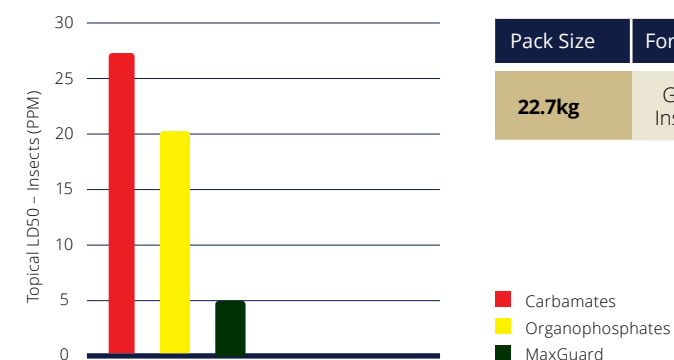
MaxGuard uses an advanced pyrethroid chemistry that is uniquely light stable. This provides significantly longer residual control (dependant on application rate) than conventional pyrethroids. MaxGuard is very effective even at low application rates. MaxGuard chemistry has more insecticidal activity than other classes of insecticides such as organophosphates and carbamates, therefore requiring less active ingredient to control pest problems. MaxGuard acts faster to combat target insects at low rates.

MaxGuard 2G Benefits

- Stimulates post-recovery of damage from insects, which assists in the repair of damage to leaves, stolons and rhizomes
- The application method is easy using a spreader
- High safety margin / low toxicity
- Quicker turf recovery



Requires less active ingredient to control pest problems than other classes of insecticides



Pack Size	Formulation	Active Constituents	Mode of Action Group	Poison Schedule
22.7kg	Granular Insecticide	2g/kg Bifenthrin	Group 3A Insecticide	Not scheduled

Application		
Target	Application rate	Critical comments
Lawn armyworm (<i>Spodoptera mauritia</i>)	60kg/ ha (600g/100m²)	Broadcast MaxGuard 2G with suitable application equipment to ensure uniform coverage over the treated area. To ensure optimum control, irrigate the treated area with up to 4mm of water soon after application. Inspect the treated areas for continuing activity. Reapply as required. Where a rate range is indicated use lower rates under lower insect pressure and higher rates under higher insect pressure.
Sod webworm (<i>Herpetogramma licarsialis</i>)	60kg/ ha (600g/100m²)	
Cutworm (<i>Agrotis sp.</i>)	60kg/ ha (600g/100m²)	
Argentine stem weevil adults (<i>Listronotus bonariensis</i>)	60-120kg/ ha (600g-1.2kg/100m²)	
African black beetle adults (<i>Heteronychus arator</i>)	120-180kg/ ha (1.2-1.8kg/100m²)	
Billbug adults (<i>Sphenophorus brunnipennis</i>)	60-120kg/ ha (600g-1.2kg/100m²)	Apply granules to areas where ants are active. Where possible, apply granules directly to the nest. Use the low rate for maintenance treatments or to control light infestations and the high rate for heavy infestations and for maximum residual control. The elimination of Funnel ants from a particular site will generally require more than one application. Initial applications should be broadcast over affected areas. As the initial numbers of active colonies is reduced, application should shift to targeting active mounds. Apply granules directly to the mound and in the area immediately surrounding active mounds (300mm radius).
Black ant, Coastal brown ant, Funnel ant, Meat ant, Sugar ant and Stinging ant only	60-220kg/ ha (600g-2.2kg/100m²)	

For further information refer to product labels and Safety Data Sheets (SDS).

Applicable APVMA permits				
Target	Rate			Permit
	Protection period (mths)	Dose rate (ppm)	Potting mix rate	
Red imported fire ant	0-12	12	3.9kg/m³	PER13916 – NSW only. PER13959 – QLD only (potting media non-food and non-bearing fruit trees)
Identified quarantine soil pests susceptible to Bifenthrin	Potting Mix	Bulk Density	Product Rate g/L	PER9796 – all states
	25% sand/ 75% peat	0.85	2.7	

See permit for detailed application rates. For more permit info: <https://portal.apvma.gov.au/permits>



Sierraron® G



Cutting weeding time, time after time

Sierraron is a proven pre-emergent weed controller that continues working for up to six months. Sierraron is recommended for use on such areas as fence lines, paths, driveways and field, park & production area perimeters.

Recurrent weeds need recurrent attention, and it's well known that most organisations whose job it is to maintain the appearance and health of industrial and community grounds and parks find weed control a time consuming and endless task.

Sierraron is a proven pre-emergent weed control solution that continues working for up to six months when applied correctly. Sierraron boasts minimal potential for run-off or leaching, and because of its granular form is easy to apply, without the risk of spray drift. Sierraron should become part of your preventative weed maintenance program.

Sierraron is an extra resource for weed control to be used in conjunction with current weed management systems. Sierraron extends your weeding effort – simply weed, and then apply Sierraron for 6 months protection from weed growth.

It should be noted that Sierraron is not ideal for every situation. As Sierraron works close to the surface, it has little or no impact on deep-rooted and established trees, however Sierraron should not be used near young, recently planted or shallow-rooted plants and shrubs. Ideally, it should be applied in Autumn, Winter and early Spring when lower temperature conditions assist in Sierraron's effectiveness.

Sierraron Benefits

- Eliminates most annual and perennial broadleaf weeds and grasses
- A single application provides season-long weed control
- Easy to apply ready to use granular formulation
- Active ingredient binds strongly to the soil, minimising the potential for run-off or leaching
- Classified as a non-hazardous chemical
- As long as soil is present, Sierraron goes to work after watering in.

Pack size	Formulation	Active constituents	Mode of action group	Poison schedule
25kg	Granular Pre-emergent Herbicide	67.5g/kg Dichlobenil	Group K Herbicide	S6

For further information refer to product labels and Safety Data Sheets (SDS).

Sierraron application rate recommendations

	Application rate	25kg pack coverage
Garden maintenance For the safe control of most annual, perennial grass and broadleafed weeds.	60g/10m ²	4,200m ²
Established orchards, vineyards	60g/10m ²	4,200m ²
Established black current, raspberries etc.	60g/10m ²	4,200m ²
Commercial and industrial Paths, paved areas, fence lines etc		
Annual weeds	180g-250/10m ²	1,200m ²
Perennial weeds	250g-370/10m ²	760m ²
Paved areas, Swept into the cracks	25g/10m ²	10,000m ²

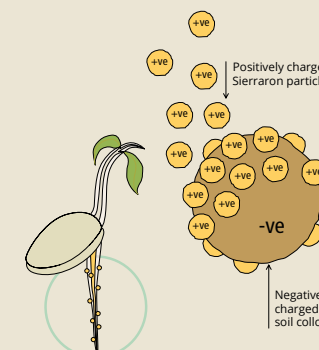
For most other herbicides to be effective, weeds have to first emerge. Spraying them results in unsightly dead weeds and alerts the public that a herbicide has been used, such as in the case when trucks spray road-side weeds. The advantage of Sierraron is that after the initial weeds are eliminated, it works below the surface, unseen.

Extensive testing by ICL in Europe has shown conclusively that Sierraron works more effectively to control most common weeds than the treatments used traditionally by councils and commercial landscape contractors. Sierraron also fits perfectly into the Australian federal, territories and state governments' Australian Weeds Strategy.

How it works

Positively (+ve) charged Sierraron particles are attracted to negatively (-ve) charged soil colloids and adsorbed on contact. This process ensures there is minimal run-off into waterways.

Sierraron is absorbed by weed roots and prevents cellulose biosynthesis at the root growing points, causing death.



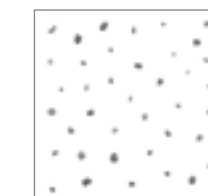
Application rate visual recommendation guide

Paved areas – Swept into cracks



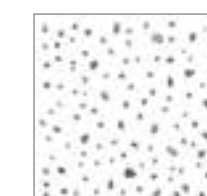
25g/10m²

General rate – Parks and recreation



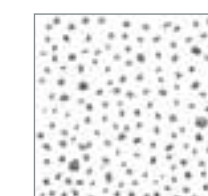
60g/10m²

Industrial use – Standard rate



180g/10m²

Industrial use – High rate



250g/10m²

These images show actual size granule spread for visual reference when calibrating and applying Sierraron.

Application areas

Councils

- Public playgrounds and community areas
- Established gardens
- Roadside and paved centre strips
- Sporting field perimeters

Landscape contractors

- Community grounds maintenance
- School playgrounds and fence perimeters
- Tennis court perimeters
- New home display centres

Other locations

- Plant Nurseries – in non-growing areas
- Exterior paved shopping walkways
- Stadium seating areas where concrete expansion joints can support weed growth
- Can be applied before paths and paving are laid down to prevent weeds emerging
- Industrial areas



Rout®

Tried, True, Tested

Rout has eliminated weeding problems for over 25 years, providing the confidence you desire to prevent weed germination in your pots and garden beds. No guessing, no gimmicks, just the trusted formula you know and rely on.

The most cost-effective pre-emergent ornamental herbicide on the market

Rout is a safe, effective and economical pre-emergent herbicide that controls a broad spectrum of broadleaf and grassy weeds. With Rout, valuable nutrients can be used by your plants, not wasted on weeds. Your plants will be stronger, greener and healthier.

Rout pre-emergent herbicide is specifically designed for nurseries and landscaping to control weeds around:

- container-grown ornamental trees and shrubs
- contained garden beds and pots
- field-grown ornamental plants

Broad control

Rout combines the action of two proven herbicides in one granule. This unique combination results in broader spectrum pre-emergent weed control of both broadleaf and grassy weeds, controlling five times as many weed species as its main competitor*. One application controls sixty five weeds for up to three months.

Save time and money with Rout

Weed control with Rout costs less than alternative control measures. The correct use of Rout saves you time and labour costs by drastically reducing the need to handweed containers and garden beds. Rout's effectiveness at half the application rate of its main competitor* brings additional economic benefits.

Note: Ideally when applied over the top of the crop or garden bed, Rout should be applied when foliage is dry to prevent granules sticking to the plant. If necessary wash off leaves after Rout application.

* Competitor formulation Active Constituent – Oxadiazon 20g/kg.



Tips for optimum Rout performance

- **Avoid applying when small plants are putting on a flush of growth or breaking dormancy.**
- **Ensure there is plenty of air movement around the plant.**
- **Apply at least two weeks before moving plants to a greenhouse or enclosed space.**
- **Low growing soft annuals and perennials may experience leaf scorch.**

Rout application

1. For best results, water plants before application to settle and firm down the soil.
2. When foliage is dry, evenly distribute granules at the correct application rate over the entire soil surface.



Locks out weeds for longer

Combines the action of two herbicides in one granule resulting in broad spectrum, pre-emergent weed control of broadleaf and grassy weeds.

Application made easy

ICL provide the tools to determine the correct rate and distribution and to increase accuracy and efficiency of application. The Rout Calibrator and Rout Shakers are available free from your local ICL Distributor.



ICL HandyGreen spreader applies Rout to larger areas quickly and evenly.



The Rout Shaker enables application around sensitive plants avoiding granules catching on foliage.



The Application Rate Calibrator assists in determining correct rate and distribution.

The Rout application tag provides a handy reminder for application times. Simply push into a pot or attach to a stake to remind you when to apply.



Proven through trials

Trials prove that Rout prevents seed germination and subsequent weed growth. In the trial to the right Rout was applied to the centre area. No herbicide was applied to the outer area.



Ideal distribution

18-20 particles per square inch (6.45cm²).



Rout controls more than 65 weeds		
Controlled per Australian and New Zealand labels	Controlled per Australian label	Controlled per New Zealand label
Amaranth (redroot)	Amsinckia	Annual poa
Barley grass	Bladder ketmia	Bittercress
Barnyard grass	Burr grass	Broad-leaved dock
Black nightshade	Caltrop	Calandrinia
Chickweed	Capeweed	Cornbind
Creeping buttercup	Flickweed	Creeping willow herb
Creeping oxalis	Giant pigweed	Dandelion
Crowsfoot grass	Liverseed grass	Groundsel
Deadnettle	Love grass	Inkweed
Fat hen	Mimosa	Liverwort
Fleabane	Pigeon grass	Montia
Mallow	Pigweed	Narrow-leaved plantain
Ryegrass	Prickly lettuce	Pearlwort
Shepherd's purse	Red caustic creeper	Pennyroyal
Sowthistle	Rhodes grass	Portulaca
Subterranean clover	Soursob	Speedwells
Summer grass	Staggerweed	Spurge
Thornapple	Starr burr	Spurrey
Wild mustard	Stink grass	Tall willow herb
Wild radish	White eye	Twincress
Willow weed	Willowherb	White clover
Winter grass		Yorkshire fog
Wireweed		

Pack size	Formulation	Active constituents	Mode of action group		Poison schedule	Application rates	
			AU	NZ		Rout Qty	Area
22.7kg	Granular pre-emergent ornamental herbicide	20g / kg Oxyfluorfen 10g / kg Oryzalin	Group D G Herbicide	Group E K1 Herbicide	Not a scheduled poison	10g 1kg 100kg 40.5kg	1m² 100m² ha acre

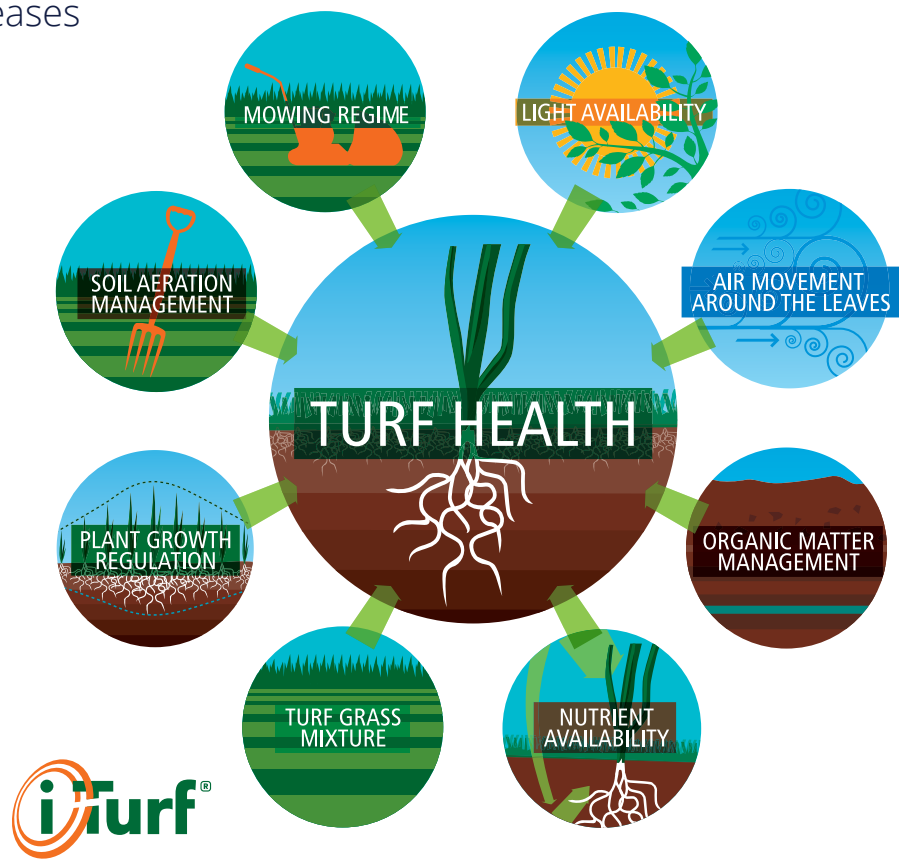
For further information refer to product labels and Safety Data Sheets (SDS).

Disease Management Strategy

How to Minimise Turf Diseases

Integrated Turf Management

All of the surrounding factors have an impact on turf health. Too much or too little of each factor will reduce plant health making it susceptible to disease and excess wear and tear. By assessing individual turf requirements the ideal programme using the influencing factors can be implemented.



Cultural practices

- Encourage a healthy grass sward
- Optimum nutritional inputs depending on turf managers' objectives and soil analysis needs
- Reduce thatch
- Increase aeration/reduce compaction
- Improve drainage
- Minimise damp turf for prolonged periods (irrigation, dew removal, manage irrigation inputs, reduce shade)
- Encourage disease resistant grasses

Spraying

- Disease identification
- Use the correct fungicide for the right disease
- Use appropriate mechanical operations, e.g. appropriate nozzles, boom height indicators, calibration equipment etc.
- Calibrate the sprayer using sprayer guidelines or a specialist contractor
- Look at weather information and disease prediction services

Using Fungicides

- Choosing the right fungicide
- Identify the disease and use the appropriate product
- Adopt an appropriate preventative or early curative programme
- Always alternate fungicides as part of a disease resistance management approach

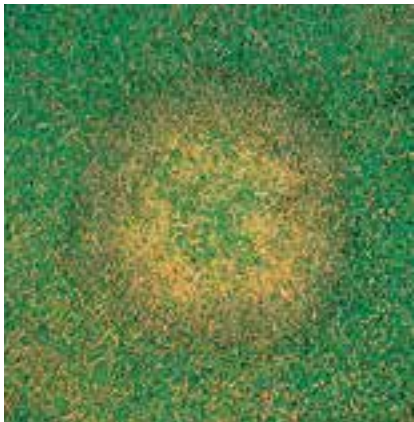
Disease identification and control

Microdochium Patch

(Formerly known as Fusarium Patch)
(*Microdochium nivale*)

This occurs late autumn and early spring during cool humid weather, high Nitrogen fertility and on thatchy poorly drained soil. The disease is discouraged by high Potash and Sulphate levels and acidic conditions. The main symptom is rapidly developing circular patches of 25-50mm diameter. Leaves become brown and mushy. Sometimes pink or white cobweb-like fungal threads can be seen in early morning. To control Microdochium Patch – promote good turf management. Your aim is to promote healthy, vigorous growth. Fescue and Browntop bents are much more resistant to the disease.

Moisture control to avoid humid surface conditions will do much to prevent disease attack. Regular aeration and careful application of fertilisers with an appropriate sandy topdress will make the surface less moisture-retentive. Reducing water holding thatch is also beneficial. The return of clippings provides a substrate for disease development, so catch and remove the grass. Care should be taken when applying fertilisers as excessive Nitrogen combined with cool wet weather can lead to severe disease outbreaks.



White (Grey) Snow Mould

(*Typhula incarnata*)

Strictly a cold weather disease, White Snow Mould appears as a fluffy white/grey or pink residue caused by the Typhula fungi. The fungi spend the warmer months as sclerotia embedded in infected grass blades and in the turf canopy. Sclerotia are very small black to orange structures that can survive hot, dry conditions. Heavy moisture and near-freezing temperatures trigger germination of sclerotia and infection of grass plants. A situation that often produces these key conditions is a deep snow or heavy mulch covering wet turfgrass

before the ground has frozen. It invariably seems to follow a retreating snow line. White snow mould activity will be slowed when the snow cover is gone due to winter thaws, but the activity will resume every time it snows, regardless of whether it is a light flurry or heavier snow. Injury to the turf is aggravated when the snow is compacted by walking, etc.



Anthracnose

(*Colletotrichum graminicola*)

This usually attacks Poa annua type species. Occurs during summer following stress caused by factors such as high temperatures, low fertility, dry soil and compaction. Likely to occur under high humidity. The main symptom is irregular shaped and sized patches in which leaves initially yellow then develop a reddish colour following wilting. Diseased plants may be easily removed from the sward and the black rotted plant base easily seen – a highly characteristic symptom of Anthracnose disease. As far as possible, compaction

should be avoided by reducing wear over an affected area e.g. keeping the heavy traffic off the turf for a while. Regular aerating and spiking are also beneficial.

In the summer months Anthracnose may be discouraged by timely and moderate Nitrogen applications but do not apply fertiliser in the winter months as this could lead to severe outbreaks of Microdochium Patch disease.



Red Thread (*Laetisaria fuciformis*)

This can occur anytime of the year, in shady, poorly aerated, compacted soils and a lack of Nitrogen. Particularly summer and autumn under warm moist conditions. The main symptoms are irregular patches of light brown or bleached leaves covered with distinctive red threads.

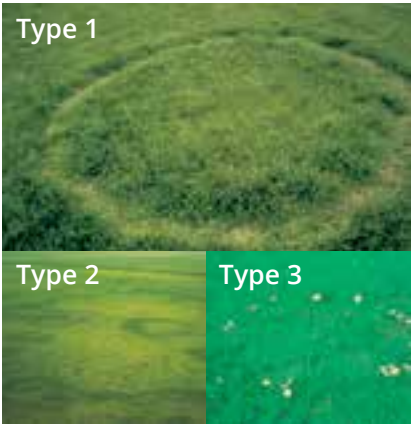
Pink patch lacks the characteristic 'Red Threads'. Instead leaves may become coated with pink mycelial growth. Whilst red thread may occur alone, it often occurs as a disease complex with pink patch. Severe outbreaks may kill the grass but generally affected turf will recover adequately.



Fairy Rings (*Basidiomycetes*)

Fungi primarily colonise thatch at the turf base and/or organic matter within the soil, usually caused by an infrequent watering and fertilizing regime. The rings of stimulated grass growth are the result of Nitrogen released in the soil by the Fairy Rings' activity underground, breaking down organic matter to release ammonia, which is then processed by soil micro-organisms into Nitrates. There are three Types of Fairy Ring. **Type 1 Fairy Rings** (*the Marasmius oreades fungus*) typically appear as a ring of dead or stressed turf, bordered on both inner and outer edges by a band of stimulated grass growth. New rings can appear just as green 'patches'. It is prevalent in hot, dry conditions and may cause turf death by soil water repellency and/or toxic substances.

Type 2 Fairy Rings (*Agaricus spp. and Lycoperdon spp.*) of stimulated grass growth are seen normally without fruiting bodies. It is rare that excessive damage is caused to the turf. **Type 3 Fairy Rings** (*Hygrophorus spp. and Psilocybe spp.*) have no distinct affect on turfgrass except when the fruiting bodies are present (normally during the autumn) when they form rings of mushrooms or puffballs. These obviously affect the quality of the sports surface.



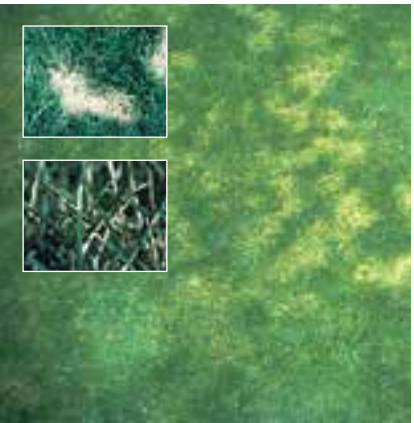
Dollar Spot (*Sclerotinia homoeocarpa*)

This occurs mid-spring to early autumn when an extended period of leaf wetness will encourage the disease. Warm day temperatures and cool nights add to susceptibility. Most likely when Nitrogen fertility is low and growth is poor. Varieties of red fescues, particularly slender creeping red fescue are the most susceptible grass species. Also those fescues found in sea-washed turf.

The main symptoms are numerous small (no more than 50mm) bleached spots which may coalesce to form larger, irregular patches.

Infected leaves appear water-soaked at first, then bleached. Leaf lesions have a characteristically bleached white centre with a reddish-brown border. White 'cotton wool' mycelium may be noted in early morning. Recovery is usually rapid, as roots are not affected.

Maintaining adequate fertility is often the easiest method of preventing attacks of Dollar Spot.



Thatch Collapse (*Basidiomycete*)

All turfed areas are susceptible to excessive thatch and it can occur right throughout the year. Excessive thatching can be induced by heavy liming. Circular patches up to 500mm in diameter can form where the surface of the green sinks due to decomposition of the thatch layer. Sometimes turf in the affected areas undergoes a colour change to a darker green or yellow.

The affected thatch may also change colour, to orange, whitish or black. White mycelium may also be visible in thatch.

Physical causes of thatching may be alleviated by additional aeration on the areas worst affected. Commercial wetting agents, e.g. Hydraflo, specifically designed for use on turf are available from ICL. Wetting agent applications should begin at the start of the growing season.



Damping-off (caused by a number of fungi including *Microdochium*)

Also known as Seedling Disease, Damping-off affects mainly bents and fescues. Perennial ryegrass is seldom susceptible. Cold, wet conditions in early spring and late autumn favour attacks, as does poorly prepared seedbeds, heavy soil, low fertility, uneven sowings and excessive seed rates.



Take-All Patch

(*Gaeumannomyces graminis*)

Take-All Patch occurs mid-spring or early autumn. Conditions which favour the disease include sterile soil conditions (such as newly constructed sand greens), poor aeration, and high alkalinity. Patches of bronzed Agrostis up to 30cm diameter with centres colonised by fescues, *Poa annua* or broad-leaved weeds are characteristic. The centres may be slightly sunken. Turf takes a long time to recover. Consequently, all efforts must be directed at preventing outbreaks of Take-All Patch.

Firstly, recognise the situation in which Take-All Patch is likely to occur. Avoid applying lime unless it is absolutely necessary. Ascertain if the water supply has a high lime content.

Apply fertilisers containing Iron and/or Ammonium Sulphate to acidify the turf surface. Maintain good turf vigour by maintaining an adequate supply of other nutrients.



Yellow Tuft

(*Sclerophthora macrospora*)

All turf species are susceptible, occurring during spring and summer when the plant is actively growing combined with poorly-drained soils and over-watering. Individual plants form into a dense tuft of yellow leaves, resulting in a bumpy surface during spring and autumn. To control yellow tuft, improve surface drainage. Yellow tufts are removed by mowing.



Slime Mould (Myxomycetes)

This does not cause any turf damage. It occurs mid autumn to mid spring. Favourable conditions are cool, wet weather which promotes fruiting body formation. They quickly disappear in dry weather. It is more common in thatchy turf. The main symptom is masses of pinhead-sized, rounded fruiting bodies suddenly appearing on leaves during cool, humid conditions. Fruiting bodies can be of various colours, but are most commonly grey, purplish-brown or white. They are easily rubbed off by fingers.

Where there are slight infestations only, control measures are not needed. Heavy infestations may be removed by mowing. Pesticides are not normally recommended, but applications of fertiliser containing Iron sulphate would probably limit the spread of slime moulds.

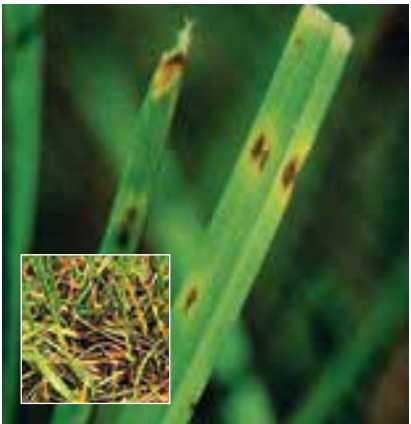


Leaf Spot or Melting Out

(Drechslera poae)
Occurs during warmer seasons. Turf under drought stress, high Nitrogen and a close mowing regime is most susceptible, especially if the foliage remains wet for an extended period. These pathogens commonly cause disease. Affected turf exhibits a general browning and melting out (thinning) resembling damage from drought. A closer inspection may show die back of the leaf tip, with the browning gradually extending down the leaf and subsequent shrivelling.

Circular lesions with dark brown margins and tan centres may be seen on the leaf. The crown and sheath can rot, which can result in a thinning of the turf.

It is difficult to give general advice about Leaf Spots and Melting Out. It is recommended that advice is sought from a local ICL Technical Manager.



Rust

(Puccinia spp, Uromyces spp)
There are many rust diseases of turf grasses. Susceptible species to this are *Perennial ryegrass* and *Poa pratensis*. This can occur all year round but most commonly from early summer to late autumn, during mild humid weather, low fertility and infrequent mowing regimes. The affected turf appears rust-coloured, due to the production of numerous yellow or orange spores on the leaf. Spores adhere to fingers when rubbed.

Conditions that favour rusts are warm, humid summers. Most often seen in long grasses.

Regular mowing will help to discourage rust attack. Ensure adequate fertility in particular with regard to Nitrogen.



Brown Patch

(Rhizoctonia solani)
Brown Patch occurs during summer, when Nitrogen is high, the weather is humid and the soil is thatchy and poorly drained. Symptoms are rapidly enlarging circular or irregular patches up to 0.5m in diameter. A dark purplish or greyish border may be visible in early morning. Sometimes turf recovers from the centre, resulting in a ring of diseased turf. Brown Patch can be prevented by regular scarification, if necessary, to reduce water-holding thatch.

As Brown Patch is favoured by high Nitrogen fertilization, applications should be light and frequent rather than in one large application.

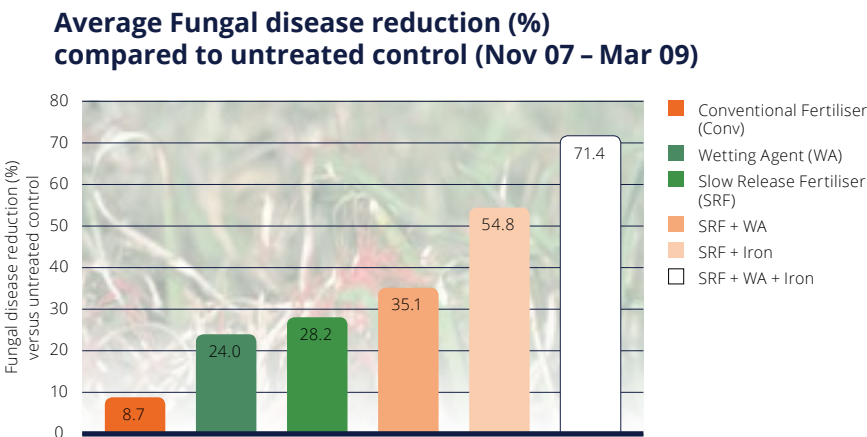


Note

A program of SierraformGT, Hydraflo and Iron effect have shown to reduce disease occurrence and severity by over 70%.



A replicated trial at STRI, UK (Nov 07 – Mar 09) showed the following results.



ICL believe that the best turf



is created by taking a responsible and well-rounded approach. We know that good turf maintenance requires consideration, understanding and planning.

Our research demonstrates the benefits of combining treatments and this is something we need to adopt. iTurf is the name we give to integrated turf management.



Anthracnose

Problem

- Anthracnose attacks grass plants (normally only *Poa Annua*) when they are under environmental stress.
- Disease triggered by low nutrition and compaction leading to reduced turf vigour.
- Once disease reaches the basal rot stage fungicides are no longer effective for control of disease but should be applied to prevent further attack.



iTurf Solutions

1. Turf should have sufficient nutritional input coming into the end of the growing season.
2. Using a slow release fertiliser late in the season ensures that adequate nutrition is in the soil to promote a healthy turf.
3. Avoid low heights of cut.
4. Minimise mechanical cultivation during periods of stress.
5. Aerate to relieve compaction and improve oxygen levels.
6. Minimise *Poa Annua* population in sward.
7. Over-seed with less susceptible varieties.
8. Irrigate in the morning to minimise long periods of leaf wetness over night.
9. Use penetrant wetting agents to move water through the soil profile and to keep the surface dry.
10. Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product type	Why	ICL solution
Quality fertiliser	Promotes healthy turf. Plants more resilient to disease attack.	Greenmaster Pro-Lite, SierraformGT, Greenmaster Liquid,
Slow release fertiliser	For spoon feeding over a prolonged period.	SierraformGT
Penetrant wetting agents	Use Hydraflo to ensure good water movement from the surface.	Hydraflo
Approved fungicide	Controls disease.	Registered product for this use
Plant Growth Regulator	Strengthen and pre-stress condition plants.	

USE PLANT PROTECTION PRODUCTS SAFELY.
ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE

Dollar Spot

Problem

- Fescue (*Festuca*) is perceived to be the most susceptible.
- Spots 25-50mm in diameter; distinct straw coloured sunken spots; leaf lesions have a bleached white centre and reddish brown borders, some mycelial growth may be visible in early morning.
- Disease triggered by: prolonged periods of leaf wetness, moderately dry soil, humid with temperatures of 21-26°C; morning dews; low to deficient Nitrogen (N) fertility, excessive thatch, frequent mowing.



iTurf Solutions

1. Reduce periods of leaf wetness.
2. Maintain balanced nutritional inputs to prevent and aid recovery.
3. Aerate to ensure that rootzone is not compacted.
4. Manage thatch levels in a programmed approach.
5. Box-off cuttings from affected areas if possible.
6. Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product type	Why	ICL solution
Penetrant wetting agents	Reduce periods of leaf wetness.	Hydraflo
Water conserving wetting agents	To ensure uniform wetting of the soil profile.	Hydraflo
Quality fertilisers	To encourage a healthy sward.	Select from ICL Range
Nitrogen containing fertilisers	Can help to prevent disease and to aid recovery.	Greenmaster Pro-Lite Spring & Summer, SierraformGT Momentum, Greenmaster High N
Approved fungicides	To prevent or cure disease outbreaks.	Registered product for this use

USE PLANT PROTECTION PRODUCTS SAFELY.
ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE



Turf maintained and image supplied by Marsupial Landscape Management www.marsupial.com.au

Leaf Spot/ Melting Out

Problem

- Occurs during warmer seasons, high humidity, drought conditions, wet foliage, high shade levels, conditions typical of a stadium environment.
- Moves across the surface on water film.
- Mainly prevalent on *Lolium Spp*, but can also be found on *Festuca Spp* and *Agrostis Spp*.
- Leaf Spot phase does not usually damage plants significantly.
- Crown infected plants turn yellow and die as temperatures increase; this is referred to as the melting-out phase of the disease.



iTurf Solutions

1. Minimise surface wetness.
2. Increase airflow.
3. Balanced nutrition promotes harder turf more resistant to disease attack.
4. Remove excess thatch in an integrated programme.
5. Use resistant cultivars.
6. Raise the height of cut to avoid stress if less than 50mm.
7. Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product t type	Why	ICL solution
Penetrant wetting agent	Remove surface moisture.	Hydraflo
Controlled release fertilisers	Ensures turf is never starved of nutrient, thereby creating conditions where Leaf Spot is less likely to occur and plants are assisted in recovering from the disease.	Sierrablen, SierrablenPlus, Sportsmaster CRF, ProTurf
Approved fungicide	Control disease.	Registered product for this use

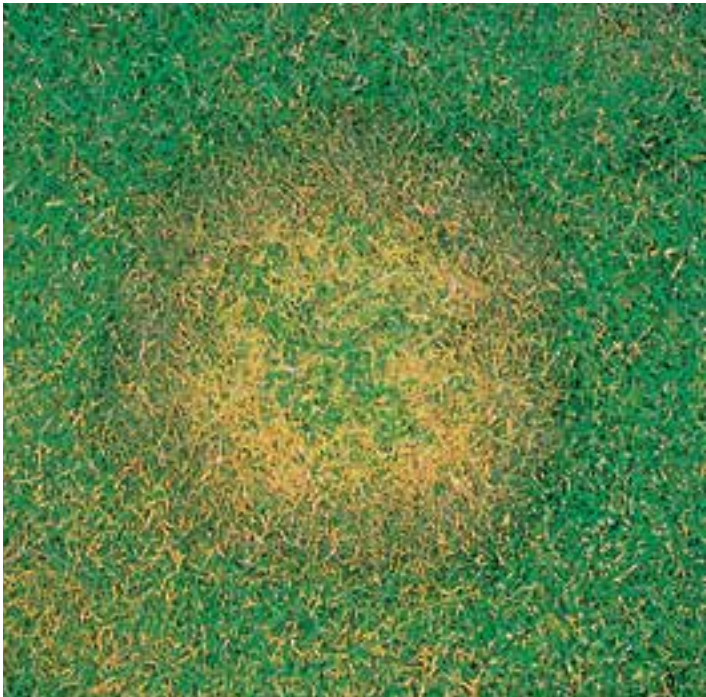
USE PLANT PROTECTION PRODUCTS SAFELY.
ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE

Microdochium Patch

(formerly known as Fusarium Patch)

Problem

- Circular patches up to 300mm in diameter.
- Leaves become water soaked, turn reddish-brown and then bleach.
- Pink mycelia may be visible in early morning.
- Develops under various conditions: wet, humid, cool (0-15°C); high Nitrogen (N) fertility in autumn and excessive thatch.



iTurf Solutions

1. Do not apply excessive amounts of Nitrogen during high-risk periods susceptible to disease attack.
2. In autumn use fertilisers with a high K to low N ratio.
3. Spoon feeding Nitrogen (either through liquids or slow release fertilisers) will avoid soft growth.
4. Control excessive thatch through programmed approach.
5. Avoid surface moisture.
6. Increase aeration.
7. Increase airflow.
8. Use acidifying fertilisers.
9. Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product type	Why	ICL solution
Approved fungicide	Control disease.	Registered product for this use
Acidifying fertiliser	Reducing soil surface pH will make conditions less favourable for pathogen.	Greenmaster Pro-Lite, Greenmaster Liquid, SierraformGT
Penetrant wetting agent	Reduced surface moisture.	Hydraflo
Long lasting liquid iron	Reducing soil surface pH will make conditions less favourable for pathogen.	Greenmaster Liquid Effect Iron FE

USE PLANT PROTECTION PRODUCTS SAFELY.
ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE



Pythium Blight

Problem

- Primarily affects cool season grasses.
- Common in hot summer weather (29-35°C) with little air movement and high relative humidity. Can occur at lower temperatures (20°C) when other environmental factors are suitable.
- Water logged, poorly drained turf is particularly susceptible.
- In warmer climates can also attack Bermuda grasses.
- Lush over fertilised turf susceptible to attack.
- The disease spreads rapidly and can destroy large areas overnight.
- First appears as rough circular patches from a few centimetres up to 15cm in diameter.
- Grass plants within affected area look dark, slimy, greasy and often mat together.
- May be covered in white mycelium.
- The infection can look streaked as it follows channels of natural drainage and paths of mowing equipment.



iTurf Solutions

- Avoid water-logging of the soil.
- Use irrigation appropriately to avoid excess soil moisture.
- Regular aeration to develop good soil structure.
- Use a top dressing programme.
- Avoid excess nutrition.
- Reduce thatch.

Product type	Why	ICL solution
Slow or controlled release fertilisers	Avoid excessive nutrition that can encourage Pythium Blight.	SierraformGT, Sierrablen, SierrablenPlus, Sportsmaster CRF, ProTurf
Penetrant wetting agent	Encourage movement of excess soil surface moisture down the soil profile.	Hydraflo

Red Thread

Problem

- Red Thread occurs mostly on turf where there is a low soil Nitrogen level.
- However, there are cases of nutrient independent Red Thread attacks.
- Light brown spots can be seen on turf, which have a reddish appearance.
- Red mycelial growth extends out from lesions in leaf.
- Compacted soils or conditions where poor rooting is likely, can increase disease occurrence.



iTurf Solutions

- Red thread is an indicator of low nutrition, especially Nitrogen.
- The first approach should be to prevent this situation arising by applying adequate Nitrogen fertiliser as part of a programmed approach.
- Apply the correct fertiliser according to turf situation and height of cut.
- Aerate soil to encourage good root growth.
- Select resistant grass cultivars.
- Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product type	Why	ICL solution
Controlled release fertilisers	Ensures turf is never starved of nutrient and therefore can create conditions whereby Red Thread is less likely to occur.	Sierrablen, SierrablenPlus, Sportsmaster CRF, ProTurf



Take-All Patch

Problem

- Take-All Patch is most commonly found on newly constructed sand based greens.
- Soils with low CEC, poor Nitrogen fertility and with a high pH (>6.5) are suitable conditions for Take-All Patch to take hold.
- Take-All Patch primarily attacks Bent (*Agrostis*) grasses.
- Circular patches/rings are created where the *Agrostis* species have been killed off allowing invasion of weeds species.
- Over time, with correct management, Take-all decline is likely to occur due to build-up of natural antagonists whereby the diseases become less severe.



iTurf Solutions

1. Ensure good availability of nutrients in poor nutrient holding soils.
2. Try to reduce pH of soil so that conditions are less favourable to pathogen.
3. Increase biological activity in the new sand environment so that there are more natural antagonists to the pathogen.
4. Manganese (Mn) has been shown to be effective as part of an integrated approach.
5. Check water quality for pH and nutrient levels.
6. Use acidifying fertilisers.
7. Avoid Potassium nitrate, which increases soil surface pH.
8. Check topdressing pH.
9. Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product type	Why	ICL solution
Slow release fertilisers (NPK + trace elements)	Ensure maximum availability of nutrients in low nutrient holding soil.	SierraformGT
Manganese fertiliser	Manganese has been shown to be effective as part of an integrated approach.	SierraformGT Spring Start, Momentum, All Season, NK, K-Step STEP Hi-Mag, Greenmaster Liquid range (except Effect Iron FE)
Acidifying fertilisers	Lower soil surface pH.	SierraformGT, Greenmaster Pro-Lite, Greenmaster Liquid
Approved fungicide	Use fungicide as part of an integrated programme.	Registered product for this use

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Fairy Rings

Problem

- Although it is not always necessary or appropriate to control Fairy Rings, they can be particularly troublesome on many different turf types.
- Decayed organic matter and high levels of thatch can favour disease development.
- Usually caused by infrequent watering and fertiliser regimes.
- The rings of stimulated grass growth are the result of Nitrogen released in the soil by the Fairy Ring activity underground breaking down organic matter to release ammonia.
- The ammonia is processed by soil micro-organism into nitrates.
- The 3 main types of Fairy Rings:
 - **Type 1:** *Marasmius oreades* – ring of dead turf bordered by stimulated turf growth. Causes turf death by soil water repellence and/or toxic substances
 - **Type 2:** *Agaricus* & *Lycoperdon spp* – stimulated grass growth with no fungal bodies. Rarely causes excessive damage to turf
 - **Type 3:** *Hygrophorus* & *Psilocybe spp* – no affect on turf grass except when fruiting bodies are present (normally in autumn).



iTurf Solutions

1. Try to minimise those conditions which favour disease development.
2. Control thatch in a programmed approach.
3. Apply wetting agents that have a penetrant activity and will help to move water through the hydrophobic layer to help cure the symptoms of the disease.
4. Wetting agents should be used in combination with deep aeration.
5. To prevent spreading pathogen use solid rather than hollow tines.
6. If required, Nitrogen fertilisers can be used to mask the visual symptoms of light and dark green rings.
7. Use fungicides as part of an IPM programme and be aware of causing resistance to one chemical group by its regular use.

Product type	Why	ICL solution
Wetting agent	To alleviate hydrophobic conditions caused by the fungus.	Hydraflo
Quality liquid or water soluble fertiliser	Used to quickly mask the symptoms.	Greenmaster Liquid, Sportsmaster WSF
Approved fungicide	To control disease.	Registered product for this use

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Algae

Problem

- Algae is normally found in cool, shady moist conditions.
- Many species are capable of fixing atmospheric Nitrogen.
- Turf with poor density is susceptible to algae infestation.
- Causes of poor density could be under fertilisation, over-watering, scalping from mowing and shady conditions.
- Algae damages turf in terms of aesthetics, competition, and via its mucilage excretions that seal surface which then leads to reduced infiltration and decreased atmospheric gas exchange.



iTurf Solutions

1. The first strategy should be to create an environment, which is not naturally suitable for the growth of algae.
2. Increase airflow and light.
3. Increase water movement and infiltration.
4. Adjust irrigation practices to allow the surface to dry out.
5. Using wetting agents with a good penetrant activity will help to remove surface moisture.
6. Raise mowing height where possible to allow turf to outcompete algae.
7. Ensure turf is healthy via good nutritional programme so that it has a competitive advantage.
8. Use of fertilisers containing ferrous sulphate will act directly upon the algae.
9. Control thatch in a programmed approach.
10. Regular aeration.
11. Once environmental conditions have been adjusted then use an approved Plant Protection Product.

Product type	Why	ICL solution
Slow or controlled release fertiliser	Promote balanced growth to create conditions less likely for Algae growth.	SierraformGT, Sierrablen, SierrablenPlus, Sportsmaster CRF, ProTurf
Penetrant wetting agent	This will move water away from the surface creating drier surface conditions less suitable for algae growth.	Hydraflo
Ferrous sulphate containing fertiliser	Lowering surface pH creates conditions less favourable for algae growth.	Greenmaster Liquid Effect Fe

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Black Layer

Problem

- Black Layer can have serious consequences on turf health.
- It is important to understand the causes of this problem and the methods used to control and prevent future occurrence.
- Black Layer only occurs in anaerobic soil conditions.
- It is caused by a physical condition of the soil.
- If soil drainage is insufficient it is likely that anaerobic conditions will develop and encourage Black Layer.
- Anaerobic bacteria produce Hydrogen sulphide gas, which has a characteristic 'rotten egg' smell.
- Hydrogen sulphide is poisonous to grass plant roots.
- Hydrogen sulphide reacts chemically with metal elements such as Iron (Fe), creating black deposits, which form layers within the soil.



Product type	Why	ICL solution
Liquid fertiliser applied as a foliar	Black Layer causes poor soil structural conditions so plants are unable to take up soil based nutrition.	Greenmaster Liquid
Penetrant wetting agent	To improve water flow through the rootzone and to improve soil aeration.	Hydraflo

iTurf Solutions

1. To control Black Layer it is essential that you treat the cause of the problem and not just the symptoms.
2. Use a good quality rootzone material.
3. Minimise layering in the soil profile through compatible top dressing and mechanical action.
4. Minimise thatch in a programmed approach.
5. Minimise compaction and soil panning.
6. Use penetrant wetting agent to improve water through the rootzone.
7. Sulphur does not cause Black Layer. Sulphur is an essential grass nutrient.
8. Potassium nitrate does not prevent 'Black Layer'. Continued use of Potassium nitrate may cause soil deflocculation, which could increase the risk of 'Black Layer' (J.B. Beard).
9. Continue normal programme but ensure good cultural practices.



Earthworms

Problem

- Earthworms have an important role in helping to aerate soils, reducing compaction, improving water penetration and infiltration rates, processing organic matter and reducing thatch.
- Earthworms come to the surface under moist soil conditions (e.g. in late autumn and winter) and retreat downward in dry weather.
- However, some species of earthworms leave casts on the turf surface and this has many negative effects:
 - Aesthetics
 - Uneven surface levels
 - Weed invasion more likely as casts may bring dormant weed seed to the surface or by wind blown seeds landing on casts and germinating.



iTurf Solutions

1. Reduce thatch in programmed approach to minimise food source for earthworms.
2. Minimal use of organic amendments.
3. Lower soil surface pH to discourage earthworm activity by using acidifying fertilisers.
4. Encourage drier surfaces through aeration and verticutting etc.
5. Minimise amount of clippings returned to soil (organic material) by the use of slow release fertilisers and/or Plant Growth Regulators.
6. Using a wetting agent with strong penetrant activity will ensure that moisture moves from the surface and down the soil profile making surface casting less likely.

Product type	Why	ICL solution
Acidifying fertiliser	Reducing soil surface pH will discourage earthworms from surfacing and producing casts.	Greenmaster Pro-Lite
Acidifying fertiliser with slow release	Reducing soil surface pH will discourage earthworms from surfacing and producing casts, while the slow release nutrition will minimise excessive top growth and hence reduce potential food source for worms.	SierraformGT
Penetrant wetting agent	Encourage water movement away from surface down through the soil profile making surface less appealing to earthworms.	Hydraflo
Plant Growth Regulator	Minimise clipping return by up to 50% and reduce food source for earthworms.	

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Drought Management

Problem

- Water resources are very valuable and becoming scarcer.
- Possibility of drought is increasing due to; access to quality water sources, cost of water, global warming and legislation.



iTurf Solutions

1. Maintain a good soil structure and composition.
2. Monitor water quality.
3. Maximise water absorbency in the soil.
4. Help turf regulate water uptake and losses.
5. Develop a good root system.
6. Maintain low salt levels in the soil.
7. Aeration programme to encourage deep rooting.
8. Topdress with appropriate material to avoid layering and avoid irregular water movement.
9. Avoid topdressing during periods of stress.
10. Use wetting agents to avoid hydrophobic conditions prior to the onset of drought.
11. Raise the height of cut where possible.
12. Use pedestrian operated instead of ride-on machinery to reduce soil compaction.
13. Select drought resistant grass varieties.
14. Balanced fertiliser to improve root growth and turf health.

Product type	Why	ICL solution
Wetting agents	Conserve water, make more water available, encourage deeper rooting.	Hydraflo
Potassium fertilisers	Potassium (K) regulates water loss.	Select from ICL Range
Slow release Nitrogen and Potassium fertilisers	Slow release N encourages harder growth and improved rooting. Slow release K ensures the plant is able to maintain water regulation over a longer period of time.	SierraformGT K-Step and Anti-Stress
Calcium fertilisers	Calcium helps to strengthen plant cell walls and helps to maintain plant vigour during drought periods.	Greenmaster Liquid Ca-Booster
Low Salt Index fertilisers	Reducing salt input maximises soil water available to turf.	All ICL fertilisers use low salt index nutrients
Low chlorine content fertilisers	Minimise Cl-accumulation in leaf tissues that can increase risk of scorch and desiccation.	Select from ICL Range
Plant growth regulator	Encourage greater root development.	
Porous topdressing material	Open cage structure of Pro-Lite allows increased waterholding in soil.	Greenmaster Liquid Effect Iron FE

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Cold Management

Problem

- Temperature is an important factor in determining the growth rate of turf. In low temperatures, grass growth will slow and eventually become dormant; in very low temperatures the turf will be damaged.
- Exposure to cold temperatures may cause water to freeze within the plant. Ice crystals may form in and around the cells and, in doing so, can cause physical damage to the plant cells.
- Water can also be pulled out of individual cells while ice crystals form around the cells. Plant cells will die from desiccation if enough water is lost. This form of freeze damage often occurs during periods of thaw or in late winter, and is commonly referred to as crown hydration injury.
- Suffocation or anoxia can also damage turf that is encased in ice or is under some type of impermeable cover for an extended period.
- Soil microbes and the plants under the ice cover utilise oxygen as they respire and anaerobic condition develops as the oxygen is depleted.



iTurf Solutions

1. Raise cutting height in late summer to increase photosynthesis potential and ability to produce carbohydrates and develop an improved root system.
2. Minimise shade where possible to maximise carbohydrate production. Turf growing in shade also has higher moisture content and a reduced cell thickness.
3. Harden turf coming into winter by appropriate use of fertilisers. Use fertilisers with low Nitrogen: high Potassium ratios to harden turf.
4. Increase aeration / reduce compaction to encourage better rooting and to help diffuse toxic gas during winter months.
5. Improve surface drainage to minimise prolonged ice cover and freeze injury.
6. Irrigate sparingly in autumn to reduce plant hydration. This will allow plant to tolerate dehydration in cold winters.
7. Select cold tolerant grass species and cultivars.

Product type	Why	ICL solution
Slow or Controlled release Nitrogen fertilisers	Encourage more balanced growth to maintain healthier turf in low temperature conditions. Slow release Methylene urea (MU ₂) Nitrogen fertilisers and controlled release fertilisers (Poly-S and PACE) ensure that Nitrogen is not released in cold conditions.	SierraformGT, Sierrablen, SierrablenPlus, Sportsmaster CRF, ProTurf
Slow release Potassium fertilisers	Slow release Potassium fertiliser ensures Potassium is not leached out of root-zone in wet winter months.	SierraformGT
Carbohydrate and seaweed biostimulant	To supply a direct source of carbohydrates to the plant and to encourage a better root system.	Sportsmaster WSF Seaweed
Plant Growth Regulator	Reduce vertical growth to minimise etiolation so the plant can re-direct it energy resources for lateral growth.	Registered product for this use
Cold tolerant grass species and cultivars	Select cultivars that are tolerant to low temperatures to optimise performance in cold conditions.	

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Moss

Problem

- Mosses are normally found in cool, shady moist conditions.
- Little soil is required by the moss for nutrient extraction.
- Turf with poor density is susceptible to moss infestation.
- Causes of poor density could be under fertilization, over-watering, scalping from mowing and shady conditions.
- Moss damages turf in terms of performance, aesthetics, and competition, creating vulnerability to wear and allow conditions for weed invasion.



iTurf Solutions

1. The first strategy should be to create an environment, which is not naturally suitable for the growth of moss.
2. Increase airflow and light.
3. Increase water movement and infiltration, adjust irrigation practices to allow the surface to dry out.
4. Using wetting agents with a good penetrant activity will help to remove surface moisture.
5. Raise mowing height where possible to allow turf to outcompete moss.
6. Ensure turf is healthy via good nutritional programme so that it has a competitive advantage over the moss.
7. Use fertilisers containing ferrous sulphate will act directly upon the moss.
8. Control thatch in a programmed approach.
9. Once environmental conditions have been adjusted then use an approved Plant Protection Product.
10. Physically remove dead moss through scarifying.

Product type	Why	ICL solution
Slow or Controlled release fertilisers	Encourage more balanced growth to maintain healthier turf able to outcompete moss.	SierraformGT, Sierrablen, SierrablenPlus, Sportsmaster CRF
Ferrous sulphate containing fertilisers	Ferrous sulphate kills moss via an acidification effect.	Greenmaster Liquid Effect Iron Fe
Penetrant wetting agent	This will move water away from the surface creating drier surface conditions less suitable for moss growth.	Hydraflo

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Nutrition – Greens

Problem

- The greens of a golf course are the single most important area of turf so their appearance and performance are critical.
- The green should have a healthy appearance and be as uniform as possible across each individual green and from green to green.
- The surface should be firm and the ball should run true when putting.



iTurf Solutions

1. Use soil analysis results as a base for determining a nutrient programme.
2. Use a combination of granular and liquid applied fertilisers.
3. Use granular fertilisers as a core nutrient programme.
4. Provide supplementary nutrition via liquid applications.
5. Avoid excessive nutrient applications.
6. Adapt the nutrient programme according to commonly occurring diseases (see specific iTurf Solutions).
7. Overseed at regular intervals with quality seed to maintain desired sward composition.

Product type	Why	ICL solution
Micro granulated fertiliser	To ensure even distribution of granules across the area and to avoid mower pick-up.	SierraformGT, Greenmaster Pro-Lite
Homogeneous granular fertiliser	To ensure even distribution of nutrients across the area and to maintain uniform growth and performance.	SierraformGT, Greenmaster Pro-Lite
Slow release Nitrogen fertiliser	To avoid growth surges that can create an imbalance between leaf and root growth. Slow nutrient release means less growth between mowing and this can help to maintain quicker green speeds with a lower height of cut.	SierraformGT
Slow release Potassium fertiliser	Slow release Potassium allows sufficient K to be applied to aid wear tolerance, water management and tolerance to environmental stresses without creating soil nutrient imbalances from using excessive conventional K sources.	SierraformGT
High quality liquid applied fertiliser for foliar uptake with readily available nutrients	Use liquid applied nutrition to complement the core granular base feed.	Greenmaster Liquid
Plant Growth Regulator	Reduce vertical growth and promote lateral and root growth to create a stronger harder turf.	
Quality grass seed	Seed with the best cultivars and overseed to maintain the desired sward composition.	

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Salt Affected Soils

Problem

- Caused by an increase in salt ions; calcium (Ca^{2+}), magnesium (Mg^{2+}), sodium (Na^+), potassium (K^+), chloride (Cl^-), sulfate (SO_4^{2-}), bicarbonate (HCO_3^-), nitrate (NO_3^-), carbonate (CO_3^{2-}) (at pH >9.0)
- Salt ions come from; dissolution of minerals, irrigation water, fertilisers, soil amendments, high water table, salt water spray, insufficient leaching.
- High soil salt levels cause the following problems: water deficit, ion toxicity, ion (nutrient) imbalances and poor soil permeability.
- Salt affected soils are classed as: Saline (high salts), Sodic (high Sodium) or Saline-Sodic (high salt and sodium).



iTurf Solutions

1. Assess the site to evaluate potential risk.
2. Restrict salt addition through the choice of fertiliser type.
3. Use salt tolerant grass cultivars.
4. Leach salt out of rootzone.
5. Check (and amend if possible) water quality.
6. Ensure nutrients are in balance.
7. Encourage good rooting.
8. Monitor situation and adapt as required (season specific).

Product type	Why	ICL solution
Slow release Nitrogen and Potassium fertilisers	Encourages deeper rooting so turf more likely to find better quality water.	SierraformGT
Low salt index conventional fertilisers	Minimise salt inputs into rootzone to reduce soil electrical conductivity (EC) levels.	Greenmaster Pro-Lite
Low salt index slow release fertilisers	Salt inputs will be further reduced if nutrient are delivered gradually over time.	SierraformGT, SierrablenPlus
Quality liquid fertilisers	Foliar application using low water volumes ensure nutrients taken up directly by plant and not via soil which could add to salt levels.	Greenmaster Liquid
Use foliar feeds in stress conditions	Foliar feeds can change the cations of Na in the leaf with Ca, K and/or Mg to get better nutrient balance.	Use Greenmaster Liquid and Step Liquid
Calcium fertiliser with nutrient uptake activator	Calcium displaces Sodium (Na) ion from cation exchange sites in sodic soils.	
Organic based fertiliser with low salt index	Organic material can improve the exchange of cations Na-Ca-K-Mg.	
Penetrant wetting agent	Encourage water and salt movement down through the soil profile to reduce surface salt levels.	Hydraflo
Use salt tolerant grass cultivars	These varieties are able to withstand high salt levels.	

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Shade

Problem

- Low light reduces photosynthesis which in turn reduces carbohydrate production and rooting.
- In low light conditions, plants naturally grow upwards in order to outcompete other plants and capture more light.
- When the low light is caused by permanent shading (not caused by competing plants) then this can also cause etiolation.
- Etiolation causes long, stretched out growth producing weak plants.
- The causes of shading (trees/buildings) are also likely to reduce air movement therefore meaning the turf surface stays wet for longer which can potentially increase disease occurrence.
- Turf growing in shade also has a thinner leaf cuticle which can make the plant more susceptible to disease attack.



iTurf Solutions

1. Where possible manage the environment to reduce the amount of shade.
2. Encourage the turf to grow without excessive vertical growth and encourage better rooting.
3. Reduce Nitrogen inputs versus full sun areas.
4. Reduce irrigation compared to full sun areas.
5. Dry surface with use of penetrant wetting agent.
6. Aerate well to encourage good rooting and movement of surface water.
7. Increase carbohydrate levels in plant.
8. Select shade tolerant grass cultivars.

Product type	Why	ICL solution
Shade tolerant grass cultivars	Promotes healthy turf plant more resilient to disease attack.	
Plant Growth Regulator	Reduce vertical growth to minimise etiolation so plant can re-direct its energy resources for lateral growth.	
Slow or Controlled release fertilisers	Encourage more balanced growth to maintain healthier turf in low light conditions.	SierraformGT, Sierrablen, SierrablenPlus, Sportsmaster CRF, ProTurf
Carbohydrate and seaweed biostimulant	To supply a direct source of carbohydrate to the plant so increasing stress tolerance in low light conditions.	Sportsmaster WSF Seaweed
Penetrant wetting agent	Avoid excessive surface moisture caused by low evapo-transpiration in shaded areas.	Hydraflo

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Thatch

Problem

- Thatch is the organic layer below the green leaf material of the turf and above the soil itself.
- Excess thatch occurs when new tissue develops at a rate quicker than soil microbes can break it down.
- Thatch can hinder root development.
- Thatch provides a good environment for turf pathogens and insect pests.
- Thatch removes the buffering effect of soil on rapid changes of air temperature around the crown of the plant.
- Thatch becomes hydrophobic when it dries out and it can cause water holding problems.
- Over-seeding can be less successful if thatch creates a barrier between the seed and soil.



iTurf Solutions

1. Control should be via an integrated approach of cultural practices and sensible product use.
2. Aerate to encourage soil microbial action.
3. Scarify to remove dead plant material.
4. Apply topdressing to dilute thatch.
5. Use correct levels of nutrition. Excess Nitrogen will encourage thatch.
6. Use the correct types of nutrition.
7. Wetting agents to aid water management.
8. Use soil biostimulants to encourage microbial breakdown of thatch.
9. Box off clippings to limit build up of dead plant material in soil.

Product type	Why	ICL solution
Slow release fertilisers	Gradual consistent feeding avoids over-feeding that can lead to thatch development.	SierraformGT
Controlled release fertilisers	Gradual consistent feeding avoids over-feeding that can lead to thatch development.	Sierrablen, SierrablenPlus
Wetting agent with penetrant action	Breakdown hydrophobic barrier caused by thatch to allow better wetting of soil and to allow moisture penetration when too wet.	Hydraflo

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Water-Logging

Problem

- High rainfall events and winter flooding are becoming more common.
- The risk of water-logging and flooding are more likely due to a number of factors:
 - Poor soil structure reduces water holding capacity of soil.
 - Poor ground cover increases potential for surface run-off.



iTurf Solutions

1. Aerate the soil to encourage water infiltration.
2. Select grass seed cultivars with improved root growth.
3. Encourage good rooting through good nutrition and managing soil structure.
4. Ensure strong growing turf that will take up water efficiently.
5. Use slow and controlled release fertilisers to avoid nutrient losses and to avoid the need for re-application in wet conditions.
6. Raise the height of cut prior to likely flood event to increase sward canopy and also to encourage deeper rooting.
7. If possible, use cut off drains to protect sensitive areas.
8. Contouring of surface levels (where possible) can help to control movement of water away from problem areas.
9. Aerate the soil to encourage water infiltration.
10. Encourage good rooting through good nutrition and managing soil structure.

Product type	Why	ICL solution
Slow or controlled release fertiliser applied prior to water-logging	Improves rooting and water uptake efficiency.	SierraformGT SierrablenPlus
Slow or controlled release fertiliser applied prior to water-logging	Improve sward density so that surface run-off is reduced.	SierraformGT SierrablenPlus
Penetrant wetting agent	This type of wetting agent will move water away from the surface and down the soil profile and therefore reduce surface run-off.	Hydraflo
Plant Growth Regulator	Improve sward density and root development to improve water uptake and reduce water loss.	
Use grass seed cultivars with improved root growth	These Poa pratensis varieties have significantly more and longer roots	

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Wear Tolerance

Problem

- Turf that receives high traffic pressure will be susceptible to wear damage and also increase the risk of disease.
- Wear damage causes aesthetic damage as well as a poor quality playing surface.
- Where turf becomes worn and bare patches occur this provide opportunities for weed invasion.
- When the turf cover is reduced, this also reduces the stability of the soil which can then lead onto more problems.
- Turf that receives high traffic pressure will be susceptible to wear damage.



iTurf Solutions

1. Harden turf and avoid soft lush growth.
2. Ensure good nutrition for healthy turf growth to increase wear tolerance.
3. Ensure good nutrition to aid recovery from wear.
4. Reduce surface moisture in wet conditions.
5. Use wear tolerant grass cultivars.
6. Limit traffic where possible and alternate areas of use.

Product type	Why	ICL solution
Use slow release fertilisers	Continuous nutrition at the correct level that avoids over and under feeding maintains a stronger and healthier turf surface more tolerant to wear.	SierraformGT
Use controlled release fertilisers	Continuous nutrition at the correct level that avoids over and under feeding maintains a stronger and healthier turf surface more tolerant to wear.	SierrablenPlus, Sierrablen, Sportsmaster CRF, ProTurf
Use Potassium fertilisers	Potassium plays an important role in hardening the turf against wear and tear.	SierraformGT 6-0-13.3 and Anti-Stress SierrablenPlus Stress Control
Slow release Potassium nutrition	If Potassium can be delivered constantly over a 6-8 week period then the wear benefits of potassium are enhanced.	SierraformGT
Controlled released Potassium nutrition	If Potassium can be delivered constantly over a 3 month to 4-5 month period then the wear benefits of potassium are over the season and not just following application.	SierrablenPlus Spring Starter, SierrablenPlus Active
Water conservation and penetrant wetting agent	Maintain adequate soil moisture to ensure turf is healthy and able to withstand wear stress in dry conditions. Reducing surface moisture and promoting better soil stability will aid the turf in tolerating wear stress.	Hydraflo
Use wear tolerant grass cultivars	These varieties are able to withstand high levels of wear	



Green Speed

Problem

- Fast greens are sometimes perceived to be good greens but this is not necessarily the case.
- Trueness and consistency across all greens are more important than speed.
- Average mowing heights in the summer months are between 3-5mm and slightly higher in the winter months.
- Cutting the greens lower or rolling can increase green speed. However, in the long-term these practices can encourage undesirable coarse grass species such as *Poa annua*, moss and algae.
- Green Speed is measured with a device known as a Stimpmeter.



iTurf Solutions

1. Greens can be managed to produce firm, true putting surfaces without the need to cut them down to excessively low heights. Treatments include: light/frequent top dressing, regular verti-cutting treatments, balanced nutrient input.
2. Occasional light rolling can help to increase green speed without the need to lower the cutting heights (treatments should be used in conjunction with an appropriate aeration programme).
3. Use low Nitrogen inputs to harden turf growth.
4. Slow release nutrients will not give surge growth and will therefore improve green speed consistency between mowing.
5. Calcium fertilisers strengthen cell walls and improve green speed.
6. Use Plant Growth Regulators to increase green speed and improve consistency during the day.
7. Double mowing especially prior to tournaments.
8. Irrigation should be kept to minimum required for healthy turf growth.
9. Remove surface dew.

Product type	Why	ICL solution
Slow release fertiliser	No flush of growth, low nutrient inputs and good balance between shoot and root growth.	SierraformGT
Liquid fertiliser	Spoon feeding low nutrient inputs creates harder turf growth and faster greens.	Greenmaster Liquid
Plant Growth Regulator	Minimising top growth and improving consistency between mowing will increase green speed.	
Penetrant wetting agent	Product will move water away from surface ensuring it is firm and dry.	Hydraflo
Calcium fertiliser	Calcium enhances cell strength and makes plant more rigid.	Select from ICL Range

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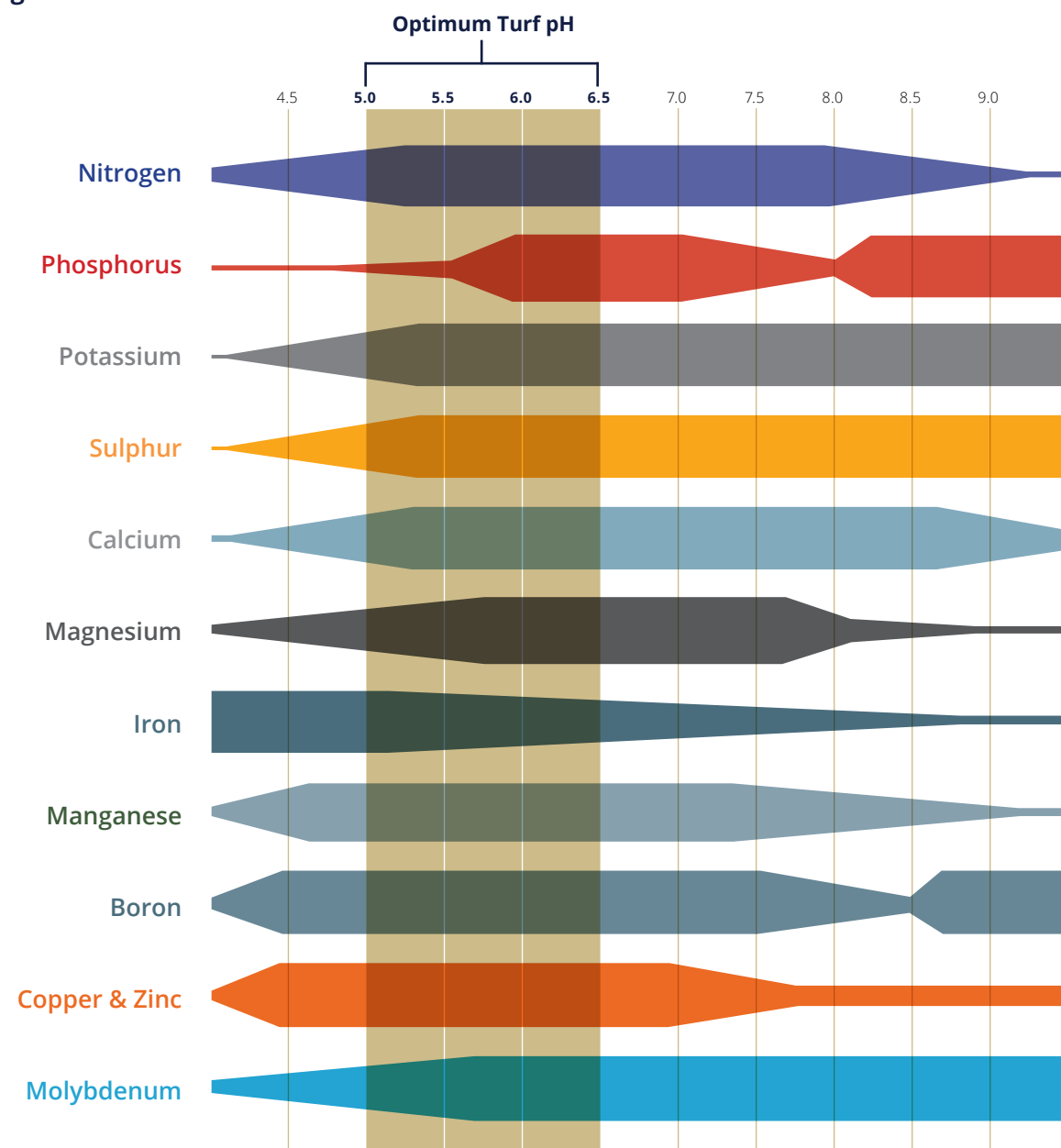
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The influence of pH on nutrient availability

Nutrient availability within the soil is significantly affected by the pH of the soil. The chart below shows how availability of each essential turf nutrient is affected by pH. This chart can be used when formulating a fertiliser programme.



Nutrient Cycle & Fertiliser Selection

In very general terms, fertilisers are products that improve the levels of available plant nutrients either directly to the plant or via the soil. There are a number of nutrients that are classified as 'Essential Nutrients'. These Essential Nutrients are required by the plant in order to complete its life cycle and/or are directly involved in plant metabolism or required in a metabolic reaction.

The reason that some turf areas do not need these nutrients applied on a regular basis is because they are either already present within the rootzone, or already supplied via top dressing treatments or other means. These nutrients (shown with their chemical symbol) can be classed as Macro and Micro (or trace) nutrients. Macro nutrients are needed in far higher quantities than micro nutrients, but all are equally important. If there is a deficiency of one nutrient then the plant will suffer;

Macro

- Carbon (C)
- Hydrogen (H)
- Oxygen (O)
- Nitrogen (N)
- Phosphate (P)
- Potassium (K)
- Calcium (Ca)
- Magnesium (Mg)
- Sulphur (S)

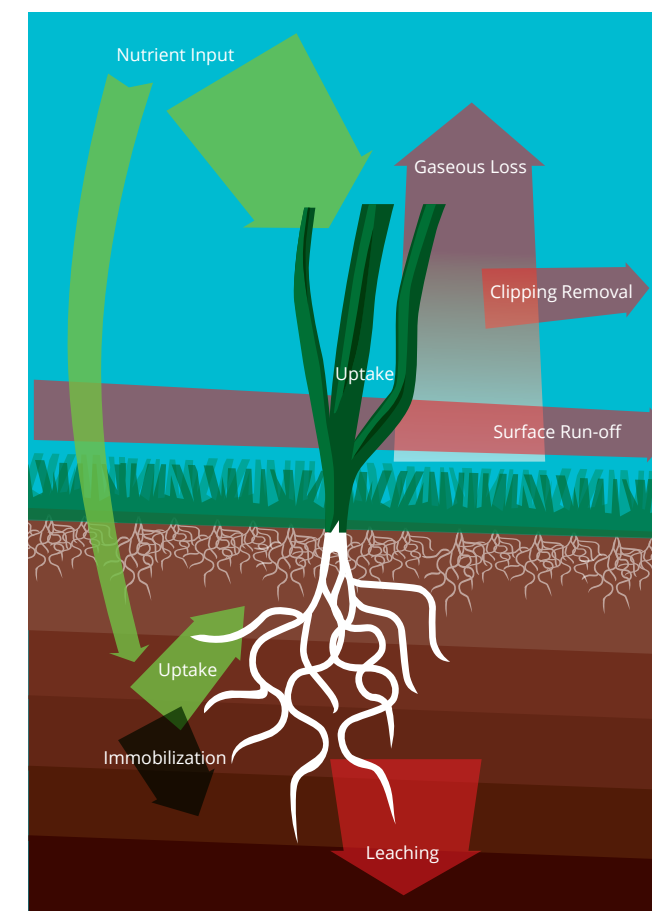
Micro (Trace)

- Iron (Fe)
- Zinc (Zn)
- Copper (Cu)
- Manganese (Mn)
- Molybdenum (Mo)
- Boron (B)
- Chlorine (Cl)

Carbon, Hydrogen and Oxygen are derived from Carbon Dioxide in the air, absorbed by the leaves, and in water, absorbed by leaves and the roots. The remaining elements are mainly taken in by the roots, but may also be absorbed by the leaves if fertilisers are applied.

CRF Benefits

- Safe and consistent feeding
- Nutrient release based on turf needs
- Efficient use of nutrients
- Environmentally friendly





Spreaders

To get the very best results from your fertiliser, it's essential to apply it accurately.

ICL spreaders are durable, easy to use, and offer turf managers the very best in application efficiency.

Spreader Index

Spreader	Type	Spread width	Hopper capacity	Product usage				
				Conventional fertilisers	Coated fertilisers	Granular wetting agents	Seeds	Top dressing
SR-2000	Rotary	2.0-6.0m	42 litres	✓	✓	✓		✓
AccuPro 2000	Rotary	2.0-6.0m	42 litres	✓	✓	✓		✓
SS-2 Drop Spreader	Drop	910 mm	46 litres	✓		✓	✓	✓
HandyGreen II	Handheld	Variable	2 litres	✓	✓	✓		



Top fertilisers need top spreaders

SR-2000 Rotary Spreader

Has all the features of the AccuPro 2000 Rotary Spreader plus:

- Larger 139 Turf Saver 2 pneumatic wheels for an easier push
- New and improved larger diameter, more durable stainless steel frame
- Patented Helical Cone for a uniform, consistent spread pattern
- Extended handle with tuff-foam grips for added comfort
- Positive on-off deflector provides effective product delivery control
- Standard port shut-off control for greater application efficiency



SS-2 Drop Spreader

- Stainless steel frame, hopper and fasteners provides outstanding durability and corrosion resistance
- Larger 139 Turf Saver 2 pneumatic wheels for easier operator use
- Extended ergonomic handle is more durable
- Lift handles in the front and back for easier loading and unloading
- Not suitable for coated controlled release products

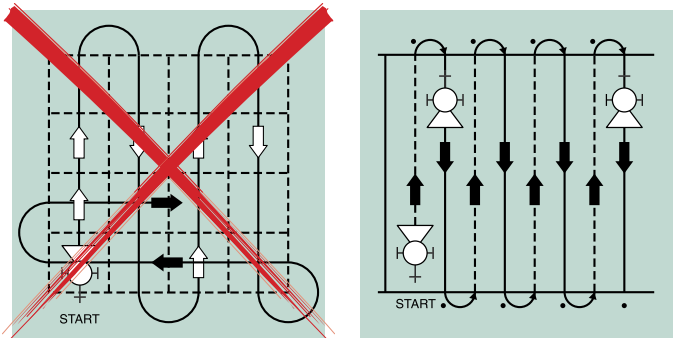


HandyGreen II Spreader

- A hand-held spreader that disperses ICL fertilisers as you turn the handle
- Comfortable to hold and easy to use
- Suitable for small to medium lawns

Walking Pattern

Recommended walking pattern for drop and hand-held spreaders



Optimum distribution at half rate and double pass.

Helical Cone®

Optimal spreading due to the patented Helical Cone



Spreader Setting Guidelines

These recommended spreader settings are given for a walking speed of approximately 5km/hr. These settings are for guidance only. Exact rates, using the settings below, cannot be guaranteed – rates depend on the spreader itself and accuracy of the operator. Calibrate the spreader at regular intervals, including effective spreading width.

Rotary Spreader Settings for AccuPro 2000, SR-2000 Single pass at FULL RATE

	Cone setting	Effective width (m)	Amount of product applied (g/m²) after one pass													
			5	10	15	20	25	30	35	40	45	50	55	60	65	70
SierraformGT All analyses	6	3.7		I ½	K	L	M	M ½								
STEP STEP Hi-Mag	7	4.3	H	I ½	K ½											
Greenmaster Pro-Lite All analyses	6	3.7						M	N							
Sportsmaster CRF All analyses	3	5.0				Q	R ½	Y ½								
SierrablenPlus All analyses	4	4.8				N	O	P	R	S	T					
Sierrablen All analyses	4	4.7					Q	R ½	T ½	V	X	Q (x2)	R (x2)	R ½ (x2)		
Hydraflo 2	5	4.0		J	K ½	M										
ProTurf All analyses	6	5.0				N ½	O ½	P	Q ½							

Rotary Spreader Settings for AccuPro 2000, SR-2000 Double pass at HALF RATE

	Cone setting	Effective width (m)	Amount of product applied (g/m²) after two passes													
			5	10	15	20	25	30	35	40	45	50	55	60	65	70
SierraformGT All analyses	6	3.7			H	I ½	J ½	K								
STEP STEP Hi-Mag	7	4.3	G ½	H	I											
Greenmaster Pro-Lite All analyses	6	3.7						J ½	K							
Sportsmaster CRF All analyses	3	5.0				M ½	O	O ½								
SierrablenPlus All analyses	4	4.8					L	M	M ½	N	N ½	O				
Sierrablen All analyses	4	4.7					M	N	O	O ½	P	Q	R	R ½		
Hydraflo 2	5	4.0		H ½	I	J										
ProTurf All analyses	6	5.0				K ½	L	M	N							

Drop Spreader Settings for SS-1 Single pass at FULL RATE

		Amount of product applied (g/m²) after one pass										
		5	10	15	20	25	30	35	40	45	50	55
Greenmaster Pro-Lite	All analyses		3 ¾	4	4 ½	5	5 ¼	5 ½	6	6 ¼	6 ½	
SierraformGT	All analyses		3 ¼	3 ¾	4 ¼	4 ¾	5 ¼	5 ¾	6 ¼	6 ½		
Step Hi-Mag	Trace Elements	2	2 ¾	3 ½								
Hydraflo 2	Granules		3 ¾	4 ¼	4 ¾							





Spreader calibration

Time invested in checking and setting spreaders is quickly recouped by better application accuracy, which prevents under or over-dosing and stripes in the sward caused by misses or overlaps.

Effective applications start with the end of the last job. Machines need to be thoroughly cleaned and, if possible, dried before they are put away. Fertiliser absorbs moisture from the air and if any is left in the spreader this will quickly corrode metal parts.

Before starting work, operators should give the applicator a thorough inspection: Ensure the rate setting mechanism is free and adjusts easily, check the on/off works and the distribution rotor and spinning discs are not worn and are functioning properly.

It is vital to then set and test the machine with the actual fertiliser it will be applying. The bulk density of the material affects the spread pattern and flow rate. The same application rate will need fewer denser granules to flow through than less dense material, even though they could be the same physical size. Denser particles will be spread further – e.g. consider how far a cricket ball can be thrown compared with a tennis ball.

This is a very important consideration when setting pedestrian and tractor-mounted spinning disc spreaders, which rely on centrifugal force to achieve the spreading width, with larger, denser granules travelling further than lighter, less dense ones.

With these applicators it is crucial to check the distribution pattern, with a full-width tray test, as well as the rate calibration. This will ensure you know how much is being applied as well as ensuring it is being spread evenly across the whole width.

There are four main spreaders used to apply fertiliser – pedestrian drop-style, pedestrian spinning disc, tractor-mounted spinning disc or oscillating spout. All have different calibration and settings procedures.

With pedestrian operated machines, settings are usually made for a 'normal walking pace' of 5km/hr (3mph). It is important to maintain the speed for which the calibration settings have been made to prevent under or overdosing. Walking speed also influences the spread width on spinning disc applicators. Also keep spreaders parallel to the ground to maintain an even distribution.



SCS Spreader & Sprayer Testing is the UK's largest independent fertiliser spreader testing specialist and their advice to operators is to ensure equipment is properly maintained and tested for application rate and distribution pattern with every product it will apply. Spinning disc spreaders will also need to be tested over trays to determine the true spreading width and evenness of distribution.

Calibration & Testing Procedures

Pedestrian drop-style

Application width is set (usually a little narrower than the hopper), rate is adjusted by opening or closing the outlet and will vary with walking speed.

- Adjust spreader outlet to the setting in the operator's manual for product type and application rate.
- Apply fertiliser over a measured distance (e.g. 10m) at normal walking pace (5km/hr).
- Determine quantity spread over distance by one of the following methods:
 - Lay sheet on ground and then collect and weigh fertiliser distributed on top.
 - Place a known weight in hopper, apply fertiliser, empty and weigh remaining hopper contents and subtract from original weight.
 - Adjust machine setting for desired application rate if necessary. Note this setting will apply only for this fertiliser and operator's walking pace. Recalibrate for different operators and materials.

Use following formulas to calculate rate in g/m²

Spreading width x distance = area covered
 Weight of fertiliser collected ÷ area covered = kg/m²
 e.g.
 Weight spread over distance = 125g
 0.5m (width) x 10m (distance) = 5m²
 Application rate = 125 ÷ 5 = 25g/m²

Pedestrian Spinning Disc

Application width and dose rate will vary with walking speed and fertiliser characteristics and opening adjustment.

- A spreading width test with the actual material should be carried out, preferably across special collection trays, before any other calibration. This will determine the spread width for the particular fertiliser and operator's pace (aim for 5km/hr) and how far apart you should walk to maintain an even spread.
- Adjust spreader for desired application rate. Place known quantity e.g. 2kg in hopper.
- Walk set distance (10m) at normal walking pace.
- Empty and weigh remaining hopper contents.
- Calculate area by multiplying the application width by the distance walked.

To calculate application rate use following procedure:

Original hopper content minus contents after spreading
 e.g: 2,000g – 1,000g = 1,000g spread in 10m.
 Area: (distance) 10m x (width) 4m = 40m²
 Weight ÷ area = application rate/m²
 1,000 ÷ 40 = 25g/m²

Distribution Pattern Check

- Lay out testing trays to full application width.
- Use fertiliser to be applied and actual operator doing the job walking at set pace (5km/hr).
- Spread fertiliser through trays, which will collect material being spread.
- Place contents of each tray in test tubes to check the evenness of the spread pattern. Alternatively this could be done by weighing contents of each tray and plotting on a bar chart.

Tractor-Mounted Spinning Disc (Or Oscillating Spout)

Application width determined by fertiliser characteristics, machine type and PTO drive speed. Forward speed and opening setting will influence application rate.

- Follow application rate calibration procedure in operator's manual. Usually this means opening a chute and collecting the amount of fertiliser that runs out in a set time. Weigh amount collected and compare with recommendation in manual. Make necessary adjustments to gain correct application rate. This must be done using actual fertiliser to be applied.
- Spreading width will be set by the machine – usually 6-12m. But this will be achieved only at the correct PTO speed (e.g. 540rpm) and this requires the tractor engine speed to be set at the correct rpm. You can check the actual PTO speed with a tachometer.
- The forward speed for the application rate will be shown in the manual. It is crucial to select the right gear with the engine rpm to achieve the PTO speed to drive at the forward speed.

Use the following formula to check the application rate:

Application rate in kg/ha =

$$\frac{\text{(Total weight collected in one minute (kg) x 600)}}{\text{(Spread width (m) x tractor forward speed (km/hr))}}$$

Spread Pattern Accuracy Test:

- A full-width tray test is essential to ensure the fertiliser is being distributed evenly across the whole width.
- Place special collection trays across width.
- Tractor is driven in the gear and set engine speed to achieve the PTO and forward speed.
- Spreader is operated through the line of trays and contents of each are placed in individual test tubes.
- Measure the contents of each tube to assess spread pattern.
- Make the machine adjustment to correct any highs or lows to achieve even pattern.



Tank Mix Guidelines

Compatibility and water volumes

	Greenmaster Liquid High N ¹	Greenmaster Liquid High NK ¹	Greenmaster Liquid High K ¹	Greenmaster Liquid Spring & Summer ¹	Greenmaster Liquid Step ¹	Greenmaster Liquid Effect Iron FE ¹	Sportsmaster WSF High N ²		Sportsmaster WSF High K ²	Sportsmaster WSF Seaweed ²	H2Pro DewSmart ³	Primo Maxx	Heritage Maxx	Medal-lion	Banner Maxx	Instrata	Head-way	Jewel	Rescue	Praxys	Qualibra
Greenmaster Liquid High N ¹		400-1,000	400-1,000	400-1,000	400-1,000	600-1,000	400-1,000		400-1,000	400-1,000	✗	400-600	400-1,000	400-500	400-1,000	500-1,000	400-1,000	(.500)	✗	✗	400-1,000
Greenmaster Liquid High NK ¹	400-1,000		400-1,000	400-1,000	400-1,000	600-1,000	400-1,000		400-1,000	400-1,000	✗	400-600	400-1,000	✗	400-1,000	✗	400-1,000	(.500)	✗	✗	400-1,000
Greenmaster Liquid High K ¹	400-1,000	400-1,000		400-1,000	400-1,000	600-1,000	400-1,000		400-1,000	400-1,000	✗	400-600	400-1,000	✗	400-1,000	✗	400-1,000	(.500)	✗	✗	400-1,000
Greenmaster Liquid Spring & Summer ¹	400-1,000	400-1,000	400-1,000		400-1,000	✗	400-1,000		400-1,000	400-1,000	✗	400-600	400-1,000	400-500	400-1,000	500-1,000	400-1,000	(.500)	✗	✗	400-1,000
Greenmaster Liquid Step ¹	400-1,000	400-1,000	400-1,000	400-1,000		400-1,000	400-1,000		400-1,000	400-1,000	✗	400-600	400-1,000	400-1,000	400-1,000	400-1,000	400-1,000	(.500)	400-1,000	✗	400-1,000
Greenmaster Effect Iron FE ¹	600-1,000	600-1,000	600-1,000	✗	400-1,000		600-1,000		600-1,000	600-1,000	✗	✗	✗	✗	600-1,000	✗	✗	✗	✗	✗	400-1,000
Sportsmaster WSF High N ²	400-1,000	400-1,000	400-1,000	400-1,000	400-1,000	600-1,000			300-1,000	300-1,000	✗	300-600	300-1,000	300-500	400-1,000	500-1,000	300-1,000	(.500)	✗	✗	400-1,000
Sportsmaster WSF High K ²	400-1,000	400-1,000	400-1,000	400-1,000	400-1,000	600-1,000	300-1,000			300-1,000	✗	300-600	300-1,000	✗	400-1,000	500-1,000	300-1,000	(.500)	✗	✗	✗
Sportsmaster WSF Seaweed ²	400-1,000	400-1,000	400-100	400-1,000	400-1,000	600-1,000	300-1,000		300-1,000		✗	400-600	400-1,000	400-500	400-1,000	✗	400-1,000	(.500)	✗	✗	400-1,000
H2Pro DewSmart ³	✗	✗	✗	✗	✗	✗	✗		✗	✗		✗	✗	✗	✗	✗	✗	✗	✗	✗	
Primo Maxx	400-600	400-600	400-600	400-600	400-600	✗	300-600		300-600	400-1600	✗		300-600	400-500	400-600	500-600	400-600	✗	✗	✗	✗
Heritage Maxx	400-1,000	400-1,000	400-1,000	400-1,000	400-1,000	✗	300-1,000		300-1,000	400-1,000	✗	300-600		125-500	400-1,000	✗	✗	✗	✗	✗	400-1,000
Medallion	400-500	✗	✗	400-500	400-1,000	✗	300-500		✗	400-500	✗	400-500	125-500		✗	✗	✗	✗	✗	✗	400-500
Banner Maxx	400-1,000	400-1,000	400-1,000	400-1,000	400-1,000	600-1,000	400-1,000		400-1,000	400-1,000	✗	400-600	400-1,000	✗		✗	✗	✗	✗	✗	400-1,000
Instrata	500-1,000	✗	✗	500-1,000	400-1,000	✗	500-1,000		500-1,000	✗	✗	500-600	✗	✗	✗		✗	✗	✗	✗	500-1,000
Headway	400-1,000	400-1,000	400-1,000	400-1,000	400-1,000	✗	300-1,000		300-1,000	400-1,000	✗	400-600	✗	✗	✗	✗		✗	✗	✗	400-1,000
Jewel	(.500)	(.500)	(.500)	(.500)	400-1,000	✗	(.500)		(.500)	(.500)	✗	✗	✗	✗	✗	✗	✗		✗	✗	✗
Rescue	✗	✗	✗	✗	400-1,000	✗	✗		✗	✗	✗	✗	✗	✗	✗	✗	✗	✗		✗	✗
Praxys	✗	✗	✗	✗	✗	✗	✗		✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗		✗
Qualibra	400-1,000	400-1,000	400-1,000	400-1,000	400-1,000	400-1,000	400-1,000		✗	400-1,000	✗	✗	400-1,000	400-500	400-1,000	500-1,000	400-1,000	✗	✗	✗	

✗ = Not compatible / Not appropriate water volumes

The above mixes indicate physical and chemical compatibility.

Individual products within the mix should be applied according their label recommendations. Do not exceed applications rates for the selected situation and follow label advice and restrictions as appropriate.

1 Do not exceed individual product rates. Do not exceed 120L/ha for combined total Greenmaster Liquid product input or 60L/ha for speciality Greenmaster Liquids (STEP/Effect Iron Fe).

2 Do not exceed individual product rates. Do not exceed 30kg/ha for combined total Sportsmaster WSF product input for foliar applications (water volumes of 300-600L/ha) or 60kg/ha for drench applications (water volumes of 600-1,000L/ha).

3 H2Pro DewSmart should not be tank mixed with any other product.

Ready Reckoner

Nutrient application from granular fertilisers

Calculation of amount of nutrient applied from declared analyses and treatment rate.

Nutrient analysis	Kg nutrient/ha applied at these applications rates					
% N P K etc.	20 g/m²	30 g/m²	35 g/m²	70 g/m²	105 g/m²	140 g/m²
Declared						
1	2.0	3.0	3.5	7.0	10.5	14.0
2	4.0	6.0	7.0	14.0	21.0	28.0
3	6.0	9.0	10.5	21.0	31.5	42.0
4	8.0	12.0	14.0	28.0	42.0	56.0
5	10.0	15.0	17.5	35.0	52.5	70.0
6	12.0	18.0	21.0	42.0	63.0	84.0
7	14.0	21.0	24.5	49.0	73.5	98.0
8	16.0	24.0	28.0	56.0	84.0	112.0
9	18.0	27.0	31.5	63.0	94.5	126.0
10	20.0	30.0	35.0	70.0	105.0	140.0
11	22.0	33.0	38.5	77.0	115.5	154.0
12	24.0	36.0	42.0	84.0	126.0	168.0
13	26.0	39.0	45.5	91.0	136.5	182.0
14	28.0	42.0	49.0	98.0	147.0	196.0
15	30.0	45.0	52.5	105.0	157.5	210.0
16	32.0	48.0	56.0	112.0	168.0	224.0
17	34.0	51.0	59.5	119.0	178.5	238.0
18	36.0	54.0	63.0	126.0	189.0	252.0
19	38.0	57.0	66.5	133.0	199.5	266.0
20	40.0	60.0	70.0	140.0	210.0	280.0
21	42.0	63.0	73.5	147.0	220.5	294.0
22	44.0	66.0	77.0	154.0	231.0	308.0
23	46.0	69.0	80.5	161.0	241.5	322.0
24	48.0	72.0	84.0	168.0	252.0	336.0
25	50.0	75.0	87.5	175.0	262.5	350.0

Note: 35 per m² = 350kg per ha = 1 oz. per sq yd = 2.7 cwt per acre
Note: 50kg per ha = 0.38 cwt per acre = 43lbs per acre
Note: 1kg per ha = 0.86lbs per acre

Nutrient Calculations

Nutrient application from granular fertilisers

Calculation of amount of nutrient applied from declared analyses and treatment rate.

The fertiliser declarations are always expressed as % weight by weight, with nutrients being declared in the elemental form in Australia and New Zealand.

Therefore, a 14-2.2-8.3 fertiliser contains:
14% w/w N
2.2% w/w P
8.3% w/w K

Granular fertilisers

For calculating nutrient inputs for granular fertiliser use the following formula:

Application rate
(kg/ha) x (% nutrient/100) = kg nutrient/ha
Example: 14-0-0 @ 35g/m²
Convert application rate from g/m² to kg/ha
(i.e. 35g/m² x10 = 350kg/ha)
Multiply Product Rate (kg/ha) by % N content
(i.e. 14% N = 0.14)
= kg N per ha
(i.e. 350 x 0.14 = 49kg N/ha)

Liquid fertilisers

In order to calculate the nutrient inputs from Greenmaster Liquid fertilisers you need to use the Specific Gravity (kg/litre) of the particular product being used.

Specific Gravity (SG) of:
NK 1.23
High N 1.31
Spring & Summer 1.18
High K 1.18
Ca Booster 1.32
STEP Liquid 1.15
Effect Iron Fe 1.25
Vitalnova Blade 1.36

For calculating nutrient inputs for liquid fertilisers use the following formula:

Application Rate
(L/ha) x Specific Gravity (SG) x (% nutrient/100) = kg nutrient/ha
Example: 12-1.7-5 @ 60 L/ha (SG = 1.18kg/L)
Convert application rate from L/ha to kg/ha
(i.e. 60L/ha 1.18 = 70.8kg/ha)
Multiply Product Rate (kg/ha) by % N content
(i.e. 12% N = 0.12)
= kg N per ha
(i.e. 70.8 x 0.12 = 8.5kg N/ha)

Conversion Tables

Ounces per square yard to grams per square metre

oz per yd²	1/4	1/2	1	2	3	4	5	6	7	8	9	10	15	20
g per m²	8.5	17	34	68	102	136	170	204	238	272	306	340	510	680

Fluid ounces per square yard to millilitres per square metre

fl.oz per sq.yd	1/4	1/2	1	2	3	4	5	6	7	8	9	10	15	20
mL per m²	8.5	17	34	68	102	136	170	204	238	272	306	340	510	680

Conversion of imperial to metric and metric to imperial

Weight	pounds	to kilograms	divide by	2.205	kilograms	to pounds	multiply by	2.205
	tons	to tonnes	multiply by	1.016	tonnes	to tons	divide by	1.016
	cwts	to kilograms	multiply by	50.794	kilograms	to cwts	divide by	50.794
Area	acres	to hectares	divide by	2.471	hectares	to acres	multiply by	2.471
	square yards	to square metres	multiply by	0.8361	square metres	to square yards	divide by	0.8361
Volume	pints	to litres	multiply by	0.568	litres	to pints	divide by	0.568
	litres	to gallons	divide by	4.546	gallons	to litres	multiply by	4.546
Weight/Area	tons/acre	to tonnes/hectare	multiply by	2.51	tonnes/hectare	to tons/acre	divide by	2.51
	cwts/acre	to tonnes/hectare	divide by	8.00	tonnes/hectare	to cwts/acre	multiply by	8.00
	cwts/acre	to kilograms/hectare	multiply by	125.00	kilograms/hectare	to cwts/acre	divide by	125.00
Volume/Acre	pints/acre	to litres/hectare	divide by	0.712	litres/hectare	to pints/acre	multiply by	0.712
	gallons/acre	to litres/hectare	multiply by	11.233	litres/hectare	to gallons/acre	divide by	11.233
	lbs/cu.ft	to kg/cu.m	multiply by	16.052	kg/cu.m	to lbs/cu.ft	divide by	16.052

Quick reference

Length	1 metre (100cm)	3.281 feet
		1.094 yards
Area	square metres	1.196 sq.yards
	1 hectare (10,000m²)	2.471 acres
Volume	1 litre (1,000 mL)	35.211 fl.oz
		1.76 pints
Weight	1 gram	0.0353 ounces
	1 kilogram	35.2074 ounces
		2.205 lbs
Temperature	Degree Centigrade (°C) to Degree Fahrenheit (°F) multiply by 1.8 and add 32	

Oxide & Elemental Conversion table for common elements requiring conversion

Element	Element	Oxide	Conversion	Oxide	Elemental
Calcium	Ca	CaO	0.71	1	0.71
Magnesium	Mg	MgO	0.60	1	0.60
Phosphorus	P	P ₂ O ₅	0.44	1	0.44
Potassium	K	K ₂ O	0.83	1	0.83
Sulfur	S	SO ₃	0.40	1	0.40

N.B. Nitrogen is always present in element form (N) & does not require conversion.
Oxide Percent x Conversion Number = Elemental Percent
Elemental Percent ÷ Conversion Number = Oxide Percent

Typical areas of use

Golf green		365-640m²	400-700 sq.yds
Bowling green		38.4 × 38.4m	1,475m²
		42.0 × 42.0 sq.yd	1,764 sq.yds
Cricket square		27.4 × 27.4m	752m²
		30.0 × 30.0 yds	900 sq.yds
Tennis court	(reg)	23.8 × 11.0m	262m²
		26.0 × 12.0 yds	312 sq.yds
	(full)	36.6 × 18.3m	670m²
		40.0 × 20.0 yds	800 sq.yds
Lacrosse		137.0 × 73.0m	10,001m²
		150.0 × 80.0 yds	12,000 sq.yds
Football pitch	(small)	91.4 × 46.0m	4,204m²
		100.0 × 50.0 yds	5,000 sq.yds
	(large)	119.0 × 91.4m	10,877m²
		130.0 × 100 yds	13,000 sq.yds
Rugby pitch		100.0 × 69.0m	6,900m²
		110.0 × 75.0 yds	8,250 sq.yds
Hockey pitch	(small)	91.4 × 50.0m²	4,570m²
		100.0 × 55.0 yds	5,500 sq.yds
	(large)	91.4 × 55.0m²	5,027m²
		100.0 × 60.0 yds	6,000 sq.yds
Croquet		32.0 × 26.0m²	832m²
		35.0 × 28.0 yds	980 sq.yds

Notes





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