

Soil-Zyme™

biochemical soil renovation

bio-energizer for your soil

Manufactured in Australia by:
International Rehabilitation and Soil Stabilization Services

Your Distributor

Soil-Zyme™

biochemical soil renovator

Soil-Zyme™ is a powerful biochemical soil activator designed for the turf and horticulture industries. Its advanced new enzyme technology uses specially selected enzymes to biologically re-invigorate degraded soils. The enzymes stimulate and enhance existing soil bacteria to treat a wide range of soil ailments and plant diseases. It is not a microbial inoculant because it contains no actual living organisms of its own. **Soil-Zyme™** is for use on golf courses, sporting fields, bowling greens, parkland, nurseries, turf-farms or in any horticultural situation where an effective, environmentally responsible and economical alternative to traditional soil management practices are required. It is formulated and manufactured in Australia and marketed as a liquid concentrate.

How and why it works

Enzymes are proteins within bacteria and the enzymes used in **Soil-Zyme™** are extracted from high quality bacteria cultures using a multi-stage fermentation process. The enzymes are stabilized against oxidation in a strong surfactant solution. When the solution is applied to turf, the surfactant (soil wetter) assists the enzymes to penetrate beyond any hydrophobic soil near the surface into the thatch and mat layers below. Local or existing soil bacteria absorb the new enzymes and when they reproduce, the new bacteria inherit within them an exact copy of the enzyme from **Soil-Zyme™**. Hormones within the **Soil-Zyme™** then further accelerate bacterial multiplication to around 50 times the normal rate. The result is a massive population explosion of aerobic soil bacteria which has been observed at over 600 times pre-existing numbers two weeks after application.

Soil-Zyme™ enhancement of bacteria also provides them with a more efficient digestive tool than their own. This enables them to consume and decompose organic matter, which before only fungi could attack. The massive increase in numbers of the enhanced aerobic bacteria sets up a feeding frenzy in which the bacteria look for any suitable food. They attack anaerobic bacteria, hydrocarbons, chemical residues (all contributing causes of black-layer), fungi spores (cause of diseases and hydrophobic soil) and plant lignin contained in thatch. The soil is being composted. As the process cleans the soil it also unlocks many other nutrients in the soil that would otherwise be unavailable to the plants. It also decompacts and encourages deeper more efficient root systems and reduces the plant's dependency on irrigation and fertilizer.

Unique features

Unlike inoculated biological soil management products, **Soil-Zyme™** contains no actual living bacteria or organisms of its own. This is a great advantage to turf managers because it does not require special storage facilities, nor does it have to be applied before or after daylight and there is no possibility of introducing bacteria cultures that are often hostile to local microbe populations. There is no wastage or time lag whilst added microbes adjust to a new environment. **Soil-Zyme™** simply assists the local or indigenous microbes to perform at levels far in excess of their normal capability, so you see more effective results more quickly. The concentrate is easily diluted with water and applied with conventional spraying equipment.

Soil-Zyme™

biochemical soil renovator

What it controls and how

Soil-Zyme™ is recommended for the control of the following soil and turf related problems. (Improvements can be observed in 1 - 2 weeks from time of application)

Surface algae and moss.

Grass growing in moist or humid conditions with low light intensity and poor drainage is usually plagued with either or both of these conditions, particularly in situations where there are plenty of nutrients available. **Soil-Zyme's™** action quickly decomposes algae plants into carbon and eliminates any new spores in the soil. Generally speaking, algae or moss growing on the surface is often an indication of other problems developing further beneath.

Excess Thatch.

Is an accumulated layer of dead and decaying stolons, rhizomes and clippings immediately below the surface. It is often hydrophobic and results from the inability of soil fungi to break down and decompose plant lignin present in dead plant matter at a rate faster than it is produced. Decomposition of lignin is always a very slow process, achievable only by fungi in the soil. When turfgrass is under intense management pressure to perform at a high level, it produces plant material at a faster rate than the soil fungi can decompose it. Bacterial decomposition is extremely rapid by comparison and soil bacteria enhanced with **Soil-Zyme™** complete the process of thatch decomposition far more efficiently and can reduce, or even eliminate the need for disruptive mechanical renovation.

Fungal diseases.

Symptoms of most fungal diseases appear on or near a turf surface. Once diseases have manifest in their respective observable forms the grass will have either already died or declined beyond recovery. If disease pathogens are already present, **Soil-Zyme's™** bio-activation process will quickly consume them and stimulate the grass re-grow into the affected areas quickly. Prevention is better than cure with fungal disease and regular treatment with **Soil-Zyme™** will enable the local soil bacteria keep them in balance and prevent it re-establishing.

Hydrophobic soil.

The surfactant in **Soil-Zyme™** helps moisture to penetrate and weaken the waxy coating surrounding fungal spores. These are the major cause of water repellant or hydrophobic soil in organically rich soils. As the local bacteria become enhanced with enzymes from **Soil-Zyme™** they are able to completely break down the waxy coating and attack and kill the spore inside. This is a more permanent way to control dry patch than spraying it with surfactants that need to be added regularly. Use of surfactants merely displaces the wax and grease to lower levels in the soil. They cannot eliminate the cause but reduce the symptoms near the surface temporarily and eventually cause soil to tighten up and compact.

Soil compaction.

As the bacterial breeding and organic decomposition process accelerates, it breaks down bondage agents such as grease and wax, and produces very large amounts of carbon di-oxide. Increased CO₂ pressure lifts the soil (like dough rising with yeast). More oxygen is drawn in from the atmosphere to fuel the process as carbon di-oxide production increases thus aerating and de-compacting soil. Gas exchange rates are raised to around 6 cubic metres per square metre, per minute for a period of about 4 weeks after application. When used as directed, **Soil-Zyme™** will reduce and often eliminate the need for disruptive and expensive deep soil maintenance practices such as coring and vertidrainning.

Black-layer.

Black-layer is a layer of accumulated grease, waxes, fungal residues and sulphide deposits in an anaerobic (oxygen-less) environment. It is observable anywhere between 25 to 250 mm below the surface. Anaerobic bacterial decomposition from black-layer gives off methane and hydrogen sulphide gas, both of which are antagonistic to plant growth and acidify the soil. Hydrogen sulphide gas is what causes the noxious odour associated with black-layer. As **Soil-Zyme™** makes its way down through the soil and the enzyme enhanced bacteria breed faster and faster, they consume all foreign elements they come across including anaerobic bacteria and the materials mentioned above which accumulate to form black-layer. The process aerates the soil and continues deeper until all the anaerobic bacteria and residues have been reduced to humic acid. With the removal of methane and hydrogen sulphide gasses the soil pH returns to normal and grass roots are able to penetrate deeper as a result.

Soil-Zyme™

biochemical soil renovator

Humic Acid

The end product from aerobic bacterial decomposition in soil is organic carbon or humic acid. This base element is essential for healthy plant growth and proper nutrient assimilation.

Cost comparisons

An example of maintenance costs comparing a **Soil-Zyme™ turf management program** with mechanical and chemical turf maintenance methods.

*Expressed in **US dollars** per hectare, per year.*

These costs are fairly accurate for Australia but may vary slightly from country to country.

1: Vertidrainage.	1 treatment per year (fairways only)	550.00 per ha	U\$ 550.00
2: Hollow tyne coring and topdressing.	1 treatment per year (greens & tees)	1000.00 per ha	U\$1000.00
3: Surfactant application.	2 treatments per year (all surfaces)	150.00 per ha (each)	U\$ 300.00
4: Renovation & disposal. (De-thatching)	1 treatment per year (all surfaces)	800.00 per ha	U\$ 800.00
5: Fungicide application.	Multiple treatments (all surfaces)	9000.00 per ha	U\$9000.00
6: Surface algae removal	Multiple treatments (greens & tees)	1500.00 per ha	U\$1500.00
<hr/>			
Soil-Zyme™ turf management program.	25litres per hectare per year (Applied over 4 applications)	400.00 per ha (each)	U\$1600.00

A **Soil-Zyme turf management program** can accomplish all of the above tasks biologically, without interference to the turf surface or its users. Furthermore, turf quality will be improved and irrigation and fertilizer requirement reduced.

Packaging details

Soil-Zyme™ concentrate is available in 25 litre, 10 litre, 5 litre and 2 litre plastic containers but this may vary in some countries.

Soil-Zyme™

biochemical soil renovator

Application details

VERY IMPORTANT: A small amount of fresh, elemental nitrogen must be applied immediately prior to each application of **Soil-Zyme™**. We recommend granulated **urea** at the rate of **300 grams per 100 square metres** (30 kg per hectare). Nitrogen is critical in order to trigger the bacterial decomposition process. **Ammonium** sulphate can also be used but at **500 grams per 100 square metres** (50 kg per hectare). We do not recommend dissolving the nitrogen with the **Soil-Zyme** solution as burning can result. If applying **Soil-Zyme** after your regular nitrogen fertilizer application, it must be done on the same day prior to the fertilizer being irrigated in. **Severe yellowing of the turf may result if the nitrogen is omitted.**

1: To treat and control fungal disease, thatch, algae and other surface ailments to 50 mm depth:

First application: 3.5 litres per hectare.
Second and subsequent applications: 2 litres per hectare after 1 month. Then 2 litres per hectare monthly as a continuous maintenance program.

Apply nitrogen as above immediately before applying **Soil-Zyme** with each and every treatment.

2: To treat and control black-layer, compaction, hydrophobic soil and soil ailments below 50 mm:

First application: 7 litres per hectare.
Second and subsequent applications: 3.5 litres per hectare after 8 weeks. Then 3.5 litres per hectare every 8 - 12 weeks till problems are alleviated completely.

Apply nitrogen as above immediately before applying **Soil-Zyme** with each and every treatment.

3: To avoid the surfactant burning the turf, irrigate for 5 - 10 minutes immediately following application to wash **Soil-Zyme™** off the leaf. Suspend further irrigation or apply when there is no risk of rainfall for 12 hours, then resume normal irrigation program.

4: Since there are no living organisms in **Soil-Zyme™** it can be applied at any time of day without risk of product deterioration.

5: Best results are achieved when soil temperatures are above 18° C measured at 100mm (4 inches) depth although significant benefits can still be seen at much lower temperatures.

6: In addition to visual evaluation of the turf surface, regular sampling and monitoring of the soil profile is recommended to prevent problems re-occurring.

Mixing protocol

NB: a) When mixing, always add the **Soil-Zyme™** to water, not water to **Soil-Zyme™** or excessive foaming will result.

b) **Do not mix or apply with any other chemical.** **Soil-Zyme** should not be applied 5 days before or after herbicides, insecticides or fungicides.

c) When using a **Soil-Zyme™** management program, normal turf grooming and mechanical surface management practices should be carried on as usual.

Dilution:

1: For treatment of all ultra-dwarf bermudagrasses, Tiff-type bermudagrasses, all cultivars of bentgrass or any grasses prepared as putting or bowling surfaces, the minimum dilution rate is **50 litres water to 1 litre Soil-Zyme™**.

2: For all grass species (except bentgrasses) which are not prepared as putting or bowling surfaces, the minimum dilution rate is **25 litres water to 1 litre Soil-Zyme™**.

3: For all bentgrass species in any situation, the minimum dilution is **50 litres water to 1 litre Soil-Zyme™**.

Soil-Zyme™

biochemical soil renovator

Storage

As **Soil-Zyme™** contains no living organisms there is no need to store it in a temperature-controlled environment. However it should be stored away from direct sunlight at normal room temperature. It is not advisable to store the product mixed in diluted form. Once mixed with water it becomes unstable and will deteriorate rapidly if not applied promptly. **Soil-Zyme™** has an unlimited shelf life if stored as directed. In temperatures below 8 degrees Celsius the product may congeal into a jelly-like substance. It will not flow in this condition and will need to stand in a tub of warm water for about 30 minutes prior to decanting.

Testimonials

Gary Chatfield, Global Turf Consulting, Thailand: *"I have found **Soil-Zyme** to be excellent in the control of thatch. Mechanical removal and top-dressing have been the only way to keep the thatch under control until now. With **Soil-Zyme** now incorporated into my management programs it assists me in maintaining better turf surfaces with less disruption to golfers. I will continue to use and specify **Soil-Zyme** as one of the best management practices to help produce and maintain the best turf surfaces possible".*

Shane Templeton, Course Manager, Hong Kong Golf Club: *"I now recognize **Soil-Zyme** to be an integral part of any turf management program. My fertilizer and chemical use has reduced significantly and the root depth of the bermudagrass is increasing allowing longer periods between irrigation. This has in turn reduced disease."*

Suresh Chandran, Course Superintendent, Sembawang Country Club, Singapore: *"I have been using the **Soil-Zyme** program for 2 years to renovate and manage my greens. My greens are now healthy and I have root depths of over 10 inches (250 mm). I have reduced my annual fungicide expenses by 60% and have not needed to core or de-thatch for over 16 months. I have also noted a significant reduction in parasitic nematodes. I sincerely recommend it."*

References

James Sua, CGCS	Course Manager	NSR Country Club	Singapore
Normas Yakin	Club Manager	Kota Permai Golf & Country Club	Malaysia
Derek Wee	Course Superintendent	Raffles Country Club	Singapore

Material Safety Data

Soil-Zyme™ is completely non-toxic and harmless to humans, animals and the environment. No special protective clothing is required during mixing or spraying.

Classification:	Soil bioactivator
Applications:	Soil / water treatment
Physical Properties:	Dark tan viscous aqueous solution
Specific gravity:	0.96KL/1 at 20° C
pH (concentrate):	5.8 (plus or minus 0.2)
pH (activated):	5.1 (plus or minus 0.2)
Viscosity (at 20°C):	0.13 – 0.25 dynes / sq cm
Biodegradability:	82% in 14 days
Ingredients:	Enzymes / Surfactant / Micronutrients
Flashpoint:	Non flammable
Auto ignition temperature:	Not applicable
Physical effects to humans:	Non harmful. Mild skin and eye irritant