

Martin Lishman

Compost Tea Systems

Biological Soil Management



Growing Solutions[®]
INCORPORATED

Compost Tea Systems

- the world's leading compost tea production system

- Easy to use, easy to clean
- Ready to use in just 24 hours
- Highest quality compost tea extraction
- High dissolved O₂ levels sustain microbes
- Unique catalyst to stimulate microbes
- Available in 4 convenient sizes



Compost tea is used in the agricultural, horticultural, landscaping, viticulture and turf care industries

COMPOST TEA

Compost tea is an aerated solution derived from compost containing a high concentration of beneficial micro-organisms that can be sprayed directly onto plants as a liquid feed or onto soil as a drench.

- Improves soil and plant health
- Users experience less disease
- Improves root growth and penetration
- 100% safe and natural
- Helps achieve better looking plants
- Aids nutrient recycling
- Users reduce pesticide application
- Cannot be over-applied

Growing Solutions Compost Tea Systems

Uses and Benefits of Compost Tea

Turf Care

The use of Compost Tea in the turf care industry is growing. Greenkeepers and groundsmen are using alternatives to traditional chemicals as costs rise and environmental regulations change. Local authorities in San Francisco and New York in the USA have banned the use of pesticides on playing fields. Compost Tea is being used instead, with the benefit of improved recovery time of sports turf after heavy use.

Compost Tea users have reduced fungicide use on sports turf by up to 100% and experienced less turf disease. The beneficial organisms and micronutrients in Compost Tea can also assist weed control, improve root penetration without promoting top growth and lower the maintenance costs of worn sports turf.



The well-known playing fields at Oakham School have benefited from regular applications of Compost Tea.



Compost Tea is popular with golf course greenkeepers, especially to improve root structure in sandy soils.

Agriculture

Compost Tea is being used in conventional and organic agricultural production all over the world. Healthy crops grown with Compost Tea are less susceptible to disease, for example in potatoes and field vegetables. The Compost Tea is used as a means of low-cost growth stimulation and to build a sustainable soil structure. An added benefit has been improved tolerance to drought and reduced irrigation.

As costs increase there is considerable interest in using Compost Tea to reduce fertiliser and agrochemical use in arable crop production. Results of UK trials with wheat and oil seed rape and the use of Compost Tea with tomatoes in South Africa are given later in this brochure.



Wheat trial plot where 25% increase in yield, higher specific weight and higher protein has been achieved.



Swiss chard grown under glass from plugs that are pre-dipped in Compost Tea.

Horticulture

As fungicide and fertilizer costs increase, Compost Tea offers an economical alternative in quality plant production. Whether used in greenhouse production, container stock or field planting, Compost Tea can be used as part of existing application programmes to reduce the amount of artificial fertiliser and fungicides required. Applied to leaves, the beneficial micro-organisms colonise plant surfaces, prevent disease-causing organisms from gaining a foothold and leave the plants looking healthy.



Landscaping

Compost Tea use in the landscaping industry is one of the fastest growing areas of use. A wide range of benefits are realized with the addition of Compost Tea to existing contracts as well as new landscape projects. Turf, ornamentals and trees all benefit greatly from Compost Tea, with users commenting that the plants have a 'compost tea glow'. Producers such as James Coles Nurseries in Leicestershire, who are wholesale producers of container-grown trees and plants, have reduced their fertiliser rates by more than 30% and improved environmental conditions without compromising plant performance and vitality.

Viniculture

The use of Compost Tea in commercial wine making is gaining momentum in many countries, including the USA, Taiwan, Italy and the UK, where producers are using it as an alternative to standard chemicals. Compost Tea users have experienced reduced incidence of powdery mildew and botrytis and increased vine and soil health, resulting in improved fruit quality. The effects of application have been especially successful where the Compost Tea solution was blown into the vine canopy using a low pressure rotating disc sprayer.



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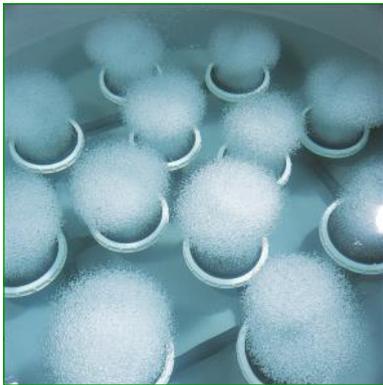


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Pioneers of Compost Tea Production and Use

Growing Solutions in the USA has been a leader in the Compost Tea industry since 1996, and is committed to its successful evolution. They work with several laboratories that measure the microbial, chemical and physical characteristics of Compost Tea made in their Compost Tea Systems and in the formulation of supporting products such as Compost Tea Catalyst. The systems are now sold all over the world and used in all types of the growing industries.

Growing Solutions' Compost Tea Systems are designed to optimise the mechanical and biological processes of Compost Tea extraction. The keys to successful and consistent results are high levels of oxygen throughout the brewing process, the highest quality compost, suitable additives to sustain the micro-organisms in the brew and easy-to-clean equipment to reduce contamination from anaerobic agents.



High Oxygen Levels with Fine Bubble Air Diffusion

Growing Solutions patented Compost Tea Systems are engineered to create the highest levels of dissolved oxygen. Tests in the UK have shown a consistent level of 13ppm throughout the Compost Tea extraction process. The systems feature Fine Bubble Diffusion technology using air discs located in the base of the tank and supplementary air diffusers which supply oxygen directly amongst the compost being used for extraction.



Compost Tea Catalyst

A key feature of Compost Tea Systems is the catalyst added during the brewing process to feed the rapid multiplication of micro-organisms stimulated by the high oxygen levels. The catalyst is a unique blend of ingredients such as seaweed extract and minerals formulated to stimulate microbial growth and diversity. It has been designed to suit use in organic production and carries OMRI certification.

High Quality Compost

In theory, any well-made compost can be used to make Compost Tea. However, it is essential that the compost has been properly made to BSI PAS100 standards to ensure the absence of harmful pathogens. The make-up of the compost should also be considered; high green waste content or high wood content composts can produce a very different balance of bacteria and fungi in the compost tea. This, in turn, can suit different types of application. See page 7 for details of MycoLife Compost Tea Compost.

The Compost Tea System Range



System10 (40 litres)

- a basic, entry-level compost tea brewer, ideal for gardens, small nurseries and research centres

- Air delivery by 220v piston air pump
- UV stabilized polyethylene tank
- Polypropylene valves/fittings
- Stainless steel fasteners
- Weight 12Kg
- Dimensions 51 x 51 x 71 cm

500g of Compost Tea Catalyst with a System10 is enough for up to five 40 litre brews. Needs 1.5-2 litres of compost per brew.

System25 (100 litres)

- a professional specification brewer, ideal for 1 ha areas such as gardens, nurseries, small farms, garden centres and sports fields

- 220v diaphragm air pump (RoHS compliant)
- UV stabilized polyethylene tank
- Polypropylene valves/fittings
- Stainless steel fasteners
- Weight 41Kg
- Dimensions 94 x 94 x 117cm

2Kg of Compost Tea Catalyst with a System25 is enough for up to ten 100 litre brews. Needs 3-5 litres of compost per brew.



System100 (400 litres)

- ideal for 5-20 ha gardens, nurseries, mid-size farms, landscape contractors, commercial growing operations and sports facilities

- 115/230v 50/60Hz air pump
- UV stabilized polyethylene tank
- Polypropylene valves/fittings
- Stainless steel fasteners
- Weight 114Kg
- Dimensions 163 x 137 x 140cm



4Kg of Compost Tea Catalyst with a System100 is enough for up to five 400 litre brews. Needs 12-20 litres of compost per brew.

System500 (2000 litres)

- ideal for large growing operations, sports facilities and golf courses

- 115/230v 50/60Hz air pump
- UV stabilized polyethylene tank
- Polypropylene valves/fittings
- Stainless steel fasteners
- Weight 250Kg
- Dimensions 228 x 202 x 157cm



20Kg of Compost Tea Catalyst with a System500 is enough for up to five 2000 litre brews. Needs 60-100 litres of compost per brew.

Compost Tea Field Trials 2009-2013

Trial Details

Farm and Crops

Compost Tea was applied to conventionally farmed crops as part of normal farming practice. It was the farmer's decision as to when and how often it was applied. Equally, if the farmer felt that agrochemicals and artificial fertiliser were required, it was his decision to apply them.

This approach ensured the trial was as much as possible part of the farming plan and made the outcomes more relevant to the commercial necessity of profitable farming.

Trial Methods

The method varied slightly between the years:

2009

Wheat; 4 x 0.3ha strips:

1. Compost Tea only
2. Compost Tea plus half rates of fertiliser and pesticides
3. Compost Tea plus normal rates of agrochemicals
4. Agrochemicals only

2010 & 2012 - Wheat

2011 - Rape

2 x 1ha strips:

1. Compost Tea plus half rates of agrochemicals
2. Agrochemicals only

2013 - Linseed

2 x 1ha strips:

1. Compost Tea plus normal rates of agrochemicals
2. Agrochemicals only

Compost Tea applications were made immediately after harvest as a soil drench and then in the Spring as growing got underway. Foliar sprays were applied between once per week and every 4 weeks depending on the farm schedule, weather conditions and disease pressure.

Analysis

The input costs of fertiliser, agrochemicals and Compost Tea compost were calculated.

The yield from each strip was recorded and a sample from each strip laboratory tested for:

Moisture content (%)
Hectolitre weight (Kg/hl)
Hagberg Falling Number
Protein (%)

Subjective assessments of plant condition, size, root mass and density were also made at stages during the growing season.



Farm Trial Site with Wheat, Oil Seed Rape and Linseed

Trial Highlights

Crop Yield

Year 1 Wheat (2009):

- Cost reduction was nearly 25% when Compost Tea was used with half-rate agrochemicals and fertiliser, but yield only reduced by 15%.

Year 2 Wheat (2010):

- Yield increased by 25% where Compost Tea was used, but the input costs per ton were almost identical. There was a net gain in income of £145 per ha.

Year 3 Rape (2011):

- Yield increased by 27% where Compost Tea was used.

Year 4 Wheat (2012):

- Yield increased by 14% where Compost Tea was used. A comparison between the 2010 conventional strip and the 2012 strip where Compost Tea was applied shows a 63% increase.

Year 5 Linseed (2013):

- Yield increased by 77% where Compost Tea was used. In adjacent one hectare strips a typical yield of 1.4 t/ha increased to 2.4 t/ha where Compost Tea was applied.

Crop Quality (Wheat)

Specific Weight

- Where Compost Tea was used in 2009 and 2010 the specific weight was not significantly different from the conventional strip.
- In 2012 (a year of very poor crop quality throughout the UK) the specific weight was 70 kg/hl where Compost Tea was used, compared to 64 kg/hl from the conventional strip.

Protein

- Protein levels were either not significantly different or, in 2010, 14% higher where Compost Tea was used.

Hagberg

- Levels were low throughout the field in 2009 and 2010 but in 2012 reached 258 where Compost Tea was used, compared to 223 in the conventional strip.

Drought, Cold and Wet Tolerance

- Growing conditions in both 2010 and 2011 included extreme drought in the early part of the season. As on many farms, crop establishment was patchy and some re-drilling was necessary. However, as the photos opposite illustrate, where Compost Tea was used, the plants were larger and looked in better health.
- UK 2012 harvest conditions were some of the worst ever experienced and yet crop quality and yield was significantly better where Compost Tea was used.
- In the 2013 trials, there was a clear difference in the Linseed where Compost Tea was used. Root growth was greater and the plants came into flower earlier despite the coldest Spring for 50 years. In the Compost Tea plot, the Linseed produced around two and a half times the amount of straw.

Compost Tea Field Trials 2009-2013

Visual Differences

Sample of wheat where Compost Tea has not been applied



Sample of wheat where Compost Tea has been applied

- Wheat from the 2010 trial shows clear differences between plants grown in the conventional strip and where Compost Tea was used.
- The plants sprayed with Compost Tea had longer roots and higher root mass, allowing the plants to access moisture lower down in the soil, despite the drought conditions.
- This improved the overall quality and colour of the crop and the yield was 25% higher.



- Oil Seed Rape from the 2011 trial shows clear differences in leaf size, root length and root mass between plants grown in the conventional strip and those grown where Compost Tea was used in another drought year.

Soil Biology

The soils in the trial site were tested two years after the first application of Compost Tea. The results were compared with levels of bacteria, fungi and protozoans that could be expected in healthy soil.

	Active Bacteria (µg/g)	Total Bacteria (µg/g)	Active Fungi (µg/g)	Total Fungi (µg/g)	Protozoans (per g)			Nematodes (per g)	
					Flagellates	Amoebae	Ciliates		
Conventional	50.6	148	0	3.95	331	0	0	0	
Compost Tea	62.0	177	1.35	5.55	335	0	55	0.03	
Expected range	Low	10	100	2	50	5000	5000	50	10
	High	20	200	10	100			100	20

The trial site is medium limestone brash that has been conventionally and intensively farmed with arable crops for 60 years. Although clearly there is a long way to go before the soil reaches all of the expected ranges for healthy soil, there has been some significant improvements to the biology where Compost Tea has been used. This is reflected in the gradual improvements in yield, plant health and soil structure - and has been a major factor in the farmer's decision to expand his use of Compost Tea on the farm.

Compost Tea - Vegetable, Horticultural and Turf Experiences

Growing trials and commercial scale use of compost tea



Commercial scale lettuce grown under glass in Switzerland and tomatoes grown in a poly tunnel in South Africa



- both sprayed only with Compost Tea



Comparative pictures of different vegetables grown with and without Compost Tea in an open raised bed

Typical results of using compost tea:

- Higher yield of produce (or at least as good as where chemicals were used), with more consistent size
- More foliage, better formed trusses (tomatoes) and longer and more developed root systems
- Higher brix readings (tomatoes), more crunchy, crisp and flavoursome (radishes)
- More substantial, less spindly foliage and more flowers (calendula)
- Virtually no disease effects (tomatoes) and reduced pest infestation



David Millais and Michael Alms, CEO of Growing Solutions

Millais nurseries report excellent results

David Millais, award-winning rhododendron grower, comments:

- We have been delighted with the results of using Compost Tea. So far we have only applied one fungicide, and have relied on the tea and a few other organic based products in rotation.
- Compost Tea made with the Growing Solutions system has proven to be economic, quick to use, easy to apply and clean up.
- Our plants are looking better than ever - darker green foliage and typically clean of all diseases, though they have seen a little mildew on some particularly prone varieties (varieties which in fact we had given up growing until recently because they were so bad!)



The plants are looking better than ever



James Moffat and Harry Hitchcock of James Coles Nurseries

James Coles nurseries use Compost Tea to reduce sprays and gain a marketing advantage

James Moffat and Harry Hitchcock explain further:

- Crop protection products are disappearing from the market all the time and those that remain are increasingly expensive, so it makes business sense to examine alternatives.
- Compost Tea provides a real tonic to the plants and helps protect against fungal, bacterial and disease problems like leaf scab and downy mildew. We have reduced spray usage because the plants seemed more vigorous and stayed cleaner.
- Improved health has also enabled us to reduce the amount of controlled release fertiliser we use, from 6 to 4 kg/m³.
- The fact that our plants are being produced with less chemicals is a useful marketing advantage when selling into the amenity, landscaping and garden centre trades.



Fertiliser use reduced by 33%



Michael Alms and Richard Dexter, Head Groundsman at Oakham School

Oakham School cut fertiliser costs by around 75% following a switch to Compost Tea

Richard Dexter, Head Groundsman at Oakham School, comments:

- Using Compost Tea as part of a more sustainable and environmentally friendly turf care regime has been very successful in restoring the health of a selected trial area.
- Compost Tea is very safe to make and use, and on the trial area is proving beneficial to the grass and soil, and I believe we are improving the quality of both far quicker this way than we would by any alternative method. In addition, we have almost totally eliminated Poa annua (annual grass meadow) and all the pitches look much better.



Oakham School Compost Tea Trial Site

Making and Applying Compost Tea

Compost Tea Step by Step

1. Fill the tank with water to the fill line and start aeration

Untreated rainwater at 15-24°C is the ideal water source. The warmer the water the more quickly and effectively the microbes from the compost will multiply. If chlorinated water from the mains supply has to be used, it should be aerated in the Compost Tea System tank for at least 30 minutes to drive off the chlorine before adding the compost.



2. Add Compost Tea Catalyst to the water

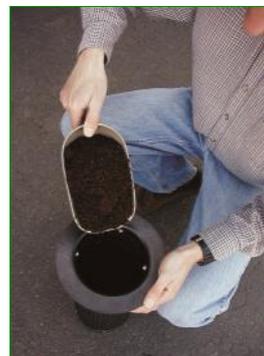
Compost Tea Catalyst is a balanced food resource that provides additional ingredients to feed the microbial population that grows rapidly during the brewing cycle and sustain microbial activity during Compost Tea application. Other components can be added to the brew, such as single species fungi additives to address a specific cultivation problem or fish protein hydrolysates to provide an added nitrogen source and amino acids for growth of the micro-organisms and to boost plant yield.



3. Loosely add high quality compost to the compost basket

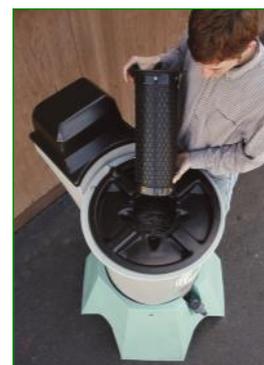
Type of compost The highest quality compost should always be used to make Compost Tea. The compost should be properly finished, sourced from predominantly green waste and contain a high diversity of beneficial micro-organisms. Specially formulated MycoLife Compost Tea Compost, which ensures consistent high quality compost tea in every brew, is available from Martin Lishman Ltd (see panel on right).

Amount of compost A very small amount of compost is required relative to the amount of water. The density of the compost will determine how much is required per brew, but the compost baskets in the brewer should be $\frac{2}{3}$ to $\frac{3}{4}$ full. This typically means 3-5 litres of compost per 100 litres of water in the brewer.



4. Place compost basket into the basket tray

Compost is placed in the basket and suspended in the water so that the aeration system forces air through the compost and strips the microbes from the compost. The compost is held in one place so that the bubbles from the aeration discs can more easily interact with the compost particles. The mesh size of the basket is designed to allow bacteria and fungi to pass through but with only a minimum amount of compost particles. This makes filtering the Compost Tea during application much simpler.



Key points when making Compost Tea

- Compost Tea cannot be over-applied since it is completely natural and organic
- There is no single application rate or frequency
- High quality green waste compost should always be used
- Compost Tea should be applied as soon as possible after brewing
- Most conventional spraying and irrigation equipment can be used
- Always clean all parts of the Compost Tea System and spraying equipment immediately after use

MycoLife Compost

MycoLife compost was developed to achieve a balanced, high quality compost, rich in bacteria, fungi and protozoa, specifically suitable for making Compost Tea. Temperature, moisture, chemical analysis and microbiological activity and diversity are monitored to ensure the inherent variability of compost is kept to a minimum.

Every batch is tested before packing:

	Test	Expected range
Active Bacteria (µg/g)	168	15-25
Total Bacteria (µg/g)	815	100-3000
Active Fungi (µg/g)	19.9	15-25
Total Fungi (µg/g)	406	100-300
Protozoa (per g)	84760	20000
Nematodes (per g)	26	20-30

Making and Applying Compost Tea

5. Insert diffuser into compost basket

To ensure complete aeration of all of the compost in the basket, an air diffuser system is used in the System 25 and System 100 Compost Tea Systems. The diffuser forces oxygen into the centre of the compost in the basket and makes sure that all the microbes are stripped away. The System 10 does not require a diffuser because only a small amount of compost is used and the oxygen can easily penetrate it. The System 500 uses additional aeration discs in the compost basket because the volume of compost is large and it is important to maintain complete oxygenation throughout the brewing process.



6. Replace tank lid and aerate for 24 hours

A complete production cycle with a Compost Tea System is just 24 hours. The tea should then be used as quickly as possible to avoid deterioration of the living organisms, preferably within 18-24 hours and no longer than 48 hours after production. Application should be early or late in the day and preferably just after rain or dew formation. If it is not applied immediately it should be stored in a cool, dark place or kept within the tea system with the aeration continuing.



7. Application of Compost Tea

When to apply Compost Tea Compost Tea should be applied throughout the growing season every 14-30 days, but up to once a week in times of disease pressure, other crop stress or if the soil quality is poor. Applications are usually in the form of a foliar spray but prior to or just after planting a soil drench of Compost Tea can be beneficial. Soaking plug plants in Compost Tea prior to planting can also help in early growth stages. As Compost Tea contains living micro-organisms, it is not advisable to mix it with fungicides or other pesticides. If these chemicals do need to be used, apply them beforehand. Then the Compost Tea that follows will help to restore the beneficial micro-life that may be destroyed by the chemical.

Application rates Compost Tea can be used undiluted in situations of extreme disease pressure or diluted to provide adequate coverage or to suit the size of the sprayer. A typical application rate is 100-200l/ha but in drip irrigation or dosing systems the dilution can be as high as 1 to 100. Compost Tea cannot be over-applied because it is completely natural and organic. Users tend to find a rate and frequency to suit both their operation routines and the beneficial outcomes in terms of plant growth and disease suppression.

How to apply Compost Tea Any conventional type of application equipment such as trailed, tractor mounted, wheelbarrow, air-assisted or demount sprayers, overhead glasshouse applicators, drip irrigation systems, backpack sprayers and even watering cans can be used to apply Compost Tea. Some changes to filtration and nozzle type may be required to allow for the slight suspension of compost particles that can result from the brewing process. An ideal level of 2-2.5 bar spray pressure should be used to ensure microbes (especially fungi) are not damaged during application. Martin Lishman manufactures a range of compact sprayers, all of which are ideally suited to Compost Tea application (see www.martinlishman.com for more details).

Cleaning the tea system after application Cleanliness is critical to successful Compost Tea use and application. If any equipment has been previously used with chemical it must be thoroughly cleaned to avoid killing the beneficial microbes. Equally, Compost Tea Systems should be dismantled and cleaned after use to avoid a build up of anaerobic bacteria which can have harmful effects on the Compost Tea and the plants treated.



FURTHER INFORMATION

For further details about compost tea or Compost Tea Systems, please contact us as below and we will do our best to answer your questions.

We reserve the right to alter product specifications at any time without notice.
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Your Growing Solutions Compost Tea System Supplier: