EM AGRITON SYSTEM
Horticulture Manual

Working Together For a Sustainable Profitable Farm

www.effectivemicro-organisms.co.uk

Index Application manual - EM & Horticulture

a biological approach

Instructions for usage of Effective Micro-organisms (EM-1®)

CULTIVATION

COMPOSTING & GRASS

Instructions for usage of Effective Micro-organisms (EM-1®)

Preparation and application.

EM (abbreviation) for Effective Micro-organisms contains many different strains of micro-organisms that have been collected from natural sources and grown using a specific technical method. This method and specific unique mixture have been developed by Professor Higa from the University of Ryukyus in Okinawa, Japan. The main strains of micro-organisms in EM are from five major micro-organism groups; lactic acid bacteria, photosynthesising bacteria, yeasts, fungi and actinomycetes. These micro-organisms have been used medicinally and in food processing for many years. This gives some indication as to how safe EM is and the benefits brought to the health and wellbeing of plants, soil, animals and human beings.

EM-1, EM-Activated and Ready-to-use ACTIFERM
EM-1 is the name given to the dormant concentrate of Effective Micro-organisms, that EM Limited supplies in plastic bottles of 1 litre and large containers of 10 litres. To apply these Effective Micro-organisms for agricultural use the EM-1 must first be activated. The activation of EM-1 is acheived by adding sugar cane molasses and water which allows the EM to start multipying. This activated EM is known as EM-Activated (EM-A) and is prepared as follows:

Total:		**10 litres EM-A**	**100 litres EM-A**	**1000 litres EM-A**
EM-1	5%	0.5 litre	5 litre	50 litre
Sugar Cane Molasse	5%	0.5 litre	5 litre	50 litre

The EM-A needs to be then diluted with water (1: maximal 100), and can then be used for many different applications. **The EM-A diluted solution must be used within 48 hours. The EM-A before dilution can be kept for a month in an airtight vessel.**
We also have EM –A now available for people who don't want to brew their own. ACTIFERM is available in 3L and 20L packaging.

Applications:

The usages for EM-dilutions are widely divers and achieve an increase in the microbial diversity. These dilutions can be used for the following applications:

Soil improvement & 10 Litres EM-A dilution per 100M2.

Plant fertilizer spray or use a watering can to apply 5-6 x per growing season

Compost activation 1 litre EM-A dilution per m3 compost.

Seed disinfectant Immerse in 1 litre EM dilution for 30 minutes.
Bulbs and tubers: 1 hour (Infected with Fusarium 6-7 hours)
Potatoes: 30 minutes (Infected with ralstonia solanancearum
2-4 hours

EM products that can be used in horticulture:

EM-1®: Microbial liquid containing a variety of different micro-organisms which are derived from 5 major bacterial groups; lactic acid, phototrophic, yeasts, fungi and actinomyecetes.

Supplied in a dormant state (EM-1) which need to be activated in an incubator during a period of 7 days, with a sugar cane molasses.
EM-1 is a soil activator and precipitator for nutrient uptake.
EM-1 also contains amino acids and other bioactive substances that strengthen plants.
EM-1 is a living product and has a shelf-life of 12 months after production.

ACTIFERM: Ready-to-use activated EM-1 . All the work has been done for you, Quality controlled to gaurantee results each time.
Supplied in various size vacuum containers for ultimate freshness.
A special technique in our laboratories gives a shelf life of 12 months.

EM-5: A microbial active mixture , vinegar and spirits (alcohol) that acts as an insect repellent. Insects will be driven away by a thorough soaking with EM-5.

EM-FHE: EM Fermented Herb extract is a microbial preparation based on plant extracts. This product strengthens plants and increases immunity. Due to the large number of micro-elements and micronutrients, this product has already proved its worth as a plant foliage nutrient.

Horti-plus : An extraordinary plant nutrient with a homeopathic base. Horti-plus takes effect by reaching even the tiniest particles. As with the other products mentioned above, it is equally harmless for both human and plant life. A capful in 10 Ltrs of water is sufficient once a month.

Agrisanum: This product is unique, consisting of Bentoniet clay minerals and enriched with organic Germanium that does not contain any chemical pesticides. Agrisanum strengthens plants from germination to harvest by providing natural immunity to viruses, fungi and parasites as well as the harmful effects of flies affecting carrot, leek, onion and cabbage crops.

Grow-Best:
Organic fertiliser made from all natural ingredients:
Grow Best is a unique fertiliser which is valued for its percentage of organic matter rather then The NPK content. Sustaining and improving soil makes good sense. Often the soil organic matter content is diminished due to intensive growing and the use of herbicides and synthetic fertilisers.
Good soil management can improve the nursery growers profits by reducing plant disease, improving plant growth and providing a stronger end-product that has much more chance of survival than the average garden centre plant.

Why Grow Best can replace a traditional fertiliser.

Most organic matter added to a soil decomposes over a few years as animals and micro-organisms feed on it. This process releases nutrients for the plants to grow. During this period of decomposition organic matter is often called the active fraction and this fraction can quickly change with changes in soil management.

Most of the remaining organic matter does not break down so easily – it can take many years. This more stable matter is known as humus. Both active and stable soil organic matter make important contributions to binding soil particles together in top stable aggregates that give soil its crumb like structure. They improve a soils workability, root penetration, and water and nutrient holding capacity. Soil organic matter can be both financially and environementally beneficial to a nursery enterprise.

Properties of Grow Best: Excellent all-round fertiliser for all Flowers, Vegetables, Lawns, Shrubs & Trees.

- Water and air enter and circulate more freely in the soil.
- Improved root penetration
- Water-logging and surface water is reduced which in turn reduces soil erosion
- Plant growth and establishment benefit from improved water and nutrient availability.
- Soil workability improved which cuts cultivation costs.
- Soil is more resistant to compaction
- Storage and supply of plant nutrients –N P K and micro-nutrients is improved.
- Cation exchange capacity which governs nutrient availability for plant uptake is improved
- Soil needs less lime because of improved soil Ph buffering.
- Carbon and energy are available for the soil micro-organisms that cycle nutrients and fight disease.
- Contaminants are bound up reducing the negative environmental effects of pesticides, heavy metals and other pollutants.

Ingredients:

Worm cast, cinus communis (castor-oil plant) ,Clay Minerals, Basalt powder (volcanic rock dust), Seaweed extracts, Trace Minerals, Effective Micro-organisms.

Organic Material 62% NPK 5-4-2
Packaging 40 Litre (approx 23 kg) treats 100 M² soil
Use: 1 Litre per 2x M²

Edasil clay minerals: This product has a tremendous swelling capacity due to the specific plate-like structure and is therefore able to bind together a large amount of water and nutrients. In addition, it contains all of the essential micro-elements in a balanced dose.

EDASIL®

Natural Calcium-Bentonite

The Soil Adjuvant for Gardening and Agriculture

„Soil“ (top soil) is a conversion product of minerals and organic substances which is saturated with water and living beings (e.g. worms, bacteria; important for the creation of humus) and permits plant growth.

Mineral Substances = Clay Minerals

Montmorillonite (main ingredient in bentonites) is a so-called triple-layer clay mineral.
Because of their disc-shaped crystal structure these triple-layer clay minerals have a very high specific surface (600 - 800 m²/gram) with the ability to store water molecules and nutrient ions on their surface.
A soil's ability to retain water (particularly in sandy soil and especially with strong solar radiation) significantly increases when a triple-layer clay mineral is added, so that the water stored in the soil is available to plants over a longer period of time.
Another important characteristic of these clay minerals is their high capacity for ion exchange. So-called “crystal mistakes” cause the clay minerals to be negatively charged, which is why they can bind nutrient ions such as potassium, ammonia, calcium and magnesium. A specialty of this bond is that bonded nutrients are largely protected against being washed out, but can still be absorbed by the plants.

Organic substances = living organisms (worms, bacteria), humus, humic materials

Combined with the minerals they cause:
the soil’s crumb structure, its readiness for cultivation, as well as absorption capability, and act as nutrient deposit for plants.
By adding triple-layer clay minerals (bentonites) in soil with organic substances plant growth and health can be effectively ensured through better storage of water and nutrients in the soil.

These soil properties are achieved with the clay mineral product **EDASIL®**, a bentonite montmorillonite made from choice Bavarian clays.

EDASIL®	is a soil adjuvant for gardening and agriculture.
EDASIL®	is a natural clay mineral product, without chemical additives.
EDASIL®	is a calcium bentonite with a very high portion (65-70%) of the triple-layer clay mineral montmorillonite, which is important for soil improvement.
EDASIL®	can be easily dosed and is low in dust because of its fine granulation.

EDASIL® Fine Granules

Natural Calcium-Bentonite

Typical values

Montmorillonite content	%	65 - 70
Specific surface	m^2/g	500 - 600
Water uptake capacity (Enslin-Neff)	%	220 - 250
Electric conductivity	$mS.cm^{-1}$	1,04
Na	$mmol.l^{-1}$	0,65
Cl	$mmol.l^{-1}$	1,09
Dioxin Content,TCDD nach WHO	**ng TE/kg**	0,22
pH-Wert (KCL)		7,9
Mn-activ	mg/kg	25
P-AL	mg/kg	15
Ion change capacity (CEC)	mval/100 g	70 – 85
Basic efficiency	%	4 - 6
Bulk density	g/l	900
Water content	%	6 - 8

Chemical analysis

SiO_2	ca. 56,0 %	MgO	ca. 4,0 %
Fe_2O_3	ca. 4,0 %	K_2O	ca. 2,0 %
Al_2O_3	ca. 16,0 %	Na_2O	ca. 0,4 %
CaO	ca. 4,0 %	Ignition loss	ca. 10,0 %

Heavy metals

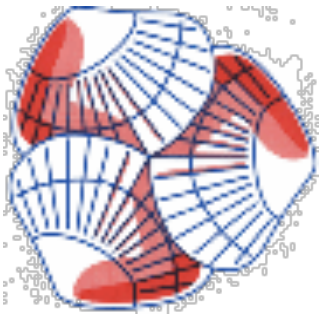
Chromium	ca. 56 ppm	Molybdenium	ca. 20 ppm
Lead	ca. 18 ppm	Nickel	ca. 25 ppm
Copper	ca. 22 ppm	Zinc	ca. 85 ppm
Manganese	ca. 300 ppm	Arsenic	ca. 6 ppm
Cadmium	< 1 ppm	Mercury	< 1 ppm

Particle size

EDASIL® Fine Granules	< 0,5 mm	< 1%
	0,5 – 1,0 mm	20 - 40%
	1,0 – 2,0 mm	60 - 80%
	>2,0 mm	max. 2%

September 2002

Ostrea seashell lime: Slow release trace minerals from the sea.
One advantage of sea shell lime is that its effect is long-lasting and can therefore avoid pH values that are either too high or too low. The pH value is therefore influenced over a fair period of time which results in optimal plant growth.



OSTREA®

Crushed Sea-shell lime

Feedstuffs: Min 38 % Calcium Max. 5 % Insoluble in Hcl

Ostrea Crushed Sea Shells is a source of lime derived from natural shell banks in the North Sea. The shells are dried and then crushed providing a slow release rich source of calciumcarbonaat (96.1 %) with a minimal water content. The dry matter percentage is 99.5 %.

A mineral analysis has been undertaken by LabCo BV, Europoort Rotterdam, dated 10th februari 2005 resulting in the following:
Test number : 392653 Analysis number :063653

Analysis results:

Calcium	44	%
Ash	99.44	%
Arsenic	9.7	mg/kg
Cadmium	0.02	mg/kg
Mercury	0.04	mg/kg
Lead	1.8	mg/kg
Fluoride	51	mg/kg
Sodium	5000	mg/kg
Potassium	150	mg/kg
Magnesium	450	mg/kg
Zinc	18	mg/kg
Manganese	55	mg/kg
Cobalt	16	mg/kg
Selenium	< 0.1	mg/kg
Chloride	1130	mg/kg
Phosphate	12	mg/kg
Sulfur	470	mg/kg
Copper	12	mg/kg
Iron	4400	mg/kg

Nature had dosed the correct balance of spoor elements !

VULKAMIN

Top dressing remineralisation.

Using VULKAMIN Prehistoric Rock Meal is the best way of producing fertile soils over a long period of time

Prehistoric rock meal *matured over millions of years.*

resulting in:
improved natural growth
healthy soil
healthy food

From the Kaiserstuhl, the famous winegrowing region of volcanic origin, situated in the south-west of Germany, comes one of the most effective and most healthy preparations for soil improvement: the prehistoric rock meal VULKAMIN.
Particular characteristics:

- natural richness in nutrients and trace elements
- extraordinarily high content of zeolites and soluble silicic acid

VULKAMIN prehistoric rockmeal consists of finely ground phonolite, a silicate rock of volcanic origin which is alkali-rich. Naturally rich in nutrients, trace elements and soluble silicic acids and its mineralogical peculiarity is that it contains zeolites*, which are special hollow part minerals.

***VULKAMIN* prehistoric rock meal is not a "fertiliser" in the traditional sense but a real agent to improve soils.** Thanks to the very finely ground elements *VULKAMIN* has large active surfaces and is thus effective even in small quantities.

- enriches the soil with nutrients, trace elements and other useful elements in a wellbalanced proportion – fundamental to healthy balanced plant nutrition.
- balances "loss of calcium" by its alkaline effect and stabilises the soil at a favourable Ph level - an important condition for good availability of nutritients, intact soil life and a good soil structure.

- rich in soluble silicic acid which is directly absorbable for plants and strengthens their resistance to fungal disease and other harmful organisms - the use of chemical-synthetic fungicides can thus be reduced.
- activates available reserves of phosphates in the soil by adding silicic acid - large unused deposits of phosphates can be better used.
- increases the quantity of available sodium, which has the same regulating effect as potassium in the water balance of plants and activation of enzymes - the quantity of potassium needed by plants will thus be reduced and the yield of certain useful plants (such as cabbage, barley) will be increased. Potassium also helps to give grazing animals a healthy diet.
- dissolves gradually, providing nutrients and trace elements evenly over a long period of time - the result is a mild effect and a long-lasting improvement of available nutritive elements in the soil. Erosion is reduced to a minimum.
- improves conditions for micro-organisms living in the soil, especially for nitrogen-binding bacteria.
-

***Zeolites - Minerals with very special qualities**

•From the mineralogical point of view *VULKAMIN* prehistoric rock meal has a very high content of zeolites - zeolites are hollow part minerals with astonishing qualities:

•*Zeolites* are able to store nutrients and to supply them later on. They help to reduce the loss of nutrients caused by erosion.

•*Zeolites* react as catalysts: they accelerate and activate natural processes and reactions.

•*Zeolites* can also be used in the technical sector, for example in drinking water purification systems.

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How to use VULKAMIN Prehistoric Rock Meal?

VULKAMIN prehistoric rock meal can be spread out at any season of the year. The best method is to distribute it just on top of the soil or to mix it in to the upper layer of the soil.

General Recommendations

When using VULKAMIN for the first time you should distribute about 2 ton (2000kg) per hectare - except if you are using high dosages. Available in 1000kg Big bags & 23kg bags

Bokashi: This is a bran-based fermented organic material based on brewer's grains for animals, plants and soil. Bokashi is a source of nourishment for micro-organisms that grow in the soil. These establish themselves on a permanent basis in the soil, multiply and then dominate the harmful bacteria, viruses and fungi that are present.

Fermentation tanks with heating element and airlock: Plastic cask with electric heating element for a volume of 30, 60, 120, 220, & 1000 litres for fermenting EM-1 into EM-A. EM-1 is a dormant microbial solution which is activated before application with sugar cane molasses (c6 carbon) .

Book "The secrets of a fertile soil": This book has been written in a style that is readable even for those who do not work in agriculture. It describes in a nutshell how we can produce crops in an environmentally responsible manner. The reader is introduced briefly but thoroughly to the processes that take place in the soil and how a balanced nutrition for plants can be achieved. Agricultural knowledge is needed in order to produce crops that are safe and healthy for all. After reading this book, the methods of growing crops can be looked at from another viewpoint.

Book "Effective Micro-organisms": Dr Higa describes in this book the secret of EM and explores all the possibilities of the concept. In a language that is easy to understand, he examines the current problems encountered in agriculture and how EM products can be used to counteract them.

Film "Life in the soil": This film shows the enormous diversity of life in the soil and the various processes that take place there.

Instructions for using an airlock with cork.

An airlock with cork is used to make EM-A from the dormant EM-1 solution. This is an anaerobic process. (anaerobic = without oxygen/air)

Fill a 1 litre plastic bottle with: 50 ml EM-1
50 ml Molasses
900 ml warm water with a temp. of ±Celsius

Press the rubber cork into the bottle
Press the airlock into the cork and pour a small amount of water into the airlock.
This allows water to escape from the vessel but no air to enter. The oxygen in the air can affect the EM as some of the bacteria can only survive in anaerobic conditions.
When the 'brewing' or 'fermentation' process is finished (7 days) the airlock can be removed from the bottle. A cap must then be placed on the bottle. It is important to use a plastic bottle as the living organisms present in the EM-A can expand with varying temperatures.

Alternatively the 1 litre EM activator can be used which has been specially designed for this purpose and also ensures that the EM is activated at the optimal temperature through means of the inbuilt warming system. This activator is part of the 'Naturally Active' range of products. For more information see www.emnaturally-active.com

Instructions for using the 30, 60, 120 & 220 litre fermentation tanks.

EM Fermentation tanks.
The EM fermenters are ideal to activate the EM-1 with the sugar
Cane Molasses and water to an activated EM which is then ready
for use after dilution.To ‘wake-up’ all the organisms in the
dormant EM-1 solution the fermentation tanks are easy to use and
ensure a complete process.
These activator tanks are available in the following sizes: 30, 60,120 and 220 litres.
The airlock on the top allows air to escape which is formed in the natural fermentation process but ensures that no air can enter the vessel.
The warming element which is supplied with the fermentation tank ensures a constant optimal temperature during the activation process.

Airlock

Fill the outside ring with water. This allows CO_2 (gas) to escape and prevents oxygen entering.

Tap
When the EM-A is ready it can be easily tapped off via the
tap near the base of the activator

Warming element
The warming element ensures a constant temperature in the tank.
A temperature of approx. 30° C is the most effective temperature to multiply the micro-organisms.

The EM system for glasshouse horticulture

- ✓ Smooth out the ground surface after the first tillage.
- ✓ Spread out the organic matter such as compost etc. evenly over the greenhouse area and work this into the ground evenly.
- ✓ Steam.
- ✓ Spread the Bokashi evenly over the surface area (400 kg per 1,000 m^2).
- ✓ Spread the seashell lime evenly over the surface area (50 kg per 1,000 m^2).
- ✓ Spread the clay minerals evenly over the surface area (30 kg per 1,000 m^2).
- ✓ Work these three products evenly into the top 20 cm of the soil.
- ✓ The ground is now ready for planting.

The EM system for the first treatment.

- ✓ Mix 1 litre of EM-1 with 1 litre of Molasses and 20 litres of water and leave this to mature under anaerobic conditions (without any oxygen reaching it) for 7 days at room temperature. Then dilute the obtained liquid to a total of 1,000 litres of water and apply this to the land at the next rainfall per 2,000 m^2.

- ✓ If desired, apply a fungicide treatment in a lowered dose.

Making up EM after the EM system has been implemented.

- ✓ Mix 1 litre of EM-1 with 1 litre of Molasses and 20 litres of water and leave this to mature for 7 days at a minimum room temperature. The obtained liquid is now called EM-A.
  The shelf-life of this liquid is 4 - 5 weeks provided it is kept absolutely airtight.

- ✓ Dilute this liquid further at a concentration of 1:100 and apply this at evenly spaced intervals throughout the year to the soil so that the total amount of EM-1 comes to 8 to 10 EM-1 litres per year per hectare.

For making up the EM-A, we advise you to use a fermentation tank that is spotlessly clean and that has an airlock. For this purpose, fermentation tanks (with a volume of 30 and 60 litres) are available from your dealer.

EM system treatments to be repeated at yearly intervals

- ✓ Apply 400 kg of Bokashi per 1,000 m^2 to your glasshouse every year
- ✓ As above, also apply the following: 50 kg of seashell lime per 1,000 m^2
- ✓ 30 kg of clay minerals per 1,000 m^2
- ✓ Also spread at equal intervals throughout the year 0.8 litres EM-1 per 1,000 m^2.

The EM system for the container cultivation industry

Treatment of the potting compost:

Mix the potting compost with the Bokashi product in a volume ratio of 6%
(this means 6 litres of Bokashi to 100 litres potting compost). Let this mixture stand for 1 week before using it as seed/cutting or potting compost.

EM treatment for the sprinkling of container cultivation:

- ✓ Mix 2 litres EM-1 and 2 litres Molasses in 40 litres of warm water (approximately 20 ^{o}C).
- ✓ Set the thermostat at 23 °C.
- ✓ Close the fermentation tank.
- ✓ Fill the airlock one quarter (25%) up with water.
- ✓ Let this mixture stand for 1 week.
- ✓ After 1 week, you will have 42 litres of EM-A that you can use for up to 4 weeks.
- ✓ Then take 1 litre of EM-A and mix it with 1,000 litres of sprinkling water and put this in a suction tank.
- ✓ Set the dosage system up so that it applies a minimum of 1 litre EM-A per 1,000 litres water.

The importance of pH-testing:

An acidic soil must be neutralised using a chalk or chalk-rich manure. This is necessary for an optimal up-take of fertilizers. When these are widespreadly used a manganese deficiency can occur in the soil. The soil becomes infertile and poor. If application of chalk or chalk-rich fertilizers is advised, the soil acidity should be checked, this is the pH test. This allows a correct calculation to be made as to how much chalk should be spread. A pH test is easy to make and gives an accurate result. A completely neutral soil has a pH of 7.

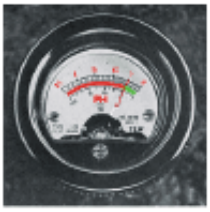

Fig. 1

Using the pH-tester.

1. Remove the tester from the carrying bag and check that the indicator is pointing to pH-7 (fig.1). If this is not the case the tester should be reset which is simple to achieve. Remove the lid with the window by gently turning to the right or the left.

2. The electrode is extremely sensitive and should be rinsed clean and dried carefully after each use, see(fig.2). This is of importance to be able to get an accurate reading. After cleaning the electrodes should not be touched at all.This includes hands which always carry perspiration which would effect the efficiency of the tester.

Fig. 2

3. To test the soil put the soil sample in the soil compartment and press down to be sure that the electrodes are buried in the soil. Stick the meter far enough into the soil so that the silver-coloured electrodes are covered in soil. Screw the meter together and turn twice to make sure the contact with the electrodes is sufficient (fig.3).

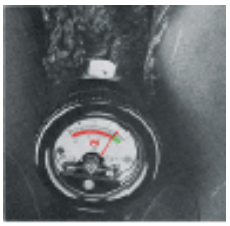

Fig. 3

The soil (such as black soil, clay, sulphur etc) need a minimum of 50 % humidity. Soils rich in Humus may have a humidity of 100% . When testing very wet soil, press the soil to remove as much liquid as possible, preferably so that the soil then has a 50-70% humidity. The pH cannot be measured if the soil is too dry. Very dry soils need to be dampened with distilled water two hours before testing.

4. Press the button on the device to measure the humidity of the soil. The humidity will be shown on the display of the device (fig.5). After use clean the electrodes thouroughly by rinsing with distilled water and drying with a soft cloth. (fig.2). It is highly unlikely to be testing soil with a humidity lower that 30%. (e.g. sand)

5. The meter takes about 3 minutes to give a reading (fig.4). Never leave the meter in the ground for longer than 5 minutes. This prevents corrosion of the electrodes.


Fig. 4


Fig. 5

Advantages of the pH-tester

1. This instrument has it's own energy supply when in contact with soil. For this reason there are no chemicals, distilled water or battery required.

2. Using this instrument is simple and efficient.

3. Compact and light making it ideal for in the pocket.

Practical tips.

1. Should the arrow on the meter move to the left and right preventing a reading, check that the electrodes are completely buried in the soil. A high salt content in the soil may effect the functionality as will a too high iron, magnesium etc content. If the soil has been recently fertilised this could lead to a false reading when the meter measures the pH of the fertiliser and not the soil in general.

2. Keep the electrodes always clean and free from rust. If part of the instrument is corroded the accuracy will be affected.
A rusty electrode can be cleaned with sand to remove the rust. After this procedure wait at least 30 minutes before using.

3. The reading may be distorted if the soil is close to a high voltage electricity tower. The pH and humidity reading will then be higher.

4. Handle the instrument with care. Do not drop it on hard surfaces or subject it to shaking or vibration. The pH-tester serves as an instrument providing information on your soil and the conditions which may affect your crops. When a negative reading is shown steps may be taken by adding the right components to the soil to ensure a good crop. This can save time, energy and finances. The humidity meter that is combined with the pH-tester has been included in this instrument so that you can be sure the humidity is correct to be able to take a pH test. It is not meant to measure the humidity only.

Plant Nursery wanting to change to biological cultivation:

The EM System can offer a good solution for any nursery wanting to change over to biological cultivation. It is important to mix any potting compost used with Bokashi. For this purpose, EM Effective Micro-organisms Ltd will get in contact with the potting compost supplier . It is recommended that at least 5% Bokashi is added to the potting compost.

In addition to adding Bokashi to the potting compost, if outside soil is to be used in the cultivation process, then this should be inoculated with:

- ✓ 4,000 kg Bokashi
- ✓ 500 kg seashell lime
- ✓ 300 kg clay minerals

(these amounts are for areas of 10,000 m^2 per year).

EM-A should be added to rain water at every rainfall when it is to be used in sprinklers.
Dosage: 1 litre EM-A per 1,000 litres water.

Making EM-A:
Make up a 5% solution of EM-1 with Molasses and water in a fermentation tank that is fitted with a thermostat and heating element e.g. 3 litres EM-1 litres and 3 litres Molasses to 60 litres water). Set the heating element at 22 ^oC. Then allow this liquid to ferment at a temperature of 23 ^oC. After one week, the liquid that has formed is EM-A.
When sprinkling, this liquid should be applied at a solution of 1 litre to 1,000 litres of sprinkling water.

Actiferm is also available . This is ready to use activated EM-1.

EM-5:
It is recommended to spray the crops once a week with EM-5. For this purpose a spray unit that is suitable for EM-5 should be used. Clean this spray unit thoroughly before use, especially if you have used the same unit for chemical spraying. Ideally, a special spray should be purchased for this purpose. Dosage: 0.2%. 1 litre EM-5 per 500 litres water .

FHE:
FHE stands for fermented herbal extract and is used as plant strengtheners.
A solution of 0.2% of FHE should be sprayed over the crop once a week. Only spraying equipment that is specially made for EM products or that has been thoroughly cleaned should be used.

The EM system for hydroculture with Uvc desinfectors

Requirements:

- ✓ Fermentation tank for 60 litres with a heating element
- ✓ EM-1
- ✓ Molasses
- ✓ Water

Preparation method:
Mix 3 litres EM-1 and 3 litres Molasses with 60 litres of water in the fermentation tank.
Allow this mixture to ferment for 7 days at 23 ^{o}C.
After 7 days you will have a liquid that we call EM-A.
This EM-A can be kept for up to 4 weeks if it is stored in an airtight container.

Application:
The best results are achieved if EM-A is applied continually through a droplet system.
Spread an amount of preferably 60 litres EM-A per week over an area of 10,000 m^2.
In order to achieve an evenly spread distribution, dilute the EM-A to a solution of 1:100.
Then apply this diluted solution.

Special areas of attention:
EM-A lowers the pH value.
Avoid high EC values as much as possible. In particular, significant variations in the E.C. values are detrimental for the root environment.
Monitor the acidity level (pH value) of your water by using EM-A.
Never mix EM-A with chemical crop pesticides.

The EM system for tree cultivation and perennials.

- ✓ Spread 4 to 6 tons Bokashi per ha over the ground before planting.
- ✓ Spread 500 kg Ostrea seashell lime per ha over the ground.
- ✓ Spread 300 kg Edasil clay minerals per ha over the ground.
- ✓ Mix all of the above products into the top 10 cm of the ground.
- ✓ The ground is now ready for planting.
- ✓ After planting, apply 100 litres EM-A to the rainwater system for sprinkling over the planted area.
- ✓ Then spread an amount of 100 litres EM-A annually over the crop through the rainwater system, e.g. every month 20 litres.
- ✓ The system is even more effective if organic manure that has been treated with EM is applied

Uses for EM-A in Chrysanthemum Culture.

An amount of approximately 8 to 10 litres of EM-1 is required annually for chrysanthemum culture.
These 8 to 10 litres are separate from the amount of 5 litres EM-1 that are applied after the steaming and mixing in of the Bokashi (amounts per 10,000 m^2).

A Making EM-A from EM-1 for application following steaming.

Make a solution of 5% EM-1 with Molasses and water
(e.g. 5 litres EM-1 with 5 litres Molasses in 100 litres water).
In practice, 1,5 litres EM-1 with 1.5 litres Molasses is placed together in a 30 litre volume fermentation tank. Place the fermentation tank at a minimum room temperature.
Then let the liquid ripen for a minimum of 7 days.
After 7 days you will have a liquid that we call EM-A. (EM-Active)
The shelf-life of this EM-A in a fermentation tank is 4 weeks.

B Making EM-A from EM-1 for application during the growth season.

Make a 5% solution of EM-1 with Molasses and water.
For example, 5 litres EM-1 with 5 litres Molasses in 100 litres water). In practice, 1.5 litres EM-1 is mixed together with 1.5 litres Molasses in a 30 litre volume fermentation tank.
Let the liquid ripen for a minimum of 7 days.
After a minimum of seven days, the EM-A is ready to use.

C Dissolving the EM-A in the C container.

Apply the EM-A at least twice a week with the rainwater system.
Place 100 litres water with 1 litre EM-A in the C container.
This liquid can then be applied with the rainwater sprinkler.
The dilution of 1:100 is meant to provide a good distribution balance with the rainwater. If you can achieve a well-balanced distribution with the rainwater by using less water, then use another dilution.

Calculation for use once every 2 weeks:

You will need 10 litres EM-1 per year for each 10,000 m^2.
This EM-1 will make 200 litres EM-A after fementation.
You will need 200 / 52 * 2 = 8 litres EM-A.
(use half this amount if you want to use it every week).
If you make new EM-A once a month, then the amount you need to make is 16 litres per 10,000 m^2 each time. In order to make these 16 litres, you need a little less than 1 litre EM-1 together with a little less than 1 litre Molasses.

The EM system for nurseries cultivating plant cuttings.

Once the cuttings have taken root, EM can be applied by adding it to the sprinklers at a ratio of 1 litre EM-A to 500 litres water.

Proceed as follows for making up the EM-A:

- ✓ Mix 1 litre EM-1 and 1 litre Molasses with 20 litres of water in the fermentation tank.
- ✓ Set the thermostat at 23 °C.
- ✓ Close the fermentation tank and fill the airlock one quarter (25%) full with water.
- ✓ Leave this to ferment for 7 days.
- ✓ After 1 week you will have approximately 21 litres EM-A which can be kept for up to 4 weeks.
- ✓ Then tap off 1 litre EM-A and mix this well with 500 litres water for sprinkling.
- ✓ Sprinkle this mixture over the cuttings.
- ✓ Add EM-A to every sprinkler application as described above.

The EM system for fruit trees:

For newly-planted orchards:

- ✓ Spread 500 kg Edasil clay minerals over the ground.
- ✓ Spread 300 kg Edasil clay minerals over the ground.
- ✓ Work these materials into the ground
- ✓ Before planting, put 1 kg Bokashi into the holes that have been dug and then plant the trees.

Existing orchards:

- ✓ Spread 500 kg Ostrea seashell lime under the trees annually.
- ✓ Spread 200 kg Ostrea seashell lime under the trees annually.
- ✓ During the growth season, sprinkle 10 litres EM-A diluted in at least 500 litres water per ha once a month.
- ✓ At the end of each season, apply Bokashi to the foot of each tree in such a way that an amount of 1 kg per m² of planting circle or crown projection area is applied (approximately 5,000 kg per ha.)

Treatment of crops:

- ✓ Sprinkle 1 litre EM-5 diluted in 500-1,000 litres water over the crops once a week.
- ✓ Sprinkle once every two weeks 1 litre EM-GKE diluted in 500-1,000 litres water over the crops.

Making EM-A:

- ✓ Make a solution of 5% EM-1 with Molasses in the fermentation tank.
  This amounts to 5 litres of EM-1 and 5 litres Molasses per 100 litres of water.
  The temperature of the water should be at least 20 °C.
- ✓ Turn the temperature of the heating element up to a minimum of 22 °C and a maximum of 30 °C.
- ✓ Allow the solution to ferment for a period of 7 days. After 7 days the solution of EM-A is ready to use.

Total:		**10 litres EM-A**	**100 litres EM-A**	**1,000 litres EM-A**
EM-1	5%	0.5 litre	5 litres	50 litres
Molasses or sugar	5%	0.5 litre	5 litres	50 litres
Water	90%	9.0 litres	90 litres	900 litres

The use of the EM System for strawberry farming (ground crops)

Before planting:

Apply an amount of 4,000 kg Bokashi per ha and spread this out evenly.

- ✓ Spread 500 kg Edasil clay minerals per ha evenly using an artificial manure spreader.
- ✓ Spread 500 kg Ostrea seashell lime per ha evenly using an artificial manure spreader.
- ✓ Work these products evenly into the top 10 cm of the soil.
- ✓ Leave the ground to rest for 5 to 7 days.
- ✓ Plant the strawberry plants.

After planting:

At equal intervals during the growth season, add 100 to 200 litres EM-A to the sprinklers before spraying the strawberry plants. This amount can be spread out e.g. in 5 sprinkling sessions (20 to 40 litres each time.)

Making EM-A from EM-1:

Make a solution of 5% with EM-1 and Molasses in the fermentation tank.
This amounts to 5 litres of EM-1 and 5 litres Molasses per 100 litres of water.
The temperature of the water should be at least 20 °C.
Turn the temperature of the heating element up to a minimum of 22 °C and a maximum of 30 °C.
Allow the solution to ferment for a period of 7 days. After 7 days the solution of EM-A is ready to use.

Setting up the EM System for the fermentation of leaf waste.

In order to ferment leaf waste satisfactorily, it must be thoroughly mixed with Edasil clay minerals, Ostrea seashell lime, and EM-A. The mixed materials must have a moisture content of at least 30 percent for a good fermentation to take place. After thorough mixing, the material should be covered with agricultural foil and left undisturbed for at least six weeks. The period of six weeks is the absolute minimum of time needed. This period can even be extended without any problems occurring.

Requirements:

Edasil clay minerals	5% in weight.
Ostrea seashell lime	5% in weight.
EM-A	2% in weight.

For 20 tons of product this amounts to the following:

Edasil clay minerals	1,000 kg.
Ostrea seashell lime	1,000 kg.
EM-A	400 litres. (diluted in 20 litres EM-1).

Making EM-A from EM-1:

- ✓ Make a solution of 5% EM-1 with Molasses in the fermentation tank. This amounts to 5 litres of EM-1 and 5 litres Molasses per 100 litres of water. The temperature of the water should be at least 20 °C.
- ✓ Turn the temperature of the heating element up to a minimum of 22 °C and a maximum of 30 °C.
- ✓ Allow the solution to ferment for a period of 7 days. After 7 days the solution of EM-A is ready to use.

The fermented product can be applied in amounts of 4,000 kg per ha.

Making Bokashi in a trench silo.

Requirements:

150 litres volume	organic material
3 litres	EM-A
15 litres	Water
2.5 kg	Edasil clay minerals
2.5 kg	Ostrea seashell lime.

Method:
Mix the raw materials together and close the silo so that it is airtight for a period of at least six weeks.

Extra information:
Making Bokashi (fermented organic material made under anaerobic conditions) can be done by everybody. The important thing to remember is that the material must be fresh and organic and not have lain around rotting, heating up or collecting fungi.

This organic material must contain both carbon as well as nitrogen sources so that the bacteria can start the fermentation process off.

Materials containing carbon are, for example, waste clippings and wheat straw. Materials containing nitrogen are, for example, brewer's grain or chicken manure.

The maximum amount of water largely depends on the moisture content of the organic material used. The total moisture content of the bokashi to be made up must not be more than 30%.

Bokashi is easy to make in a trench silo due to the fact that every time new organic material is added, the heap can be covered up with foil. A trench silo creates a situation of continuous production as long as the period of six weeks for fermentation is adhered to.

Fill the trench on one side with fresh material and remove the bokashi from the other side of the trench. In practice, this means ensiling against the previously made product and only requires a small amount of the foil to be removed.

The EM system for golf courses.

- ✓ Spread an amount of 500 kg Edasil clay minerals per 10,000 m^2 on the greens each year.

- ✓ Once every 3 years, depending on the pH of the green, spread 500 to 1,000 kg Ostrea seashell lime per 10,000 m^2.

- ✓ Whilst sprinkling, add a maximum amount of 100 litres EM-A per 10,000 m^2 green to the sprinkler (i.e. 5 litres EM-1). The concentration of the EM-A must not be higher than 1 litre EM-A to 100 litres water.

- ✓ Only use organically-based fertilizers such as Grow-Best.

Grow-Best is an organic fertilizer which should be given in amounts of 1,000 kg per 10,000 m^2.
Grow-Best contains natrium, phosphorus, nitrogen and micro-elements that are bound together in organic forms. This means that the fertilizer elements present are released slowly during the whole of the growth season. Spread the required amount of Grow-Best over the area in several sessions.

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