Efficient Microbes (EM): Product Information and Usage

1. What is EM?

EM stands for Effective or Efficient Microorganisms (EM), which are a mixed culture of, fermentative, soil-based, beneficial microorganisms which can be applied to many environments to break down organic matter. EM is provided as Mother Culture but to be economic it must be activated before it can be used.

2. What is OrganiCure™ EM?

OrganiCure EM is an activated solution of EM Mother Culture. To be economic, EM Mother Culture must be activated in most applications, and Eco Organics activates this culture in a variety of ways for a range of applications.

Some of these applications include:

1. Agriculture/Landscaping as a soil builder.
2. Household Cleaning to exclude and eliminate harmful bacteria.
3. Pets / Animals as a probiotic to reduce pet odors and for good health.
4. Water purification to reduce algae and harmful bacteria in water.

When applied in agriculture, OrganiCure™ EM increases the microbial diversity of soil, thus, enhancing growth, yield, quality, and disease-resistance of crops. OrganiCure™ EM cultures do not contain any genetically modified microorganisms. OrganiCure™ EM is made of mixed cultures of microbial species that occur naturally in environments worldwide but which have decreased in many soils due to over-farming, and chemical fertilizer and pesticide use. The principal microorganisms in OrganiCure™ EM are:

A. Photosynthetic Bacteria

The photosynthetic or phototropic bacteria are a group of independent, self supporting microbes. These bacteria synthesize useful substances from secretions of roots, organic matter and/or harmful gases (eg. Hydrogen sulphide), by using sunlight and the heat of soil as sources of energy. Useful substances developed by these microbes include amino acids, nucleic acids, bioactive substances and sugars, all of which promote plant growth and development. The metabolites developed by these microorganisms are absorbed directly into plants and act as substrates for increasing beneficial populations.

B. Lactic acid bacteria

Lactic acid bacteria produce lactic acid from sugars and other carbohydrates, developed by photosynthetic bacteria and yeast. Therefore, some foods and drinks such as yogurt and pickles have been made with lactic acid bacteria for decades. However, lactic acid is a strong sterilizing compound, and suppresses harmful microorganisms and enhances

decomposition of organic matter. Moreover, lactic acid bacteria promote the decomposition of material such as lignin and cellulose and ferments these materials, thereby removing undesirable effects of undecomposed organic matter.

C. Yeast

Yeasts synthesize antimicrobial and other useful substances required for plant growth from amino acids and sugars secreted by photosynthetic bacteria, organic matter and plant roots. The bioactive substances such as hormones and enzymes produced by yeasts promote active cell and root division. These secretions are also useful substrates for effective microbes such as lactic acid bacteria and actinomycetes.

3. Activating EM

The primary reason to activate EM is economy not efficacy. It is perfectly acceptable to use EM without activating it. However, adding a sugar source and culturing the microorganisms ensures that the microbes are active. Once the following procedure has been followed, the end result will be a full strength culture of EM that can then be diluted and applied.
Materials: airtight plastic container, or large tank, 1 part EM, 1 part blackstrap molasses, 22 parts water. ¾ cup EM, ¾ cup molasses in 1 gallon of water.
Procedure: Dissolve molasses in warm water and add EM. Activating EM is a mostly anaerobic process; thus, the presence of excessive oxygen is not desirable. Keep the extension as warm as possible. If you keep the EM between 85-95 degrees it should activate in approximately 4 days. If the extension is kept between 70-80 degrees then allow for 5-7 days. Depending on technique and extension conditions, it may take anywhere from 4-14 days.

Check the pH to ascertain when the process is complete; EM is ready when the pH drops to 3.7 or below. Do not use EM that has not dropped below 4.0. If your pH continues to drop to 3.0 or even 2.0 this is normal and indicates high microbial activity. The end product should smell slightly sweet and pickled. Activated EM, unlike EM Mother Culture, is best used within 7 days. It may last up to 1 month but should be used within this time. Never extend an EM extension. The results cannot be guaranteed.

DILUTION GUIDE

EM TO WATER
1: 50 1 tsp 1 Cup
4 tsp 1 Quart
5 Tbsp 1 Gallon
1: 100 1 tsp 2 Cups
2 tsp 1 Quart
2.5 Tbsp 1 Gallon
1: 500 3/4 tsp 2 Quarts
1.5 tsp 1 Gallon
2 Tbsp 4 Gallons
1: 1000 3/4 tsp 1 Gallon
1 tsp 6 Quarts
1.5 tsp 2 Gallons
1: 10,000 3/4 tsp 10 Gallons
1 Tbsp 40 Gallons

4. Home Uses - Cleaning with EM

EM is a very acidic solution that re-populates surfaces with beneficial microbes. The presence of these microbes discourage mold, fungus and harmful bacteria from taking root. EM helps to eliminate odors from pets, cigarette smoke, and odor-causing bacteria, as well. A small squirt bottle filled with straight EM is handy to keep by the kitchen sink.
It is convenient to add to water for washing vegetables, to pour down the garbage disposal to reduce odors, and to spray on sponges to keep it fresh and reduce harmful bacteria. One teaspoon of EM can be added per load as the washing machine fills with water. This is recommended for light colored laundry since the microbes love fabric dyes, and dark colored articles have a tendency to fade.) If using EM reduce detergent to 1/3 the usual amount. If possible, let the clothes presoak for 10-15 minutes before running through the cycle. Use 2 Tbsp of EM to 2 gallons room temperature water for mopping ceramic tile or vinyl floors. No detergent is needed. For use on wood floors and furniture, dilute ¾ tsp. to one gallon water. Wipe dry immediately. Add 1 tsp. EM to one quart of water, and spray or wipe on tile, porcelain, and Formica. Let is stand on wood or plastic cutting boards to discourage salmonella and other harmful bacteria. Then rinse. This dilution must be used within 3 days.

Diluted EM can be sprayed lightly in shoes to keep them smelling fresh and on shower curtains to discourage mold. Clean garbage receptacles with this mixture to reduce odors. Use a diluted solution and spray generously on light colored automobile interior, door panels, light-colored upholstery, and carpets to freshen and deodorize.

5. Soil Uses – Gardening and Landscaping

EM can be used to inoculate plants, water and soil in various ways to achieve beneficial results. It can be sprayed on soil as a pre-planting treatment, used to inoculate seeds or transplants, and applied to growing crops as a foliar spray or through irrigation systems. EM is useful in growing nursery crops, container-grown plants, and even in hydroponics. After crops are harvested, EM is used to help break down crop residues. EM can be applied to cover crops and green manures during growth and upon incorporation into the soil, and is applied to pastures with good results.

General Directions

For most crop applications, EM or AEM is diluted with water at a ratio of 1 part EM to 1,000 parts water. Do not apply with pesticides or fungicides. It is best to start on a small scale and experiment with EM to determine the best methods and ratios for specific locations.

Pre-Planting

Between two and three weeks before planting, apply a 1:1,000 dilution of EM to the soil. Apply as a spray, drench or introduce into irrigation water. Cultivate weeds that emerge after 10-14 days. To activate EM on a large scale, you may start with 1 gallon of EM and 1 gallon of molasses per acre treated. Dilute EM and molasses in water to a concentration of 1:1,000 and apply. Do not exceed recommended dilution.

Seed Treatment

Gardeners may want to try soaking seeds in a solution of EM before planting to increase seed viability. Dilute EM with water at 1:1,000. Soak seeds in solution for 5-10 minutes and no longer. Air dry and plant as usual. Experiment with small batches before treating larger quantities. Weak seeds and soil conditions may lead to decreased results.

Nursery / Container-grown Plants

Inoculate with EM at seeding and transplant stages, then on a monthly basis thereafter. Use the standard dilution of 1:1,000. Orchid growers have achieved good results by inoculating with EM immediately after planting in sterile media.

Hydroponics
In hydroponic crop production systems, EM can be diluted with the nutrient solution at a rate of 1:10,000. This practice will coat the root systems with beneficial microorganisms and make nutrient uptake more efficient.

Grain Crops, Vegetables, Fruits & Herbs:
Spray the standard dilution of 1:1,000 onto the plants. If introducing EM into an irrigation system, the dilution should be increased to 1:10,000. Apply as a pre-planting treatment, again at planting/transplanting and every three to four weeks during crop growth. Apply also to crop residues after harvest, just before incorporating residues into the soil. Use 1 gallon of activated EM per acre, diluted with the appropriate amount of water for each application.

Orchard Crops / Perennials:
For orchard crops, such as apples and pears, apply EM immediately after fall harvest, along with other amendments. Spray plants and soil thoroughly, applying 1 gallon of EM per acre at any dilution appropriate (1:500). Repeat this treatment weekly until the first snow or hard freeze. Then, discontinue application until spring. Resume application after the last spring fronts and continue until the fruit is fully formed. Stop applying EM before ripening begins.

6. EM Improves Animal Health

Dogs and cats
Add EM-X ceramic powder to litter boxes to keep odor under control.

Spray litter box with EM diluted 1:100 parts water.

You can add EM to bathwater when bathing your dog. This will help keep the dog's coat shiny and clean. Add 1 cup to bathwater.

For customers outside of Australia: Add 1% (just a few drops in the water bowl) EM to pet's drinking water to help maintain good digestive health.

Fish tank
To reduce ammonia in fish tanks, and promote beneficial bacteria in the water, add 1 part EM to 1000 parts water once a week, or as necessary. Use EM-X ceramics in the filter. S-type are porous to absorb ammonia and floating material and must be changed every six months. K-type are used to structure the water and need not be changed.

Livestock and Farm animals
To improve microflora in the intestines and make nutrient absorption more efficient, try the following applications.

For customers outside Australia: mix 10 ml of **OrganiCure™ EM** in 1 litre of drinking water.

Mix bokashi into livestock feed (1-5% of feed) or sprinkle bokashi on top of feed daily.

Spray EM dilution in barns and pens to control flies and odors at a ratio of 1:100.
Foul odors are present in barns and livestock pens due to the proliferation of harmful, putrefactive microorganisms. These bacteria produce harmful toxins such as ammonia, hydrogen sulfide and methane. EM controls the proliferation of harmful microorganisms by competitive exclusion and the animal's quarters will be drastically improved.

7. Water / Pond Treatment

To treat sewer lines, livestock holding facilities, solid waste and food waste, apply at a ratio of 1:100 parts water and saturate then compost For septic systems, holding tanks, recreational vehicles and portable restrooms, apply 1 liter of EM per 1,000 gallon holding capacity every 3 months by pouring down a drain in the house, or directly into the holding tank. The septic system still may need regular pumping and maintenance.

To control algae blooms dilute activated EM at a ratio of 1:10,000 and spray over the pond or fountain once every 2-4 weeks beginning in the early spring. Or apply as needed. If it is not possible to spray the solution, introduce EM at several different sources in order to avoid shock to other pond life. Results will vary depending on the source of inflow and other factors.

8. Storage and Handling

Store EM out of direct sunlight at room temperature. When activating EM, some sunlight is preferable since the bacteria need light to reproduce. Do not refrigerate. Use by the recommended expiration date. If in doubt, check the smell and pH. Good quality EM will have a sweet-and-sour smell and a pH below 3.7. If the pH rises to 3.8, use the remaining EM as soon as possible or within 30 days. Do not use EM if a foul or rotten odor is present. Keep in mind that you are dealing with living organisms. Best results are realized when EM is supported with good soil management. Avoid bare soil. Feed beneficial and effective microorganisms with crop residues, cover crops, compost and other forms of organic matter.