



# Effective micro-organisms for ecological agriculture during transition

About 25 years ago, I came to know about Effective Microorganisms and their use in agriculture, animal health and sanitation through a Japanese friend who visited my farm and also arranged to get literature about Effective Microorganisms.

Prof. Teruo Higa, an agronomist, modified an age-old Japanese technology which he learnt from his grandmother. Traditionally, Japanese farmers used to make 'Bokashi', a concentrated form of compost, apply it to the soil along with other organic manures. The purpose was to inoculate beneficial organisms to improve the quality of organic manure and to check fungus and virus problems in the soil. They used to collect chemical free soil, rich in humus, from forests and mix it with dry cow dung powder, dry fish meal, jaggery syrup, oil cake and rice bran, adding about 10% to 12% of potable water. The anaerobic compost thus prepared was used at the rate of 100 grams per square metre of land. Prof. Higa, further worked on this traditional practice along with his friend, a microbiologist and introduced Effective Microorganisms to agriculture, animal health and sanitary uses. Now, almost after 30 years of its introduction, it is being used in most of the countries all over the world. In India, through its licensed tie-up with Maple Orgtech (I) Limited, the Effective Microorganisms are being supplied through their distributors all over India.

### What is EM?

EM contains more than 70 beneficial organisms, more importantly lactic acid bacteria, photosynthetic bacteria (*Rhodospseudomonas Palustris*) and yeast. Surprisingly, use of EM helps in augmenting the photosynthesis by about 30% in all the crops. Further, it controls viruses and fungal damage to crops and animals by inoculating lactic acid bacteria and actinomycetes bacteria. It is very expensive and not very effective to use the stock solution. So, the farmer has to prepare Secondary Effective Microorganisms (SEM) or Extended Effective Microorganisms (EEM).

To prepare SEM/EEM, we need a 20 litre plastic can, free from chemicals, 20 litres of potable water (not chlorinated, or bleaching power being used for purification), 1 or 2 kgs of chemical free Jaggery. Mix jaggery in 20 litres of water in the plastic can and add one litre of Effective Microorganisms stock solution. Close the lid and keep in a cool and dark place for about 8 to 10 days. The PH will come down to 3.5 and the processed product - E.E.M or S.E.M will smell sweet and sour like a mixture of jaggery and curd.

### Ways in which EEM can be used

E.E.M or S.E.M can be used in agriculture in 5 ways.

#### 1. Direct use of E.E.M

You can spray E.E.M. directly on crops at 0.1% or one ml in one litre of water. You can also spray on the soil or crop residues at 0.5% to help them break down much faster (particularly

sugarcane and paddy thrash). If you have S.E.M in excess, not being used after 60 days, you can spray at 0.5% on your compost heap.

#### 2. Enriched Urine with E.E.M

Collect urine including human urine and process anaerobically for 8 days. Mix 50 ml E.E.M with one litre of urine and 100 gms of jaggery and spray on crops at the rate of one ml in one litre of water. Farmers in Doddaballapura, Bangalore Rural district, Karnataka State area are collecting urine from school latrines and are using on their crops as soil application as they hesitate to spray on crops. But for sure there will be no traces of bad odour after addition of E.E.M and fermentation done anaerobically.

#### 3. Fermented Plant Extraction (F.P.E)

Collect about 10 kgs of weeds at the time of sunrise and cut them into 2 inch pieces. Fill them into a plastic container with water, adding 500ml of E.E.M. and 500 ml of jaggery syrup. Close the lid, not too tight, as this particular fermentation releases some gas. Allow it to ferment for 8 days, in a cool and dark place. You will find clear odourless liquid which can be strained in a cotton cloth. This sap can be sprayed on the crops at one ml in one litre of water i.e., at the rate of 0.1%.

#### 4. Bokashi or concentrated compost

You need 100 litres of fine rice or wheat bran, 10 kgs of dry cow dung powder, 10 kgs of groundnut oil cake, 5 kgs dry fish meal, 2 kgs of jaggery, about 12 to 14 litres of chemical free potable water, one litre of SEM or EEM and a suitable plastic container to fill all the above material. Mix all the ingredients well and fill into the container as tightly as possible for anaerobic composting for 8 to 10 days in a cool and dark place. The pH will come down below 3.5 and the product can be mixed with soil at a cooler time along with other organic manures at the rate of 100 gms per square metre.

#### 5. E.M. 5

You will need 600 ml of chemical free potable water, 100 ml of jaggery syrup, 100 ml of E.E.M or S.E.M, 100 ml of ethyl alcohol (rum or brandy) and 100 ml of natural vinegar. Fill and mix all the above ingredients in 1 litre bottle and allow to ferment anaerobically in a cool and dark place for 8 to 10 days. The pH will come down to 3.5. You can spray EM 5 as an antifungal, antiviral and insecticide at the rate of one ml in one litre of water.

In my vast experience on my family's five mixed (bio-intensive) farms, I can recommend the use of EM to increase soil fertility and

suppress development of harmful organisms. In the first two to three years, we used EM as a 5 percent spray on our crop residues such as maize, rice paddy stubble and sunflower, to decompose them quickly. We noticed that by using EM spray, composting is quicker and better. Similarly, when we applied bokashi (another EM product) together with farmyard manure, we noticed that our rice, tomato, bottlegourd, soyabean, gladiolus, banana and papaya crops were free from fungal attacks and viral diseases. Another EM preparation was very useful in controlling sucking insects on legumes and cucurbits. We have observed better growth in the leaves and stems of crops sprayed with different EM preparations, leading to yield increases of 15 percent and fewer pest infestations.

Farmers in Erode District of Tamil Nadu in South India, are regularly using EM preparations for soil treatment to check root-rots. Farmers in Raichur District, Karnataka State are using EM to help quicken the breakdown of paddy stubble, as do sugarcane growers in Sivaganga District, Tamil Nadu. The EPPL thermal power company, with 700 acres of hill neem trees (also in Tamil Nadu), found that the germination capacity of their seeds increased from 5 percent at the beginning to 85 percent after soaking their dry fruits in 5 percent EM solution for 24 hours before planting. I myself and over 500 farmers in the area also use EM solution to soak all our seeds before sowing.

#### Care in use of EM

Since Effective Microorganisms are basically an inoculum of beneficial organisms, care needs to be taken not to use any chemicals

in the same land. Also, as these are acidic in nature, EM preparations of 0.1% only should be sprayed, otherwise, it may scorch the plants. All the preparations have to be stored in a cool and dark place and should be used before 60 to 70 days of preparation.

Although some farmers produce their own micro-organism mixtures, for example, keeping rice gruel near humus rich wet soil for 4-5 days, my fear is that farmers cannot identify any harmful organisms getting into the preparations, as they do not have suitable laboratory equipment to segregate them. Therefore, I think it is better to get EM stock solution from an authentic laboratory. It is very cheap to use it; in India, the use of EM on one acre costs less than a cup of coffee. Farmers use it 3-4 times a year on all their crops. Nevertheless, it is enough to use EM preparations only in the first 2-3 years during the transition from chemical to organic farming. It is very useful in building up the population of beneficial organisms both in the soil and plants. In my opinion, use of EM is the best way for farmers intending for a transition from chemical farming to bio-intensive farming.

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## Farmers Diary

# Living soil

## Madhu Ramakrishnan

Directly or indirectly all food comes from soil. If it is not a living system, it can't continuously produce. Just as any other living thing, soil possesses physical, chemical and biological properties. It is also believed that it has physiological systems like digestion, respiration, circulation and excretion. Soil being the basis for all human life, our only hope for a healthy world rests on re-establishing the harmony in the soil.

Soil organic matter is an essential component of the soil and in association with the soil fauna, contributes to the soil fertility. Soil is said to have 'life' only when it is holistically looked upon along with its inhabitants, in the form of flora and fauna. Soil faunal density and diversity is also partly due to the C: N availability in soils. Though the soil is rich in microflora, it remains inactive and inefficient when there is lack of organic carbon. Sources of carbon in the form of cellulose are mainly contributed by plants. Practices like mulching and incorporating crop residues into the soil helps build up the soil carbon. Also, integrating livestock with agriculture enables access to animal waste which can be converted to organic manure.

Cow dung and cow urine are the sources which are cheapest and most accessible for farmers to increase the biological activity in their soils. Irrigation is an effective medium in spreading them across the field.

The cow dung and urine mixed with a small quantity of jaggery is being extensively used in India under different names like Jeevamirtham, Amirthapani, starter solution, Janjeevani and so on. This solution is mixed with the irrigation water in a most effective way, by following a novel method in our farm.

The irrigation water tank is made up of two parts - one big and one small. The water from the pump set is filled in both the parts. In the big part of the tank, cow dung, cow urine and jaggery are put and stirred well. Once the motor is switched on, plain water from the smaller part of the tank flows out through the outlet into the bigger part. In this part, water fills and spills out through the small hole made in the wall, allowing a uniform mixing of *Amirthapani* with irrigation water. Thus, the multiplication of microbial population is improved in the entire land, by maintaining a favorable atmosphere with good mulching.

*The living soil is an organic entity and this entire web of life must be protected and nurtured. Natural Farming is the way.*

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