

EM–Multifunctional Microbiological Preparation

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doi: <https://doi.org/10.21467/abstracts.93.86>**ABSTRACT**

It is known that microorganisms exist everywhere on Earth and people live in the ocean of them. Wherever we go, we constantly take about 100 trillion microorganisms (85 % enter our body through the air and 15 % from food). Thus, we continuously absorb a huge number of microbes and substances that pollute our environment. In 1980 after much trial and error Dr. Teruo Higa discovered the optimal combination of safe and harmless microorganisms (lactic acid bacteria, yeast, and phototrophic bacteria) that promoted healthy plant growth and maintained soil fertility. He called this mixture "effective microorganisms" or EM. In 1994 the scientific-research organization EMRO (Japan) was founded in order to improve the environment through EM.

Currently, in more than 100 countries around the world EM is used in many areas such as:

Crop production – the microorganisms contained in EM and the metabolites they produce increase the number and diversity of microorganisms in the soil. When effective microorganisms begin to multiply in the soil, its biological activity increases, mesofauna such as earthworms are activated, and, as a result, a healthier ecosystem is formed. Soil with a variety of microflora will prevent the development of pathogenic bacteria, as well as contribute to improving the yield and quality of products. Vegetables obtained on such soil have high nutritional value, high sugar content and have a long shelf life.

Animal breeding – the main advantage of using EM products in animal husbandry is that the various microorganisms contained in EM and the metabolites produced by these microorganisms improve the microflora not only in barns (suppressing the growth of putrid bacteria, reducing the number of flies and eliminating unpleasant odors), but also inside animal organisms (improving the intestinal microflora). That is, the health of livestock is improved, the use of vaccines and antibiotics is reduced, therefore, the resulting livestock products are of higher quality and stay fresh longer.

Aquaculture (breeding a certain type of fish in a closed area) – excessive nutrition to accelerate fish production usually leads to the formation of too large quantities of waste, which are transformed into sediment and degrade water quality. To prevent fish from getting sick from contaminated water, antibiotics and other drugs are often added to the water. This affects the environment, puts fish communities and habitats at risk, and puts food safety at risk. EM was used to break this vicious circle created by current fish farming practices. The technology has proven effective in crab farming in China, as well as in shrimp farming in Thailand, Vietnam, and Ecuador.

Water purification – adding EM to rivers increases the number of microbes that form the base of the ecological pyramid. When this base becomes larger, the pyramid itself also becomes larger, resulting in a richer diversity in the ecosystem. Consequently, the ability of rivers to clean themselves will improve, helping them to become clean and beautiful again.

Utilization of wastes – EM is used in treatment plants around the world. For example, in Vietnam programs related to EM products have solved the problem of unpleasant odors emanating from urban recycling centers of utilization of wastes and converting organic waste into compost. In various cities in Colombia, a large number of communities have learned to recycle their own kitchen waste, taking it from landfills and



turning it into valuable soil additives. In the Kingdom of Bhutan, the entire country has been declared a world natural heritage site. They are moving away from the use of chemical fertilizers towards organic farming. The Ministry of agriculture encourages them to process food waste and turn animal manure into organic fertilizers, so the country has introduced EM in more than 150 schools for introduction the organic agriculture as part of the curriculum. Students manage school gardens, and actively use EM products in their dormitories.

Construction –experiments have shown that EM products increase the durability of buildings and reduce the damage to public health caused by organic solvents in paints and adhesives. In Malaysia, there is an "ECO-town" where EM products were used not only in the composition of concrete, but also in cleaning the territory, caring for trees and recycling. Owners of EM buildings reported that in newly built blocks do not have characteristic chemical odors, mold does not grow, and there is a higher heat-retaining effect.

Medicine – a drink containing natural fermented probiotics without GMO for maintaining intestinal health has been developed and is available on the world market.

Home and pet care – using EM when washing floors helps to eliminate unpleasant odors, reduce static electricity, which increases the accumulation of dust. Adding EM when washing clothes makes it easier to remove dirt, sebum, and makes the fabric softer and smoother. Since this product is 100% natural, it can be used for washing children's dishes, toys, and pets.

Within the framework of the cooperation agreement with EMRO, the Institute of radiobiology is studying the effect of the microbiological drug EM on the accumulation and elimination of radioactive cesium (^{137}Cs) in laboratory animals and plants, as well as developing methods for the rehabilitation of territories contaminated with radionuclides.

According to preliminary data, the use of only EM or fermented organic fertilizer (Bokashi) on sod-podzolic sandy loam soil significantly reduced the conversion factor of ^{137}Cs to barley by 37 % and 44%, respectively. The combination of EM with Bokashi or potash fertilizer resulted in the greatest reduction in the conversion factor of ^{137}Cs to barley biomass (50 % and 63 %, respectively). EM had a stronger effect on the accumulation of ^{137}Cs in barley compared to lettuce. Laboratory experiments have shown that the effect of microorganisms on the absorption of ^{137}Cs can be explained by a decrease in the proportion of bioavailable physical and chemical forms of ^{137}Cs in soils treated with EM and Bocashi.

Thus, effective microorganisms can create a favorable environment for humans, even in conditions of increasing man-made stress.