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EFFECTIVE MICROORGANISMS (EM) TECHNOLOGY IN PLANTS

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Özet:

Son yıllarda efektif mikro organizmalar teknolojisi tarım ve ormancılık alanlarında kullanılmaktadır. Bu teknoloji tamamen doğal olup çevre ile dost bir ilişki içerisindedir. Bu teknolojinin bir ürünü olan BAIKAL EM1 fotosentetik, laktik asit bakterileri, mayalar ve onların metabolizmik faaliyetleri sonucunda ortaya çıkan ürünlerini kapsamaktadır (enzimler, vitaminler vb.). Bu mikrobiyolojik gübre farklı bitkilerin yetiştirilmesinde; büyümesine, gelişmesine ve tüm metabolizmasına olumlu etki yapmıştır.

Anahtar Kelimeler: Biyoteknoloji, Baikal EM1, Etkin Mikroorginazmalar, Bitki, Çevre.

Abstract:

Effective microorganism technology has been used in the fields of agriculture and forestry recently. This technology is totally natural and environmentally friendly. BAIKAL EM1, a product of this technology, includes the photosynthetic lactic acid bacteria, ferments and products that are formed by the metabolism activities of these ferments and bacteria (enzymes, vitamins etc.) This microbiological fertilizer has a positive effect in growing plants; to their development and metabolism.

Keywords: Biotechnology, Baikal EM1, Effective Microorganisms, Plant, Environment.

1. General Information

Biotechnology is a science about the contribution of biological processes in industrial production of economical useful products. As use of culture cells of bacteria, yeast, animals or plants biotechnology, is a metabolism, which produce specific substances as a result of biosynthetic activities (8).

According to the definition of United Nations Convention on Biological Diversity, any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.

Biotechnology is used in such fields as insufficiency of the foodstuffs, greenhouse gas emission, prevention of environmental contamination, preservation and regulation of animals and flora, diagnostics and treatment of dangerous diseases, sewage disposal and other problems. In industrial scale biotechnology represents bioindustry. Bioindustry includes branches in which biotechnological methods can successfully replace widely used traditional methods. Biotechnology is widely used in chemical industry in the production of polymers; and in textile industry for the production of such necessary raw materials as methanol, ethanol, biogas and hydrogen. Biotechnology is used in biometallurgy, in extraction of some metals.

Biotechnology covers manufacturing of foodstuffs (large - scale cultivation of yeast, seaweed and bacteria for reception of proteins, amino acids, vitamins, and also for use of their enzymes); increase the productivity

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of agriculture (cloning and selection of species of plants, proceeding from tissue and cellular cultures, manufacture bioinsecticides); pharmacological industry (development of vaccines, synthesis of hormones and antibiotics); reduction of environmental pollution (sewage treatment, manufacturing compost).

It is not possible to improve biotechnology without special biotechnological laboratory equipment. Under normal conditions, there is a continuous relationship between ground and lithosphere, hydrosphere and atmosphere. However, the relationship built between plants, animals and insects and the smallest mechanisms during the process of evolution has now been destroyed.

AIDS, new types of hepatitis, cancer, virus infections, mad calf disease, misimplementation of antibiotics, and chemical combination of agricultural lands are the most serious problems of modern history of human being.

Today biotechnology solves many problems in the field of agriculture. And one of the solutions is the EM Technology (Effective Microorganisms Technology), which is widely used in organic agriculture recently (1 - 10).

In the last century, the rate of black soil in Ukrainian and Russian agricultural lands (chernozem-black soil) decreased from 16% to 6% and below. EM Technology solves these problems in many countries around the world and provides the restoration of the effective microflora.

Microbiologic materials called «Baikal EM1» lies behind the EM Technology of Russia (11). In its structure there are groups of lactic acid, nitrogen fixation bacterias, photosynthetic bacteria and yeast.

Lactic acid bacteria (these are beneficial organisms largely found in fermented foods, and in the gastro-intestinal canal of healthy humans and animals*): Lactobacillus plantarum, Lactobacillus casei, Lactobacillus fermentum, Lactobacillus salivarius, Lactobacillus delbrueckii*.

Phototrophic purple non-sulfur bacteria, aka PNSB (these are widely found in ponds, soil, on plant leaves, ice and snow: *Rhodopseudomonas palustris, Rhodobacter sphaeroides, Rhodobacter capsulatus*.

Yeast: *Saccharomyces cerevisiae*

These substances possess a wide range of action that favorably distinguishes it from other microbiological substances which contain as a rule one-two species of useful microorganisms.

«Baikal EM1» production in Russia began in 1998. It is a liquid with pleasant silage smell, packaged in plastic bottles with 0,5 and 1,0 l capacity. The period of storage is 1 year. «Baikal EM 1» improves the microflora of soil, increases the productivity of agricultural crops, and raises their quality and safety.

«Baikal EM1» activities facilitate plants' food intake and enrich the soil with vitamins, amino acids and biologically active substances. Soaking of seeds in «Baikal EM1» and spraying of plants during the vegetation period provides resistance against diseases, pests and unfavourable weather conditions.

Since 2005, large scale tests on forests and agricultural plants in Turkey, Russia and Azerbaijan have been carried out using «Baikal EM1». Below mentioned plants can be counted among these studies: Chestnut (*Castanea sativa* Mill.) it is known that chestnuts start to fructify after 5-7 years in our experiences, the «Baikal EM1» prepared samples fructified after 3-4 years, Oriental Beech (*Fagus orientalis* Lipsky), Red Alder (*Alnus glutinosa* Mill.), Oriental Fir (*Picea orientalis* Link), Calabrian Pine (*Pinus brutia* L.), Black Pine (*Pinus nigra* Arnold), White Acacia (*Robinia pseudoacacia*), Amaranthus (*Amaranthus cruentus* L. and *Amaranthus tricolor* L.), Saffron (*Saffron crocus*) and tomatoes (*Solanum lycopersicum*).

Experiences have been carried out in nurseries and greenhouses (tomato). Required laboratory studies to determine the best «Baikal EM1» ratio for tree seed treatment.

«Baikal EM1» seeds were first applied in the form of aqueous solution before they were planted to soil. Besides, after the offshoots occurred they were sprayed once in a month during the vegetative period. Rate of implementation was 1:100 (on 10 liters of water of 100 ml. preparation) in seed treatment and 1:2000 (0,5 ml. preparation on one liter of water) in spraying. Soaking periods of seeds, depending on their structure

(firm or soft, large or small) was between 10 and 14 hours. The first spraying was made 3 days after the formation of offshoots. In order to prevent burning sun light might cause, spraying was made during the evening hours.

At the end of the study, as a result of comparison with control specimens, it is seen that «Baikal EM1» had a positive effect in all plants without distinction. These effects are highest germination ratio and germination energy, better offshoots, more leaves, darker green coloration, strong stem, better root system and higher stability against abiotic (physical and chemical) and biotic (pathogenic organisms) stresses.

The obtained data proves that the EM preparation effects the optimization of physiological processes (photosynthesis, respiration, transpiration and enzyme systems) in plants positively, provides immunity of plants in relation to pathogenic organisms and stressful factors in their environment.

EM-preparations are natural products and don't pollute the soil. This characteristic is significant with respect to the critical limit of ecological pollution today.

EM Technology is also largely used in husbandry. Effective microorganisms enrich important amino acids in fodder. These amino acids can be listed as lysine, valine, methionine, leitsin, isoleitsin, tyrosine, phenylalanine, gistidin and threonine.

On the other hand, it also removes the gastro-intestinal problems of the animals, weight losses and malodor on and around the animals.

2. Conclusion

EM – Technology is multi-purpose. This technology can be applied in following areas:
1) Agricultural production;
2) Restoration of soil because of the problems caused by chemical fertilizers and pesticides;
3) Manufacturing of the fermented fertilizers, forages and bioadditives in forages;
4) Processing and storage of agricultural production;
5) Processing organic waste, sewage treatment;
6) Protection of animal health. (Bovine animals and birds);
7) Manufacturing medical cosmetics.
«Baikal EM 1» is a certificated fertilizer in the Russian State catalog.

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