

INTRODUCTION OF EFFECTIVE MICROORGANISM AND ITS PROSPECT IN D.P.R.KOREA

Ryang Hong-Gon

Deputy Director, Research Center of Compound Microorganisms, Academy of Sciences of the D.P.R.Korea

ABSTRACT

In our country, we have conducted research work to develop beneficial bacterial fertilizer since the middle of the 1970's. In recent years, in particular, we introduced the production technique of EM and established a well-organized industrial system under the wise leadership of the great leader.

It was spring of the year 1994 when EM technology was known to our country for the first time. Since then, we carried forward vigorously the research work of technical development for the production of EM and its application into our agricultural area.

In 1995, two EM fertilizer factories with an annual capacity of 100t were operated and started a trial production and now they are increased more than 90. Since the field experiment of EM fertilizer began in paddy-rice and maize of about 8 ha in 1994, its application area is increased every year and expanded by about 800×10^3 ha this year, and its beneficial effects from several regions are reported.

This paper represents success achieved in the areas of introduction of EM technique, production and dissemination of EM established in DPR. Korea in the last 4-5 years and its prospect of EM technique on various areas of national economy such as environment conservation and environment purification in the future.

1. BACKGROUND

Even though we have used much chemical fertilizer and pesticides for a long time in our country-D.P.R. Korea, we couldn't apply high-quality compost enough due to the limitation of organic matter resources. Moreover, abnormal climate continued on from long ago and, in particular, influences of natural disasters such as a severe flood and the long-term draught repeated in a few recent years, brought a serious difficulty in agricultural production. All these factors enhanced the acidification as well as the erosion of soil and, as a result, decreased soil productivity.

“Sustainable Agriculture” and “Modern Nature Farming” to maintain stable crop products continually by conserving ecological environment of agriculture were first introduced in some countries such as USA that were largely influenced by chemical agriculture and now they are extended in the world wide scale (Reganold, J. P., et al.1990). Keeping pace with such a world trend, the research works were begun to develop beneficial bacterial fertilizers such as nitrogen fixing bacteria while laying the main stress on organic matter and combine it with microbiological technology since the middle of the 1970's in our country and in the 1980's, it

has been actively undergone so that some successes have been achieving (Ryang Hong-Gon, 1991; 1994).

In order to solve the food production completely by farming properly in our country which has a little arable land and low soil quality, first of all, it is necessary to improve soil and thus make soil fertility enrich.

The fundamental methods to solve this problem seem that, firstly, it is to fix a correct level of organic matters' dressing as well as mineral nutrients and combine these in a rational way For this case, a method should be found out to overcome the insufficiencies of organic resources. Secondly, it is to improve the humus level in soil and maintain it continually. Thirdly, it is to keep humus from soil that would be lost by erosive action.

Considering such a point of view, we came to think that the Effective Microorganism technology studied and invented by Prof. Higa Teruo, can be the best alternative for increasing crop production by enhancing soil productivity in our country (Higa T. 1991; Higa, T and G.N.Wididana,1991; Higa, T. 1994).

Just only 5 years have been elapsed since the EM-technology was first introduced to our country. But, however, we developed actively EM technology to meet our conditions, while referring to the experiences of other countries where this technique was widely practiced (Zafar Altaf, et al., 1997; Cho Cho Myint. 1997).

2. INITIAL RESEARCH ON EM

2:1: Preliminary Research

We conducted a trial experiment with some samples (stock and bokashi) by referring to the papers of EM-technique obtained in 1994. In this process, we isolated and identified microorganisms of about 20 species that belong on photosynthetic bacteria, lactobacilli, yeast, actinomycosis, filamentous fungi and nitrogen fixing bacteria, in bokashi. Besides, based on the experiments of these incubating characteristics, we produced EM1 on laboratory scale as a trial.

2:2: Trial Production of EM

In spring of 1995, the pilot plants with each annual capacity of 100t were built in 2 regions. At these factories, trial production was successful in collaboration with the scientists in EM laboratory, Japan and the method of EM production was developed.

2:3: Mini-plot Experiments with EM Fertilizer

Applying tests with EM fertilizer produced here (D.P.R. Korea) in 1994-1995 along with the other EM fertilizer brought from Japan were conducted in various forms of bioassay port, mini-plots experiment, etc. by using paddy-rice, corn and vegetables as objectives.

We could solve the technical method that can develop production technique of EM through the stage of such initial research works and thus come to have a certain opinion on effects of EM.

3. ACHIEVEMENTS AND EXPERIENCES IN EXTENSION OF EM - TECHNIQUE

3:1 : Industrialization of EM Production Technique.

- Center for EM Stock Production, “Research Center of Compound Microorganisms”

“Research Center of Compound Microorganisms”, the stock production base of EM was built in Pyongyang in less than 10 months and was thus inaugurated in June, 1997. Annual productive capacity of this Center are that EM stock No.1 is about 200t, EM stock N0.2 is 80t and EM stock N0.3 is approximately 300t respectively (Photo 1-4).

Nowadays this Center produces and provides reliably with EM stock of 3 species required at the EM fertilizer factories situated throughout the nation and a special transportation unit delivers EM directly to the local factories (Photo 5).

- EM Fertilizer Factories

Since 1995, many EM fertilizer factories have been built every year so that the productive scale of EM fertilizer was rapidly expanded. EM fertilizer factories with each annual productive capacity of 500-2,000t will be increased to more than 100 by the end of this year and their total productive capacity estimates nearly 12,000t (Table 1, Photo 6).

- Original Stock Factory for EM

In Pyongyang today, original EM stock factory is being built in an area of about 1800M. This factory would be completed in Dec. this year. If this factory is inaugurated in our country would have a well-organized system from the production of original EM stock to the production of EM fertilizer (Photo 7).

3:2: Extension of EM-applied Area in Agriculture

Cultivated area applied with EM fertilizer has been expanded every year since 1995 and paddy-rice and corn of nearly 800,000ha were dressed with EM this year (Table 2).

In the last 4 years, the arable land of EM was increased so rapidly. It is because that the base for EM production was firmly established (Photo 8-11).

3:3: National Dissemination For EM Technology

- Lecture, Training Course and Demonstration

National-wide lecture and training course are conducted in concentrated way about one week in every year, under the sponsorship of Ministry of Agriculture. This meeting is organized in 3 big groups such as technicians of EM production and applying and officers in charge of agricultural field and it is mainly conducted in late Autumn and Winter-the farmer’s leisure season (Table 3).

In addition to this, national demonstrations for producers and users are underway at EM factory along with farm plant every year and sometimes conducted by regional groups when necessary. There are many occasions when nearly 800 people participate in such a meeting in one time.

- Seminar for Technique and Experience

In Ministry .of Agriculture, the results of technical experiences are summed up during the period from Nov.-Dec., the time after farming season.

Through this seminar, the producers and consumers exchange their experiences each other and therefore, the state measure is taken to generalize the best alternatives.

- Other Types of Dissemination

Booklets for mass education, pamphlets and manuals for productive and applying technique on EM production and application are published in thousands of copies and thus distributed to provinces, cities, counties, etc.

As the scientific movies on EM are manufactured and projected, and video cassettes of hundreds of copies are made up to be distributed to the regions, they are widely used for dissemination and technique within many people.

Besides, the platform for scientific technical propagation and the beneficiary experiences obtained in EM production and application are also often introduced on central television.

In a word, the work for dissemination on EM technology is being actively conducted on a nation-wide scale in various forms and methods.

4. EXTENSIVE INTRODUCTION OF EM-TECHNOLOGY TO VARIOUS FIELDS OF NATIONAL ECONOMY

EM technology was begun to be introduced not only to agricultural production but also to general agricultural areas as like as livestock, orchard and fish farming.

EM technique is also practiced in the area of environment purification and a factory of EM-ferment sewage manure is inaugurated and entered into production in a sewage purification plant situated in Pyongyang this spring. The annual productive capacity of this factory is approximately 2,000t (Photo. 1a). With that as a momentum, research work is regularized to purify sewage and waste water with EM.

In the field of Medical Science and Light Industry Science, research assignments are formulated and undergone to develop medicine, healthy cosmetics, antiseptics, etc. with EM.

5. TASKS TO FURTHER DEVELOP OF EM TECHNOLOGY

5:1: Solution of Alternative Saccharide Resources Necessary in EM Production.

It is urgently necessary to find out for alternative saccharide that meets the condition of our country where molasses are not produced. At present, the method using the mixture of molasses of maize and sugarcane, as a saccharide is utilized and the quality of produced EM fertilizer becomes different according to the quality of resources.

5:2: Development of Technology for EM Fermented Compost

The effects of soil improvement with EM fertilizer depend largely on the dressing amount of organic matter of high quality. At present, organic resources consist of mainly crop straw such as paddy-straw under our condition, but, however, we feel very lack of it in the absolute

quantities. Therefore, the technique of fermented compost production should be solved to obtain the best result by using the straws which is not only low in qualities but also in quantities, compared with rice bran, bean cake and fish cake.

5:3: Intensification of Productive and Technical Guidance

EM fertilizer will be produced from more than 100 factories in our country since next year. The operating period of these factories is 3 years for the longs and less than a year for the shorts.

To make the matter worse, the producers working at each factory, have also different technical levels. Therefore, the technical guidance must be intensified in order to make goods produced from all factories equal in high quality. And then in consumer areas far from EM fertilizer factory; the dissemination of technology should be realized so that the consumers can make EM fertilizer by themselves.

5:4: Establishment of Scientific Dressing System of EM Fertilizer for the Condition of Our Country

Scientification of dressing time, amount and method of EM fertilizer should be realized according to the species of our crops, our climatic and soil conditions, the levels and demands of our agricultural people. In this way, the effectiveness of EM fertilizer should be expressed all over the country ,not only in the special areas.

5:5: Extensive Dissemination of EM technology

It is important to make many producers, consumers and officers in agricultural area participate in works of technical dissemination such as lectures, courses and demonstrations. But the more important matter is not only to make hundreds of thousands of people, several millions of people dealing with EM possess high level technique on it ,but also to have a direct interest in it. Therefore, we should intensify the activity of EM technique more thoroughly in various forms and methods by making a good use of every time and period.

5:6: Extensive Introduction of EM Technology to Several Fields of national Economy.

The activity to introduce extensively EM technology to several areas of national economy. We think that the major method here is to make a model at individual sectors and generalize it.

6. CONCLUSION

Nearly 4 years have been elapsed since EM-technology was firstly known to D.P.R. Korea. It is not so long when we consider it as a time concept. The features of the process of EM-technology during this period in our country can be said that the technical development and productive introduction are realized simultaneously on large-scale in three dimensions before the research work.

As the modern EM stock production base and more than 100 EM fertilizer factories were built all over the country and the production became normal, material and technical base able to produce and provide with EM fertilizer of nearly 120,000t in a year was strictly provided.

Moreover, the applying area of EM fertilizer was about 300ha in 1995 but expanded by 800,000ha this year.

All these successes are thoroughly achieved under the wise leadership and the careful concern of the great leader Comrade Kim Jong II. And we are well aware of the fact that this is permeated with the lofty patriotic spirit of ChongRyon (Patriotic Organization of our motherland) and compatriots in Japan, who are trying very hard for the food problem of our fatherland, as well as the helps of INFRC and EMRO such as Prof. Teruo Higa.

We aimed as an immediate target the realization of epoch-making development in introduction EM

technology into various industrial areas such as agriculture by the end of the year 2,000 and carry on properly to achieve it.

First of all, the effects of EM fertilizer should be expressed in general at the agricultural area. Even though the effects of EM fertilizer are considered in some regions where EM has been dressed from 3-4years ago, but it is also true that the farmers are not interested in EM till now. In order to solve this problem, I think that the first 5 problems of 6 tasks explained in above item No.5 should be solved. For this one , we should intensify research work to develop EM technology creatively according to our condition.

National industrial system of EM established in our country is a stable material and technical base that can develop extensively this technique not only in agricultural but also in the other industrial area. On the basis of this, we are sure that EM technology could bring better results in several industrial fields.

In this way, we would like to make our active contribution to the development of EM technology-the common treasure of mankind.

REFERENCES

- Cho Cho Myint. 1997. EM nature farming technology; Research and extension activities in Myanmar. Paper presented at the Fifth International Conference on Kyusei Nature Farming in Bangkok, Thailand.
- Higa, T. 1994. Effective Microorganisms; A biotechnology for mankind, P 8-14. In J.F. Parr, S.B. Hornick, and C.E. Whitman(ed.) Proceedings of the First International Conference on Kyusei Nature Farming .U.S Department of Agriculture, Washington, D.C., USA.
- Higa, T. and G.N. Wididana. 1991. Changes in the soil micro flora induced by Effective Microorganisms. P.153-162. In J.F. Parr, S.B. Hornick, and C.E. Whitman(ed.) Proceedings of the First International Conference on Kyusei nature farming U.S. Department of Agriculture, Washington, D.C., USA.
- Reganold, J.P., R.I.Papendick, and J.F.Parr.1990. Sustainable Agriculture, Scientific American 262(6):112-120.
- Ryang Hong-Gon, 1991. Research tendency and prospect of biotechnology of biological

nitrogen fixation. Bulletin of Plant Phyciology, No.1. 56-63 (Published in Korean).

Ryang Hong-Gon, 1994. Thesis: "Study on development of production technique of N₂-fixing bacterial fertilizer". (Un published)

Zafar Altaf, T. Hussain, G. Filani, and T. Javaid, 1997. Revolutionizing agriculture through the dissemination of EM Technology -A practicable model developed in Pakistan. Paper presented at the Fifth International Conference on Kyusei Nature Farming, Bangkok, Thailand.

Table 1. Increase of EM Fertilizer Factories and EM Production.

Year	Number of factories	Quantity of production
1995	2	300
1996	22	5,000
1997	69	54,000
1998	about 100	about 90,000

Table 2. Increase of Applying Area with EM Fertilizer.

Year	Applying area (ha)
1995	300 *Paddy-rice and maize
1996	about 40,000
1997	about 600,000
1998	about 800,000

Table 3. Number of Lectures, Training Courses and Demonstrations.

Year	The number of times (No.)	The number of participants (No.)
1995	-	-
1996	9	1,100
1997	12	3,000
1998	16	3,300