

EM Technology Application in Vietnam and Some Results in Environment Treatment

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Abstract : *Since May 1997, EM technology has been applied in different domains. A study at national level entitled “Research, Testing and Application of EM Technology in Agriculture and Environmental Sanitation” has been worked out and implemented since January 1998 by the Hanoi Agricultural College under the guidance and supervision of the Ministry of Science, Technology and Environment. The results of the study will be used for demonstrating the effectiveness of EM technology in crops, animal husbandry and environmental protection, and will be used as a basis for the extension of EM technology in Vietnam.*

The study has been conducted with 18 experiments related to micro-organisms of EM, effect of EM on different crops such as rice, maize, soybean, vegetables; on domestic animals such as poultry, swine, in plant protection, production of fertilizer, treatment of waste and garbage, and seeking the adverse aspects of EM.

The Hanoi Agriculture University while conducting this study has collaborated with the Hanoi National University, the Plant Protection Institute, the Institute for Agricultural Science, the Veterinary Institute (within the Ministry of Agriculture and Rural Development), the Institute for Industrial Chemistry (within the Ministry of Industry), the Vina-Nichi Center for Technology Development (within the Ministry of Science, Technology and Environment). Besides, some provincial Departments of Science, Technology and Environment and other research institutions have also participated in the study.

Each participating unit conducts some experiments. The success in 1998 was very satisfactory, especially in the treatment of solid and liquid wastes for environmental protection. Some results of EM application in treating solid and liquid wastes in Vietnam are presented in this report.

Introduction The Effective Micro-organisms (EM) technology, initiated by Prof. Dr. Teruo Higa working in Ruykyus University in Okinawa, Japan, has been

put into application since 1980. Until now, this technology has been applied in a lot of countries and is considered as an effective solution for developing a sustainable agriculture, increasing the quantity and quality of cropping and animal husbandry products as well as for treating solid and liquid waste and improving environmental sanitation.

Vietnam got access to EM technology since 1994 – 1995, through South Korea and China. But until April 1997, after the visit of Prof. Dr. Teruo Higa to Vietnam and the signing of Memorandum of Understanding between him and Prof. Dr. Chu Hao, Deputy Minister of Science, Technology and Environment, this technology became officially and widely applied in cultivation, animal husbandry and environment treatment.

Since January 1998, the Ministry of Science, Technology and Environment has decided to carry out an independent national scientific study : “Study, test and acceptance of EM technology in agriculture and environmental sanitation”.

Until now, the study has brought about a lot of good results, especially in the treatment of pollution, reduction of pollutants such as municipal solid waste (MSW), waste water from residential quarters and industrial enterprises.

The present report will focus in presenting some initial results of using WM for treating garbage, hospital waste and slaughtering house wastes in Hanoi Capital.

**Materials
And
Methods**

Application of EM Technology in Vietnam

Preliminary Stages of Development

Since May 1997, EM Technology has been applied in Vietnam. The basis for developing EM technology in Vietnam are : -

- The document signed on 28/04/1997 between the Ministry of Science, Technology and Environment of Vietnam represented by Prof. Dr. Chu Hao and Asia Pacific Natural Network (APNAN), EM Research Organization (ERO), Okinawa, Japan, International Nature Farming Research Center (INFRC), ATAMI, Japan organizations represented by Prof. Dr. Teruo Higa.
- The assignment of the Ministry of Science, Technology and Environment for applying EM technology. Application included the following :-

- The Vina-Nichi Center for Technology Development, within the Ministry of Science, Technology and Environment.
- The Hanoi Agriculture College No. 1, within the Ministry of Education and Training.
- The Applied Microbiology Center, under the Hanoi National University, within the Ministry of Education and Training.
- The Plant Protection Institute, within the Ministry of Agriculture and Rural Development;

The programme of EM technology application in Vietnam was implemented in three years from 1997, with two main orientations, namely, (i) to study, test acceptance of EM Technology and (ii) educate, train, and disseminate EM technology.

During the implementation of the program, since 1997 until now, the Vietnam side has received extremely valuable assistance from APNAN, EMRO and INFRC organizations, including: preparation of EM in Vietnam, creation of conditions for Vietnamese scientists and technicians to practice EM technology in Thailand and participate in international seminars in nature farming and EM technology. Due to this assistance, the Vietnam side has promoted the application of EM technology in different domains of agricultural production and environmental protection.

National Project

The Ministry of Science, Technology and Environment launched a national research project titled “Study, test and acceptance of EM technology in agriculture and environmental sanitation”, with the Hanoi Agriculture College No. 1 as monitor of the project.

Seven institutions have joined together in the implementation of the project namely:

- Hanoi Agriculture College No.1, within the Ministry of Education and Training.
- Hanoi National University, within the Ministry of Education and Training.
- Hanoi Agriculture Science and Technique Institute, within the Ministry of Agriculture and Rural Development.
- Plant Protection Institute, within the Ministry of Agriculture and Rural Development.
- Veterinary Institute, within the Ministry of Agriculture and Rural Development.

- Chemical Industry Institute, within the Ministry of Industry
- Vica-Nichi Center for Technology Development, within the Ministry of Science Technology and Environment.

Researchers have conducted 18 experiments which are classified into the following groups :

1. Studies of main species of micro-organisms available in EM product.

This group has carried out the following experiments :

- Main species of micro-organisms available in EM.
- Conservation and multiplication of micro-organism strains in EM
- Preparation of EM solution mixed useful micro-organisms and micro-organisms of Vietnam
- Studies of EM influence upon useful micro-organisms and micro-organisms available in the root system of crops

These studies have been carried out by :

- Hanoi National University, Ministry of Education and Training
- Hanoi Agricultural Science and Technique Institute, Ministry of Agriculture and Rural Development.

2. Studies of using EM product in environmental protection :

The following two experiments were carried out by the second group :-

- Using EM in treating solid waste : burying and processing garbage into organic compost.
- Treating waste water discharged from hospitals and enterprises.

These studies have been conducted by :

- Vina-Nichi Center for Technology Development, within the Ministry of Science Technology and Environment
- Hanoi Union of Biology Associations
- Chemical Industry Institute, within the Ministry of Industry
- Hanoi City Urban Environment Company
- Hochiminh City Consultation Center for Technology and Environment.

3. Studies of EM efficiency on crops :

The emphasis in these studies was to examine EM efficiency on rice, corn, soybean and some vegetables (cabbage, carrot, tomato, cucumber).

These studies have been carried out by :

- Hanoi Agriculture College No1, Ministry of Education and Training and
- Plant Protection Institute, Ministry of Agriculture and Rural Development.

4. Study of EM impact on pests and diseases:

These studies have been conducted by :

- Plant Protection Institute, Ministry of Agriculture and Rural Development and
- Department of Plant Protection of Vinh Phuc, Da Nang, Ha Nam Ninh and Khanh Hoa province.

5. Studies of EM effect in animal husbandry and veterinary:

These studies have been conducted by :

- Veterinary Institute, Ministry of Agriculture and Rural Development and
- Hanoi Agriculture College No1, Ministry of Education and Training.

Results from these studies have shown that :

- Elements harmful to people and animal were not found in EM.
- EM has positive effects. It can raise the yield of food crops, vegetables and beans. Using EM may reduce the use of chemical fertilizers and insecticides and may shorten the vegetation period of crops.
- The effect of EM in restricting diseases of rice is rather obvious, but it is not so clear in other crops such as vegetables. However, the yield of crops applied with insecticides is equivalent to that applied with insecticides.
- EM has positive effects on domestic animals. It can

accelerate the growth of animals, control some diseases and improve hygienic conditions of stables, pigsties and animal husbandry farms.

- EM has an obvious effect in the treatment of urban garbage and transformation of it into organic fertilizer. Odours, putrid smell and flies decrease. The quality of manure produced from garbage is much better.
- EM is very effective in the treatment of waste water, especially waste water discharged from tanning factories, paper plants, sugar refineries and slaughtering houses and hospitals.

Education and Training in EM Technology

Overseas training

With the assistance of Prof. Dr. Teruo Higa, APNAN organization and the Saraburi Training Center for EM technology in Thailand, two groups including 45 Vietnamese scientists and technicians were sent separately in September 1997 and July 1998 to be trained in EM technology in the Saraburi Center.

In-country training

From June 1997 until now, on the average every month a training course on EM technology has been organized for about 20-30 trainees who are engineers, practitioners of this technology in different localities. These trainees subsequently become trainers for other people to understand and apply EM technology. At present, thousands of people have accessed this technology and applied it in different domains of different sizes nation-wide.

The EM technology is particularly applied in the treatment of garbage, waste water, stables and pigsties.

EM Technology Application for Treating Solid and Liquid Wastes in Vietnam :

Experiment 1 : Application of EM technology in treating garbage treating buried garbage

EM secondary solution was prepared from 1 liter EM1 + 6kg molasses + 93 liters of water. 1 liter of secondary EM was diluted 500 times to be sprayed on garbage.

EM Bokashi :

Compost produced from garbage fermented by EM

Compost	:	780 kg (78 percent)
Rice bran	:	150 kg (15 percent)
Molasses	:	70 kg (7 percent)

If there was no compost, EM Bokashi was produced from :

Sawdust	:	60 kg (60 percent)
Rice bran	:	40 kg (40 percent)

Technological procedure of burying garbage :

+ Levelling and pressing garbage with caterpillar bulldozer for achieving a density of 550-700 kg/m³ spraying EM solution on garbage with a proportion of 5 ml EM1/ton of garbage.

+ After each layer of garbage of 0.8 – 1.0 m thickness, a layer of EM Bokashi was spread with a proportion of 0.1kg/m² then garbage was covered by a 10cm thick layer of soil.

Experiment was conducted according to a comparative method, between garbage with treated EM and garbage without EM treatment as the control.

Vietnam's 1995 environment standards 5937 and 5938 were used for comparison.

Results

Experiment 1

The values obtained in the comparative experiment anaerobic fermentation with and without EM treatment are given in Table 1.

**Table 1. Gas Contents in Experimental Garbage Basins (24M3)
(Anaerobic Condition)**

Date of Measurement	Method	Gas Contents (mg/m ³)			
		CO	SO ₂	H ₂ S	CH ₄
6/9/1998	Without EM	0.2	3.76	0.36	1.08
	With EM	0.2	3.10	0.26	1.04
15/9/1998	Without EM	0.39	0.20	0.52	0.057
	With EM	0.28	0.20	0.15	0.015
24/9/1998	Without EM	0.10	0.10	0.12	0.02
	With EM	not detected	0.05	not detected	0.007
23/10/1998	Without EM	0.10	0.080	0.20	0.02
	With EM	not detected	not detected	not detected	0.005