Effect of EM on the Production of Crops and Waste Treatment in Korea

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Abstract

Since 1991, the Korea Nature Farming Research Center (KNFRC) has made a great effort for the development of EM technology and its dissemination. The KNFRC conducted experiments on the effects of EM application in various crops and citrus at several model farms and at chicken farms as well.

To find out the effects of EM on rice yield and soil improvement, rice paddy was treated with EM. Compared to the untreated plot, yield increase was observed with less occurrence of weeds, diseases and pests on EM treated plot. Treated paddy soils also showed more friability deeper. Increase of citrus yield was obtained when the soil in the green house was incorporated with diluted solution of 500 – 1,000 times. Higher sugar content of 1 – 2° brix was observed in juice.

Significant effect of EM application on earlier maturity was also observed when chickens were fed with EM mixed feed, resulting cost-cut effect. The offensive odor from chicken manure was greatly reduced with the EM-fed treatment revealing the effect of waste treatment in henhouse.

Due to the positive results with the EM treatment in plants and animals. Korean farmers are interested in the extended use of EM products as an alternative way to increase the agricultural productivity with less inputs.

Introduction

At First International Conference at KhonKaen University in Thailand in 1989, eight years ago, we knew for the first time about the Kyusei Nature Farming using EM. Thereafter, on the recommendation of the President, Kyung-Hee Lee of KORIN (EM) Korea Co. Ltd, the effects of EM were examined. According to beneficial results of an experimental application of EM on a pilot scale on a paddy and vegetable field in 1990, it was recommended for use in 1991 to volunteer farmers in a broad area. A pilot EM production plant was built in Korea on May, 1993, and it began to supply various farms with the experimental EM product.

On June 1996, KORIN Korea CO.LTD constructed a regular EM plant at foreign investors' industrial park in Chun-An city, located 100km south from Seoul, after EM technology was officially approved by the Ministry of Finance and Economy of Korea. The plant supplies 10 mt. of EM per month from May 1997. Demands for EM comes from farms raising crops, orchard fruits, flowers and livestock. It was also proved that EM is useful in waste water treatment in livestock raising farms. EM supply or marketing system is developing in various ways. One example may be illustrated by Agricultural Cooperative Union in southern Korea, which supplies 1-2 mt per month through its local branches. Another example is seen by Natural Farming Union in Jeju Province on the largest island in Korea, whose members are composed of more than 300 farmers. Through EM application, they attained more than 20 per cent, yield increase of citrus and kiwi, in addition to their quality improvement, which were confirmed by the National Institute of Agri-products Quality Investigation. Therefore, they were able to sell their products at more than 30 per cent higher price, in addition to getting farming fund support greater than 50 percent from administration offices and farming loan of 30 percent. Therefore, they needed only 20 percent of their own farming fund, Such support is also given to vegetable union, flower growing union, poultry raising farms using EM, whose effects can be illustrated as follows;

Orchid-Denphale Cultivation Using EM

Background

Orchid-denphale cultivation has been desired by many farmers for their higher income, but it has not been successful because of its susceptibility to root decaying disease, which prevents roots from

absorbing water, showing a mortality of 30-60 percent. 200 farms of orchid-denphale cultivation had failed every year in Jeju island, before one farmer, whose name is Heo, Sung-Won, became successful using EM.

EM Composting and its Application

Traditionally orchid farmers made their compost from wood bark soaked in sea water for a long time. The salts contained in the bark disturb orchid growing. Therefore, the bark should be fermented using EM plus rice bran and sieved into appropriate particle sizes. The fermented compost may be mixed with 50 percent waste wood particle from mushroom growing. Cindery and barley stone (diabase porhyrite) powder is added to the fermented compost as its growing bed. Tap water should be stored in water tank with barley stone for its purification before spraying. A solution of EM diluted 1000 times is sprayed on orchid –denphale once or twice per month with addition of pyroligneous liquor of 2.5 percent and kitosan of 2.5 percent in it.

Growth Status

EM treated orchid-denphale grows faster and has thicker stems than traditional orchid-denphale. The EM treated has 8-9 flowers per plant, while the traditional had only 5 flowers. Therefore, the EM treated ones is higher in marketing quality than the traditional. EM treatment shortens growth period by 6 months, making its shipment possible after one year's growth, while traditional farmers need 1 years growth before shipment. Moreover, traditional farmers frequently lose 30 – 60 percent plants due to root decaying disease during hot, wet summers, but EM treating farmers have not observed such disease as yet. EM treatment reduced growth hindering effects of salts in wood bark and removed farmer's anxiety on root decaying phenomena during the growing period, saving labour and material cost for fungicide spraying of approximately 10 times per year (Table 1).

Table 1. Apparent Income Comparison

Treatment	Shipping (per number)	Price/pot (US$)	Gross income (US 1,000$/farm)
EM treated	50,000	7.7	385
Traditional	35,000	7.0	245
Difference	15,000	0.7	140

Citrus- Miyakawa Cultivation in Green House Using EM

Background.

Oranges had been a high income crop grown only in warmer Jeju island in Korea, before its sudden price fall due to the opening of the Korean market to foreign oranges. Farmers in Jeju island began to grow oranges in the cool season in greenhouses in order to harvest them from May to July for the improvement of their income against open market competition. But high temperature and humidity and the stagnant atmosphere in the greenhouse promoted the spread of various diseases and pests, increasing the requirement of agri-chemical sprays in contrary to consumers uneasiness on product quality related to public health (Table 2). Therefore, citrus farmers wanted new technology to reduce chemical spray on citrus trees and a farmer, named Lee, Chong-Hun, began to use EM with satisfactory results on the quality of his citrus product.

Table 2. Monthly Temperature (°C) in the Citrus Growing Greenhouse.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Aver
Green-House in Jeju	20.6	23.4	24.0	27.5	30.0	31.2	30.4	30.6	30.0	28.5	27.2	25.1	27.4
Atmosphere in Jeju	6.0	6.6	9.7	14.0	17.9	20.9	25.1	26.7	23.2	18.5	13.4	8.4	15.9
Atmosphere in Suweon	-3.9	-1.8	3.7	10.9	16.5	20.9	24.4	25.1	19.8	13.0	5.7	-1.2	11.1

Farming Methods

EM compost of 80kg/0.1ha was applied twice at an interval of 20 days after harvesting and another of similar quantity was applied in early October just before warming the green house. During the culture in closed green house from October to April of the following year, 50kg/0.1ha of EM compost was applied 3 to 4 times depending on the colour of citrus leaves. In addition, a mixture of 500 times dilute solution of EM5 and 500 times dilute solution of fermented EM (400 ml of EM and 400 ml of molasses is added into 18 l of water and kept for 10 days for fermentation) was sprayed on the leaves 12 to 15 times, along with additional spray of EM compost extract as deemed necessary.

EM Effects

Traditional farming has applied as much as 3 to 4 mt/0.1ha organic compost but resulted in yield decrease of 20 to 40 percent plus quality deterioration due to various diseases and pests. Nature farming applies as little compost as 300 to 400kg/0.1ha, but results in healthy trees with straight and thicker leaves getting more light. Diseases and pests are rare and the sugar content of the orange was higher by 1-2° brix. It is thought that the applied EM compost contributed to improvement of soil physical properties such as friability, porosity, consistency, and increasing the population of earth worms. Particularly it reduced the growth of harmful microbes, decreasing the requirements of fungicide spray. Consumers option declines gradually to the EM treated citrus, free from agro-chemicals for their health (Table 3).

Table 3. EM Effects on Citrus Compared to Traditional Farming

	Yield (ton)	Price (US$/kg)	Gross Income (1,000$)	Fuel cost (Index)
EM farming	54.0	4.8	248.4	0.75
Traditional	37.8	3.9	147.4	1.00
Difference	16.2	0.7	101.0	

House area: 0.92ha, 30% less yield and 0.7$ less price for traditional farming

Poultry Farming Using EM

Background

Various problems are evident in recently developed mass production poultry farms, one of which is the ammonia smell from poultry yards spreading over neighbouring villages. The smell induced friction between poultry farmers and neighbouring crop growers and the Korean government by law permitted new large farms of poultry only in mountainous areas. But the existing poultry farmers must solve the odour problem by themselves. One named Cho, Chu-Hyun in Sunchun city, Jeonnam Province paid attention to microbial activity of EM. He fed 22,000 chickens with EM mixed feed in 1996 to find satisfactory results. Now, EM mixed feed is spreading out into neighbouring poultry farms as well.

Farming Method

EM is diluted with 100 parts of water and sprayed on poultry yard at rate of 11/17m^2. Feed is mixed with EM compost of 1 to 2 percent. Drinking water is replaced by 5000 to 10000 times dilute solution of EM.

EM Effect

The ammonia smell in poultry yards became negligible through EM treatment and the eggs layed were clean and glittering. Egg yolk became more elastic and flavoured with better marketing quality than traditional eggs. Moreover, EM treatment shortened the 45 days of growing period for marketing of chickens by 2–3 days, removed antibiotics, decreased poultry death rate from diseases of respiratory organs, and doubled the environment cleaning effect by savings on production costs.

Rice Yield Using EM

Experimental Method

The experiment was carried out at the National Crop Experiment Station of the Rural Development Administration

- Application of EM compost : 400kg/0.1ha
- Application of EM : applied 4 times/month interval with solution diluted 100 times.

Treatment I: Chemical fertilizer NPK : 11 to 7-8 kg/0.1ha
II: Chemical fertilizer ½ with EM compost 400kg/0.1ha
III: No fertilizer with EM compost 400kg/0.1ha

Results

The results (Table 4) show that EM application increased yields of brown rice due to higher panicles per hill.

Table 4. EM Effects on Rice Yield

Treatment	Panicle (no/hill)	Grain wt. (g/1000 grains)	Yield of brown rice	
			Kg/0.1ha	Index
I	15.6	21.8	557	100
II	20.3	21.2	596	107
III	18.2	21.6	582	105

5% increase in yield on EM compost application

Conclusion

As a result of imprudent use of agro-chemicals, such as fertilizer, fungicides, and insecticides for raising yields of crops, consumers tend to become uneasy of existing agricultural products and gradually tend to select unpolluted farm products. Large scale raising of livestock using imported feed also contributed to environmental pollution, because the farmers have neglected to clean their waste water from livestock yards, before releasing it into steams. Now, we should be prudent through self-control in using agro-chemicals in relation to our environment and health. Microbial activities of EM depress the growth of noxious or harmful microbial, promote the decaying process cleaning the environment, and is partly able to replace agro-chemicals. Therefore, nature farming technology using EM is expected to contribute to sustainable agriculture including unpolluted farm production. If government recommends and supports the use of EM, it would be the best way for future Green-Round policy.

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