
EM Technology Has a Vast Range of Prospects on the Green Food in China

Weijiong(1), Yongzhen Ni(1), Akira Suzuki(2)

(1) China Agricultural University, Beijing, China 100094

(2) International Nature Farming Research and Development Center, Japan

Abstract

This article briefly introduced and expounded the concept of the Japanese Nature Farming and EM technology and the relationship between them. Based on this, it put forward the technology and method of using the EM bacterial agent for producing non-polluted grain, vegetable, poultry, egg, pork, and other products in China accorded with the Chinese Green Food Standard.

1. The Concept of Nature Farming

In recent years, the corrupt practice of the appearance of the petroleum agriculture or energy resource agriculture is recognized, so that the idea of the instead agriculture is widely accepted by the world people, for example, organic agriculture, regenerated agriculture and consistent agriculture in the USA; stereoscopic agriculture and ecological agriculture in Asia and Nature Farming in Japan.

The Nature Farming was put forward by Mr. Mokichi Okada in 1935. Its kernel is to respect the Great Nature to manage according to the natural and to fully display the great power by itself for the production so as to hope for the construction of a paradise without any the poor disease or war on earth by the way of this agriculture law. There, he firstly advance the idea to produce healthy food through the culture without fertilizer in 1935.

Up to now, the Nature Farming itself has also developed and enriched. It put forward five realized target. They are as follows:

- To produce high-quality non-polluted food so as to strengthen human health;
- To be beneficial to the producers and customers one economy and spirit;
- To develop everlastingly with easy grasp; Without destroying the nature to protect the environment;
- To produce enough grain to satisfy the increasing world population.

The green food is kind of food which is no-pollution, safety , high-quality, nourishing. At the same time , it has yet to be authenticated and allowed to use the mark of the green food by China Green Food Development Center.

The standards of the green food contains 4 aspects, but the most important is the standard of production process, i.e. a little or no-chemical fertilizer and pesticide in plantation industry, a little or no-growth hormone and antibiotic in husbandry industry. Only the production process of the green food are safety and no-pollution, the quality of productions ensured.

2. EM Technology and Green Food Production

During the early 1990's, the Chinese and Japanese scientists cooperated to introduce EM technology in to China. Under the support and help of the Japanese International Research and Development Center of Nature Farming and Prof. Teruo Higa, we carried out thousands of experiment in the aspects of the planting industry, raising industry and environmental protection only with several years, which not only got obvious effects and results but also summed up the technology and method of applying EM bacterial agent in China. At present, EM technology has been tested, demonstrated and applied in over 30 Chinese provinces, cities and autonomous regions to be paid wide attention. Many production units take EM technology as the first selected technology of carrying out the ecological agriculture and producing green food to open up a new way for the non-pollution food production.

2.1 Development of non-pollution grain products

Since 1993, we have used EM technology to culture the grain crops for test and research in the Quzhou Experiment Station, China Agriculture University. After several years' experiment and research, under the condition of without using pesticide and chemical fertilizer, to utilize the combination of EM and organic manure, the yield per Chinese mu (1 ha. = 15 mu) of double-season wheat and corn reached over 1200 kg, which surpassed the level of ton grain yield per mu. Its quality reached the standard of the Chinese Green Food (Table 1), this result was checked and appraised in Sept.1999 and was highly praised by experts.

Table 1. Test result of non-polluted wheat products

| Test item | Unit | Present green food standard | Actual test result | Qualified or not |
|--------------------------|-------|-----------------------------|--------------------|------------------|
| As | mg/kg | ≤ 0.7 | 0.003 | Qualified |
| Hg | mg/kg | ≤ 0.02 | 0.005 | Ditto |
| F | mg/kg | ≤ 1.0 | 0.1 | Ditto |
| Cd | mg/kg | ≤ 0.1 | 0.002 | Ditto |
| Cr | mg/kg | ≤ 1.0 | 0.01 | Ditto |
| Zn | mg/kg | ≤ 50 | 21 | Ditto |
| Se | mg/kg | ≤ 0.3 | 0.01 | Ditto |
| Cu | mg/kg | ≤ 10 | 0.05 | Ditto |
| Pb | mg/kg | ≤ 0.4 | 0.01 | Ditto |
| Nitrous acid | mg/kg | ≤ 3 | 1 | Ditto |
| Allatoxin B ₁ | mg/kg | ≤ 5 | (<1) | Ditto |
| Phosphide | mg/kg | ≤ 0.05 | Negative | Ditto |
| Cyanide | mg/kg | ≤ 5 | Negative | Ditto |
| Chloride | mg/kg | ≤ 2 | No (< 0.05) | Ditto |
| Carbon bisulfid | mg/kg | ≤ 10 | No (< 0.20) | Ditto |
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|---------------|-------|-------------|---------------------------|-------|
| Heptachlorine | mg/kg | ≤ 0.02 | No (1×10^{-4}) | Ditto |
| Aldrin | mg/kg | ≤ 0.02 | No (1×10^{-4}) | Ditto |
| Dieldria | mg/kg | ≤ 0.02 | No (1×10^{-4}) | Ditto |
| Phorate | mg/kg | ≤ 0.02 | No (1×10^{-3}) | Ditto |
| Fenitrothion | mg/kg | ≤ 5 | No (1×10^{-3}) | Ditto |
| Fenthion | mg/kg | ≤ 0.05 | No (1×10^{-3}) | Ditto |
| DDVP | mg/kg | ≤ 0.1 | No (1×10^{-3}) | Ditto |
| Rogor | mg/kg | ≤ 0.05 | No (1×10^{-3}) | Ditto |
| Malathion | mg/kg | ≤ 3 | No (1×10^{-3}) | Ditto |
| Parathion | mg/kg | ≤ 0.1 | No (1×10^{-3}) | Ditto |
| BHC | mg/kg | ≤ 0.3 | No (1×10^{-5}) | Ditto |
| DDT | mg/kg | ≤ 0.2 | No (1×10^{-5}) | Ditto |

Test unit: Chinese Land Reclamation North Food Monitor Center

2.2 Research and exploitation of Non-Pollution vegetable Products

In recent years, we have tested and studied to use the biological active organic manure combined with EM and organic manure instead of chemical fertilizer and use biological pesticide and biological control instead of chemical pesticide on the vegetable production in many areas, i.e. Beijing, Hebei, etc., so as to produce vegetable products, i.e. non-pollution green food-cucumber, etc. (Table 2).

Table 2. Test result of non-polluted cucumber products

| Test item | Unit | Present green food standard | Actual test result | Qualified or not |
|-------------|-------|-----------------------------|-----------------------------|------------------|
| As | mg/kg | ≤ 0.2 | 0.01 | Qualified |
| Cd | mg/kg | ≤ 0.05 | 0.002 | Ditto |
| Zn | mg/kg | ≤ 20 | 4 | Ditto |
| Se | mg/kg | ≤ 0.1 | 0.01 | Ditto |
| Cr | mg/kg | ≤ 0.5 | 0.01 | Ditto |
| Pb | mg/kg | ≤ 0.2 | 0.01 | Ditto |
| Cu | mg/kg | ≤ 10 | 0.04 | Ditto |
| Hg | mg/kg | ≤ 0.01 | 0.01 | Ditto |
| F | mg/kg | ≤ 1.0 | 0.1 | Ditto |
| BHC | mg/kg | ≤ 0.2 | No ($< 1 \times 10^{-5}$) | Ditto |
| DDT | mg/kg | ≤ 0.1 | No ($< 1 \times 10^{-5}$) | Ditto |
| Phorate | mg/kg | No | No ($< 1 \times 10^{-3}$) | Ditto |
| Fentrothion | mg/kg | ≤ 0.2 | No ($< 1 \times 10^{-3}$) | Ditto |
| Fenthion | mg/kg | ≤ 0.05 | No ($< 1 \times 10^{-3}$) | Ditto |

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|--------------|-------|-------|---------------------------|-------|
| DDVP | mg/kg | ≤ 0.1 | No (<1x10 ⁻³) | Ditto |
| Rogor | mg/kg | ≤ 0.5 | No (<1x10 ⁻³) | Ditto |
| Malathion | mg/kg | No | No (<1x10 ⁻³) | Ditto |
| Parathion | mg/kg | No | No (<1x10 ⁻³) | Ditto |
| Nitrate acid | mg/kg | ≤ 4 | 1 | Ditto |

Test Unit: Chinese Land Reclamation North Food Monitor Center

2.3 Research and Development of Non-pollution poultry and Egg.

Under the support of Beijing EM Biological Technology Limited Co, after several years' research, we applied fermented technology combined with aerobic and anaerobic to produce EM fermented and fed the hen with EM diluted liquid for drinking water or spraying over the hen house. We didn't use antibiotic and hormone matters to produce EM egg without pesticide remain and with low fat and cholesterol high protein (Table 3). These eggs entered Beijing market and were warmly welcomed by the consumers.

Table 3. Test result of EM egg

| Test item | Unit | EM egg | Average value of common egg | Ratio |
|-------------------------|---------|--------|-----------------------------|---------|
| Protein (whole egg) | % | 13.3 | 12.6 | +0.70 |
| Fat (whole egg) | g/100g | 2.9 | 11.0 | -8.10 |
| Cholesterol (whole egg) | mg/100g | 120.8 | 680.0 | -559.20 |

Protein increased 7% , fat decreased 73.6% , cholesterol decreased 82.2%, pesticides: DDT, BHC, remains were not found. Hormones: DES, DET, TEP, HPT, and HEX were not found.

Test unit: Monitoring Institute of Food Hygiene of Chinese Sanitation Ministry.

We cooperated with the head office of the Chinese Green Food Corporation to apply the above-mentioned technology and method to produce the Tiandisheng trademark green food chicken (Table 4).

Since it entered Beijing market, it has had a good sale all the time.

Table 4. Test result of Tiandisheng trademark green food broiler

| Test item | Unit | Present green food standard | Actual test result | Qualified or not |
|------------|-------|-----------------------------|--------------------|------------------|
| Penicillin | mg/kg | -- | No(< 0.01) | -- |
| Aureomycin | mg/kg | -- | No(< 0.01) | -- |
| Terramycin | mg/kg | -- | No(< 0.01) | -- |
| Gentamicin | mg/kg | -- | No(< 0.01) | -- |
| Protein | % | -- | 19 | -- |
| Fat | % | -- | 19 | -- |
| BHC | mg/kg | < 4.0 | No(< 0.00001) | Qualified |
| DDT | mg/kg | < 0.2 | No(< 0.00001) | Qualified |

| | | | | |
|--------------------------|-------|--------|-------|-----------|
| Hg | mg/kg | < 0.05 | 0.01 | Qualified |
| As | mg/kg | < 0.5 | 0.02 | Qualified |
| Se | mg/kg | < 0.5 | 0.001 | Qualified |
| Cd | mg/kg | < 0.1 | 0.004 | Qualified |
| F | mg/kg | < 2.0 | 1.1 | Qualified |
| Volatility Base nitrogen | mg/kg | <15 | 11 | Qualified |

Test unit: Chinese Land Reclamation North Monitor Center

2.4 Research and Exploitation of Non-Pollution Pork Products

Under the support of the Beijing Science Committee, we cooperated with the Changping Science Committee to study and apply EM technology to succeed in setting up the ecological pig farm, which not only summed up a series of combined technology for the construction of the ecological pig farm, but also produced the non-pollution pork to accord with the standard of green food (Table 5). This result was checked upon delivery and praised by experts. They all agreed that we should.

Table 5. Spread the result with great effort. Test result of non-polluted pork Products

| Test item | Unit | Present green food standard | Actual test result | Qualified or not |
|------------------------|---------|-----------------------------|---------------------------|------------------|
| As | mg/kg | < 0.5 | 0.01 | Qualified |
| Cd | mg/kg | < 0.1 | 0.002 | Qualified |
| Hg | mg/kg | < 0.05 | 0.0006 | Qualified |
| Zn | mg/kg | <100 | 18 | Qualified |
| Se | mg/kg | < 0.5 | 0.0007 | Qualified |
| Cr | mg/kg | < 0.5 | 0.06 | Qualified |
| Pb | mg/kg | <1.0 | 0.01 | Qualified |
| Nitrous acid | mg/kg | < 0.5 | 0.7 | Qualified |
| Volatity base nitrogen | mg/100g | < 3 | 6 | Qualified |
| BHC | mg/kg | < 20 | No (<1x10 ⁻⁵) | Qualified |
| DDT | mg/kg | < 4 | No (<1x10 ⁻⁵) | Qualified |
| Cu | mg/kg | < 2.0 | 0.04 | Qualified |
| F | mg/kg | <10 | 0.2 | Qualified |
| Penicillin | mg/kg | < 2.0 | No (<1x10 ⁻⁵) | Qualified |
| Aureomycin | mg/kg | -- | No (<1x10 ⁻⁵) | Qualified |
| Tetracgcline | mg/kg | -- | No (<1x10 ⁻⁵) | Qualified |
| Terramgcin | mg/kg | -- | No (<1x10 ⁻⁵) | Qualified |

Test unit: Chinese Land Reclamation North Food Monitor Center


3. Conclusion and Discussion

3.1 The past eight years, research and practice proved that the EM technology advanced by the

International Research and Development Center of Japanese Natural Farming is effectual on the production and exploitation of the non-pollution agriculture and animal products. It also display active contribution to the sustainable, development of agriculture production and the environmental protection.

3.2 It is only under the conditions of the combination of EM with lots of organic manure, i.e. stalk and dung, etc. on the application of planting industry that the EM can fully display its effect to increase the yield, resist disease and raise the quality of products. Under definite conditions, Em bacterial agent also has certain preventive effects to some pests of crops but EM bacterial agent itself is not fertilizer or pesticide so we can't regard EM bacterial agent instead of fertilizer or pesticide.

3.3 EM bacterial agent has its particular actions on the application of raising industry, such as, to remove the offensive smell and flies, cleanup the environment, reduce the animal disease and increase the yield and effect, etc. However, its effect has close relation to its applied technology level. Therefore, we must strengthen the skill training, grasp the operative technique seriously, then its actions may be fully display.



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