



Biofertilizer Group Newsletter

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2002 FNCA Workshop on Biofertilizer, 20-23 August, 2002, Beijing, China

Sponsor by : The Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT)

China Atomic Energy Authority (CAEA)

Local organizer: Institute for Application of Atomic Energy, Chinese Academy of Agricultural Sciences (CAAS)

Secretariat: Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan

Japan Atomic Industrial Forum (JAIF) as the secretariat.

The workshop was attended by project leaders of biofertilizer from each of participating countries, i.e. Indonesia, Korea, Malaysia, the Philippines, Thailand and Vietnam. Six participants from Japan, four participants and one invited speaker from China attended the workshop. Eight country reports describing the current status of biofertilizers, such as rhizobia, mycorrhiza, associative nitrogen fixing bacteria and phosphate solubilizing microorganisms in each country and one invited paper from China were presented. Also, four selected topics were presented by Japanese experts. At this workshop, topics of 2002 were reviewed and the plans for 2003 were discussed.

In order to enhance the use of biofertilizers, a manual for biofertilizers was proposed to published during the project period: Vietnam: Chief editor; Japan: General methodology; Vietnam: Rhizobia; Korea, Vietnam: Quality control; Malaysia and Thailand: Mycorrhiza; China, the Philippines and Indonesia: Associative nitrogen fixing bacteria; Korea: Phosphate solubilizing microorganisms. The manual will be published during the project period.

Biofertilizer web-site will be constructed in the FNCA web-site, which includes mailing list and workshop information such as country reports, invited lecture and topics.

It was decided to separate the FNCA Workshop on Biofertilizer from the FNCA Workshop on Mutation Breeding. The next Biofertilizer Workshop will be held in Vietnam.

The Biofertilizer group made technical visit to the Institute for Application of Atomic Energy, Chinese Academy of Agricultural Sciences (CAAS). The participants appreciated the efforts and guidance of the staff of hosting laboratory.

It was agreed that the Philippines would host the 2003 FNCA Mutation Breeding Workshop and Vietnam the 2003 FNCA Biofertilizer Workshop. All participants appreciated the candidature of Malaysia as the venue for the 2004 Mutation Breeding Workshop.

Achievements of 2002 on Selection of Effective Microorganisms

(1) Evaluation by tracer technique and other methods

Nitrogen fixation activity and P absorption activity can be most reliably evaluated by ^{15}N and ^{32}P tracer technique. For field evaluation of leguminous crops, ^{15}N natural abundance method, relative ureide method, and N-difference method may be useful.

(2) Environmental adaptability with the crops

Inoculant with the target crops should be adapted for the environmental conditions in various regions. Selection of inoculant from indigenous microorganisms may be more adaptable than foreign inoculants.

(3) Compatibility with the crops

Inoculant of biofertilizer should be compatible with the target crops. It is necessary to evaluate the compatibility with various varieties and cultivars.

(4) Identification of effective microorganisms

Identification of effective microorganisms should be carried out based on phenotypic characterization and/or 16S RNA sequencing.

(5) Use of non-nodulating plant mutants

The use of non-nodulating mutants of leguminous crop is useful as a reference plants of N-difference method, ^{15}N dilution technique and ^{15}N natural abundance method. Non-nodulating mutant of soybean is available and the other legumes can be obtained by radiation breeding or chemical mutagens.

(6) Competition between inoculated and indigenous microorganisms

In the field where the indigenous strains of the inoculating microorganisms are present, an appropriate inoculation method should be taken to overcome the problem of the "competition".

Profile of Project Leaders of China, Indonesia and Philippines

(Profile of Project Leader of each Country is/will be described briefly in this issue and later ones)



Dr. Pan Jiarong

Soil Scientist of Plant Nutrition

Project Leader of China

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Projects (as Chief Scientific Investigator)

1. Modeling of CERES Crop Models for Nitrogen Management;
2. The Use of Nuclear Techniques to Study the Use Efficiency and Uptake Efficiency of Ammonium Bicarbonate;
3. The Use of Nuclear and Related Techniques to Optimize the management of Nitrogen Fertilizer,

Straw and Water for Aerobic rice/Wheat Rotation at Southwest China;

4. Associative Nitrogen Fixation in Rice and wheat/Biofertilizer application;
5. Restoration of Soil Fertility and Sustenance of Agricultural Productivity
6. Assessment of Transgenic Products;
7. Methods of Analysis, Detect and Control of Food Safety.

Bio-fertilizer Related works

Since 1977 when A-15, a strains of associative nitrogen fixing bacteria, *Alcaligenes faecalis*, was isolated from rhizosphere of rice roots, its physiological characteristics and evaluation of its biological nitrogen fixation/mechanism have been studied for two dozens of years. It showed that A-15

- (1) Can not only be adsorbed on root surface, but also enter into rice roots and live there;
- (2) Can exude ammonium which could utilized by rice, 1/3 nitrogen fixed utilization by rice during a course of 69 h;
- (3) Exude plant regulator, such as IAA and GA3, to promote the growth of rice;
- (4) Contains nitrate reductase and increase the uptake of nitrogen by rice roots;
- (5) Increase the uptake of nutrients by rice roots

On the basis of better understanding of interaction between plants and A15, genes (Nitrogen fixation genes and their regulation genes) were cloned and genetically-modified strain, A1514 was obtained. A compound bio-fertilizer, “Shenli” Bio-fertilizer, with A1514 as key strain was manufactured, which is the first transgenic nitrogen fixation bio-fertilizer for plant use. Since 1995, it has been put into industrialization, at a scale of about 20,000 tons annually.

Biofertilizer Team:

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Bio-fertilizer Related works

1983-1989, Biological Nitrogen Fixation of soybean mutant lines in collaboration with Plant Mutation Breeding Research Group using isotope (^{15}N) and related technique.

1990-1993, Collaboration Program on Biological Nitrogen Fixation of soybean in acid soil under EEC program with Wageningen Agricultural University and Research Center for Biotechnology, Indonesian Institute for Science.

1999- IAEA TC Project INS 5/028 on Biotechnology of *Azospirillum* with Research Center for Biotechnology on *Azospirillum* in Maize.

Selection of mixed inoculants in several maize hybrids, the use of *Azolla* and *Sesbania* in lowland rice, and *Glycirdia* in cropping pattern (rice-soybean-maize) in upland condition

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Mr. Sudono Slamet

Some laboratory and field technicians

Scientists from Assessment Institute for Agricultural Technology, Lampung Province

Sembawa Research. Institute, Rubber Research Center, South Sumatera.



MS. CRISPINA MAIQUEZROSALES

Senior Science Research Specialist on Use of Nuclear Techniques in Soil Fertility and Plant Nutrition

Project Leader of the Philippines

Philippine Nuclear Research Institute (PNRI)

Diliman, Quezon City, Philippines

Projects (as Chief Scientific Investigator)

1. Isotope-aided Micronutrient Studies on Rice Production with Special Reference to Zinc Deficiency
2. Biological Nitrogen Fixation in Food Legumes
3. The Use of Nuclear Techniques in Assessing Nitrogen Efficiency in Irrigated Rice Cropping
4. Quantification of Biological Nitrogen Fixation Under Environmental Stress
5. The Use of Nuclear Techniques for the Promotion of the Agroforestry Systems
6. Restoration of Soil Fertility and Sustenance of Agricultural Productivity
7. Bio-fertilizer Production and Application

Highlights of Project 2002 – Research work on Bio N

Bio N is a nitrogen fixing inoculant for rice. It is an effective and cheap source of nitrogen as claimed by the researchers who discovered the said bacteria. Thus, a field experiment was conducted in Dalwangan, Bukidnon to determine the efficiency of N uptake from inorganic fertilizer and BIO N inoculant using ^{15}N .

Initial results from samples collected at between panicle initiation and flowering stage growth of rice indicates that higher fertilizer N yield and Fertilizer N Use Efficiency (FUE) for treatments with half recommended rate plus BIO N inoculant. This assessment is not final yet since the results of laboratory analyses of samples collected at maturity growth of rice is still in progress.

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