

Annex 3. Summary of Session 1 Country Report

Summary of Session 1 Country Report FNCA 2014 Workshop on Biofertilizer Project

Eight countries reported progress and research summaries for 2012-2014 respectively. The summaries of reports are as follows:

China (Dr. Fan Bingquan, CAAS)

Inoculation of P-solubilizing fungi with insoluble $\text{Ca}_3(\text{PO}_4)_2$ and rock phosphate were evaluated and obtained a higher biomass and a significant increase than that of applying water soluble phosphorus. Comparison of new P-solubilizing fungi on plant growth with and without chemical fertilizers was conducted. The data obtained on plant biomass of peanut and sunflower were influenced by the inoculation of the organisms in combination with chemical fertilizers. The effects of antagonistic and P-solubilizing strains on peanut and sunflower were evaluated and results showed that a couple of strains could increase peanut yield by 22-26% over control, and increased the sunflower yield by more than 18%. The effect of oligochitosan combined with P-solubilizing fungi on garlic biomass exhibited an increase in the the garlic biomass than control plants by 10-20%.

The research of irradiation sterilization of carriers for good quality biofertilizer production showed that the lower dose of electron beam such as 5 kGy to 20 kGy was not enough to kill all indigenous microbes in the carriers.

Indonesia (Dr. Iswandi Anas, Bogor University)

In the development of multifunctional biofertilizer, we focused our study on isolation and selection of phosphates solubilizing microbes, based on their ability to dissolve insoluble phosphate i.e. $\text{Ca}_3(\text{PO}_4)_2$, $\text{Al}(\text{PO}_4)$, and Phosphate Rock. The isolates will be further evaluated for their ability to solubilize insoluble potassium such as feldspar or mica (2014-2015). Application of radiation sterilization of carriers for production better quality commercial biofertilizer of *Azospirillum*, *Azotobacter* and phosphate solubilizing microbes showed that Gamma irradiation by Co-60 gave the best survival of microbes in different carriers. Synergistic effect of biofertilizer with irradiated oligochitosan increased yield of rice and increase plant resistancy to anthracnose disease. Oligochitosan and biofertilizer were able to reduce NPK fertilizer.

Japan (Dr. Shotaro Ando, JIRCAS)

Antibiotic-resistant mutant was developed to trace inoculated strain of *Bacillus* biofertilizer to paddy rice. Inoculation effects of vegetative cell and endospore were compared and advantage of endospore was confirmed. Entomopathogenic fungi are important agents for the biological control of insect pests. Mutagenesis using ion beams or gamma rays was used to generate thermotolerant mutants and mutants with enhanced

resistance to the fungicide benomyl.

Malaysia (Dr. Khairuddin Bin Abdul Rahim, Nuclear Malaysia)

In 2014, Ministry of Science, Technology and Innovation, Malaysia (MOSTI) announced this year as “Commercialization Year” to promote commercialization research output. With the support from MOSTI, Malaysian Nuclear Agency (Nuclear Malaysia) received two ScienceFund grants for biofertilizer projects in 2007 and 2011 for research and development of biofertilizer products. Nuclear Malaysia has developed a series of multifunctional bioorganic fertilizers from these grants, which include two multifunctional bioorganic fertilizers namely, MULTIFUNCTIONAL BIOFERT PG & PA, a pellet bioorganic fertilizer as MF-BIOPELLET and a liquid fertilizer as BIOLIQUIFERT, in an effort to reduce dependency on chemical fertilizer for crop production. Nuclear Malaysia had demo effectiveness of biofertilizer in paddy rice field trials at MADA, Kedah and Perlis in year 2013 and 2014. This effort is to promote biofertilizer to the farmer through R & D. Combination biofertilizer with liquid smoke and oligochitosan had good yield for paddy rice. Gamma irradiation for carrier sterilization was used to produce high quality biofertilizers. Gamma irradiation carrier showed better shelf life for biofertilizer inoculants compared to autoclave carrier. Future plan for biofertilizer project are mutagenesis biofertilizer inoculants to improve their multifunctional activities through gamma irradiation and investigation combination treatment (biofertilizer + liquid smoke and oligochitosan) for paddy rice in field trial..

Mongolia (Dr. Delgermaa Bongosuren, PSARI)

The biofertilizer project in Mongolia is continuous work were developed multi-functional Biofertilizer, they are N-fixing *Azospirillum* and *Azotobacter*, P-solubilizing *Azoarcus* sp microbial strain and their combination Rhizobacterial biofertilizer. Biofertilizer produced by using beneficial microorganisms have a positive economic impact in terms of nitrogen fertilizer saving and increasing the crop yield. At present new varieties of wheat and potatoes are being used by farmers. The need for generating more data on the response of *biofertilizer* to new varieties are very essential to convince more farmers on the *Rhizobacterial biofertilizer* usage. 4.5 tons of biofertilizer is produced and distributed to farmers in 2014.

The result have has with 100 ppm of oligochitosan applied to leaves at every 2 weeks a reduction of tomato yield under a *Fusarium* contaminated soil, were positive for disease resistance and high yield.

The Philippines (Ms. Juliet A. Anarna, UPLB)

Azospirillum, with a registered brand name of *Bio N* which has been shown to increase the income of the farmers by increasing yield of rice and corn by eleven percent (11%) and reduced on its chemical usage by 30 to 50%..

An alternative means of sterilization process has been used, by gamma irradiation sterilization at 20Kgy dosage and found its sterile and also has longer lifespan/storage. The

establishments of mixing plants is one of the strategies in commercial application of biofertilizer because they served as sales and distributing centers. The synergy effect between *Bio N* and irradiated oligochitosan were evaluated under greenhouse and field condition and data revealed that based on yield the combination of Bio N + oligochitosan + ½ chemical Nitrogen fertilizer had the highest yield of 2.5 g in 100 grains under greenhouse and 17.67 kg under field condition., Continuous research, development, and improvement of the technology was conducted to offer and expand the application of biofertilizer to the end user.

Thailand (Dr. Phatchayaphon Meunchang, DOA)

In Thailand, on 2014 the biofertilizer has continue develop and extension. Rhizobium, PGPRs, Phosphate solubilizing biofertilizer, AM-mycorrhiza had been produced and sale to farmers. We found gamma radiation 25 kGy improved survival of *Azospirillum* kept in room temperature for 240 days while non-sterile and autoclave 121 C for 1 hour treatments were not survival after 30 and 90 days respectively. The multifunctional of biofertilizer and oligo-chotosan was synergic effect on yield and nitrogen uptake in rice. For effect of oligochitosan and biofertilizer to suppress the *Fusarium* in rice did not clear.

Vietnam (Dr. Pham Van Toan, MARD)

In 2014 Vietnam continued the research of multi-functional biofertilizer for sandy soil containing N-fixing, P-solubilizing, Cilicate solubilizing and polysaccharid producing microbes and tested on growth, yield of peanut fertilized with full recommended NPK and reduced NPK of 10, 20 and 30% recommended doses. The results showed that in sandy soil biofertilizer can replace 10% of recommended NPK without changing the growth, yield of peanut and also improve the fertility of sandy soil, inspecially the soil moisture.

Field experiment to evaluating the synergy effect of oligochitosan and biofertilizer on growth, yield of tomato and cabbage showed, that oligochitosan and biofertilizer have the synergy effect on growth of tested crops. Application of biofertilizer and oligochitosan increased the yield of 16,03% by tomato and 19,6% by cabbage. The disease control effect was not cleary to see, caused by low disease occurence in the field.